Charles Sanders Peirce Papers
MS Am 1632 (339)
Logic notebook, CSP 339

When editing of Peirce's papers was begun, this manuscript was largely out of proper sequence and was scattered among several files. During editing an attempt was made to arrange the papers in proper sequence, and following that attempt page numbers were assigned to each part. These numbers appear as lightly penciled marks on the upper right corner of each recto.

Subsequent to the above arrangement, some pages were further rearranged in what was believed to be an improved sequence. In so doing, however, no changes were made in the above assigned numbers. The microfilm produced in 1964 reproduced the pages in this order. A check list of the contents of this manuscript was prepared in August 1961 by Don D. Roberts. This check list follows this document. Within it are indicated some of the sequential changes made prior to microfilming.

Prior to digital photography in 2010, the manuscript was collated against the corrected sequence provided in the checklist. Where the foliation needed to be changed, this was done by lightly striking through the first foliation, and writing the new foliation below it.

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January 2010

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The rearrangement of pages indicated in black ink was effected 8/2/62. Don D Roberts

C. S. PEIRCE'S "LOGIC NOTEBOOK" AS ASSEMBLED BY DON D. ROBERTS 8/10/61

1r LOGIC
1v blank
2r Miscellaneous Observations / 12 Nov. 1865.... 12 Nov. 1865.... Nov. 14....
Nov. 14.... is
2v reduced.... Nov 14.... Nov. 14.... space
3r Nov 15/ A fallacy.... Nov 15.... say?
3v Scepticism.... Dec 13.... Dec 13.... proof
4r in.... this
4v conception.... justified
5r Dec 14. / Hegel.... Dec 15.... subordinate super-
5v ordinate.... intersection
6r But.... <u>being</u>.
6v In.... <u>copy</u>
7r (1) Would be.... contra-
7v dicted.... A
8r U.... Dec 20.... term
8v of both.... connotative.
9r The same.... no limi-
9v tative.... hence
10r but.... 1866 March.... conflict
10v March / Two.... destroyed
11r 1 A term.... disquiparants
11v 1866 October 25 / Boole.... Nov. 20.... Nov. 20.... <u>fact</u>
12r Nov. 23 / All.... proposition.
12v blank
13r 1866 Dec 6 / Remarks.... <u>ideas</u>
13v do.... spirit.
14r 1866 Dec 8. / In.... quantity &
14v quality.... negative.
15r 4th.... again
15v result.... of
16r major.... last.
16v blank
17r 1867 March 23 / I.... but
17v that.... stand.
18r Whatever.... what?
18v Only.... vague.
19r 1867 March 25 / Here.... <u>that</u>.
19v We.... predicate.
20r Then.... 1867 April 1.... parts.
20v April 12 / The.... M
21r S is P.... P
21v S S' S".... <u>M</u>
22r All M.... Fig 2
22v Mis P.... S is M

23r Any M.... is M
23v April 13. / S S' S".... S S' S".
24r Whatever.... in P
24v Now.... Attr.
25r Whatever.... exist
25v The combined.... probable (date in middle of page) April 14
26r Negatives & Particulars.... non-A
26v Whatever.... induction

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27r Induction.... follows]
27v S S' S"..... P.

28r Some S S' S"..... &c.
28v (in pencil) Apr 15 / Every.... (in ink) Apr. 16.... P
29r M is P.... P
29v May 20 / Any.... all)
30r 1867 September 24.... shadow
30v of.... pre-
31r liminary.... which
31v 1867 Sep 26.... consequences.--
32r 1867 Sep 27.... here
32v such.... nothing.
33r Sep. 28 / To.... predicate.
33v To.... cases.
34r On Logical Extension and Comprehension.... comprehensive
34v blank
35r than.... essential
35v extension.... terms.
36r Oct 2. / There.... an ex-
36v All M.... subject
37r tension.... P
37v blank
38r Ah I think I have it now.... extension.
38v blank
39r We may.... existence
39v blank
40r Oct 2. / §2. Of the Effect of a Change of Information.... not P
40v blank
41r 1867 Nov. 24.... representation
41v blank
42r 1867 Dec. 7.... Very true.
42v blank

43r When.... object. (All in pencil)
43v blank

44r and.... points.
44v Our.... that is if (followed by three lines of formulas)
45r We may.... nothing
45v It would.... $\overline{\overline{\ }}\ l_n$, x
46r In short... . over
46v or still.... analoguous (CSP here corrected "analogue" to "analogous")
47r For example.... something.
47v I see.... $\overline{\overline{\ }}$ 0
48r Syllogism.... $\overline{\overline{\ }}$ 0
48v Return.... This will never never do --
49r $A_1 \overline{\overline{\ }} B_{1\ell}$ (followed by five lines of formulas)
49v $a_1 \overline{\overline{\ }}$ a (followed by eight lines of formulas plus others to the side)

50r 1868 Nov. 3.... Turn over.
50v l_x denotes.... (various formulas)
51r l_x denotes.... $\overline{\overline{\ }}\ 1 - (l_x +, l_y)$
51v 1868 Nov. 8....(various formulas)

44r,v = 51A
45r,v = 51B
a5r,v ——— a5r,v = 51C

Only this instance is the number 1.
Otherwise, l.

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52r When we take relation.... (followed by formulas)
52v Nov. 9. / A.... (16 lines of formulas)
53r $l(a,b) \doteq$ .... except zero
53v Now if.... (formulas)
54r $\therefore$ V, $eV \doteq 0$ .... [1]
54v (9) Hence.... (formulas)
55r Nov. 10. / I think.... to some one x.
55v Then.... else is.
56r Any term.... (last line is numbered 19)
56v From.... might be written l_{ℓ}
57r We have also.... (10 lines of formulas)
57v If.... anything not ∞
58r Let.... (formulas).... over
58v Let.... (followed by 18 lines of formulas)
59r $(x + \Delta x)^n \doteq (1 + \Delta)^n x$ .... (formulas)
59v Now if this is all right.... (formulas)
60r Now.... (formulas)
60v Nov. 11. / Then.... For
61r However.... over
61v (first line numbered 1).... This hardly follows
62r so that.... for the present.
62v Nov 12. / If.... (formulas etc.)
63r In arithmetic.... But this is not so here
63v This.... not a
64r $a, b \doteq 0$.... (formulas etc.)
64v $1 - x$ .... (formulas)
65r (formulas).... (next to last line:) This n must be zero.
65v Nov. 15.... Caucasian
66r $a \doteq 1^b$ .... (interpreted formulas in the logic of relatives)
66v Then if.... (formulas)
67r Every man.... (formulas)
67v blank
68r 1869 Oct. 6.... (formulas)
68v blank
69r Hence.... $x, \bar{n} \doteq 0$
69v blank
70r Oct 6. / Example.... are given
70v blank
71r Let us.... when
71v blank
72r When A = 1 .... contradict it.
72v Oct 15 / If.... (formulas)
73r Eureka .... (formulas)
73v blank
74r 1880 Nov. 6.... moods etc.
74v blank
75r On Chapter II.... = V
75v blank
76r Then we have.... (formulas)
76v (One formula in middle of page)
77r In short.... is x.
77v Same thing.... (three lines only)
78r Then.... Cayley's proposal
78v blank
79r But if.... not -v.
79v blank

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80r Composition of Relatives.... (formulas)
80v blank
81r 1891 Feb 24....(whole page crossed out by CSP)
81v (scattered formulas)
82r Right to .... (derivation of principles of algebra of copula)
82v blank
83r 1891 Feb 24.... (formulas)
83v (formulas)
84r $(a^b)^c = a^{bc}$ .... (formulas)
84v blank
85r An Unscientific Grammar.... found.
85v blank
86r 1894 July 20.... under A ⊤ B
86v blank
87r And one.... fenced off --
87v blank
88r Let us consider.... form?
88v blank

89r The relation is to have as aggregants... (formulas)
89v blank
90r (formulas)....Suppose.... Can we also have.... If there is an M such that....(etc.)
90v blank
91r blank
91v (formulas from middle of page on; some use of Pi and Sigma as quantifiers)
92r If I had any form of relation such that.... (formulas)
92v blank
93r This leads us to notice that.... (formulas)
93v (4 lines of formulas)
94r Then.... But in a universe .... (formulas)
94v blank
95r (formulas).... Ha! Hah!.... But it is an (argument ?)
95v 4 lines of formulas
96r (formulas, but end of first line:) A loves everything B loves....
96v blank
97r (8 lines of formulas concerning the relative "loves")
97v blank
98r There Fact of relation T
98v to 101v: blank

102r 1898 June 9 / Existential Graphs.... calls up.
102v blank
103r We "pretend".... It is
103v blank
104r 1898 June 9 / Existential Graphs.... 3.
104v blank
105r 1898 June 9 / Existential Graphs.... individual.
105v blank
106r 1898 June 10 / Existential Graphs.... genuine triadic fact.
106v blank
107r 1898 June 10 / Existential Graphs.... make the reader see that
107v blank
108r 1898 June 11 / Existential Graphs.... object determined
108v (has only the two words:) Degenerescent, Perdegenerate
a 14r - 108A

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109r in respect.... An
109v blank
110r argument.... 1898 June 14.... with Y.
110v blank
111r Questions.... another.
111v blank
112r Basic Formal Rules.... (in margin:) Replaced two pages on.... connections
112v The fact.... rules. (dated) 1898 June 15
113r Theorems / Notation .... (formulas)
113v blank
114r 1898 June 15 / Basic Formal Rules. . . . written
114v blank
115r Theorems./ Notation .... Q.E.D.
115v blank
116r XV If an.... ovals.
116v blank
117r XVII. Any evenly.... written.
117v (one graph with algebraic interpretation)
118r XX Any graph.... outside.
118v blank
119r XXIII. An evenly.... by XIV
119v 1903 June 9: Theorem XXVI may be extended as follows: (this a later note by CSP) ....(formulas)
120r XXV. A heavy.... (formulas)
120v (Two lines only) This is wrong.... It is correct.
121r Scholium This proof.... (formulas etc.)
121v blank
122r 1898 June 18. / The basic.... etc.
122v blank
123r XIV. A graph.... etc.
123v blank
124r XV. If any.... first.
124v blank
125r 1898 June 19. / The Dozen Basic Formal Rules.... indifferent.
125v (scribbling)
126r 1898 June 20.... erased.
126v (in black at top) always.... (in blue) I. Any.... before (pencil notes at bottom)
127r 1898 Aug 4 .... be written
127v It is.... developed.
128r 1898 Aug 4 .... We now come to.... loved --
128v blank
129r continued.... Turn over
129v (graphs and interpretation)
130r Continued.... (graphs etc.)
130v blank
131r No 5 Given.... (graphs etc.)
131v blank

132r 1898 Aug 5.... description
132v blank
133r But.... description
133v blank
134r (graph)
134v blank
135r (graph, like that of 134r, but there are two cuts added to this one)
135v blank

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136r (two graphs at top, in red and blue).... first.
136v blank
a13r,v =136A
137r (three graphs, etc.)
137v blank
138r (one graph)
138v blank
139r 1898 Aug 6 / The whole numbers.... (graphs etc.)
139v blank
140r 1898 Aug 8.... the Bs.
140v blank
141r 1898 Aug 9. / The Multitudes.... mode of
141v blank
142r 1898 Aug 9 (in corner; then) ordered pairing.... numbers.
142v blank
143r Every.... long.
143v blank
144r as x .... continuous.
144v blank
145r 1898 Sep 29 / I am convinced.... (Under III) Objective Logic.
145v blank
146r 1898 Sep 29. / Logical Analysis of the Properties of Time.... thus: (Compare Harv. Coop booklet in IA 1, which may be part of the interim notebook CSP mentions below on page dated 10/25/06 -- The booklet is titled "Analysis of T I M E")
146v blank
147r (under card signs) If we compare.... property.)
147v blank
148r 1898 Sep 30 / Logical Analysis of the Properties of Time.... duration
148v blank
149r 5th, ... time is the em-
149v blank
150r bodiment.... themselves.
150v blank
151r 1898 Oct 1. / I am writing.... (here the French writing begins).... recherches.
151v blank
152r D'abord.... métaphysique.
152v blank
153r 1898 Oct 2.... un effort.
153v blank
154r Art. 2 Dans.... de la
154v blank
155r distinction.... nous
155v blank
156r apercevoir.... l'application
156v blank
157r utile.... ils ne
157v blank
158r tout-à-fait.... résultats
158v blank
159r des investigations.... questions.
159v blank
160r Art. 4. La logique.... d'être.
160v blank
161r 1898 Oct 3 / Maintenant.... que
161v blank
162r quand.... rien.
162v blank

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163r La mode.... 1898 Oct 4.... percept....(three lines at bottom crossed out)
163v blank
164r (1st 8 lines crossed out, then:) 3rd Les Objets.... fommes
164v blank
165r contraints ~~(?)~~ par.... est
165v blank
166r vrai;.... gratuite.
166v blank
167r 1899 Apr 7 / The Place of Logic among the Sciences.... knowledge
167v blank
168r is of.... philosophy.
168v blank
169r But.... 1899 Apr 10.... sciences.
169v blank
170r 1899 Aug 16 / Geometry of the Circle.... of
170v blank
171r the collections.... the
171v (small bit on secundals)
172r relate.... irrational units.
172v blank
173r 1899 Aug 17.... existential. ("A continuum is...")
173v blank
174r 1899 August 17.... affinity.
174v Better.... necessary
175r 1900 Nov 27 / The Fermatian.... Q.E.D.
175v (5 lines crossed out, then:) If.... has it
176r 1900 Nov 28 / To justify the Fermatian inference.... r to B
176v blank
177r 1900 Dec 11 / A New System of Graphs.... (formulas) 177 = 181A
177v (few formulas)
178r 1900 Dec 11 / A New Logical Algebra.... (CSP used the hand sign ☞ for illative transformation).... (formulas)
178v blank
179r 1900 Dec 11 / (Corner torn, all that is left of title -- which may be presumed same as 178r, is:) Logical Algebra.... III. If
179v (graphs and formulas)
180r 1900 D (rest of date missing, corner torn off; but must be Dec 11).... A New Logical Algebra.... (Prin. VIII last one listed, last words torn off with corner or page)
180v (Graphs and formulas)
181r 1900 Dec 11. A New Logical Algebra....(sheet ends with formulas)
181v blank
182r 1900 Dec 11.... (formulas)
182v (scattered formulas)
183r Moods of two term props are.... (formulas)
183v blank
184r 1901 Jan 12 / The following was communicated some time ago to Mrs Franklin.... (formulas)
184v blank
185r 1901 Jan 13.... confusion.
185v blank
186r Why.... (formulas)
186v (formulas)
187r (interpreted formulas)
187v 13. Albert further says.... Ed Bridges II p 81 (This a continuation of 188r)
188r 1901 Jan 14 / 1 Logic may be defined.... 12 Albert says .... notum.
188v 23 Raymund Lully gives various definitions.... terminus

178-181 Precede 177 [8/64,208]

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189r "argumentatio".... 53 Catharticon Intellectus.
189v 72.... Logic 20. (Continued from 190r)
190r 54 Sanderson.... proof.
190v blank
191r Division of Logic.... Synthetic (under "Alexander")
191v (formulas etc.)
192r 1901 March 23.... events.
192v Suppose.... (formulas)
193r (formulas cover entire side)
193v (formulas on probability)
194r (6 lines of formulas etc.)
194v 1901 Sep 10 / On the opposite page I am making a table of possibly proposed ultimate goods.... Outward fact
195r 1901 Sep 8.... (Here is the table of 28 circles)
195v blank
196r 1901 Oct 12 / If my present view.... distinction
196v (formulas, making use of quantifiers)
197r 1901 Oct 13 / The arithmetic of multitude.... (formulas)
197v blank
198r 1901 Dec 10 / To prove that.... (18 lines of formulas, and note:) The first is the better.
198v To prove that.... (formulas)
199r 1901 Dec 10 / To prove that....(formulas, with last 8 lines crossed out)
199v (9 lines of formulas)
200r Dec 10 1901 / Now to prove.... (formulas) (Here CSP begins to stamp the date)
200v Dec 16 1901 / Follows last page.... turn over
201r Dec 10 1901 / Algebra of the Copula.... Dec 16 1901.... then q
201v Dec 16 1901 / Start again.... (formulas)
202r Dec 16 1901 / From B and C alone.... From A, B and C
202v Dec 16 1901 / Start again.... then t
203r From A and B alone.... (formulas 14-32)
203v I am.... (formulas)
204r Dec 16 1901 / From A, B, C .... formulae
204v blank
205r Dec 16 1901 / That.... (formulas)
205v The ultimate.... (formulas)
206r Dec 19 1901 / The algebra.... (formulas)
206v Dec 19 1901 / A consequence.... (formulas)
207r Dec 19 1901.... (formulas)
207v (formulas).... consequent of T.
208r Dec 19 1901 (stamped twice).... (last 10 lines crossed out)
208v (formulas)
209r 1902 Jan 31 / I record here the "tedious" proof of the distributive principle which I omitted Am. J. Math. III. 33....(formulas)
209v blank
210r Mar 19 1902 / A general.... to a Q
210v I.... tried.
211r Mar 20 1902 / The analytic.... definitum
211v blank
212r Mar 20 1902 / Now.... Mar 21 1902 / The form.... the
212v blank
213r same.... world
213v blank
214r is not.... different.
214v blank
215r Take.... from
215v blank
216r other.... Mar 23 1902.... are
216v blank

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217r collections.... Existence.
217v blank
218r Let.... beads.
218v Every.... subject.
219r Mar 24 1902 / Theory of Collections.... one.
219v And.... distinguished.
a6 r,v =219A
220r Suppose A.... defined.
220v (graphs).... If.... excepted.
221r The doctrine of substantive possibility laid down in my article of Jan 1897 is certainly correct.... (page ends with formulas) (See G-1896-6(b)
a11 r,v
221v (graphs)
a12 r,v = 221A 221B
222r Jul 22 1902 / The business of collections enters into mathematics. It is represented in the theory of substantive possibility, and this flows from Categoric. Therefore the doctrine of the categories must precede mathematics.... flavor.
222v blank
223r Let.... to C
223v blank
224r Let is [sic] take.... two
a1 r,v =225A
224v blank
225r as one.... (formulas)
a2 r,v
225v The next.... an a.
a4 r,v =225D 225B
226r To say.... (formulas)
226v blank
227r We.... paired
a3 r,v = 225C
227v blank
228r Aug 10 1902 / This seems.... exist.
228v blank
229r Given.... (last line crossed out)
229v blank
230r Aug 10 1902 / Let us call.... and to i
230v blank
231r Aug 16 1902 / Εὕρηκα .... (formulas ending with b)
231v blank
232r Sep 8 1902 / A collection.... Bs
232v (secundals)
233r 1902 Nov 21 / In topical geometry.... (secundals)
233v blank
234r 1902 Nov 22.... As
234v blank
235r 1902 Nov 26.... is Y
235v (graphs)
236r 1903 June 11.... (graphs)
236v (graphs)
237r 1903 June 27 / There are 8 possible systems of Existential Graphs, as follows: (only one is discussed).... (graphs)
237v blank
238r 1903 June 29 / The great défaut of my graphs (and of course of my logical algebras) is this.... (graphs)
238v blank
239r 1903 July 10 / Endless Nests of Seps.... (graphs and formulas)
239v B.... urged upon reason
240r 1904 Aug 7 / The distinction.... Sign
240v 1904 Aug 13.... an Existent.... (some figures at bottom of page)
241r blank
241v (in brown) Improved.... (in black) Primity
242r 1905 June 1.... over
242v Grade.... Abstraction
243r Tertiality.... Tertiality
a10 r,v = 243A
243v blank

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244r 1905 June 2. 4¼ A.M.... together.
244v (three words:) How is that?
245r 1905 June 2 4:50 AM.... externisensation.
245v blank
246r 1905 June 2 8:45 PM.... Third.
246v blank
247r 1905 July 7.... Tertian
247v blank
248r 1905 July 8.... 1905 Oct 8 (at bottom of page).... force
248v blank
249r 1905 Sep 20.... unlike
249v blank
250r and.... not.
250v blank
251r 1905 Oct 8 / I jot down a few things relating to Phanerology.... by
251v blank
252r 1905 Oct 8 Continued.... Argument.
252v blank
253r 1905 Oct 8 3rd page
253v blank
254r 1905 Oct 9.... mind.
254v blank
255r 1905 Oct 9 continued
255v blank
256r 1905 Oct 10
256v blank
257r b. According.... Symbol. (in middle of page) 1905 Oct 12
257v There.... signs.
258r 1905 Oct 12 continued.... Significative.
258v blank
259r 1905 Oct 12 continued.... Transactive
259v blank
260r 1905 Oct 12 continued / The immediate.... termed Significative
260v blank
261r 1905 Oct 12 continued.... (drawing in margin).... In itself
261v blank
262r 1905 Oct 13.... Interpretant
262v blank
263r 1905 Oct 30.... object.
263v blank
264r 1905 Dec 14 / In existential graphs on the sheet we erase what we like that is to say we erase depth.... fact.
264v How.... perfect
265r 1905 Dec 14 / continued.... ideal world.
265v (CSP subtracts 30 from 73)
266r 1905 Dec 15 / 1:15 PM / At 5:30 this morning, as I was standing back to the heater.... (on graphs).... 1905 Dec 20.... and so on.
266v blank
267r 1905 Dec 20.... permit. (Science has 3 meanings)
267v I. Introduction:.... But
268r 1905 Dec 20 continued 2.... their issue.
268v The.... intellectual.
269r 1905 Dec 20 continued 3 .... III. Normative Science.
269v blank
270r 1905 Dec 21.... thought.
270v blank

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271r 1906 Jan 30.... over
271v blank
272r 1906 Jan 30 Continued from last page.... sign.
272v blank
273r 1906 Mar 7.... (graphs)
273v blank
274r 1906 Mar 9.... warranted.
274v (10 numbers occur here; they belong to the classification of 275r)
275r Provisional Classification of signs / 1906 March 31.... Triadic ??
275v The.... identification
276r 1906 April 2.... place (Notes on my Provisional Classification of Signs)
276v blank
277r 1906 Apr 2 continued.... new
277v blank
278r A sign.... legs.
278v (2 short of lines of formulas, bottom of page)
279r 1906 April 3.... thus
279v blank
280r not.... characters.
280v blank
281r The second.... coexist.
281v blank
282r 1906 April 4 / Father's birth day.... experiment
282v blank
283r 1906 Aug 30.... ideals.
283v blank
284r 1906 Aug 30 continued.... Relative
284v blank
285r PROVISIONAL DIVISION OF SIGNS. 1906 Aug 31.... Form.
285v blank
286r 1906 Sep 5.... Eventual Interp.
286v blank
287r 1906 Oct 21.... Triadic.
287v blank
288r 1906 Oct 23.... Turn Over
288v blank
289r The Final Interpretant.... 1906 Oct 25.... account.
289v Arranging.... kinds
290r 1906 Oct 25.... 1908 Aug 18 / This book having been misl~~a~~d for a good many ai/ months, I have written some things in others. As in a book 8½ X 7 inches 5/8 in thick with yellow sides shaded diagonally with brown & reddish brown back by J.L. Fairbanks and in several Harvard Cooperative Books with thin brown pasteboard sides 8 3/8 X 6 15/16 inch ¼ in thick / There is no subject into which I have inquired more particularly & persistently than the varieties of dyadic and triadic relations without obtaining a satisfactory classification of either.... relatives
290v Other.... gratification
291r 1908 Aug 21 / Different kinds of Analysis.... analysis.
291v Every.... error.
292r 1908 Aug 26 / I shall best begin my book on Logic somewhat thiswise.... (marginal note at bottom of page:) This sentence is written on the wrong page. It belongs 1909 Nov 1
292v blank

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293r 1908 Aug 28 / I have been for some months working out a Hypothetical Cosmology of both worlds, the here and the hereafter.... not
293v Description.... ones,
294r merely.... explanations).
294v blank
295r The explanation.... have.
295v blank
296r Continuation of the preceding 1908 Aug 29.... were
296v blank
297r there.... law
297v blank
298r would.... multiplication.)
298v blank
299r 1908 Aug 29.... (figures)
299v (formulas)
300r 1908 Aug 31.... (formulas)
300v Here is the title of my book.... Peirce.
301r 1908 Sep 1.... others, (More on the Cosmology of the two worlds)
301v blank
302r and.... I am
302v blank
303r constrained...to admit that they have given a fair provisional proof that we can sometimes communicate with the dead.... comparative
303v blank
304r biography,.... first
304v blank
305r introduction.... The logician feels this hatred of logic in a resulting antipathy to himself that stands very much in the way of anything he may undertake.... would be
305v 1908 Sep 2.... out of (apparently a revision of the material #3 on 306r)
306r well worth.... positive (i.e. ex
306v every.... stuff
307r It.... sought
307v blank
308r 1908 Sep 3.... sets forth
308v This.... Gay (?)
309r that.... days
309v blank
310r in the.... import of;
310v blank
311r to interpret.... to its
311v blank
312r original.... quite
312v (formulas, graphs)
313r distances.... Latin.)
313v (figures)
314r We learn.... orbit (in red ink CSP wrote over this entire page:) Dele all this Turn Over
314v Observations of Brahe used by Keppler.... 102 observations
315r 1908 Sep 4.... evident
315v (formulas)
316r that.... To be
316v blank
317r sure,.... 1908 Sep 5.... understood (Def. of "Real": That and that alone is Real which is distinguished from everything else by characters which belong to it independently of their being in any way attributed to it by any single man or single group of men. Dated 9/5/08 as above)
317v blank

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318r that Hamlet.... and
318v (formulas and graphs; date in middle of page:) 1909 Jan 7.
319r 1908 Sep 6 / I consider the graph (CSP now discusses the graph of Fig. 210 of CP 4.569; see CP 8, p 297 corrected).... See 1909 Jan 7
319v 1908 Sep 7.... one. (all in blue ink)
320r 1908 Sep 7.... suicide (more on graphs, see 319r)
320v blank
321r 1908 Sep 8 / By the way.... (figures)
321v blank
322r 1908 Sep 9 / As to the Real, I have decided within the last few days that my definition in the Hibbert Journal was not advisable.... postulate
322v blank
323r of logic that everything is Explicable.... they
323v blank
324r are not.... attributes.
324v (graphs)
325r 1908 Sep 10.... (graphs)
325v blank
326r Any.... relations
326v 1908 Oct 15 / I am planning a smallish & popularish book on logic.... round
327r toward.... that,
327v I will admit.... all
328r have.... 1908 Oct 16.... sound
328v (I.... hyperbolic
329r functions.... result.
329v 1908 Oct 17./By an Ens, or something that has Being, I mean anything that can properly be regarded as anything denoted by a Proper Name or by a noun of any kind is regarded. [sic] .... a
330r mutual.... to
330v perform.... your
331r wiser.... will
331v serve.... me.
332r 1908 Oct 18.... (page ends with graphs)
332v (in red:) I try again 1908 Oct 21.... mine.
333r 1908 Oct 22.... 1898 Oct 26.... (graphs)
333v 1908 Nov 2.... (formulas)
334r (formulas)
334v 1908 Dec 3 / Definition of Next After.... possessed
335r There is.... (crossed out:) some other.)
335v 1908 Dec 4.... (graphs)
336r 1st.... whiere (?)
336v 1908 Dec 4.... blank
337r 1908 Dec 19 / Notes for a Paper for the American Mathematical Society. / Logical Remarks on Some Mathematical Definitions.... into
337v 1908 Dec 20.... See next page but one.... 1906 Dec 20.... not
338r the science.... parts.
338v A Collection (first two paragraphs crossed out).... etc.
339r 1908 Dec 20.... parts.
339v 1908 Dec 27.... (figures)
340r 1908 Dec 27 (crossed out) / 1909 Jan 7.... (graphs and figures)
340v If.... All this is mighty close to nonsense.... (formulas)
341r 1909 Feb 16.... case.
341v Try.... (formulas)
342r 1909 Feb 17.... (formulas)
342v blank

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343r 1909 Feb 17 / Geometrical Topics .... (graphs)
343v blank
344r 1909 Feb 23 / Triadic Logic.... only L.
344v blank
345r Note on the T I N C T U R E S 1909 Feb 26.... is
345v blank
346r 1909 May 29.... measure?
346v blank
347r 1909 July 6 / The distinctive features of my System of Logic are as follows.... signi
347v blank
348r 1909 July 11 / The meaning of any sign is its rightful effect. And its rational meaning is its rightful effect upon that which ought to be governed by my reason; that is to say, upon my conduct. / This follows from the definition of a sign.
348v blank
349r 1909 Aug 9.... than
349v blank
350r the Greeks.... we find in the Elements of Euclid...recognition of the necessity of having
350v blank
351r before the mind's eye a diagrammatic image of the relations between the parts of the subject of the ratiocination.... any
351v blank
352r support.... arranged.
352v Most.... shift.
353r depends.... (compare this on the necessity of using parentheses etc. to CSP-JR, alternate draft of letter of 8.21/05: ...but for my part, I should omit the parenthese & write.... However, mathematicians seem nowadays to have a wild passion for parentheses; so I suppose they must be added.).... puerile
353v blank
354r weakness.... 1909 Aug 11.... (in red) Turn over two leaves (the rest then crossed out)
354v blank
355r (whole page crossed out in red; first word) increase
355v (figures)
356r (first half page crossed out in red; then, in red:) Text resumed / (now in black ink:) To define.... compara
× 356v (one figure)
357r tively.... boundaries.
357v (two graphs in ink, one in pencil)
358r (graph).... tallies.
358v (figures at the top).... true
359r Let us now.... (all but first three lines crossed out in red)
a7r,v — 359v of.... presupposition.
a9r,v — 360r 1909 Nov 1 / During the last 3 years I have been resting from my work on the Division of Signs and have only lately -- in the last week or two been turning back to it; and I find my work of 1905 better than any since that time, though the latter doubtless has value and must not be passed by without consideration. / Looking over the book labelled in red "The Prescott
a8r,v — Ms 277 Book," and also this one, I find entries in this book of "Provisional Classification of 1906 March 31" and of 1905 Oct 13 particularly important from my present (accidentally limited, no doubt) point of view; particularly in regard to the point made in the Prescott Book 1909 Oct 28 and what immediately precedes that in that book but is not dated.... (The Prescott Book is in ~~"Diaries and Notebooks", black box.)~~ Ms 277.)
= 359A
359B
359C
360v A "Sign" is an Ens.... SKIP NEXT PAGES

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361r 1909 Nov 1 (in brown) / A "Sign" is an ens.... On the Opposite Page Better put
361v Let it be admitted then that no act of thinking can involve thinking about that very act of thinking.

8/2/62 Placed between } ADDITIONAL PAGES FROM THE NOTEBOOK TO BE PLACED IN SEQUENCE IN THE FUTURE IF POSSIBLE

a1r,v (blank)
225 / a4 a2r (formulas making use of quantifiers; this page and a3 are on the same sheet)
a2v (blank)
a3r, v (blank)
a2 / 226 a4r (formulas).... mode of pairing
a4v (blank)
45 / 52 a5r DeMorgan Myself.... (formulas)
a5v (formulas)
219 / 220 a6r Suppose.... (figures)
a6v (blank)
359 / a9 a7r effect.... three cases.
a7v (figures)
a9 / 360 a8r (figures)
a8v (blank)
a7 / a8 a9r First case.... (figures).... certain point
a9v (figures)
243 / 244 a10r (blank)
a10v A primal is.... operation
221 / a12 a11r We must acknowledge.... with it.
a11v (blank)
a11 / 222 a12r Now how about.... (formulas for only four lines)
136 / 137 a13r (four small figures)
8.17.64 a13v Either B a....(graphs)....My dear Mrs. Jacobi....
108/ 109 a14r in respect....thirdness
7.2.65 a14v (blank)

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LOGIC

(Lowell 1865-7)

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Miscellaneous Observations

12 Nov. 1865

What is a real definition? A definition of a word whose essence lies in its denotation.

12 Nov. 1865

There are three forms of question

1 Are quadrupeds animals?

2 Are there quadruped animals?

3 ~~Is anything~~ Are quadruped ~~is~~ animals either quadruped or animal?

The affirmative answers will be

To 1. Universal Affirmative. Yes. ~~all~~ Quadrupeds are animals.

To 2 Particular Affirmative Yes Quadruped animals exist

To 3 Universal Negative. Yes. There is a ~~collection~~ no animal quadruped.

Nov. 14

There is no difference logically between hypotheticals & categoricals. The subject is a sign of the predicate, the antecedent of the consequent; and this is the only point that concerns logic.

Nov. 14

Admit that there are no coëxtensive notions (and there never are known to be) and the system of propositions is

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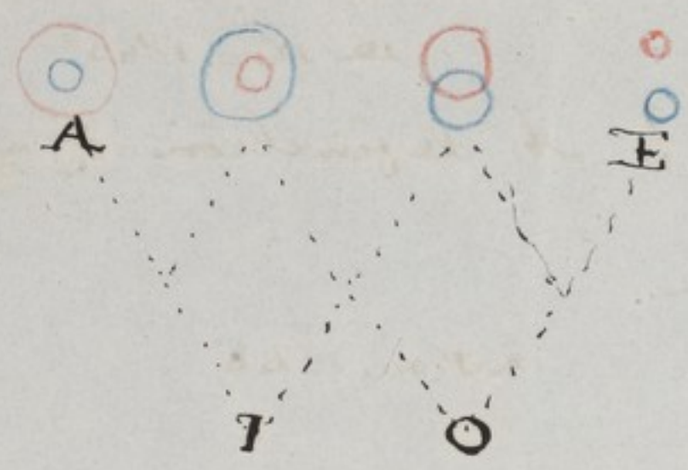
reduced to great simplicity, thus



If we have four simple relations abcd & join them

thus $\overset{a}{ab}\ \overset{b}{bc}\ \overset{c}{cd}\ \overset{d}{}$ / abc bcd to make nine judgements of a simple character five others remain ac ad bd abd acd

Nov 14.

Deduction may be reduced to the inference of A (informative)
to the inference of E (connotative)
Induction to the inference of I (denotative)
Hypothesis

and thus the whole of logic is deductable from the distinction of Substantial Form, Matter, and Accident.

Nov. 14

The doctrine of Immortality which makes man last forever is not so ennobling as ~~that~~ its contrary which must make man's interest outrun himself, in time as well as space.

Do you say that man lives in all time? I will match all your arguments by others to show that he lives in all space.

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A fallacy is a miracle. I cannot admit its existence as a violation of logical law. A fallacy is a reasoning from mistaken data. That is 1st from insufficient data or from a fallacious inference or 2nd from using as data something different from what appears to be used. Thus for example if I say for fun

It either rains or it doesn't rain
It doesn't rain
∴ It rains

This conclusion is not reached directly from the premisses written here but from certain emotional premisses relating to fun.

Nov 15

The common-sense doctrine is to be held as far as this goes, - that there are no fallacies. Prove that a given belief really arises from certain data universal to all mankind & it must be admitted. Doubt that (as Hume did) and what has common-sense to say?

Scepticism may doubt every thing in particular much it must not lay down any rule of doubt for therein it ceases to be scepticism.

Dec 13

It is necessary to reduce all our actions to logical processes so that to do anything is but to take another step in the chain of inference. Thus only can we effect that complete reciprocity between Thought & its Object which it was Kant's Copernican step to announce.

Dec 13

The Scotch philosophers used to tell us that ~~there is a~~ the burden of proof is ~~presumption~~ in favor of the results of Common Sense. ~~A presumption is out of place~~ ~~There is no~~ The burden of proof is ~~speculative science, but only~~ a phrase of the courtroom where questions must be decided one way or the other & has no place in speculative science where ~~scepticism or~~ indefinite suspension of judgment is permissible. However, since ~~many~~ several of the important questions of philosophy are matters of practical interest, it may be allowed to speak of a burden of proof

in, their practical ~~reference~~. Still the burden of proof 4r
~~will~~ ceases to be when the side of Common Sense shew
it is shown to be contradictory & absurd. Now the whole
developement of modern philosophy consists in showing that
In general, it will lie with a metaphysical theory. But com-
mon sense is itself a conceiver metaphysical theories. And moreover
the History of modern philosophy may be stated in epitome as
the awakening of the mind to the unsatisfactoriness of that
theory that man feels. It cannot indeed be denied that
there is some truth in this; at any rate it is a hypothesis
which accounts very prettily with many facts. In particular
it accounts for the partial & only partial confirmation which
~~our~~ opinions receive from ~~intercourse with~~ the opinions of
others. How natural it is to infer from this that they are
our opinions, and so to get an idea that we are ~~because~~ and that
we think. Perhaps we cannot even yet devise any more
satisfactory explanation of this fact. But the theory puts
an I & a not-I over against each other in absolute separation
& yet so that one determines the other. ~~This being done, the sim-~~
~~plest process~~ ~~it will be admitted is that there~~ Now immedi-
ately upon this Scepticism arises as to the validity of this

conception of the determination of a thing by another without it, of causality, that is to say. To resolve this problem we have been forced first to consider the object as also determined by the subject. And this is to encroach already upon the absolute boundary of ? & not-?. But even this ~~will not do~~ ~~Even~~ the object itself does not determine the subject, ~~but only~~ a false object does it.

* * * * * *

What shall we finally say then? The theory that man is is incomprehensible & self-contradictory.

But is it not justified? Yes.

Shall we then attempt to satisfy our intellects with an incomprehensible & self-contradictory hypothesis? Certainly not. Nay, such a hypothesis is not intellectual by the very definition of the intellect. It cannot be held in a comprehensible form but it may be held.

The intellect did not make this hypothesis. The intellect makes no hypotheses, which are incomprehensible. The intellect is not therefore alone concerned in any proposition.

But we make it. All that the words convey is something in capable of being made distinct. Hence it is emotionally in its own nature. And as an emotion it is justified.

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Dec 14.

Hegel makes a great boast of the fact that his Logic developes its own method. Mine pursues a rational method of which the Logic itself is but the deduction & proof. Moreover I are not forced to make my book unintelligible in order to follow mine, but on the contrary it is the very procedure which perspicuity demands. Another thing; Hegel never deduces the necessity of considering what he considers before considering it; but I never introduce a ~~concep~~ distinction without having deduced the necessity for it.

Dec 15

When the implication is constant, if two symbols are equal in extension or intension they are equal in both. Neither can be increased relatively to the other in either respect without diminishing it in the other respect. Accordingly,

1 If A & B are coëxtensive, they are cointensive

2 Increase the extension of A; you diminish its intension. Hence if A is super-ordinate to B in extension, it is subordinate in intension.

~~3 Next add to B an extension which A has not. You take away from it~~ If we had increased the intension of B, we should have produced the same result.

3 Next add to B an extension which A has not. You diminish its intension. You cannot however leave it subordinate super-

ordinate or cointensive with A. And supposing that there is a symbol which denotes any sum of symbols, there will be a symbol C to which both A & B are subordinate in extension. Hence, they will both be superordinate to it & intension & will have in common the intension of C. Hence they will intersect in intension.

If on the other hand we had added to A an intension excluded from B. We should have diminished the extension of A ~~without~~ leaving it subordinate superordinate or coextensive with B. And supposing that any sum of intensions has some symbol to connote it, there will be a symbol C' to which both A & B are subordinate in intension. Hence they will both be superordinate to it in extension & will intersect in extension.

4 Next suppose that from the extensions of both A & B we take away that part which they have in common. This will only add to the intension of both & as they cannot be subordinate superordinate or cointensive, they will still intersect in intension.

Or suppose they are made to exclude each other in intension then by the same reasoning, they would intersect in extension.

Hence since intersection in either quantity by (3) implies intersection in both it follows that upon the suppositions of (3) there can be no exclusion either in extension or intension. But if there be no exclusion, there is no coincidence or subordination since these imply exclusion (?) & hence nothing but intersection.

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But the extension of C may be only being which is the Summum Genus.
and the extension of C′ may be only nothing which is the Infima Species. 6r

In the former case therefore they may be said to exclude each other in intension and in the latter case to exclude each other in extension

Then we have when information is constant

Extension		Intension
Coincidence	→←	Coincidence
Subordination	⇉ ⇇	Subordination
Subordination	⇉ ⇇	Subordination
Intersection	⇄ ⇄	Intersection
Exclusion	⇄ ⇄	Exclusion

If A & B exclude each other both in extension & intension. Their common extension is nothing & their common intension being

Let us now change our implication. If we have no implication we shall have no ~~relations~~ of extension & intension but intersection. Hence we shall have no nothing nor being All connotation will be self-contradictory & all denotation will be obscure.

When implication is at a maximum ~~every class will~~ intersection in extension & intension will be abolished. Consequently subordination will be abolished. Consequently all classes will exclude each other and their common extension will be nothing & their common intension being.

In the formula

Extension × Intension = Implication

we may have the values

(1)	0	×	0	=	0
(2)	0	×	n	=	0
(3)	0	×	∞	=	0
(4)	0	×	∞	=	n
(5)	0	×	∞	=	∞
(6)	n	×	0	=	0
(7)	∞	×	n	=	n
(8)	n	×	∞	=	∞
(9)	∞	×	0	=	0
(10)	∞	×	0	=	n
(11)	∞	×	0	=	∞
(12)	∞	×	n	=	∞
(13)	∞	×	∞	=	∞

(7) will be the case with any ordinary symbol.

(4) is the ordinary nothing.

(10) the ordinary being.

These are the cases when Implication is n. Now for those where it is 0.

(6) is the case of a sign (2) of a why.

(1) would be a sign of nothing or a copy of being which are 7r
undetermined to be representations.

(2) would be being supposing it were not known to be so or being considered abstractly of the fact that it is.

(3) would be nothing ~~apart which~~ abstracting from the fact that there is anything so that its opposition is taken away.

A being which is not, would be a nothing which is unopposed to anything hence being abstracted from the fact that it is is abstracted from all that makes it differ from nothing abstracted from its opposition & vice versa.

We will now take up the cases where the implication = ∞

(12) is being of which some determinate quality is supposed to be known.

(8) is ~~nothing~~ a contradiction in being implied that it exists.

(13) is being which is supposed to have all attributes.

(11) would purport to be a complete list of all beings.

(5) would purport to be a complete conjunction of all attributes.

What has just been said & the perfect balance of extension & comprehension here made manifest calls to our mind the theorems ~~A~~ E 10 of propositions ~~consider~~ are modifications of the primary form A in extension only but A is contra-

dicted not only by I ~~but also~~ or

"A class subordinate to A in extension is denoted by a symbol exclusive of B in extension"

but also by

"A class exclusive of A in comprehension is denoted by a symbol subordinate to B in comprehension."

Let a class exclusive of A in comprehension be called a reverse of A. And let a symbol subordinate to B in comprehension be called some what B.

Then we have

A All A is B — No reverse of A is at all B

I Some A is B

W A reverse of A is B — Some A is not at all B in any given respect

E No A is B

O Some A is not B

U A reverse of A is not B

H All A is somewhat B — No reverse of A is B

Some A is somewhat B

Y A reverse of A is somewhat B — Some A is not B

A is contradicted by O or Y

I " " " E

W " " " H

E " " " I

O " " " A

U
H is contradicted by W & ~~A~~

13

Ω
Y " " " A.

Proof of the above relations.

1 If we take A & O both Informatively & i P
it will appear that both may be ~~false~~ true if P has no ~~ex~~
tension ~~or~~ both false if S has no extension. But taking the ~~first~~
cases of extension we see that A has 2 and O the other three.

In the same way if we take A & Y informatively
both may be false if P has no intension & both true of S
has no extension. But of the 5 relations of intension A ad-
mits 2 and Y the other 3.

Dec 20

I find that a good deal of the above is wrong.
Propositions have relations of Intension corresponding to
Subalternation } which are relations of Intension.
& Contradictory

2 forms of Propositions are contradictory when taking any symbol as
predicate term all terms are divisible into such which may be
put as subject term of one & of the other.
Corresponding to this will be a relation between terms
forms such that any symbol being taken as subject term

of both all symbols are divisible into such as may be put into predicate term of one or the other.

Thus 'All A is B &

Some A is not B are contradictory.

Because if the whole extension of A is in that of B then it is not true that some of it is excluded from A. & vice versa.

Now take All A is B

& ~~Whatever is in no respect like~~ the reverse of A is some what B

Now if the whole intension of B is in the intension of A, no part of it is excluded from the intension of A; hence no part of it is in that which is entirely excluded from A; & hence no part of it is in that from which the intension of A is entirely excluded. On the other hand take any intension you please it is either wholly in A or else some part of it is out of A, if it is out of A it is in what is excluded from A, & hence is in that from which the intension of A is entirely excluded.

For example let be be taken as quadruped & A as ~~sentient~~ sentient

Now since quadruped is not in sentient, part of it out of sentient, part of it therefore is in that in which no part of sentient is. The reverse of A has all the qualities which A has not hence it has that part of B which A has not.

The propositions Some A is not B

& the reverse of A resembles B

will coincide when the former is denotative & the latter connotative.

The same intensive relation subsists between

~~No A is B~~
~~& The reverse of A is not B.~~

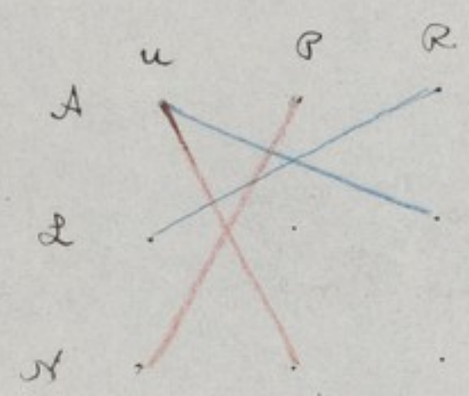
15

A is somewhat B
The reverse of A is B

~~The Reverse is not~~

And the following are contradictory

~~The reverse of A is B~~
~~The reverse of A is not B~~



The following is important.

Since the reverse of A connotes all that A does not connote; A must be determined in every respect (that is must be an individual) or else the reverse will connote contradictory attributes & so have no extent. And, therefore, there is no reverse of a particular since there is no particular of an individual. Consequently reverses are singular judgments.

Since the negative of B denotes all that B does not denote; B must have a definite sphere (that is must be a simple attribute) or else its negative will denote heterogeneous classes & so have no intent. And therefore there is no negative of a limitative since there is no limit.

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tative of a simple attribute. Consequently negatives are simple statements.

A reverse however when connotative need not be singular, nor need a negative when denotative be simple.

If the reverse negative is a singular simple proposition. Then from All A is B it follows that the reverse of A is not B and ~~from~~ conversely. So that they coincide.

The difference between being & a heterogeneous sum of classes is that being not only has no intent but has ~~not~~ extent.

The difference between nothing & a self-contradiction is that nothing not only has no extent but has ~~no~~ intent.

We have therefore
- Being
- Sum of Classes
- Nothing
- Self-Contradictions
- All self-contradictions at once.

Remarks on Passages in Kant.

In the Critic of the Pure Reason. transcendental stoicheiology 2nd Part. 1st Division. Book 1 Ch 2 Section 2. §2. second Paragraph occurs the sentence:—

"There must therefore be something which makes this very reproduction of the appearances possible, by being the ground a priori of a necessary synthetical unity of them."

This is not quite evident; but it should be considered first that there must be a Rule in the phenomena & that it must be a necessary rule, otherwise they will not give the result except by chance. And hence

but seldom. And as the rule must contain the element of necessity, it must be a priori.

17

1866 March

Liberty & Necessity

Suppose a man is in a room locked in and does not want to go out, so that his staying is voluntary; is he at liberty? No. But suppose that if he were to have wished to go out the doors would be unlocked, was he then at liberty? Yes. Now this is the situation of every man upon the theory of necessity. He prefers to do a certain thing & he cannot do otherwise, but yet if he should prefer to do otherwise he could do so. So that liberty & necessity do not conflict.

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March

Two Kinds of Disquipavants

1st those which would be of the same internal character as they are, even without reference to the correlate as greater

2nd Such whose internal character is affected by the reference to a correlate as Killed

This division seems to correspond to that of Symbols into terms, propositions, arguments.

For a Term would have the same character even if its object should be destroyed

A proposition would remain the same even if its interpretant should cease. Though not if its object were destroyed

An argument would not be the same if either object or interpretant were destroyed.

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1 A term is a symbol which in itself ~~does~~ is not held as representing an object. No matter how great its information may be, if it is not asserted, it ~~does~~ is not held to represent any object. Thus dragons.

2. A proposition stores knowledge does not produce it

3 An argument produces knowledge.

---

1 A term is a part of a symbol, which may be itself a symbol but is ~~only~~ considered as that element of the symbol which gives reference to a ground.

2 A proposition is ~~a~~ part of a symbol which though possibly itself a symbol is such by giving reference to the object.

3 An argument is a total symbol considered as such.

---

1 Significants ~~Relates~~ of the 1st kind, effect their correlates ~~objects~~ only as equisignants

2 " " " 2nd Kind, effect their correlates as disquisignants.

1866 October 25

Boole in his method of probabilities, introduces rightly the symbol $\frac{0}{0}$. But he does not sufficiently consider cases where this would become very small. It would be interesting to discuss these cases & thus perhaps justify the Method of Least Squares.

Nov. 20

Boole's multiplication is finding the least common multiple

Nov. 20

What is not a question of what can possibly be known is not a question of fact

Nov. 23

All murder is wicked 21

All abortion is murder

∴ All abortion is wicked

This begs the question because wicked is part of the essence of murder & therefore no one need admit abortion to be murder until it is otherwise shown to be wicked.* This shows that the rule must be an accidental not an essential proposition.

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1866 Dec 6

23

Remarks on Berkeley's "Principles of Human Knowledge".

The design of this book is to introduce a further distinction between Being and Knowing.

Our ideas exist only in the mind i.e. whether they are thought as being there or not. But our ideas are all that we immediately know. Hence we immediately know only what is in the mind. It do not see therefore that Reid's criticism was irrelevant.

The question next is what evidence we have of the absolute existence of matter of external qualities & of spirit. Berkeley maintains that matter ~~has~~ no meaning, or is inconceivable. It is totally invalid as an hypothesis inasmuch as the facts the ideas

do not apodeictically follow from it. It is the same with external qualities. On the other hand spirit is a good hypothesis because ~~the~~ it does explain the facts. Only it is admitted it does not explain the influencing of one mind by another. That is inexplicable.

The doctrine is good against an absolute matter. But an equally strong argument would be brought against an absolutely acting spirit.

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1866 Dec 8.

In order to prove the greater simplicity of my Rules of Syllogism, I propose to show how 1st the old rules are proved by mine & 2nd how mine are proved by the old rules.

1st: That no term can be distributed in the conclusion which is not distributed in one of the premisses.

Proof The rule & case can only appear in the conclusion when denied. Hence as their common term is undistributed in but one, its distribution must be the same ~~when~~ in both propositions ~~cases~~ when it appears in the conclusion. As but one proposition can be conclusion & as the result can be out of the conclusion only when denied, no term of the result can be in the conclusion unless both the propositions in which it occurs are affirmed or both denied. And never as the result agrees in quantity &

quality with the ~~proposition~~ case & rule respectively, in which its subject & predicate respectively occur, these terms must agree in distribution

2nd That the middle term must be distributed at least once. If the subject predicate is the middle term it must be distributed in the rule of which it is subject & which is universal. Any other term must be of different distributions if occuring twice in the premises, because the subject & predicate of the ~~rule~~ result are subject & predicate respectively again & the result if in the premises must be denied, but the result agrees in quantity & quality with the propositions in which its subject & predicate respectively occur.

3rd From two affirmatives a negative cannot be concluded. As rule & case alt agree in quality, the propositions containing them must agree in quality if ~~they are not differ~~ one is conclusion, since then both or neither, are denied, and hence in that case the conclusion cannot be negative without a premiss being negative. But if both are in the premisses they must disagree in quality & hence both cannot be negative.

4th: One premiss must be universal.

Either the rule is a premiss in which case it ~~must~~ universal, or the result is denied in one premiss & the case affirmed in the other, whence ~~as~~ result & case agree in quantity, the premisses must disagree in quantity & hence both cannot be particular

5th: One premiss must be affirmative

Proved in the same way.

6th: The conclusion follows the worse part.

If the result is ~~premiss~~ conclusion it agrees in quantity & quality with certain premisses, the others having the best modification. If it is premiss it agrees with the conclusion in the same way & the terms not appearing in the result must have the best modifications in the ~~conclusion~~ premisses & hence the worst in the conclusion

Proof of my rules from the old ones.

1st: The rule must be universal.

If the particular rule be a premiss ~~& for~~ of the other propositions one must be affirmative & the other negative & hence the ~~rule~~ case & result must differ in quantity. If it be conclusion the ~~other~~ premisses must both be universal & hence again

result & case must differ in quantity. The reason of the proof is below

2nd The case must be affirmative

Otherwise as before the rule & result must differ in quality

3rd The result must agree with the case in quantity

If both are in the premisses

~~If both are in the premisses~~ This is allowable provided the result is ~~both are~~ particular, otherwise not for then there would be two particular premisses If one is in the conclusion ~~this one must be~~ the propositions which contain them will disagree in quantity & hence the conclusion must be particular otherwise there will be an illicit process of the minor. If the conclusion is particular & the minor universal the major must be particular otherwise the worse part would not be followed. Then the subject of the major is either major or middle term. If the former the minor must be negative otherwise the middle would be undistributed & then the conclusion must be negative to follow the worse part & then the major must be affirmative which will give an illicit process or negative which will give two negative premisses. If the subject of

major is major term then since the subject of the minor is minor term, the middle term is predicate twice. Hence ~~it~~ one premiss must be negative ~~or~~ there would be an undistributed middle. Then the conclusion is either affirmative & does not follow the worse part or negative & makes an illicit process.

4th. The result agrees with the rule in quality.

Proved like the last.

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1867 March 23

31

I cannot explain the deep emotion with which I open this book again. Here I write but never after read what I have written for what I write is done in the process of forming a conception. Yet I cannot forget that here are the germs of the theory of the categories which is (if anything is) the gift I make to the world. That is my child. In it I shall live when oblivion has me – my body.

This matter of the logical principles of the different kinds of inference is a difficult matter. One way of putting it would be this.

Every symbol denotes certain objects & connotes certain characters. The symbol represents each of those objects to have each of those characters. The symbol may be a false one its may be that the objects it denotes do not have the characters it connotes. But if S is M in this sense: not merely that M is a name for S. but

that it is the name of a class of things among which S is and if M is P not merely in the sense that — — — —

then S is P.

Here the principle is that

That which is M is what M is.

Everyone of the integrant parts of m is an integrant part of each prime aliquot of m & vice versa

A purely contentless principle. As a logical principle should be.

Now let us take up the synthetic arguments.

Whatever is a character of everything denoted by M is a character of M. Whatever is ~~denoted~~ has every character of M is denoted by m.

Here are two principles. But they do not apply to inductions & hypotheses just as they stand.

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"Whatever is a common character of many things denoted by M is likely to be a character of m. 33

That does not quite hit the point. It does not contain the idea that the things must have been taken at random out of those denoted by M.

In what point of view shall we regard this necessity for a random selection?

Suppose we look at the matter thus. Certain things have a certain character in common. It follows that there must be some genus of these things which have the character. We cannot take any genus lower that that which they are selected as belonging to. To take a higher one would involve a perfectly arbitrary proposition.

I am convinced that this is a very awkward way of taking hold of the matter.

Suppose we take it up another way

For any subject or predicate we can substitute what?

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Only that which this subject or predicate represents — only that which fulfils the function of that subject or predicate — only that which the subject or predicate represents to the proposition or to the other terms of it.

Now a subject is a direct symbol of its subject to its predicate & ~~of its~~ a predicate of its predicate to its subject.

But a subject is also an imperfect representation of that genus from which it has been taken — by which it is determined. It is not a sermeion sign of it as I have ~~been~~ said — it is an example of it.

A predicate is a representation of the thing of which it is a random character — a copy of it.

This is horribly vague.

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1867 March 25

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Here is another point of view.

What is the function of a symbol as subject? To stand for certain things. Then if the predicate be true of all the things that it stands for as yet that is for all which we yet know it to stand for, the symbol may stand as subject provisionally.

The difficulty with this is that it does not represent the synthetic probability of the inference.

It is however a good idea that a random selection is equivalent to all known — the genus of those two would lie that.

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We have

M is P in the sense that the actual denotation of things taken under M are P (contingent)

& 2nd in the sense that all possible things taken under M would be P (necessary)

On the same principle

~~A~~ B

S is M in the senses (attributive)

1st that S has the qualities taken of M

2nd that S has all qualities of M (subsumptive)

Still it may be doubted if Hypothesis proceeds by random selection of qualities of the new predicate.

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Then the principle would be

the possible is like most of the actual.

1867 April 1.

What is taken – the present – of a class if it has any common character – that character probably belongs to the class, or to the majority of it. ~~or something like it do~~ And if what is known of the characters of a thing belong to another thing, the second thing has most of the characters of the first, probably.

The reason is that the parts compose the whole and therefore what does not belong to ~~a number of parts~~ the majority of the whole does not belong to the majority of the parts.

What does not belong to most of the parts does not belong to the parts taken mostly, because the parts to be taken are all the possible parts.

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April 10

The distinction must be observed between Induction & Hypothesis as formal operations & between them as leading to truth.

S S' S'' are taken as M [So far as this represents a state of knowledge they are ~~[illegible]~~ nothing else.]
S S' S'' are found to be P
∴ M is P

M is (for example) P P' P''
S is upon examination P P' P''
∴ S is M

S must be M
S is found to be P
∴ M is P

M is

P P' P''
Certain characters are those known to belong to M

r. 1

S is P

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The objects of S ~~are~~ have characters of P

The objects of $\left\{\begin{matrix} S \\ \text{some } S \end{matrix}\right\}$ ~~are~~ have characters of $\left\{\begin{matrix} P \\ \text{not } P \end{matrix}\right.$

All $\left\{\begin{matrix} \text{possible} \\ \text{present} \end{matrix}\right\}$ objects of S have all $\left\{\begin{matrix} \text{existing} \\ \text{attributed} \end{matrix}\right\}$ characters of P

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SS'S" are taken as M

that is to say

SS'S" owing to the manner in which they were taken are necessarily M because

All taken are M

SS'S" are taken

∴ SS'S" are M

SS'S" (on account of a circumstance) are M

SS'S" are P

∴ Whatever is M on account of that circumstance is P

Now this circumstance is such that

All M would be M on account of that circumstance

∴ All M is P

What is this circumstance? That of <u>occurring as M</u> being <u>taken from M</u> being the <u>present M</u>

All M is the present M

All M is P

∴ ~~All P is the present M~~

All present M is P

NB rather

The present M is M

The present M is P

∴ All M is P

Now we have

All S is S

Some S is M

Some M is S

why not then

S S' S'' are taken as M

S S' S'' are found to be S S' S''

∴ M is S or S' or S''

S S' S'' is P

∴ M is P

why Yes! this is it.

Induction consists in that very conversion which Aristotle says is necessary to its validity.

The inference is –

e that if – S S' S'' occur only in consequence of ~~the occurrence~~ being M

e' then "All M has the common characters of S S' S''

~~As in the conversion~~ Some S is M ; Some M is S

Turn now to hypothesis & fig 2

12

M is P
S is M
S is P

S is P
S is M
M is P

M is P
S is P
S is M

Some / All S is not / is P
All / Some S is M
Some M is not / is P

—

All S is followed P
S is taken on M
∴ All M is P

All M is / is not P
Some / All S is not / is P
Some / All S is not M

—

All M is for example P P′ P″
S is P P′ P″
S is M

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Any M is not P
Any P is not P
∴ Any P is not M
All S is P
∴ Any S is not M

All M is for example $PP'P''$

$PP'P''$ is $PP'P''$

∴ Whatever is $PP'P''$ is M

S is $PP'P''$

∴ S is M.

---

i M has ~~has~~ its known or taken or present characters $PP'P''$

i′ ∴ Whatever has the characters $PP'P''$ is M

April 13.

S S' S'' are taken as M

∴ M has all the common characters of S S' S''

One element here which is accidental; that the premise should express a real experience.

S S' S'' owing to their genus are M

∴ M has the common characters of S S' S''

S S' S'' owing to their genus are M

∴ M (owing to its genus?) has the common character of S S' S''

S S' S'' have a common character whence it follows that they are M

∴ M has a character whence it follows that it has the common characters of S S' S''

The conditions of the existence of some common character of S S' S'' involves their having the common characters of all.

∴ The conditions of the existence of some common character of all involves its having the common characters of S S' S''.

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Whatever has the characters of S

Whatever has some characters possessed by all that is now S } { has the conn. chars. of P / is P

Whatever has the ch. connoted by M would / would not { have the chars of P / be P

Whatever has the ch. connoted by S / Whatever has some ch. possessed now by S } would have the conn. chars of M

Whatever should have the characters of S / Whatever has some character of what is now S } { has all characters which may be found to be possessed by P / has the characters attributed in P

Now try the other

M has among its known characters PP'P"

∴ PP'P" is M

M has as characters taken at random PP'P"

∴ Whatever is PP'P" is M.

M would necessarily have the characters PP'P"

∴ Whatever was PP'P" would be M

M would ~~necessarily~~ invariably be PP'P"

∴ PP'P" would invariably be M

~~S would invariably~~

S

S would invariably involve the conditions of the existence of some character of S } have the common characters of M be M

Nec. } The character S } causes it to { have the common characters of M be M. } Subj. Attr.

Conting. } Some character of what is S at present

Whatever should have the common characters of S

would have all the characters which would be possessed by P

Whatever has some character now possessed by S

has the characters attributed to P.

The modes in which S may be P are divided between these

If P

then C

—

Now if C exists not in this manner

probably P exists not in this manner

Perhaps the Particular Contingent

& Negative Attributive do not exist

The ~~chan~~ combined change of Univ. & Part.

and of Aff. & Neg.

gives a process contradiction which is reciprocal

But probably the combined change of

Necess. & Conting.

Subsump. & Attrib.

is not a reciprocal process.

Were it so the conversion would be necessary

not probable.

April 14

On the other hand, if this process is not reciprocal how

can the change be made in either direction?

The change I think may be reciprocal & yet the

inference only probable.

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Negatives & Particulars

in their variations Contingent & Attributive

M	P
S	M
S	P

M	N
N	M
N	N

N	N
N	M
M	N

S	P
S	M
M	P

N	N
N	M
M	N

S	P
S	M
M	P

N	N
N	M
M	N

No N is M

No M is N

All A is non-B

All B is non-A

A has the characters attributed to non-B

B has the characters attributed to non-A

whatever has ~~some~~ character of what is now $S S' S''$

has every character which may be found to be possessed by M

whatever has the common characters of $S S' S''$ is P

$\therefore$ whatever has ~~some~~ character of what is now M is P

---

whatever has the common characters of $S S' S''$

has every character which may be found to be possessed by M

whatever has some character of what is now $S S' S''$ is P

$\therefore$ whatever has some character of what is now M is P

This may be the difference of nominal & real induction.

Induction

This, this, this & this are what have been drawn from this bag
This, this, this & this are all balls
∴ All that is drawn from the bag would be balls.

This, this, this, and this have been taken from this room
This, this, this, & this are all the gold balls. I know

Non sequiter

Some of these things have been taken from the bag
Some of these things are balls
∴ All that is taken from the bag are balls
[Doubtful whether this follows]

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S S′ S″ are taken as M
S S′ S″ are found to be P
∴ M is found to be P.

S S′ S″ are taken as not-P
S S′ S″ are found to be not-M
∴ Not P is found to be not-M
M is found to be P

but this cannot be found to be

Some M is P
S′ S′ S″ is taken as M
∴ Some S S′ S″ is P.

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Some S S' S" are taken to be M

Some S S' S" are found to be P

∴ All M is P

very doubtful.

not

M is P P' P" for instance

not

S is also P P' P"

∴ S is M

by no means obvious

that this is not good

I suspect both are good the first is

Some S, some S', some S" &c.

Apr 15

Every possible S, every possible S′, every possible S″,
would ~~be all~~ have every character which may
be found to be possessed by M

Every present S, every present S′, every present S″
is P

∴ Every present possible M is S

Apr. 16.

S S′ S″ and in some way determined to have every character
which may be found to be possessed by M.

S S′ S″ have as their common character the characters
known to be possessed by P

∴ ~~Where shall have~~
M is in some way determined to have all the characters
known to be possessed by P

M is P
S is M
∴ S is P

M is P
S is P
∴ S is M

Every possible M has the characters known to be possessed by P

Every S has all the characters which may be possessed by P

S has the characters known to be possessed by M.

—

Every possible M is P

S has all the characters which may be possessed by M

∴ S is P

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May 20

Any M′ is is not P′	Any ′ is is not P′	Any Some S′ is is not P′
Any Some S′ is M′	Any Some S′ is is not P′	Any Some S′ is M′
Any Some S′ is is not P′	Any Some S′ is M′	Any M′ is is not P′

Any ~~one~~ M′s probably but more probably the fewer there are

Any one (perhaps not all)

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1867 September 24.

Let me consider a little about the nature of truth.

First. I notice that if we define an image to be a representation completely determined in content so that in its every attribute is affirmed or denied there is probably no image. And is not this what is requisite to make an image? What is an image? There is a good question for dialectical research.

As it seems to me that the world has not yet exhausted the instruction to be derived from Sophisms I shall undertake some analysis of a collocation of them which seems to me to lead at once to a solution of the ~~deepest~~ darkest questions of metaphysics.

In the first place what is meant by a hypothetical proposition, when is it true? ~~If~~ Take this one – If the carotid artery of a man is cut, he will die. or This if the shadows

of the moon is cast on the earth, there is an eclipse of the sun.

Truth may be defined as the ~~agreement~~ concurrence of the ~~denotation~~ extension & ~~connotation~~ comprehension of a representation which has ~~denotation~~ extension & ~~connotation~~ comprehension independent of one another.

Thus if a representation is a mere likeness (as no human ~~works~~ representations are), which stands for nothing except what it happens fully to agree with in characters; it cannot be false of anything because it ~~can~~ only stands for whatever it fully agrees with. & therefore truth has no ~~app~~ meaning in reference to it.

So if a representation merely points out certain things and implies nothings of them.

But if a representation at once indicates certain objects & independently implies certain characters, its truth or falsity depends on ~~the agreement of~~ whether those characters can be predicated of ~~those~~ objects.

This definition is a bad one – it contains a diallele – but it will answer as a pra-

liminary explanation and even sometimes as a test.

[Let us apply what has been said to a categorical.]

Now in a hypothetical proposition the function of the protasis ~~antecedent~~ is ~~intended~~ to mark the sphere of the representation, which it may do by means of its connotation or otherwise. The apodosis ~~consequent~~ on the other hand ~~marks~~ ~~indicates~~ conveys the content of the representation. And the question whether the proposition is true is the same as whether that content belongs in fact to that sphere. Thus in the proposition – If the shadow of the moon is cast on the earth, the sun is eclipsed. The former clause indicates the circumstances ~~in~~ to which the statement made in the latter clause is applicable. ~~The latter~~

Take now another case. If the motion of the earth in its orbit were suddenly arrested & the perturbative effects of other bodies prevented, it would fall in a direct line to the sun. Unless the word truth be taken in a quite improper sense, this proposition is true. Yet how? For in this case there are no such circumstances as those indicated, they are ever physically impossible, so that ~~this~~ would seem to be a "representation like a copy which

1867 Sep 26

Let x be that of which I know absolutely nothing
Then I do know that I know nothing of x
Therefore x is not x.

I know Greek. Greek is not present to my reminiscence, but occasion will call it up. This then is the essence of knowledge & what no occasion will call up is not known or conceived. I have therefore no conception of the absolutely unknowable.

Now a proposition is true in all its consequences for possible experience that either constitutes the truth of the proposition or it is false in reference to something which cannot be known (in which case the unknowable means something) or else it is devoid of meaning.

A proposition is not devoid of meaning which has true consequences.

1867 Sep 27.

Every quality which we know of is of course either experienced or inferred from experience. We admit that things may have qualities which we do not know but that is because we may conceive of a state of knowledge in which something more is predicable of them. But do we mean anything if we say that a thing has a quality which cannot be predicated of it; that is which is unknowable & inconceivable? What can we mean by such a statement? We can imagine such a quality for as Berkeley say were we to imagine it, it would not be unimaginable. Can we have any general or relative notion of it? To have a general ~~notion~~ notion appears to be, having a habit according to which a certain sort of images will arise on occasion, ~~that~~ is having a capacity of imaging the particulars & the sense of this habit. But here

such a thing is impossible.

Let us say then that it means nothing to say that a thing has an inconceivable quality. An inconceivable quality — one inconceivable by every being & absolutely — is no quality.

That which has no qualities is nothing.

∴ That which is absolutely inconceivable is nothing.

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Sep. 28

To say that a word has meaning is to say that a conception corresponds to it.

To say that we have a general conception of a triangle for instance is to say that upon the occasion of a triangle being presented to the imagination or in experience a certain feeling complicated in a certain way arises. We have no ~~feeling~~ conception therefore of that of which no determination can be presented in the imagination.

Consequently, though we may undoubtedly mean something by the inconceivable we can mean nothing by an absolutely & in itself inconceivable predicate.

Hence such a predicate is no predicate.

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To say that we know what a ~~thing~~ means is to say not that we can always apply it rightly in fact but that we can always apply it rightly to imagined cases.

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On Logical Extension and Comprehension

One term is more extensive than another, when it is predicable of all that the latter is and of more besides. One term is more comprehensive than another when ~~all~~ the ~~qualities~~ characters predicable of the latter are predicable of it and more beside.

From this it is plain, at once, that the greater the extension the less the comprehension and vice versa.

We may distinguish, ~~at once the~~ real and verbal comprehension & extension; ~~according as the difference~~ ~~consists~~ thus ~~a hap~~ ~~Inhabitants~~ "Englishman", ~~and~~ more extensive than "Surly Englishman" since it includes also "Englishmen not surly. But if there is any doubt on the other any of the latter exist, it is only verbally more extensive.

So magnanimous hero is more comprehensive

than here. But if there is a doubt whether anything is conveyed by the adjective not already conveyed by the noun then the difference is merely verbal.

A better instance is ~~here & Spir~~ man John & man.

Confining our attention to Real Comprehension & Extension, we may observe that the indication spoken of may be ~~such as~~ ~~or~~ either

1st such as could be made with no information except the meaning of the words. This I shall term the Essential Extension & Comprehension

2nd such as could logically be made in a particular supposed state of information. This I shall term the ~~informed~~ inferred Extension & Comprehension.

3rd such as could be made if our information were complete. This I shall term the Natural Extension & Comprehension.

Essential Extension & Comprehension.

One half of all terms are positive & one half negative.

Positive terms are defined, and therefore have an essential Comprehension. But they have no real essential Extension. Negative terms are not defined and therefore have no real essential comprehension but they have a real essential

extension ~~if it be known that~~ since it is known that ~~the positive~~ no determinate conception can embrace the whole sphere of being.

Man is a rational animal

Then Whatever is either irrational or not animal is not man

Two terms can not be equal in essential extension or comprehension because if they were they would have the same meaning. ~~the may not know what~~ the relations of two terms in essential comprehension or extension ~~may~~ may not be measurable ~~to~~ on account of the want of distinctness of one or both of these terms.

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Oct 2.

There ought to be a proposition relating to universal and particular terms similar to that relating to affirmative & negatives. My experience of logical symmetries assures me of it.

Perhaps this is it. A particular term will be found generally to have some ~~real~~ natural extension, therefore all the extension implied, but it will not have a comprehension adequate to limiting its extension as it is limited. On the other hand a universal term, will never have an ex-

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All M is P, P', P''
S is M
S is P

M M' M'' M'' is P P' P''
S is not P or not P' or not P'' &c
S is not M' or not M'' or not M''' &c

Any S or S' or S'' &c is M
Any S or S' or S'' &c is P

Some S, some S', some S'' is P
Any S or S' or S'' &c is M
Some M is P

Either S or S' or S'' &c is P
~~whatever is not S, not S' nor S''~~ is P
Any which is S or S' or S'' is M
Some M is P

Either S or S' or S'' or S''' is P
Any S, S', S'' or S''' is M
Some M is P

A negative proposition has a disjunctive predicate
A particular proposition has a disjunctive subject

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tension capable of limiting its comprehension as it is limited since new propositions will be discovered.

This is not yet very clear to me. But it would seem that as there is an arbitrariness in the extension of particulars so that we may exclude this or that from its extension so as to be able to predicate of it what we cannot predicate of them so there is an arbitrary element in the comprehension of the universal so that this or that may be omitted from it so that we can predicate it of (imaginary things) of which we could not predicate them.

I think this is it. In a particular there is no concrete thing which must be included under it; in a universal there is no concrete quality which must be included in it.

If some S is P
it does not follow that this S is P

If S is P
it does not follow that it is this P

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At I thinke I have it now –

Some S has a complete concrete comprehension

Thus Some Man – is a lawyer a one eyed man a cross personde.

This cannot be said of <u>Any man</u> which is therefore without concrete comprehension.

On the other hand Some man is not completely defined in extension since ~~You cannot say~~ it is disjunctive alternative while ~~Some man is some man~~ ~~any man~~ applies definitely to certain things.

Note the meaning of a particular in the predicate

Some S means Either S′ S″ S‴ &c select which ~~You please~~ I please.

Some S is P that is let me take as my subject one ~~or other of th~~ what one I please of S′ S″ S‴ &c & I can make the proposition true.

Now this does not hold for M is some P unless M is completely determined in comprehension just as Any S is P only holds if P has a very wide extension.

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We may therefore say

Affirmative } has no
Negative } has no } essential { extension / comprehension

Universal } has no concrete* { comprehension / extension
Particular }

* entirely knowable. Intuitional. Capable of external existence.

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Oct 2.

§2. Of the Effect of a Change of Information.

Suppose it is learned that

Any S is P

Not-P is not S
Some P is S

Then S receives an addition to its comprehension.
~~not S to its extension~~
P an addition to its extension.

~~Any S is not P~~

not-P receives an addition to its extension
not-S receives an addition to its extension

~~Also S receives an indefinite addition to its extension~~

If we looking at an S find it to be P.

Some S is P

This adds to the extension of P – supposing we know what S

Any S is not-P

This adds to the comprehension of S – supposing we know something of not P

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1867 Nov. 24.

I wish to investigate the nature of a simple concept.

Such a concept first arises as predicated of some object (occasion of experience)

S is M

On the ground of some previous representation of the object. (Not immediate)

The predication of the concept is virtually contained in this previous representation.

To say that a simple concept is the immediate apprehension of a quality is ~~that~~ a mode of saying that its meaning is given in the representation which gives rise to it inasmuch as it is as much as to say that that quality is contained in that representation

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1867 Dec. 7.

When I conceive a thing as say 'three' or say 'necessary' I necessarily have some concrete object in my imagination. I have some concrete object – 'the necessary'. By saying that I have the necessary in my mind, it is not meant that I have all necessary things in mind. Nor that I have simply the character of necessity. For what I am thinking is not necessity but the necessary. Then I must have something which I recognize as a general sign of the necessary. But which should that particular feeling which is a sign of the necessary be a sign of that any more than of anything else? Because such is my constitution. Very true.

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When I conceive as say "necessary", I have some ~~singular~~ object present to my imagination ~~this singular~~ I have not all necessary things separately imaged.

Doubted whether I ever have an absolutely singular object.

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In short there must be a Middle Voice

$\textcircled{\ell}$ ℓ to itself.

$A_1 \mathrel{\underline{\in}} A_1, \textcircled{\ell}$

$A_2 \mathrel{\underline{\in}} A_2, \textcircled{\ell}$

as

$\Sigma_i A_i \mathrel{\underline{\in}} \Sigma_i A_i, \textcircled{\ell} \mathrel{\underline{\in}} \textcircled{\ell}, \Sigma_i A_i$

$a \mathrel{\underline{\in}} \textcircled{\ell}, a$

If $a \mathrel{\underline{\in}} \textcircled{\ell}, a$

Then 1st $a \mathrel{\underline{\in}} a, \ell_a$

~~2nd If $x, (1-a) \mathrel{\underline{\in}} a$~~

~~$x, (1-a) \mathrel{\underline{\in}} 0$~~

~~$x, x \mathrel{\underline{\in}} 0$~~

And hence

if $x, (1-a) \mathrel{\underline{\in}} 0$

$a, (1-\textcircled{\ell}) \mathrel{\underline{\in}} 0$

$x, (1-a) + a, (1-\textcircled{\ell}) \mathrel{\underline{\in}} 0$

$x, (1-\textcircled{\ell}) \mathrel{\underline{\in}} 0$

$x, (1-\ell_x) \mathrel{\underline{\in}} 0$

That embodies the whole condition. Now of this symbol. That is that

$$\frac{0}{1-\textcircled{\ell}}, \left(1-\ell_{\frac{0}{1-\textcircled{\ell}}}\right) \mathrel{\underline{\in}} 0 \quad \text{or} \quad v, \textcircled{\ell}, (1-\ell_{v, \textcircled{\ell}}) \mathrel{\underline{\in}} 0$$

over

or still better

$$v, \textcircled{e}, (1 - l_v) \equiv 0$$

This fully defines $\textcircled{e}$

That is

$$\textcircled{e} \equiv \frac{0}{v, (1 - l_v)} \qquad \begin{matrix} v = 0 \\ \text{or } l_v = 1 \end{matrix}$$

$$\equiv \frac{0}{0}, \left((1 - v) +, l_v\right)$$

Here I feel myself sadly in want of a better notation. How should I denote l_x? This by the usual developement gives

$$l_x \equiv l_1, x + l_0, (1 - x)$$

This developement does not hold, but

$$l_1 \equiv l$$
$$l_0 \equiv 0$$

I want some thing similar

$$e^x \equiv e^1, x + e^0, (1 - x)$$

$e^0 \equiv 1$ so this is not what I want

$$x^l = 1^l, x + 0^l, (1 - x)$$

$1^l \equiv 1$ But l_1 is very analogous.

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For example, if I were to let the exponent express the ground of relation & the other letter the correlate of the relation fixing the meaning of a term

l could be the relation identical with

a' whatever is identical with any a

~~l' whatever is l~~

Let us see how our fundamental equations would appear –

$$x^l +_, y^l \equiv (x +_, y)^l$$

How the inverse should be expressed would require further consideration

$$l, v', (1 - v^l) \equiv 0$$

The inverse would be simply this

If $a \equiv b^l$ then ,, $b \equiv a^{-l}$

My analogies so far are but remote. Still I hope they will develope into something.

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I see, at present, no way of improving my notation –

$$\ell_{x+y} \overset{\cdot}{=} \ell_x +_{\cdot} \ell_y$$

$$\ell_{\cdot} v_{\cdot} (1 - \ell_v) \overset{\cdot}{=} 0$$

$$\ell_{\ell^{-1}} \overset{\cdot}{=} \ell_1$$

Every mother lovers ~~every~~ some son or daughter of hers –

i.e. Ever mother is lover of some son or daughter of herself.

m = mother
ℓ = lover

$$m_1 \overset{\cdot}{=} m_{1\cdot} \ell_{m^{-1}}$$

Every mother lovers every ~~son or~~ thing whose mother she is

i.e Every mother is to herself the lover of everything ~~of which she~~ mothered

The lover of every son of hers is identical with every thing except which is non-lover of some son of hers

$$m_1 \overset{\cdot}{=} m_{1\cdot} (1 - (1-\ell)_{m^{-1}})$$

$$m_{\cdot} (1-\ell)_{m^{-1}} \overset{\cdot}{=} 0$$

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Syllogism

$m_{,3}\,(1-\ell)_{m^{-1}} \mathrel{\overline{\overline{\jmath}}} 0$

$\cancel{a \mathrel{\overline{\overline{\jmath}}} m_{,3} b}$

$a(1-m_b) \mathrel{\overline{\overline{\jmath}}} 0$

$a_{,3}(1-m_b) + m_{,3}\,(1-\ell)_{m^{-1}} \mathrel{\overline{\overline{\jmath}}} 0$

$a_{,3}(1-1_b) + 1_{,3}\,(1-\ell)_{1^{-1}}$

$a_{,3}(1-0_b) + 0_{,3}\,(1-\ell)_{0^{-1}}$

$a \mathrel{\overline{\overline{\jmath}}} a_{,3} m_b$

$m_b \mathrel{\overline{\overline{\jmath}}} \frac{0}{0} a$

$m_b \mathrel{\overline{\overline{\jmath}}} v_{,} m_{,}$

$a = a m_b$

$v_{,} b_{,} \mathrel{\overline{\overline{\jmath}}} v_{,} b_{,} m_a^{-1}$

$\frac{a}{a} \mathrel{\overline{\overline{\jmath}}} m_b$

fathers dog's master

$m_a^{-1} = vb + v_{,} b_{,} v_{,} b$

m^x

$(m^1)^{x+x} + (m^0)^x$

$0 \mathrel{\overline{\overline{\jmath}}} m_{,3}\,(1-\ell)_{m^{-1}} \mathrel{\overline{\overline{\jmath}}} \frac{0}{v_{,}(1-\ell_v)} \mathrel{\overline{\overline{\jmath}}} \frac{0}{d_{,}(1-(1-\ell)_{m^{-1}_a})}, m_{,}$

$a_{,}(1-m_b) \mathrel{\overline{\overline{\jmath}}} 0$

$m_{,3}\,(1-\ell)_{m^{-1}} \mathrel{\overline{\overline{\jmath}}} 0$

$m_b{}_{,3}\,(1-\ell)_{m^{-1}} \mathrel{\overline{\overline{\jmath}}} 0$

$a \mathrel{\overline{\overline{\jmath}}} a_{,} m_b$

$m_a^{-1} \mathrel{\overline{\overline{\jmath}}} m_{a,}^{-1} m_b$

$a = \ell_b$

$\ell^{-1} = \ell_{\ell_b}^{-1} = \ell$

$a_{,}(1-\ell)_{m^{-1}} \mathrel{\overline{\overline{\jmath}}} 0$

$a_{,}(1-\ell)_{m_a^{-1}} \mathrel{\overline{\overline{\jmath}}} 0$

$a_{,}(1-\ell)_b \mathrel{\overline{\overline{\jmath}}} 0$

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Return to individuals

$$A_1 \mathrel{\underline{\underline{\ni}}} B_1^{\ell} \qquad B_1 \mathrel{\underline{\underline{\ni}}} A_1^{\frac{1}{\ell}}$$

$$A_2 \mathrel{\underline{\underline{\ni}}} B_2^{\ell} \qquad B_2 \mathrel{\underline{\underline{\ni}}} A_2^{\frac{1}{\ell}}$$

$$A_1 + A_2 \mathrel{\underline{\underline{\ni}}} B_1^{\ell} + B_2^{\ell}$$

$$(B_1 + B_2)^{\ell} = B_1^{\ell} + \frac{\ell, B_1, \cancel{B_2^{\ell-1}}}{B_2^{1-\ell}} + \cdots \frac{\ell, B_2}{B_1^{1-\ell}} + B_2^{\ell}$$

$$\cancel{(B_1 + B_2)^{\ell} =}$$

$$\cancel{A_1, A} \qquad A_1 \mathrel{\underline{\underline{\ni}}} B_1^{\ell}$$

$$C_1 \mathrel{\underline{\underline{\ni}}} B_1^{m}$$

$$A_1, C_1 \mathrel{\underline{\underline{\ni}}} B_1^{\ell + m}$$

$$A_1 \mathrel{\underline{\underline{\ni}}} B_1^{\ell} \quad A_2 \mathrel{\underline{\underline{\ni}}} B_2^{\ell}$$

$$A_1 A_2 \mathrel{\underline{\underline{\ni}}} (B_1, B_2)^{\ell}$$

This will never never do —

$$A_1 \mathrel{\underline{\underline{\ni}}} B_1^{\ell} \quad B_1 \mathrel{\underline{\underline{\ni}}} C_1^{m}$$

$$A_1 \mathrel{\underline{\underline{\ni}}} (C_1^{m})^{\ell}$$

$$\mathrel{\underline{\underline{\ni}}} C_1^{m, \ell}$$

$$x^{\ell} = \ell$$

$$x = \sqrt[\ell]{\ell}$$

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$A_1 \overset{\ell}{=} B_1$

$A_1 \overset{\ell}{=} B_1 \qquad A_2 \overset{\ell}{=} B_2$

$B_1 \overset{\ell}{=} A_1 \qquad B_2 \overset{\ell}{=} A_2$

$B_1 \overset{m}{=} C_1$

$A_1 \overset{\ell m}{=} C_1$

$C_1 \overset{m\ell}{=} A_1$

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$a_1 \underset{s}{=} a$

a_ℓ is the $\underline{\ell}$ to $\underline{a}$

ℓa is the ℓ to a

$\ell(a+b) = \ell a + \ell b$

$\ell_{a+b} = \ell_a + \ell_b$

$\ell_{-(a+b)} \underset{s}{=} \ell_{-a} + \ell_{-b}$

$\cancel{\ell} \; [\ell]_s \, v_s \, (1-\ell_{-v}) \underset{s}{=} 0$

$\cancel{[\ell \ell^{\vee}]_s = \ell_{-1}}$

$[\ell - (1-\ell^{\vee})] \underset{s}{=} 0$

$a = b_\ell$

$a_{\frac{1}{\ell}} =$

$(a_{\frac{1}{\ell}})_\ell$

$(a_x)_\ell = a$

$a_{(x_\ell)}$

$\ell a \underset{s}{=} a$

$a \underset{s}{=} a_{(\ell)}$

$\ell_{-a} \underset{s}{=} b$

$(\ell_{+s} m)a = \ell a +_s m \cdot a$

$(\ell_s m)_{-a} \underset{s}{=} \ell_{-a}, m_{-a}$

$a \underset{s}{=} \ell_b$

$\ell_{-\text{every}\, a} = 1 - (1-\ell)_a$

1868 Nov. 3.

Force let

$$l_x$$

denote ~~that~~ whatever is $\underline{l}$ to every $\underline{x}$.

Then

$$l_{(x+_5 y)} \overset{=}{_5} l_x \,_5 l_y \qquad \text{unless either } x \text{ or } y = 0$$

But if we let

$$l_x$$

denote whatever is $\underline{l}$ to some $\underline{x}$

Then

$$l_{(x+_5 y)} \overset{=}{_5} l_x +_5 l_y$$

Turn over.

ℓ_x denotes that which is $\underline{\ell}$ to every x

$$\ell_{(x+y)} \overset{=}{\circ} \ell_x \circ \ell_y$$

$$\therefore \ell_x \overset{=}{\circ} \ell_x \circ \ell_0 \qquad \cancel{\text{or } \ell_0 \overset{=}{\circ} 1}$$

$$\text{and } \ell_1 \overset{=}{\circ} \ell_x \circ \ell_1 \qquad \cancel{\text{or } \ell_1 \overset{=}{\circ} 0}$$

From the first we have

$$\ell_0 \overset{=}{\circ} \ell_x ; \ell_x \overset{=}{\circ} \ell_x + \tfrac{0}{0}(1-\ell_x)$$

$$\ell_1 \overset{=}{\circ} 0 ; (1-\ell_x) \overset{=}{\circ} \tfrac{0}{0}\ell_x$$

~~ℓ_0 the~~. Whatever is $\underline{\ell}$ at all is ℓ_0

$$\cancel{y \circ (1-\ell_y^{-1}) \overset{=}{\circ} 0}$$

$$y \circ (1-\ell_{\ell_y}^{-1}) \overset{=}{\circ} 0$$

$$y \circ (1-\ell_{\ell_y^{-1}}) \overset{=}{\circ} 0$$

$$1-\ell_x \overset{=}{\circ}$$

$$(1-\ell)_x \overset{=}{\circ}$$

$$\therefore$$

$$1-\ell_x \circ \ell_y \overset{=}{\circ}$$

$$(1-\ell)_x \circ (1-\ell)_y \overset{=}{\circ}$$

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ℓ_x denotes that which ℓ to some x

$$\ell_{(x +_0 y)} \overset{=}{_0} \ell_x +_0 \ell_y$$

$$\therefore \ell_x \overset{=}{_0} \ell_x +_0 \ell_0 \quad \text{or} \quad \ell_0 \overset{=}{_0} \frac{0}{0} \ell_x$$

and $\ell_1 \overset{=}{_0} \ell_x +_0 \ell_1$ ~~or $\ell_1 \overset{=}{_0} 1$~~

ℓ_1 is ℓ of something

ℓ_0 covers nothing except what is $\underline{\ell}$ of everything.

$$= (1-\ell)_x$$

$$= 1-\ell_x$$

$\therefore$

$$\overset{=}{_0} (1-\ell)_x +_0 (1-\ell)_y$$

$$\overset{=}{_0} 1-(\ell_x +_0 \ell_y)$$

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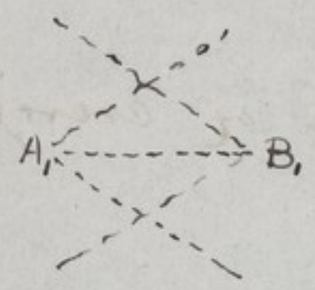
1868 Nov. 8.

If $A_1 A_2 A_3$, $B_1 B_2 B_3$ &c are individuals

~~$A_1 \ell B_1$~~

If $A_1 \equiv A_1, \ell_{B_1}$ then $B_1 \equiv B_1, \ell^{-1}_{A_1}$

and conversely



and so

if $\Sigma_i A_i \equiv \Sigma_i (A_i, \ell_{B_i})$ then $\Sigma_i B_i = \Sigma_i (B_i, \ell^{-1}_{A_i})$

and conversely

or if Σ' denotes the logical sum

if $\Sigma_i A_i \equiv \Sigma_i A_i, \Sigma'_i \ell_{B_i}$ then $\Sigma_i B_i \equiv \Sigma_i B_i, \Sigma'_i \ell^{-1}_{A_i}$

Now ℓ may be so taken that

$$\ell_{x+y} \equiv \ell_x \ell_y$$

or so that

$$\ell_{x+y} \equiv \ell_x, \ell_y$$

In the former case $\Sigma'_i \ell_{B_i} \equiv \ell_{\Sigma_i B_i}$

and if we denote

$$\Sigma_i A_i \text{ by } a$$
$$\Sigma_i B_i \text{ by } b$$

Here is a fallacy
$\Sigma_i B_i$ is ambiguous it may mean all the B's or to all the B's corresponding to a's

If $a \equiv a, l_b$ then and then only is $\overset{\cup}{,} b \equiv \overset{\cup}{,} b, l_a^{-1}$

Then $l_1 \equiv l_{\Sigma' x} \equiv \Sigma^{\circ} l_x$

$$l_0 +, l_x \equiv l_{x+,0} \equiv l_x$$

l_1 ~~is that which~~ embraces whatever is $\underline{l}$ to anything
l_0 is embraced by whatever is $\underline{l}$ to anything

But let l_x ~~be~~ written, thus,

$$l_x \equiv x, i + (1-x), j$$

When $x \equiv 1$ this becomes $l_1 \equiv i$
When $x \equiv 0$ it becomes $l_0 \equiv j$

Hence it appears that i & j change with x

Let $i = \varphi x$
$j = \psi x$

denote $\varphi x \equiv i', x + (1-x), j'$

$\varphi(1) \equiv i' \equiv l_1$

$\varphi x \equiv l_1, x + (1-x), j'$

I break off this inquiry here & go on to other points.

Our two fundamental equations so far are

$$l_{\Sigma'} \equiv \Sigma l \qquad \left(\text{whence as } \alpha x + (1-\alpha)x \equiv x \right.$$

$$l_x \equiv l_{\alpha x} + l_{(1-\alpha)x}$$

$$\text{or } l_{\alpha x} l_x \equiv l_{\alpha x}$$

$$\text{or } l_{\alpha x}(1 - l_x) \equiv 0$$

and $x,(1 - l^{-1}_{0,0,l_x}) \equiv 0$

or $x,(1 - l^{-1}_{l_x}) \equiv 0$

Can we now express the following relation:

The ~~husband~~ spouse of any woman is the husband of that woman

Let s denote spouse
h husband
w woman

Then s_w is all spouses of any woman
h_w " husbands " " "

Let the required formula be denoted thus: —

$$s_w \equiv \varphi h_w$$

Then it must follow that if $\underset{\sim}{z}$ denotes a particular woman or ~~body~~ class of women, that is if

$$z,(1-w) \equiv 0 \qquad \text{or} \qquad w \equiv \Sigma z$$

$$s_z \equiv \varphi h_z$$

$s_{z_1} \equiv h_{z_1}$ $s_{z_2} \equiv h_{z_2}$ &c is to follow from $\Sigma_i s_{z_i} \equiv \varphi \Sigma_i h_{z_i}$

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We may express it then thus

$$S_{u,w} \equiv h_{u,w} \qquad S^{-1}_{1,}u,w,(1-S^{-1}h_{u,w}) \equiv 0$$

where $\underline{u}$ is indeterminate $\quad u,w,S^{-1}_{(1-h_{u,w})} \equiv 0$

Cannot this indeterminate be eliminated, so that the indetermination shall lie in the very form of the expression?

I think it cannot be eliminated without a special form of expression. Herein lies the peculiarity of this branch of Logic. & the need of a new study.

It here occurs to me that our second fundamental equation can be rendered more definite I have said –

There is ~~no class of things which is~~ nothing of any sort except what is on the left of something on the right of something of that sort.

I should have said nothing which is on the left at all –

$$\text{or} \quad l^{-1}_{1,}x_{,}(1-l^{-1}_{l_x}) \equiv 0$$

But I might have said whatever is on the left of anything is on the left of something on the

I would add nothing

It would seem to follow

since $$l_{\Sigma x} \mathrel{\underline{\in}} \Sigma l_x$$

that $$l_{x+x+x+\&c} \mathrel{\underline{\in}} l_{n,x} \mathrel{\underline{\in}} n, l_x$$

But it plainly does not follow. Or rather that n must be $\mathrel{\underline{\in}} 1$.

It is true, however, that

$$l_{n,x} \mathrel{\underline{\in}} v, l_n, l_x$$

For ~~$l_{n,x+u} = l$~~ putting $u \mathrel{\underline{\in}} (1-n), x$

$$l_{n,x+,u} \mathrel{\underline{\in}} l_x \mathrel{\underline{\in}} l_{n,x} +, l_u$$

And so $$l_n \mathrel{\underline{\in}} l_{n,x} +, l_{u'}$$

$$\therefore \quad l_n, l_x \mathrel{\underline{\in}} l_{n,x} +, l_u, l_{u'}$$

Hence putting $v \mathrel{\underline{\in}} \cancel{l_{n,x}} (1 - l_{(1-n),x}), (1 - l_{(1-x),n})$

$$v, l_n, l_x \mathrel{\underline{\in}} l_{n,x}$$

[Follows 45] ~~a5r~~ 51C

De Morgan	Myself
$X..LY$	$X,(1-L-Y)\equiv 0$
$X.LY$	$X,L-Y\equiv 0$
$X..LMY$	$X,(1-L-M-Y)\equiv 0$
$X.LMY$	$X,L-M-Y\equiv 0$
LM'	$v(1-(1-L)-M)$
L,M	$v(1-L-(1-M))$
$L^{-1}X$	$L^{v}-X$
If $X..LY$ then $Y..L^{-1}X$	$[l-(1-l^{v})]\equiv 0$
lY	$\begin{cases} 1-l-Y \\ (1-l)-Y \end{cases}$ De Morgan does not distinguish these, because he treats only singulars
lX (provided Ll_x)	$\begin{cases} L-(1-l-X) \\ L-(1-l)-X \end{cases}$
l^{-1} is not (L^{-1})	$\cancel{(1-L)^{v}\equiv}$ $(1-L)^{v}-X\equiv 1-L^{v}-X$ not true in generals
	$(1-L^{v})-X\equiv(1-L)^{v}-X$ this is true
~~not (L^{-1})~~	Converse / Contrary
	$L-M-x$ / $M^{v}-L^{v}-x$ / $1-L-M-x$
$LM))N$	$L-M-1,[(1-N)-M^{v}-L^{v}]\equiv 0$ or $[L-M-N]\equiv 0$
$L^{-1}n))m$	$L^{v}-(1-N)-1,[M-(1-N^{v})-L]\equiv 0$ $[M-N-L]\equiv 0$
$nM'))l$	$(1-N)-M^{v}-1,[L-M-(1-N^{v})]\equiv 0$ $[L-M-N]\equiv 0$

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$[l], v, (1 - l_{-}v) \equiv 0$

$[l] \equiv [l^{-1}]$

$[l] \equiv 0; (v, (1 - lv)) \equiv \frac{0}{0} (-v +, lv)$

$\cancel{[l^{-1}] \equiv \frac{0}{0} (1 - v +, l^{-1}v)}$

$v \equiv lu$

$[l] \equiv \frac{0}{0} (1 - lu +, l^2 u)$

$\varphi x \equiv lx + mx + xe$

$x \equiv 1x$

$1 - x \equiv 1.1 - 1x \equiv 1(1 - x)$

$1x + ?x \equiv 1$

$?x, 1x \equiv 0$

$\cancel{?x, (1 -}$

When we take relation into account we see that

φx cannot be developed as

$$\varphi x \equiv i_, x + j_, (1-x)$$

where i and j are independent of x. But it can be developed as

$$\varphi x \equiv \ell x + m x + n x + \&c = \Sigma \ell x$$

$$\varphi x \equiv \varphi 0 + x D \varphi 0 + \&c$$

$$x(1-[\ell]) \equiv 0 \qquad x_,(1-[\ell]) \equiv 0$$

$$x_,(1-\ell x) \equiv 0 \qquad [\ell]_, x_,(1-\ell x) \equiv 0$$

$$x \equiv x_, \ell x \qquad x_,(1-\ell x)$$

$$[\ell(1-\ell^v)] \equiv 0 \qquad x_,(1-\ell x) \equiv 0$$

$$x_,(1-[\ell(1-\ell^v)]) \equiv 0$$

$$x_,(1-\ell(1-\ell^v)x) \equiv 0$$

$$\cancel{x_, \ell y}$$

A $\quad \ell(x+y) \mathrel{\underline{=}} \ell x +_{\circ} \ell y \mathrel{\underline{=}} \ell x + \ell y \,_{\circ}(1-\ell x)$

$\therefore \ell x \mathrel{\underline{=}} \ell x + \ell(x-x) \,_{\circ}(1-\ell x)$

$\ell x \mathrel{\underline{=}} \ell x \,_{\circ}(1-\ell(x-x)) + \ell(x-x)$

$\ell 1 - \ell x \,_{\circ}(1-\ell(1-x)) \mathrel{\underline{=}} \ell(1-x)$

$\ell 1 - \ell x \mathrel{\underline{=}} \ell(1-x) \,_{\circ}(1-\ell x)$

$\ell(1-x) \mathrel{\underline{=}} (\ell 1 - \ell x) \,_{;}(1-\ell x)$

$\mathrel{\underline{=}} \frac{0}{0} \,_{\circ} \ell 1 \,_{\circ} \ell x + \ell 1 \,_{\circ}(1-\ell x) + \frac{1}{0}(1-\ell 1) \,_{\circ} \ell x$

(1) $\quad \mathrel{\underline{=}} \frac{0}{0} \,_{\circ} \ell x + \ell 1 \,_{\circ}(1-\ell x)$

$mx +_{\circ} (1-m)x \mathrel{\underline{=}} 1$

$\therefore mx + (1-m)x \,_{\circ}(1-mx) \mathrel{\underline{=}} 1$

(2) $\quad (1-m)x \mathrel{\underline{=}} (1-mx) + \frac{0}{0} mx$

(3) $\quad \ell\left(\frac{0}{0} \,_{\circ} x\right) \mathrel{\underline{=}} \frac{0}{0} \,_{\circ} \ell x$

$\ell a \,_{\circ} \ell b \mathrel{\underline{=}} \ell(a \,_{\circ} b + a \,_{\circ} \bar{b}) \,_{\circ} \ell(\bar{a} \,_{\circ} b + \bar{a} \,_{\circ} b)$

$\mathrel{\underline{=}} \left(\ell(a \,_{\circ} b) +_{\circ} \ell(a \,_{\circ} \bar{b})\right) \,_{\circ} \left(\ell(a \,_{\circ} b) +_{\circ} \ell(\bar{a} \,_{\circ} b)\right)$

$\mathrel{\underline{=}} \ell(a \,_{\circ} b) +_{\circ} \ell(a \,_{\circ} \bar{b}) \,_{\circ} \ell(\bar{a} \,_{\circ} b)$

$\mathrel{\underline{=}} \ell(a \,_{\circ} b) \,_{\circ}(1 - \ell(a \,_{\circ} \bar{b}) \,_{\circ} \ell(\bar{a} \,_{\circ} b)) + \ell(a \,_{\circ} \bar{b}) \,_{\circ} \ell(\bar{a} \,_{\circ} b)$

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$$l(a,b) \underset{s}{=} \left(la, lb - l(a,\bar{b}), l(\bar{a},b)\right); \left(1 - l(a,\bar{b}), l(\bar{a},b)\right)$$

(4) $$\underset{s}{=} la, lb, \left(1 - l(a,\bar{b}) +_s 1 - l(\bar{a},b)\right) + \frac{0}{0}, l(a,\bar{b}), l(\bar{a},b)$$

where we have also

(5) $$l(a,b) \underset{s}{=} \frac{0}{0}, la, lb$$

~~B~~ $\cancel{[l], v, (1 - lv) \underset{s}{=} 0}$ ~~Be v what it may.~~

~~If $[lm] \underset{s}{=} 0$~~

~~By B~~ $\cancel{[lm] \underset{s}{=}} [lm], v, (1 - lmv) \underset{s}{=} 0$

~~$\Rightarrow$~~ $\cancel{[lm] \underset{s}{=} 0; (v, (1 - lmv))}$

$\cancel{\underset{s}{=} \frac{0}{0}}$

B does not quite express that everything which is l to itself is $[l]$

I guess it will do however

~~B~~ $\cancel{[l], v, (1 - lv) \underset{s}{=} 0}$

$\cancel{[l], v - [l], v, lv \underset{s}{=} 0}$

$\cancel{[l], v \underset{s}{=} [l], v, lv}$

I can do better

B $[l] \underset{s}{=} \Sigma' x$ where $x, v, (1 - lv) \underset{s}{=} 0$ whatever be the value of v, except zero.

Now if $[l] \mathrel{\underset{\jmath}{=}} 0$ $\quad x \mathrel{\underset{\jmath}{=}} 0$

that is only $x \mathrel{\underset{\jmath}{=}} 0$

will satisfy the ~~equation~~ identity

$$x, v, (1 - lv) \mathrel{\underset{\jmath}{=}} 0$$

Hence $x \mathrel{\underset{\jmath}{=}} 1$ will not satisfy it

Hence $v, (1 - lv)$ is not zero.

Let it be w

$$\cancel{v - v, lv \mathrel{\underset{\jmath}{=}} w} \quad v, (1 - lv) \mathrel{\underset{\jmath}{=}} w$$

$$\cancel{v \mathrel{\underset{\jmath}{=}} w + v, lv}$$

Multiplying by $1 - v$

$$w, (1 - v) \mathrel{\underset{\jmath}{=}} 0$$

$$w \mathrel{\underset{\jmath}{=}} w, v$$

$$\therefore \quad v, (1 - lv) \mathrel{\underset{\jmath}{=}} w, v$$

$$\therefore \quad v - v, lv \mathrel{\underset{\jmath}{=}} w, v$$

$$v - w, v \mathrel{\underset{\jmath}{=}} v, lv$$

$$v, (1 - w) \mathrel{\underset{\jmath}{=}} v, lv$$

~~Let V be any individual v~~

If now v is an individual

Since $w \mathrel{\underset{\jmath}{=}} w, v$ $\quad x$ is not zero

$$w \mathrel{\underset{\jmath}{=}} v$$

$$\therefore \quad v, (1 - w) \mathrel{\underset{\jmath}{=}} 0$$

$\therefore V, \ell V \underset{s}{=} 0$

(6) If $[\ell] \underset{s}{=} 0$ where V is any individual

Suppose $[\ell m] \underset{s}{=} 0$

Then, $V, \ell m V \underset{s}{=} 0$

Let U be any individual and denote by W

$W \underset{s}{=} U, m \ell U$

Then by (5)

$\ell W \underset{s}{=} 0, \ell U, \ell m \ell U$

Put $\ell U \underset{s}{=} \Sigma' V'$

$\ell W \underset{s}{=} 0, \Sigma' V', \ell m \Sigma' V'$

(7) Conversely if there is any $X, \ell X$

$X, \ell X \underset{s}{=} X$

$\therefore \quad X, (1 - \ell X) \underset{s}{=} 0$

and as X is an individual $v, X \underset{s}{=} X$

$\therefore X, v(1 - \ell, v) \underset{s}{=} 0$

(8) $\therefore X \underset{s}{=} X, [\ell]$

and if there is an $X, \ell X$ there is an $[\ell]$

From B we have if we let X be an individual such that

$X \underset{s}{=} X, x$

$X, v, (1 - \ell v) \underset{s}{=} 0$

and taking v as X

$X \underset{s}{=} X, \ell X$

So that if there is any $[\ell]$ there is an $X, \ell X$

(9) Hence If $[\bar{e}] \underset{s}{=} 0$ $X, eX \underset{s}{=} 0$

(10) and If $X, eX \underset{s}{=} 0$ $[e] \underset{s}{=} 0$

If there is an $[e\,m]$

~~$m[e\,m]$~~

Let it be $[e\,m] = a$

$a \underset{s}{=} a, e\,m\,a$

Then there is an $\underline{m}\underline{a}$

for if $\underline{m}a \underset{s}{=} 0$

$a \underset{s}{=} a, e\,m\,a \underset{s}{=} a, e\,0 \underset{s}{=} a, 0 \underset{s}{=} 0$

Some individual

Let $V, m\,a \underset{s}{=} b$

$V, e\,m\,a \underset{s}{=} e\,b$

But $e\,m\,a \underset{s}{=} \frac{0}{0}, a$

$\therefore$ $e\,b \underset{s}{=} \frac{0}{0}, a$

$\therefore$ $m\,e\,b \underset{s}{=} m\left(\frac{0}{0}, a\right) \underset{s}{=} \frac{0}{0}, m\,a$ ~~$\underset{s}{=} \frac{0}{0}, b$~~

~~$\therefore$ There is a~~ ~~V, m~~ ~~$b, m\,e\,b$~~

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Nov. 10.

I think $\mathfrak{B}$ can be replaced by the following —

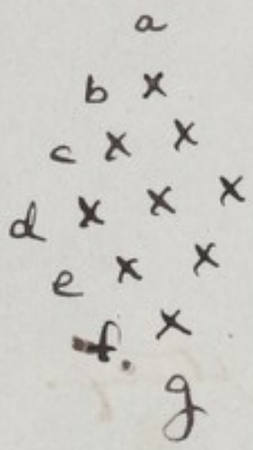
$\mathfrak{B}$ $[l] \equiv \sum^{\circ} x_{\circ}(1-(1-l)x)$ Sum of all such terms.

But before we can treat this advantageously, we must consider the terms of such symbols in general as $\sum^{\circ}$

For this purpose let us start with the symbol

$(1-l)x$ which denotes that which is not l-to-every x

i.e. that which is non-l to some x.



Thus in the figure if l is "lower than"

$(1-l)x \equiv a+b+c+d+e+f+x$

Anyhow related but lower than an x.

$1x$ would be anyhow related to $x \equiv 1$

$0x$ no how related to $x \equiv 0$

Then $(l+m)x$ would be lx or mx

x would have no peculiarity

$(l,m)x$ would be at once l & m to some one x.

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Then we have

(11) $(l +_3 m)x \equiv_3 lx +_3 mx$

(12) $(l_3 m)x \equiv_3^{0}_{0}, lx_3 mx$

This I do not see how to put into a formula.

(13) $\left(l_3(1-l)\right)1 \equiv_3 0$

Now upon this discovery I am disposed to wheel off into a wholly different way of considering the whole subject.

But in order to do so some things must be further investigated

$$l\cancel{x} +_3 l(1-x) \equiv_3 l(1 + (1-x) \equiv_3 l1$$

(14) $\therefore$ $l1$ signifies that which is l to anything.

$$lx +_3 (1-l)x \equiv_3 \left(l +_3 (1-l)\right)x \equiv_3 1\cancel{x}$$

But everything is either lower than or not lower than everything.

(15) $\therefore$ $1x \equiv_3 1$

As ~~everything~~ any is somehow related to x in a way that nothing else is

Any term z is

$$z \equiv \mu x$$

where $z \propto x$ determine μ.

$$\therefore \quad 0x +_3 z \equiv 0x +_3 \mu x \equiv (0 +_3 \mu) x \equiv \mu x \equiv z$$

Now this is the definition of zero

(16) $\therefore \quad 0x \equiv 0$

$$\ell 0 +_3 \ell x \equiv \ell(0 +_3 x) \equiv \ell x$$

$$\therefore \ell 0 +_3 (1 - \ell x) \equiv 0$$

Or that which is ℓ to zero is ℓ to everything.

So that $\ell 1$ means ℓ to <u>something</u>

$\ell 0$ " ℓ to <u>everything</u>

(17) ~~$\therefore \ell 0$ is ℓ to itself~~

Hence if ~~$x, \ell y$~~

~~$\ell 0$~~

$\therefore \ell 0$ is ℓ to itself, so that if from the nature of ℓ

(18) this is impossible (if for example ℓ is "other than") then

$\ell 0 \equiv 0$

* a q can be so taken that when neither ℓx nor $\ell y \equiv 0$

(19) Again if $\wedge \ell x, \ell y \equiv 0 \wedge \ell 0 \equiv 0$

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From (15) & (17) we have

$$10 \equiv 1$$

Hence

$$\ell 1 \equiv \ell \text{ to } \underline{\text{something}} \qquad 1\ell \equiv 1$$

$$\ell 0 \equiv 0 \text{ or } \ell \text{ to } \underline{\text{everything}} \qquad 0\ell \equiv 0$$

Now if we let

$$\ell' x \equiv 1 - (1-\ell)x$$

$$\ell' x \equiv 1 - (1-1)x \equiv 1 - 0x \equiv 1 - 0 \equiv 1$$

$$\ell' x \equiv 1 - (1-0)x \equiv 1 - 1x \equiv 1 - 1 \equiv 0$$

$$\ell' 1 \equiv 1 - (1-\ell)1 \equiv 1 - \text{other than } \ell \text{ to something} \equiv \text{what is } \ell \text{ to everything} \equiv \ell 0$$

$$\ell' 0 \equiv 1 - (1-\ell)0 \equiv 1 - \text{other than } \ell \text{ to everything} \equiv (1-\ell)1$$

Then $\ell' x$ might be written ℓ^x

and we should have

$$1^x \equiv 1 \qquad 0^x \equiv 0$$

$\ell' \equiv \ell 0$ which might be written ℓ

$(1-\ell)' \equiv (1-\ell)0 \equiv (1-\ell)$

$\ell^0 \equiv 1 - \ell 0 \equiv \cancel{(1-\ell)1}\ \ell 1$ which might be written 1ℓ

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We have also

$$e^x, e^y \equiv e^{x+y}$$

$$(e, m)^x \equiv e^x, m^x$$

$$e^{x,y} \equiv e^x +, \tfrac{0}{0} +, e^y$$

This may be expressed as $(e^x)^y \equiv (e^y)^x$??

$$(e+m)^x \equiv e^x +, \tfrac{0}{0} +, m^x$$

$$e^{0,A+1,B+\frac{0}{0},C+\frac{1}{0},D} \equiv e^0, e^B, e^{\frac{0}{0},C}, e^D$$

$$\equiv e^{B+\frac{0}{0}C} \equiv e^B, e^{\frac{0}{0},C}$$

$$e^x, e^{-x} \equiv e^{x+(-x)} \equiv e^0$$

$$e^x; e^x \equiv e^x + \tfrac{0}{0}, (1-e^x)$$

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If $e^x = y$

we must write $x = \log_e y$

But we may have also

$e^z = y$ though $z \neq x$

$\therefore \quad z = \log_e y$

$\therefore$ $\log_e y$ must be an indeterminate expression.

$\log_e e = 1$

$\log_e 1 = 0$ generally

& always $\log_e 1^a = 0$

Now in order to get at formula for developement without which Boole's Calculus is nothing, let us see if we can get at something like Taylor's theorem.

Let $\qquad \varphi x + \Delta_1 \varphi x = \varphi(x + \Delta_1 x)$

where $\Delta_1 x$ is whatever we please

Let us rather take

$$\Delta_1 \varphi x = \varphi(x + \Delta x) - \varphi x$$

where Δx is anything not 0

Let $\varphi x = x +_3 a$

$$\Delta(x +_3 a) \equiv (x + \Delta x) +_3 a - (x +_3 a)$$
$$\equiv \Delta x$$

Let $\varphi x = a_3 x$

$$\Delta(a_3 x) \equiv a_3(x + \Delta x) - a_3 x$$
$$\equiv a_3 \Delta x$$

Let $\varphi x \equiv 1 - x$

$$\Delta(1 - x) \equiv 1 - (x + \Delta x) - (1 - x)$$
$$\equiv -\Delta x$$

Let $\varphi x = e^x$

$$\Delta e^x \equiv e^{x + \Delta x} - e^x$$
$$\equiv e^x{}_3 e^{\Delta x} - e^x$$
$$\equiv -e^x{}_3 (1 - e^{\Delta x})$$

Let $\varphi x \equiv x^a$

$$\Delta x^a \equiv (x + \Delta x)^a - x^a$$

• $\Delta(\varphi x + \psi x) \equiv \varphi(x + \Delta x) + \psi(x + \Delta x) - (\varphi x + \psi x)$

$$\equiv \Delta \varphi x + \Delta \psi x$$

over

Let φ be such that

$$\varphi(x+y) \equiv \varphi x + \varphi y$$

Then $\varphi(x+\Delta x) \equiv \varphi x + \varphi \Delta x$

But $\Delta \varphi x \equiv \varphi(x+\Delta x) - \varphi x$

$$\therefore \Delta \varphi x \equiv \varphi \Delta x$$

$$\therefore \cancel{(\varphi+\Delta)(\varphi x + \Delta x)^2} \equiv (\varphi+\Delta)^n x \qquad ?$$

Let us scrutinize this.

$$(\varphi x + \Delta x)^2 \qquad \begin{array}{r} \varphi + \Delta \\ \varphi + \Delta \\ \hline \varphi^2 + 2\varphi\Delta + \Delta^2 \end{array} \quad \cancel{\equiv (\varphi+\Delta}$$

Let φ be $a_1 x + b$

$$(\varphi+\Delta)x \equiv \varphi x + \Delta x \equiv a_1 x + b + \Delta x$$

$(\varphi+\Delta)(\varphi+\Delta)x =$

$$a_1 x + a_1 b + a_1 \Delta x + b + \Delta(\varphi+\Delta)x$$

$$\equiv a_1 x + a_1 b + a_1 \Delta x + b + (\varphi+\Delta)\Delta x$$

$$\equiv a_1 x + a_1 b + a_1 \Delta x + b + a_1 \Delta x + b + \Delta . \Delta x$$

$$\equiv a_1 x + a_1 b + 2 a_1 \Delta x + 2b + \Delta^2 x$$

$$\varphi^2 x \equiv a_1 x + a_1 b + b$$

$$\varphi \Delta x = a_1 \Delta x + b$$

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$\cancel{(1+\Delta)^n x \equiv}$

$$(x+\Delta x)^n \equiv (1+\Delta)^n x$$

$$\begin{array}{r} \cancel{x+\Delta x} \\ x \\ \Delta x \\ \hline x+\Delta x \\ \Delta x+\Delta^2 x \\ \hline x+2\Delta x+\Delta^2 x \end{array} \qquad \begin{array}{r} x \\ \Delta x \\ \hline x-\Delta x \\ \Delta x-\Delta^2 x \\ \hline x-2\Delta x+\Delta^2 x \end{array}$$

If $\Delta^2 x \equiv 0$ $\Delta^3 x \equiv 0$ &c

$$(1+\Delta)^n x \equiv (1+n\Delta)x \equiv x+n\Delta x$$

$$(1-\Delta)^n x \equiv x-n\Delta x$$

$$(1-\Delta)^n fx \equiv f(x-n\Delta x)$$

$$(1-\Delta)^n \cancel{fx} \equiv 1 - n\Delta + \frac{n(n-1)}{2}\Delta^2 - \frac{n(n-1)(n-2)}{2.3}\Delta^3 + \text{&c}$$

If n is interpretable $\equiv 1-n\Delta$

$$fx - n\Delta fx = f(x-n\Delta x)$$

or putting h for $n\Delta x$

$$fx - h\Delta fx = f(x-h)$$

$$fx - h\frac{\Delta fx}{\Delta x} = f(x-h)$$

Now if this is all right the formula for the developement of fx is

$$fx \equiv \cancel{x D} \; f.0 + x D_x f0$$

$$f(1-x) \equiv f.1 - x D_x f1 \qquad ?$$

$$\cancel{f(x-1)}$$

$$f(1-x) = \frac{Dfx}{x} - fx$$

Somehow this is not satisfactory

$$D_x fx \equiv \frac{f(x+\Delta) - fx}{\Delta}$$

$$D_x f0 \equiv \frac{f\Delta - f0}{\Delta}$$

which if independent of Δ is $f(1) - f(0)$

Let us re-examine –

I had to show that

$$f(x + n\Delta x) \equiv fx + n\Delta fx$$

$$\equiv fx + n f(x+\Delta) - n fx$$

$$\equiv n, f(x+\Delta) + (1-n), fx$$

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Now $f(x+n\Delta) \equiv A_0 x +_0 B$

The whole proof rested on

$(a+b)^n = a^n + n a^{n-1} b + \&c$

Now this is true only if n is an integer

$(1+d)^n fx = f(x+nd)$

Suppose n to be an integer, $\frac{1}{0}$ and $d \equiv 0$

$nd = v$ d

$f(x+v) \equiv \left(1 + nd + \frac{n(n-1)}{2} d^2 + \frac{n(n-1)(n-2)}{2.3} d^3 + \&c\right) fx$

$\equiv (1$ which if $n-1 = n$ $\quad \frac{1}{0} - 1 =$ $\quad \frac{n-1}{2} = n$

$n-1 = 2n$

$\equiv \left(1 + v + \frac{v^2}{2} + \frac{v^3}{2.3} + \&c\right) fx$ $\quad \frac{n^2 d^2}{2} \quad \frac{1}{2} d^2$

$\frac{n^2}{2} - \frac{1}{2} d^2$

$fx \equiv 1 + x$

Nov. 11.

Then my first developement formula will be

$$\sum{}' (a + b x)^{c} = \varphi x$$

where, however, $\underline{c}$ may involve x.

c will infact itself be of the same form.

So that the formula should be written

$$\varphi x \equiv \sum_i{}' (a_i + b_i x)^{\varphi_i' x}$$

Now I reserve this important matter for future study. I ought somehow to get from it something answering to Maclaurin's theorem.

This
$$\varphi(0) \equiv \sum_i{}' a_i^{\varphi_i' 0}$$
$$\varphi(1) \equiv \sum_i{}' (a_i + b_i)^{\varphi_i' 1}$$

Here are only two equations for the determination of three unknown quantities.

But returning to φx I can first separate this into a series of terms. For

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~~$\log_1 \varphi x =_3$~~

~~$\varphi x =_3 \sum_i (a_1 +_3 b_1 x)^{\varphi_1' x} + (a_2 +_3 b_{2,3} x)^{\varphi_2' x} + \&c.$~~

However, this is not the way but thus.

First develope φ according to an absolute (non-relative) term. Then

$$\varphi x = a +_3 b_1 x +_3 \ell_1^{a_1 +_3 b_{1,3} x} +_3 \ell_2^{a_2 +_3 b_{2,3} x} +_3 \&c.$$

$$\varphi(0) = a + \quad + \ell_1^{a_1} + \ell_2^{a_2} + \&c.$$

Now $\ell_n^{a_n +_3 b_{n,3} x} =_3 \ell_n^{a_n} \cdot \ell_n^{b_{n,3} x}$

$$\therefore \ell_n^{a_n +_3 b_n x} =_3 \ell_n^{a_n +_3 b_{n,3} x} \cdot \ell_n^{a_n}$$

$$\varphi(1) =_3 a + b + \ell_1^{b_1} + \ell_2^{b_2} + \&c.$$

It is next to be determined by inspection (?) what absolute term is contained in φx. If there is none φx is a periodic which will be treated hereafter.

But here I note a mistake in my developement formula it should be

over

(1) $\mathcal{Q}x \equiv \Sigma_i \Pi_i (a_i + b_{i,j} x)^{\mathcal{D}'_i x}$

Then taking x as absolute (non-relative) so that

$$x^0 \equiv x'$$

(2) $\mathcal{Q}x \equiv a + b_1 x + c_1 l_1^{u_1 x}, l_2^{u_2 x}$ &c $+ d_1 m_1^{v_1 x}, m^{v_2 x}$ &c + &c

$\mathcal{Q}0 \equiv a + c + d +$ &c

$\mathcal{Q}1 \equiv a + b + c_1 l_1^{u_1}, l_1^{u_2}$ &c $+ d_1 m_1^{u_1}, m_2^{u_2}$ &c + &c

$\mathcal{Q}1, \mathcal{Q}0 \equiv a +$ $+ c_1 l_1^{u_1}, l_1^{u_2}$ &c $+ d_1 m_1^{u_1}, m_2^{u_2}$ &c + &c

since b in (2) may be taken so that $b_1(1-x) \equiv 0$

& so with c, d, e &c

$\mathcal{Q}1, (1-\mathcal{Q}0) \equiv b$

This also follows thus:— which involves the same hypothesis—

$(1-\mathcal{Q}0) \equiv (1-a), (1-c), (1-d),$ &c

On the same principle

$\mathcal{Q}0, (1-\mathcal{Q}1) \equiv a$ } This hardly follows.

So that if there are no relatives

$$\varphi x \equiv \varphi 1, (1-\varphi 0), x + \varphi 0, (1-\varphi 1), (1-x)$$

$$\equiv \varphi 1, x - \varphi 1, \varphi 0, x + \varphi 0, - \varphi 0, x - \varphi 1, \varphi 0 + \varphi 1, \varphi 0, x$$

$$\equiv \varphi 1, x + \varphi 0 + \varphi 1, \varphi 0, x - \varphi 0, x - \varphi 1, \varphi 0 - \varphi 1, \varphi 0, x$$

$$\equiv (\varphi 1 - \varphi 0), x + \varphi 0 (1-x) - \varphi 1, \varphi 0$$

There must be some mistake here

$$\varphi x - \varphi 1, (\varphi - \varphi 0), x \equiv \varphi 1, \varphi 0, x + \varphi 0, (1-x)$$

$$\equiv \varphi 1, \varphi 0, x + \varphi 0 - \varphi 0, x$$

$$\varphi x = \varphi 1, \varphi 0 + \varphi 1, (1-\varphi 0), x + \varphi 0, (1-\varphi 1), (1-x)$$

I drop this here for the present.

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Nov 12.

If e is a non relative term

e^x is to be regarded is signifying

the $\underline{e}$'s among all the $\underline{x}$'s

$$e^x \equiv x, e^1 + (1-x), e^0$$

perhaps rather if the $\underline{x}$'s exist.

I will now note all the exceptions in reference to these exponenents.

In arithmetic $e^{xy} \equiv (e^x)^y$

Now in Logic no sense has been attached to $(e^x)^y$ which is of course different from $e^{x \times y}$

Therefore this signification may be given to it.

If $a \equiv e^b$ $b \equiv \log_e a$ but $\log_e a$ is indeterminate

for it may be that $a \equiv e^c$

Hence we might write $b \equiv \frac{0}{0} \log_e a$

In arithmetic

$$z \log_e m^y \;\underset{\circ}{=}\; \log_e m^{y,z}$$

Now suppose $e^x \;\underset{\circ}{=}\; m^{y,z}$

Then it does not follow that every x is z

and therefore not that

$$z, \log_e m^y = \log_e m^{y,z}$$

This seems to be a down-right exception.

So this very valuable formula, without which it seems hopeless to get any developments, must be dispensed with.

In arith if $e^x \;\underset{\circ}{=}\; m^y$

$$e^{x,a} \;\underset{\circ}{=}\; m^{y,a}$$

But this is not so here

~~This because in arithmetic~~ $\cancel{e^x e^y \;\underset{\circ}{=}\; e^{xy}}$

~~But this does not hold in logic~~

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This objection is so serious that I am going to try to obviate it by a new copula

$\ni$

This is to mean 'is one of the'

$a \ni b$

Every a is b.

If $a \ni b$

$a \ni a, b$

$a, c \ni b$

$\therefore a, c \ni b, c$

If $a \ni b$

$a \ni b +_{,} c$

$a +_{,} b \ni b$

$a +_{,} b \ni b +_{,} c$

$a + \text{not}_{\cdot} a \ni 1$

$\text{not}_{\cdot} a \ni 1 - a$

$1 \ni a + \text{not}_{\cdot} a$

$1 - a \ni \text{not}_{\cdot} a$

$0 \ni 1$

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$a, b \ni 0$

This might be interesting & indeed would be, but does not look hopeful for the present purpose at all.

To return then; we must get along without the rule that if

$$l^x \underset{;}{=} m^y$$

$$l^{x,a} \underset{;}{=} m^{y,a}$$

This holds with arithmetical but not with logical.

$\log_e a$ has several values let the sum of them

$$\Sigma' \log_e a \underset{;}{=} l_r{}^a$$ then this is a particular value of $\log_e a$

Then if

$$a = l^b \quad b, l_r{}^a \underset{;}{=} b$$

$\cancel{m^0_{,}(1-[e^s])\bar{\bar{s}}0}$

$1-x$ is other than every x and may be denoted by

$$n^x$$

Then the fundamental formula of the calculus becomes

$$x,n^x \bar{\bar{s}} 0 \bar{\bar{s}} n^1$$

$$0^1 = 0 \qquad \log 1 = 0$$

$x,\log x = 0$

$\log x^x \quad x^x = 1$

$$n^x,n^{n^x} \bar{\bar{s}} n^x,x$$

$$n^x + n^{n^x} = 1$$

$$x +_{s} n^x \bar{\bar{s}} 1$$

$$\therefore n^x + n^{n^x} \bar{\bar{s}} 1$$

$$\therefore n^{n^x} \bar{\bar{s}} x$$

$$(1-x)e^x + \cancel{x} \bar{\bar{s}}$$

$0.e^x$

$1e^0$

$$\varphi x \bar{\bar{s}} a,x + b,n^x$$

$3\ a$

$$e^x \bar{\bar{s}} e^x,x + (e,n)^x$$

$$\bar{\bar{s}} x([e]+[e^{x,n}])$$

$$Q x = Q(1) . x + Q(0) . n^x$$

$$n^{x+y} \equiv n^x , n^y$$

$$n^{x,y} \equiv n^x +, n^y \qquad \text{for} \quad x = n^{n^x}, \quad y = n^{n^y}$$

$$1 \equiv x + n^x \qquad\qquad n^{x,y} = n^{n^x, n^x} = n^{n^x + n^y} \quad \text{is } n^x + n^y$$

$$1 \equiv y + n^y$$

$$\cancel{1-x} = \cancel{1 - n^x}$$

$$y = 1 - n^y$$

$$x,y = n^{(n^x + n^y)}$$

$$\cancel{n = 0} \qquad x, 1 + 0^x \equiv 1$$

$$(x, 1), 0^x \equiv 0$$

$$[n] \equiv \cancel{n}\,1$$

$$[1-e] = 1 - [e]$$

$$[n^e] = n^{[e]} \qquad\qquad [n^n] \equiv 1 \equiv$$

This n must be zero.

$$Q(1)\, x^1 + Q(0)\, 0^x$$

Nov. 15.

n^x other than every ~~w~~ woman

n^{e^x} other than ~~every~~ lover of every ~~w~~ woman

i.e. what does not love some ~~w~~ woman

$\text{Log}_{l^e} l^x$ Something loved only by every lover of every woman

~~Log_n~~

$n^x \underset{5}{=} y$ Other than every woman is non-woman

$x \underset{0}{=} \text{Log}_n y$ Something than which every non-woman alone is other

$c = w^a$ Every Caucasian ~~are~~ is whiter than any African

Everything whiter than any African is Caucasian.

$a = \text{Log}_w c$ The Africans are a class every one of whom alone is less white than any Caucasian

$a \underset{s}{=} l^b$ Alfred & Albert (& they alone) love every Brown girl

$a \underset{s}{=} l^c$ " " " " " " " " Calendar "

$b \underset{s}{=} \text{Lov}_l a$ The Brown girls are a class (every one of whom is loved only by Alfred & Albert

$n^x \underset{s}{=} y$ ~~The~~ y's (and they only) are other than every x.

$x \underset{s}{=} \text{Lov}_n y$ The x's are a class ~~of which~~ than every one of whom every y and every y only is other.

$\text{Lov}_l l^x$ A class ~~everyone~~ all of whom are loved only by every lover of every woman

$w, \text{Lov}_l y \underset{s}{=} 0$ A woman, who belongs to ~~the~~ a class all of whom are loved only by every y_1 does not exist.

This log is most inconvenient. Take l_v such that

If $m, l^w \underset{s}{=} 0$, then $w, l_v^m \underset{s}{=} 0$ and conversely

i.e. If $m \underset{s}{=} 0, l^w$ $w \underset{s}{=} 0, l_v^m$

Then if m & w are individuals

$$\text{If } M \equiv l^{w} \quad w \equiv l_{v}^{M} \equiv \log_{l} M$$

Or if

$$m = M_1 + M_2 + M_3 + \&c$$

$$w = W_1 + W_2 + W_3 + \&c$$

$$l = I_{1,1} + I_{1,2} + I_{1,3} \&c + I_{2,1} + I_{2,2} + \&c. \&c.$$

$$\cancel{M_1 \equiv M_2 + M_3 \equiv}$$

$$M_1 \equiv I_{1,1}^{W_1} \qquad M_2 \equiv I_{2,1}^{W_1} \qquad M_3 \equiv I_{3,1}^{W_1}$$

$$M_1 \equiv I_{1,2}^{W_2} \qquad M_2 \equiv I_{2,2}^{W_2}$$

$$M_1 \equiv I_{1,3}^{W_3}$$

$$M_1 \equiv (I_{1,1} + I_{1,2} + I_{1,3} + \&c)^{w} \qquad m \equiv (I_{1,1} + I_{2,1} + I_{3,1} + \&c)^{W_1}$$

$$m = l^{w}$$

$$W_1 \equiv \log_{I_{1,1}} M_1 \qquad W_1 = \log_{I_{2,1}} M_2 \qquad W_1 = \log_{I_{3,1}} M_3$$

$$W_2 \equiv \log_{I_{1,2}} M_1 \qquad W_2 = \log_{I_{2,2}} M_2$$

$$W_3 = \log_{I_{1,3}} M_1 \qquad W_3 = \log_{I_{2,3}} M_2$$

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Every man loves W_1

$$m \mathrel{\underline{\underline{\ }}} \mathrel{\underline{\underline{\ }}}_{,} e^{W_1}$$

$$m_{,}(1-e^{W_1}) \mathrel{\underline{\underline{\ }}} 0$$

$$M_{1,}(1-e^{W_1}) \mathrel{\underline{\underline{\ }}} 0 \quad M_{2,}(1-e^{W_1}) \mathrel{\underline{\underline{\ }}} 0 \quad \&c.$$

$$W_{1,}(1-e_r^{m}) \mathrel{\underline{\underline{\ }}} 0$$

$$W_{1,}(1-e_r^{M_1}) \mathrel{\underline{\underline{\ }}} 0 \quad W_{1,}(1-e_r^{M_2}) \mathrel{\underline{\underline{\ }}} 0 \quad \&c$$

$$m = e^{W} = I_1^{W_1} + I_2^{W_2} + I_3^{W_3} + \&c$$

$$\tfrac{1}{1}y + \tfrac{0}{0}(1-y) \qquad \tfrac{y}{y}$$

$$(y;y)$$

$$W_{,} \log_e\left(y + \tfrac{0}{0}\right) \mathrel{\underline{\underline{\ }}} 0 \qquad (0;x)_{,}(1-y) \mathrel{\underline{\underline{\ }}} 0$$

$$\log_e(y;y) \mathrel{\underline{\underline{\ }}} 0;W \qquad (0;x)_{,}y \mathrel{\underline{\underline{\ }}} 0$$

$$y;y \mathrel{\underline{\underline{\ }}} e^{0;W} \qquad \tfrac{0}{0}(1-x)_{,}y +_{,}$$

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1869 Oct. 6

Combination of Arithmetic & Boole's Calculus

Given $pa_1\bar{m} \,\underline{\underline{\prec}}\, 0$ where $p = \frac{1}{2}$

$qa_1\bar{n} \,\underline{\underline{\prec}}\, 0$ " $q = \frac{1}{2}$

$m_1 n \,\underline{\underline{\prec}}\, 0$

$x_1 m \,\underline{\underline{\prec}}\, 0$

$x_1 \bar{a} \,\underline{\underline{\prec}}\, 0$

We have by ordinary processes

(1) $qa_1\bar{n} + pa_1 n + pa_1 x + x_1\bar{a} \,\underline{\underline{\prec}}\, 0$

~~But as $p+_1 q \,\underline{\underline{\prec}}$~~

And from this

(2) $pa_1 q^a \,\underline{\underline{\prec}}\, 0$

But ~~$p+_1 q \,\underline{\underline{\prec}}\, p+q - pq$~~

$p+_1 q \,\underline{\underline{\prec}}\, p+q - p_1 q$

$\therefore p+_1 q = p+q - p_1 q$

& since $p+q = 1$

$p+_1 q = 1 - p_1 q$

But $p+_1 q \,\underline{\underline{\prec}}\, 1 - \bar{p}_1\bar{q}$

$= 1 - \bar{p}_1\bar{q}$

Hence $p_1 q = \bar{p}_1\bar{q}$

Hence $pa_1 q^a \,\underline{\underline{\prec}}\, 0 \,\underline{\underline{\prec}}\, \bar{p}a_1\bar{q}^a$

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Hence adding this to (1) we have

(3) $$q_a, \bar{n}_1 +_1 p_a, n +_1 p_a, x +_1 x_1 \bar{a} +_1 \bar{p}_a, \bar{q}_a \equiv 0$$

But $q_a(1-a) \equiv 0$

$p_a(1-a) \equiv 0$

Hence $x_1 \bar{a} +_1 \bar{p}_a, \bar{q}_a \equiv \bar{p}_a, \bar{q}_a$

So that (3) becomes

$$q_a, \bar{n} +_1 p_a, n +_1 p_a, x +_1 \bar{p}_a, \bar{q}_a \equiv 0$$

which gives $x, \bar{n} \equiv 0$

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Oct 6.

Example of an application of the forms ℓ^x.

How many colours are required to paint a map?

Let a, b, c, d &c be the countries

Let ℓ be like in colour

Then since there is but one $\underline{a}$ &c

$$(1-\ell)^a = 1-\ell^a$$
$$(1-\ell)^b = 1-\ell^b \quad \&c$$

Also $\ell^{\ell^x} = \ell^x \quad \ell_v^x = \ell^x$ $\left(\begin{array}{l} \ell^{(1-\ell)^x}\left(1-(1-\ell)^x\right) \equiv 0 \\ \text{or } \ell^{(1-\ell)^x}\ell^x \equiv 0 \\ \text{for } (1-\ell)^x + \ell^x \equiv 1 \end{array} \right)$

Also since the earth has no hole in it

If $\ell^a, \ell^b \equiv 0$ $\ell^a, \ell^c \equiv 0$ $\ell^b, \ell^c \equiv 0$ then $\ell^b \ell^d \equiv 0$)

$\ell^a, \ell^d \equiv 0$ $\ell^b, \ell^d \equiv 0$ are equations given.

~~$\ell^a \ell$~~ and no others of the form

$\ell^a \ell^e + \ell^b \ell^e \equiv 0$ are given

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~~That is if $\mathcal{E}$ $a, b \equiv 0$ $a, b \equiv 0$ b~~

ℓ^a, ℓ^b

Let us write $A\ B\ C$ &c for $\ell^a\ \ell^b\ \ell^c$ &c

Then the above principle is that

if $A, B \equiv 0$ $A, C \equiv 0$ $B, C \equiv 0$ are among the given equations

(by given equations I mean those determined by direct tumbling of one country on another)

and if ~~F^A~~ F^A F^B &c denote factors a b &c other than a b &c. in the given equations

$F^A, F^B = 1$ denote it by D or ℓ^d

~~$F^A, F^B, F^C = 0$~~

Let I denote the sum of terms in given equations which contain neither $A\ B$ or C (The given equations are all of the form $(\ell^g, \ell^h \equiv 0)$)

Let us now eliminate $A\ B$ &c C from the given equations. Since $AB = 0$ $AC = 0$ $BC = 0$ are given equations when ~~not~~ 2 ~~or Cont~~ or 3 of the three letters $A\ B\ C$ is first $= 1$ then the sum of the equations $= 1$ when

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when $A=1$ $B=0$ $C=0$ the sum of eq. becomes $\mathcal{F}^A +, I$

" $A=0$ $B=1$ " " " " " $\mathcal{F}^B +, I$

" A " $B=0$ $C=1$ " " " " " $\mathcal{F}^C +, I$

The product is

$$\mathcal{F}^A \mathcal{F}^B \mathcal{F}^C + I \equiv 0$$

~~Suppose~~ Denote $I \equiv D \Sigma M +, \Sigma N$

where D has the signification mentioned above

Thence it is easy to deduce that if $(1-A)(1-B)(1-C) \equiv 0$ or if only 3 colours are used

$$D = C$$

But $D = \mathcal{F}^A \mathcal{F}^B$

when $D, \mathcal{F}^C = 0$

That is D cannot touch C

But from the given equations alone this cannot be deduced. Hence not in every case will 3 colours serve.

Now let suppose $(1-A)(1-B)(1-C)(1-\ell^{(1-\ell)^{a+,b+,c}}) \equiv 0$

or that 4 colours are used.

Then if $D = C$ Nothing follows from this proposition

~~But this cannot happen~~

If $D, C = 0$ then or $D = (1-A)(1-B)(1-C)$ then

But there is nothing in the seven equations to contradict it.

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Oct 15

If

every $\underline{a}$ is lower than every $\underline{b}$

or b " higher " " $\underline{a}$

and <u>vice versa</u>

$\therefore$ If every $\underline{a}$ is not lower than every $\underline{b}$

" $\underline{b}$ " " higher " " $\underline{a}$

$e^1 = 0$ <u>usually.</u>

$e^0 = 1$ <u>invariably</u>, <u>I think</u>

If $a < e^b$ $\quad b < \log_e a$

or $b < e_r^a$

If $b < e_r^a$ $\quad a < \log_{e_r} b$

or $a < (e_r)_r^b$

Eureka

$(l^a)^b$ is not the same as $l^{a,b}$

Hence, $(l')^a$ is not the same as l^a

Hence, l is not the same as l'

For $(l)^a = l^a$ but $(l')^a$ is not

Hence, $l < m$

may be taken for the expression that

$l^a < m^a$

$l^b < m^b$ &c &c

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1880 Nov. 6

Being unable at present to write a second paper on the Algebra of Logic I make notes for one.

Notes on Previous Paper

On Chapter I §4. I have represented that the properties of the ~~copul~~ negative were

1st $\bar{A} = (A \prec x)$

2nd $A \prec \bar{\bar{A}}$

3rd $\bar{\bar{A}} \prec A$

In my circular I have ~~shown~~ stated correctly that 2nd follows from first & incorrectly that 3rd follows from 1st, which it does. Very subtle fallacy drawn from long reduction of mood.

Observe 1st is not balanced

Give table of moods etc.

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On Chapter II

Usually in algebra $u=0$ or $u=C$ $\varphi x = C$ represents the truth of a certain proposition the falsity of which is represented by φx having any other value.

So we may conceive that $\varphi(x,y)$ is the number x's that are y's $\varphi(x,y)=0$ represents No x's y's

Or we may write

$\varphi(x,y)$ number x's that are y's

$\psi(x,y)$ " " " " not y's

$\chi(x,y)$ " non x's " " y's

$\omega(x,y)$ " non x's " " not y's

Equating these to zero gives the four universal propositions, ~~equating them~~ writing

$$\varphi(x,y) \neq 0$$

(with Cayley) give particular propositions.

The above expressions are not really functions of x and y; yet we have the equations

$$\cancel{x = \varphi(x,y)}$$

$$x = \varphi + \psi \qquad y = \varphi + \chi$$

$$V - x = \chi + \omega$$

so that we do have 3 equations among the 4 unknowns

If then we assume one more say $\varphi + \omega - \psi - \chi = V$

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Then we have

$$\varphi = \frac{x+y}{2} - \frac{U-V}{4} \qquad = \frac{x+y}{2} + \frac{V-U}{4}$$

$$\psi = \frac{x-y}{2} + \frac{U+V}{4}$$

$$\chi = \frac{y-x}{2} + \frac{U+V}{4}$$

$$\omega = -\frac{x+y}{2} + \frac{3}{4}(U-V)$$

or we might write

$$U-W = \frac{x+y}{2} - \varphi$$

Put $W = \frac{1}{2}Y + \frac{1}{2}U$

$$\varphi = \frac{x+y}{2} + W - U$$

$$\psi = \frac{x-y}{2} - W + U$$

$$\chi = \frac{-x+y}{2} - W + U$$

$$\omega = \frac{-x-y}{2} + W$$

$$\varphi = \frac{x+y}{2} + \frac{Y-U}{2}$$

$$\psi = \frac{x-y-Y+U}{2}$$

$$\chi = \frac{-x+y-Y+U}{2}$$

$$\omega = \frac{-x-y+Y+U}{2}$$

Here W and V would be quantities logical not mathematical functions of x and y

$$\text{Logical sum } (x+y) = \frac{x+y-Y+U}{2} \qquad \text{Log Prod } (x \times y) = \frac{x+y+Y-U}{2}$$

$$(x+\bar{y}) = \frac{x-y+Y+U}{2} \qquad x \times \bar{y} = \frac{x-y-Y+U}{2}$$

$$\bar{x}+y = \frac{-x+y+Y+U}{2} \qquad \bar{x} \times \bar{y} \quad \frac{-x+y-Y+U}{2}$$

$$\bar{x}+\bar{y} = \frac{-x-y-Y+U}{2} \qquad \bar{x} \times \bar{y} \quad \frac{-x-y+Y+U}{2}$$

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$$\psi = x - \varphi = \frac{-lU + (x,y)\,7(k-i)x - (k-l)y}{-i+j+k-l}$$

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In short we need but <u>one</u> logical function to express everything

We may write this function (x,y) and let it mean

$$(x,y) = i\varphi + j\psi + k\chi + l\omega$$

$$U = \varphi + \psi + \chi + \omega$$

$$x = \varphi + \psi$$

$$y = \varphi + \chi$$

Solving

$$\varphi = \frac{lU - (x,y) + (j-l)x + (k-l)y}{-i+j+k-l}$$

$$x+y-\varphi = \frac{-lU + (x,y) + (k-i)x + (j-i)y}{-i+j+k-l}$$

Mar 7

The same object may be accomplished <u>without</u> any logical function (x,y). Namely let us take arbitrarily any two ~~&~~ numbers v f and let

$$x = f$$

~~denote~~ signifying that whatever object can be chosen is ~~not~~ $x = v$

that whatever objects can be chosen is x.

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Same thing other form expressed by

$$-lv + (x,y) + (k-i)x - (k-l)y = 0$$

Negative $\quad -lv + (x,y) + (k-i)x - (k-l)y > 0$

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~~Let~~ Then ~~x cannot~~ we cannot have at once

$$x = f \quad x = v$$

because f and v are different numbers.

The equation

$$(x-f)(x-v) = 0$$

will denote that $x = f$ or $x = v$ that is that every object chosen is either x or not-x. The idea is that for each object chosen this holds so that for <u>each</u> $x = f$ that is that object is not x or $x = v$ that is that object is v.

Then $$(x-f)(y-v) = 0$$

means each object chosen is either not-x or is y.

Cayley proposes to write the negative of this thus

$$(x-f)(y-v) \neq 0$$

But this would be the object chosen ~~cannot be not x~~ must be x and can't be ~~not~~ y. This states too much. The true denial of the first equation would be $(x-f)(y-v)$ is not always 0, not is <u>never</u> zero.

I have myself proposed (Logic of Rel p 7) to write $x > y$ to mean x's comprise some objects besides y's but properly this can only mean $x = v$ $y = f$ (if $v > f$) and so is ~~equivalent to~~ ~~no less as~~ Cayley's proposal

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But if x_i denotes what x becomes for the ith object, since

$$(x-f)(y-v)$$

if not zero $= -(v-f)^2$ and therefore essentially negative we may write

$$\Sigma_i (x_i - f)(y_i - v) < 0$$

to express negative of

$$(x-f)(y-v) = 0$$

which is the same as

$$\Sigma_i (x_i - f)(y_i - v) = 0$$

we may write the denial

$$\Sigma_i (x-f)(y-v) < 0$$

We have

$$\Sigma_i xy = 0 \quad \text{same as} \quad xy = 0$$

$$\Pi_i (x-y) = 0 \quad \text{same as there is an object } i \text{ for which } x = y$$

So we may also write the denial

$$\Pi_i (xy - v^2) = 0$$

provided f is not $-v$.

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Composition of Relatives

It is better to define the 8 modes of compounding dual relatives by De Morgan's 8 forms of proposition

ls denotes everything of which it can be said that what is $\breve{l}$ by it is partient of denomt of $\breve{l}(ls) \preceq \bar{s}$

$l \circ s$ $\quad \breve{\bar{l}}(l \circ s) \preceq s$

l^s $\quad \breve{\bar{l}}(l^s) \not\preceq \bar{s}$

${}^l s$ $\quad l({}^l s) \prec s$

Reciprocally we may consider the eight propositions as differing by the different modes of combining relatives

$l \prec s \qquad \infty \prec \breve{l}s \qquad l x \prec s x \qquad x \prec \breve{l}(sx)$

$\bar{l} \prec \bar{s} \qquad \infty \prec \breve{\bar{l}}^s \qquad \bar{l} x \prec \bar{s} x \qquad x \prec \breve{\bar{l}}^{sx}$

$l \preceq \bar{s} \qquad \infty \prec \breve{l}s \qquad l x \preceq \bar{s} x$

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1891 Feb 24

$X \prec Y$ means that if we have a right to write X we have a right to write Y.

F is such that $F \prec X$ whatever X may be

T is such that $X \prec T$ whatever X may be.

$$\cancel{X \prec (Y \prec X)}$$

$$\cancel{X \prec (Y \prec Y)}$$

We have a right to write

$$X \prec X$$

$$\cancel{X \prec (Y \prec X)}$$

Right to X gives right to $Y \prec X$

Corollary $X \prec (Y \prec X)$

$x+y = (x \prec y) \prec y$

$x+y = x\bar{y}+y$

$xy = (x+\bar{y})y$

x

$x.y$

$x \quad (y \prec x) \prec x$

$(x^y)^2 = (x^2)^y$

$(y^x)^y$

$x^x \quad x^{y^0}$

$y^x \quad y^x \quad (y^x)^y$

(y^x)

y^x

$(z^y)^x = (z^x)^y$

$\frac{y}{x} \quad y \quad \frac{y}{x}$

$\frac{y}{x} \quad x$

$\frac{z}{xy} \quad \frac{z}{y} \quad \frac{z}{y}$

$\frac{z}{y} \quad \frac{y}{x} \quad \frac{y}{z}$

$x\bar{y}+y \qquad x\bar{y}+z = \cancel{x\bar{y}\bar{z}+}$

$\bar{y}+ \qquad x\bar{y}+\bar{x}z+yz$

$x \prec \qquad (x \prec y) \prec (z \prec x) \prec y$

Right ⊏

$x \prec y$ means that ~~right~~ we have a right to y in case we have a right to x.

Hence if we have a right to y anyway ~~right~~ we have a right to $x \prec y$

Hence we have a right to

$$y \prec (x \prec y)$$

New principle. We have a right to

$$x \prec x$$

New principle Suppose we have a right to $x \prec (y \prec z)$

Then if we have a right to x we have a right to $y \prec z$

$\therefore$ If we have a right to x and right to y we have right to z

$\therefore$ If we have right to y we have right to $(x \prec z)$

$\therefore \quad y \prec (x \prec z)$

$\therefore \quad [x \prec (y \prec z)] \prec [y \prec (x \prec z)]$

New principle

Suppose we have a right to $(x \prec y) \prec z$

$\therefore$ If we have right to $(x \prec y)$ we have right to z

But if we have right to y we have right to $x \prec y$

$\therefore$ ~~we have right to~~ If we have right to y we have right to z

$\therefore \quad y \prec z$

$\therefore \quad [(x \prec y) \prec z] \prec [y \prec z]$

New principle

If we have right to x and to $y \prec z$

~~then~~ to $(x \prec y) \prec z$.

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$x \prec y \qquad \bar{x} + y$

$x \prec (y \prec z) \qquad \bar{x} + (\bar{y} + z) = \bar{y} + (\bar{x} + z)$

$= y \prec (\bar{x} \prec z)$

$y \therefore (\bar{x} \prec y) \qquad y \therefore \bar{x} + y$

$x \prec x \qquad 0 \therefore \bar{x} + x$

$y \prec (x \prec y) \qquad \bar{y} + \bar{x} + y$

$(x \prec y) \prec z \qquad x\bar{y} + z$

$x \prec (y \prec z) \prec (x \prec y) \prec z \qquad (x \prec y) \prec x \prec y$

$\cancel{(x \prec y) \prec (y \prec z) \prec (x \prec z)}$

$$[(a \prec b) \prec (c \prec d)] \prec [(e \prec f) \prec (g \prec h)]$$

$$(\bar{a} + b)\, c\, \bar{d} + e\bar{f} + \bar{g} + h$$

$$(e \prec \bar{f}) \prec h$$

$x \prec \bar{1}$ $\quad 1^x$

$\bar{f} \prec x$ $\quad x^0$

$x = \bar{1} \prec x$ $\quad x = x^1$

$\bar{x} = x \prec \bar{f}$ $\quad 0^x$ $\quad 0^x$ $\quad y0^x = x0^y$

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$\cancel{x+y = y+x}$

$(a^b)^c = a^{bc}$

$ab.c = a.bc$

$a^b.a^c = \cancel{a^{b+c}}$ $\quad x \prec y \quad y \prec z$

$a^c b^c \quad x \prec y \quad x \prec z \quad x \prec yz$

$(x \prec y) \prec (x \prec z) \prec x \prec yz$

$a \prec a^b \quad y \prec (x \prec y)$

$\cancel{x \prec} \quad a^{ax} \quad a^{xa}$

$ab.c = a.bc \qquad ab = ba$

$(a^b)^c = a^{(bc)}$

$a^b c \therefore a^{b^c} \therefore (a^b)^{(a^c)}$

$\cancel{(ab)^c} \quad ab^c \therefore (ab)^c \therefore (a^c)^{(a^b)}$

$(x \prec y) \prec z$

$x\bar{y} + z$

$x(\bar{y} + z) + \bar{x}z$

$\cancel{\bar{c} + ab}$

$a(b + \bar{c})$

$b\bar{a} + \bar{c} + a$

$\cancel{(a \prec b)}$

$(b \prec a) \prec (c \prec a)$

$a + b$

$\cancel{x \prec}$

$a\bar{b} + b$

$(a \prec b) \prec b$

$\frac{\binom{a}{b}}{b}$

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An Unscientific Grammar.

The ~~thing~~ is to get something said; and to this it would seem to be requisite we should have significant verbs ~~phrases or words~~ ~~con asso-ciated~~ ~~with~~ ~~phenomena of one kind~~ calling up each ideas of one kind and also some indices to show ~~where~~ ~~the~~ in what experience we mean to say the phenomena signified by the verbs are to be found.

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1894 July 20

The form of a "superiority" is

$$(l + \breve{l}) \cdot l\breve{l}$$

Required to find a form of "succession" that is a superiority such that either A is superior to B or B to A.

The negative of it must implicate some relation l and also $\breve{l}$.

Then relation itself must be an aggregate. Now how can an aggregate be transitive? And how can it be a difference?

To be a difference each aggregant must be a difference. C'est élementaire.

To be transitive

$$(A + B)(A + B)$$

$$= AA + BA + AB + BB.$$

Each of these four terms must be included under $A + B$

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And one of the aggregants is the negative converse of another

Say l and $\breve{\bar{l}}$

Then the relation must include

$l\,l$ and $l\,\breve{\bar{l}}$ and $\breve{\bar{l}}\,l$ and $\breve{\bar{l}}\,\breve{\bar{l}}$

But ~~How~~ how can the negative converse of a difference be a difference?

It cannot be –

But the problem is wrongly stated

Required to find a succession such that either A is superior to B or B to A or A and B are identical

Or, required to find a super~~cession~~imposition or covering such that A covers B or B covers A.

All the above applies except that it here fenced off –

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Let us consider

$$(l+\breve{l}) + \{l\breve{l}$$

$$[(l+\breve{l}) + l\breve{l}][(l+\breve{l}) + l\breve{l}]$$

$$= (l+\breve{l}) + l\breve{l} + l\breve{l}l\breve{l}$$

$$\cancel{(l+1) + 1\breve{l}}$$

$$\cancel{[(l+1) + 1\breve{l}][(l+1) + 1\breve{l}]}$$

Look at the matter from another point of view.

When I say a relation is transitive, I say that if it includes as aggregate l it must include ll. Hence

$$l + ll + lll + \text{etc}$$

Now here is $l+\breve{l}$ of that form?

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The relation is to have as aggregants

r and $\breve{r}$

$$(r + \breve{r} + x)(r + \breve{r} + x)$$

$$= rr + r\breve{r} + \breve{r}r + \breve{r}\breve{r}$$

$$+ rx + \breve{r}x + xr + x\breve{r} + xx$$

The negative converse of it will be

$$r \cdot \breve{r} \cdot \breve{x}$$

Now $(r \cdot \breve{r} \cdot \breve{x})(r \cdot \breve{r} \cdot \breve{x})$

$$\prec rr \cdot r\breve{r} \cdot \breve{r}r \cdot \breve{r}\breve{r} \cdot r\breve{x} \cdot \breve{x}r \cdot \breve{r}\breve{x} \cdot \breve{x}\breve{r} \cdot \breve{x}\breve{x}$$

Does it somehow depend on $x(y+z) \prec xy + z$

~~$x(y+z) \prec (y$~~

Say the relation is $(xy+z)(xy+z)$

$$xy+z\,xy+z \prec xy+z$$

Transp. com. $\breve{x}(\breve{y} + \breve{z}) \prec \breve{x}\breve{y} + \breve{z}$

$$(\breve{x}\breve{y} + \breve{z})(\breve{x}\breve{y} + \breve{z})$$

$$\prec \breve{x}\breve{y} + \breve{z}\breve{x}\breve{y} + \breve{z}$$

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$\breve{z}(\breve{y}+\breve{x})\breve{z}(\breve{y}+\breve{x})$

$\breve{x}\breve{z}\breve{y} \prec T$

$zxy \prec T$

Suppose $zx \prec \breve{y}$

$\breve{x}\breve{z} \prec \bar{y}$ $\qquad$ $zx \prec \bar{y}$

Can we also have $\breve{x}\breve{z} \prec y$ $\qquad$ $\bar{z}\bar{x} \prec \breve{y}$

If there is an M such that

$A:M \prec z$

$M:B \prec x$

then $A:B \prec y$

If $\bar{x}y \prec \breve{y}$

then $\breve{y} \prec \bar{z}+\bar{x}$

therefore $\bar{z}\bar{x} \prec \bar{z}+\bar{x}$

There is ~~always~~ never an N such that

$A:N \prec \bar{z}$

$N:B \prec \bar{x}$

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11 ~~ξ+~~

$1 \# 1 = 0$

~~Q~~ $\xi = \xi + 1$?

$(\xi+1)_{ij} = \Pi_k \, \xi_{ik} + 1_{kj}$

~~Q~~ $(\xi+1)\eta \prec \xi\bar{\eta}$? Of course $(\xi+1)\eta \prec \xi \# \bar{\eta}$

~~But is $\xi\eta \prec (\xi+1)\eta$~~ ?

~~But~~ And this $\prec \xi\eta$ if and only if $\eta \succ 0$ $\bar{\eta} \succ 0$

~~$(\xi\eta)_{ab} = \Sigma_i \, \xi_{ai} \eta_{ib}$~~ $(\xi+1)\eta = \Sigma_k \Pi_j (\xi_{aj} + 1_{jk})\eta$.

There is something

Hence $(\xi+1)\eta \prec \xi\bar{\eta}$ is a way of saying not η or $\infty\bar{\eta}$

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If I had any ~~relo~~ form of relation

such that

$$x\breve{x} \prec x + \breve{x}$$

I might then conclude –

The x it would seem must be a relative aggregate

Say $x = p + q$

$$(p+q)\breve{(p+q)} \prec p\breve{p}.$$

This looks compromising

It is true that

$$p\breve{p} \prec p + \tau\breve{p}$$

Suppose then we let

$$x = \xi + 1$$

$$\breve{x} = \tau\breve{\xi}$$

$$x\breve{x} = (\xi + 1)\tau\breve{\xi}$$

$$x + \breve{x} = \xi + 1 + \tau\breve{\xi}$$

$$p\breve{p} \prec p1\breve{p}$$
$$\prec p(1+\tau)\breve{p}$$
$$\prec p + \tau\breve{p}$$

$$p = \pi . \tau\pi$$

$$p\breve{p} = (\pi . \tau\pi)[\breve{\pi}.(\breve{\pi}+1)]$$
$$\prec \pi\breve{\pi} . \pi(\breve{\pi}+1) . \tau\pi\breve{\pi} . \tau\pi(\breve{\pi}+1)$$

$$p + \breve{p} = \pi . \tau\pi + \breve{\pi}.(\breve{\pi}+1)$$
$$= (\pi + \breve{\pi}) . \pi + \breve{\pi} + 1$$

$$\breve{p} = (\breve{\pi}+1) + \breve{\pi}$$

$$p\breve{p} = (\pi . \tau\pi)[(\breve{\pi}+1) + \breve{\pi}]$$
$$= (\pi . \tau\pi)(\breve{\pi}+1) + (\pi . \tau\pi)\breve{\pi}$$

$$p + \breve{p} = (\pi . \tau\pi) + [(\breve{\pi}+1) + \breve{\pi}]$$

$$\{\pi + [(\breve{\pi}+1) + \breve{\pi}]\}.$$

$$\{\pi + [(\breve{\pi}+1) + \breve{\pi}]\}$$

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This leads us to notice that

$$x \dagger y \prec x\bar{y} + (0 \dagger y)$$

$$(x \dagger y)_{ab} = \Pi_i\, x_{ai} \dagger y_{ib}$$

$$\left[x\bar{y} + (0 \dagger y)\right]_{ab} = \Sigma_j\, x_{aj}\, \bar{y}_{jb} + \Pi_k\, 0_{ak} \dagger y_{kb}$$

We have

$$\Sigma_l\, \bar{y}_{lb} \dagger \Pi_m\, y_{mb}$$

~~$\Sigma\ \bar{p}_{ca} = \Pi_c$~~

~~this~~ that $\bar{p} \dagger p = \infty$

(This is the fundamental formula)

Multiplying this into $(x \dagger y)_{ab}$ we get

$$\left(\Sigma_l\, \bar{y}_{lb} \dagger \Pi_m\, y_{mb}\right)\left(\Pi_i\, x_{ai} \dagger y_{ib}\right)$$

$$\Sigma_l\, \Pi_y\, (x_{ai} \dagger y_{ib})\, \bar{y}_{lb} \dagger \Pi_m \Pi_i\, (x_{ai} \dagger y_{ib})\, y_{mb}$$

Identifying y with l, ~~this gives~~

$$\Sigma_l\, x_{al}\, \bar{y}_{lb} \dagger \Pi_m\, y_{mb}$$

Hence also $\infty \bar{y} \cdot (x \dagger y) \prec x\bar{y}$

$$(\xi T)_{ab} = \sum_i \xi_{ai} T_{ib}$$

$$(\xi + 1)_{ab} = \prod_j \xi_{aj} + 1_{jb}$$

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Then $\xi \dagger 1 \prec \xi T + (0 \dagger 1)$

But in a universe of more than one individual it is not true that $0 \dagger 1$ or that anything is coexistent only with itself. Hence in every such universe

$$\xi \dagger 1 \prec \xi T + \xi$$

$$\xi \prec (\xi \dagger 1) T + \xi$$

$$\xi \prec \xi (T + 1) \prec \xi T + 1 \prec \xi T +$$

$$(\xi \dagger 1) T \xi \prec (\xi \dagger 1) \xi \prec (\xi \dagger T) \xi \prec \xi \xi$$

$$\xi \xi \prec (\xi \dagger 1) \xi \prec \left[(\xi \dagger 1) T \dagger 1 \right] \xi \prec (\xi T \dagger 1) T \dagger \xi$$

$$(\xi \dagger 1) T \xi \prec (\xi \dagger 1) T \xi \prec (\xi \dagger 1)$$

$$(\xi \dagger 1) T \xi \prec \xi$$

$$(\xi \dagger 1) T \xi \prec \xi \xi \prec \xi (\xi \dagger 1) T \xi$$

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$\bar{p} = \bar{\pi} + \bar{\pi}\tau$

$p = \pi \cdot (\pi + 1) = (\pi + \tau) \cdot (\pi + 1) = \pi + (\tau \cdot 1)$
$= \pi + 0$

$\breve{\bar{p}} = \breve{\bar{\pi}} + \tau\breve{\bar{\pi}}$

~~$p\breve{\bar{p}} =$~~ If there is something M such that
A is π of B
$(\pi + 1)$ B

$p = \pi + 0$

$\breve{\bar{p}} = \infty\breve{\bar{\pi}}$

$p\breve{\bar{p}} = (\pi + 0)\infty\breve{\bar{\pi}} \prec \pi + 0$

$p + \breve{\bar{p}} = \pi + 0 + \infty\breve{\bar{\pi}}$

$l + 0 + \infty\breve{\bar{l}}$
$l^{\infty(0 + \breve{\bar{l}})}$

Ha! Hah! there is <u>some</u> thing of which it is true that

$p\breve{\bar{p}} \prec p + \breve{\bar{p}}$.

It is also transitive
But it is an agreement

$(\ell + \bar{\ell} + \ell + \bar{\ell})\, \ell\, \bar{\ell}\, \ell$

$(1+1)$

$\ell\, \bar{\ell}\, \ell\, \bar{\ell}$

$\ell\, \bar{\ell}\, (\ell + \bar{\ell}$

$1 + 1 + 1$

$\ell + \bar{\ell}$

$(1+1)^{+}$

$1^{+} +$

$\ell +$

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$l + \breve{\bar{l}}$

A loves everything B loves
anything that does not love
everything B loves

$(l + \breve{\bar{l}})(l + \overline{\bar{l}\,\breve{l}}$

$(l + \breve{\bar{l}}) \cdot (l + l + \breve{\bar{l}})$ $\quad (l\breve{\bar{l}} + l + \breve{\bar{l}})(l\breve{\bar{l}} + l + l)$

$(l + l + \breve{\bar{l}})(l + l + \breve{\bar{l}})$

$(l + l + l + \breve{\bar{l}})$

$(l\breve{\bar{l}} + l\breve{\bar{l}} + l + \breve{\bar{l}})(l\breve{\bar{l}} + l\breve{\bar{l}} + l + \breve{\bar{l}})$

$(l\breve{\bar{l}} + l\breve{\bar{l}} + l + \breve{\bar{l}})\, l\breve{\bar{l}} + l\breve{\bar{l}} + l + \breve{\bar{l}}$

$l\breve{\bar{l}} + l\breve{\bar{l}} + \breve{\bar{l}}\breve{\bar{l}} + l\breve{\bar{l}} + l + \breve{\bar{l}}$

$(l\breve{\bar{l}} + l + \breve{\bar{l}})\, \cancel{l\breve{\bar{l}}}$

$l\breve{\bar{l}}(l + \breve{\bar{l}})\, l\breve{\bar{l}}(l + \breve{\bar{l}})$ $\quad ll$

A B C

$l\breve{\bar{l}} \quad l + \breve{\bar{l}}$

$(l + \breve{\bar{l}} + l + \breve{\bar{l}})(l + \breve{\bar{l}} +$

ll

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$(l + \breve{l}) + l\breve{l}$

$(l + \breve{l}) \cdot l\breve{l} + (l + \breve{l}) +$

$[(l + \breve{l}) + l\breve{l}][(l + \breve{l}) + l\breve{l}]$

$= (l + \breve{l})(l + \breve{l}) + (l + \breve{l})l\breve{l} + l\breve{l}(l + \breve{l}) + l\breve{l}l\breve{l}$

$\prec \cdot l + \breve{l} + l\breve{l}$

$l\breve{l}l\breve{l}$

$\top \prec \breve{l}\bar{l} + \breve{l}l$

$\breve{l}l \prec \breve{l} + l$

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Then fact of relation T

A is related to something to which B is not so related

by such a relation that taking any four facts of ~~re~~ ~~fact~~ ~~and~~ ~~P~~ ~~h i j k~~ ~~P~~ ~~Q~~ ~~R~~ ~~S~~ ~~U V~~ ~~Z W~~

fact Q and any ~~two~~ three things X ~~and~~ Y, ~~Z~~

~~either~~

either that relation is not the relation of P

or X is not relate of P

or Y is not correlate P

that relation is not the relation of Q

or Y not relate Q

or U not correlate Q

or the negative of that relation is not the relation of R

or X is not the relation of R

or V is not the corr. R

or the negative of that relation ~~is not the relation~~ S

or Y is not the relation of S

U Corr. S

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1898 June 9

102r

Existential Graphs:

a system of logical expression.

The Constitutive Conventions of this language.

1. We pretend that the "graph", that is, what is written in a certain ~~place~~ ~~recogn~~ place agreed up and called the "sheet of the graph" is a general description of a certain recognized state of things. With this state of things it is essential that the writer and reader of the graph should have sufficient common experience ~~to identify~~ it. For this purpose, the writer must act upon the reader ~~to such effect~~ that, first, the latter shall be forced into a dynamic, or experiential, reaction with the state of things referred to, and second, that he shall be further forced to regard the graph as standing for that state of things. A general description is a sign of such a ~~nature~~ nature that, on the one hand, it calls ~~up~~ to mind ~~as~~ images ~~contents~~ "like", that is to say, ~~as~~ by virtue of the occult inward nature of the mind associated with, images of the object described, ~~which on the other hand~~ and like them in a ~~constant~~ respect, that is to say, mentally attracted ~~to~~ each other in being attracted to the images they are like, and with a special liveliness of consciousness of this circumstance, while on the other hand the images it calls up are not attracted ~~to~~ one another when the attention is so directed that they are not attracted to the images to which the object described calls up.

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We "postulate" that it is so; for our purpose is merely to study formal logic. The graph is a mere specimen of an assertion for whose matter we care nothing.

The graph is a sign. A sign is the third member of the triad, Quale, Relate, Sign. A quale is something considered only as an ~~embodiment~~ embodying in itself an idea. A relate is something considered as paired with something. Every brutally physical relation is dyadic. Every triadic relation has some intellectual character. A triadic fact is ~~spurious~~ degenerate, if it is a mere sum of dyadic relations. It is

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1898 June 4

104r

Existential Graphs

The constitutive conventions

We pretend that

1. ~~everything~~ What is the graph, that is what is written on the sheet of this graph ~~is~~ is ~~called the graph) and is~~ understood to be a representation more or less vague, hoped to be absolutely ~~dogmatically~~ quite definite, so far as concerns the ~~certain~~ respects ~~perfectly definite~~ of a state of things. With ~~which~~ this state of things, it is assumed the writer and reader have a common experiential acquaintance ~~are~~ sufficiently ~~acquainted~~ ~~to make it possible~~ give the representation a ~~precaution~~ meaning, ~~but~~ But such that one can supplement the other's experience, and it is hoped this state of things ~~assumed~~ definite

any graph ~~representation~~ ~~representations~~ dealt with ~~that everything~~ is either true or false of that state of things, that is, that experience would either compel its acceptance or rejection.

2. The above is understood to be true not merely of the whole graph ~~as a whole entirely~~ collectively but of all parts distributively.

Thus, ~~*~~ the graph

It lightens
It thunders

~~was~~ represents that in the state of things agreed upon, it lightens and also that it thunders

3.

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10.9 d June 9

105r

Existential Graphs

The Constitutive Conventions of this system of ~~assertion~~ expression.

1. We pretend that the "graph", that is, what is written in a recognized place called the "sheet of the graph", is a general description, or qualitative representation more or less vague, of a certain state of things. With this state of things it is essential that the writer and the reader of the graph ~~must~~ should have a sufficient common experience to identify it. For that purpose, the writer must ~~communicate~~ so act upon to the reader ~~a~~ that the latter shall be forced into a dynamic, or experiential, relation to the state of things in question and further be ~~made~~ forced to connect ~~it with~~ the graph with it as its object. At the same time, the reader ~~must~~ is supposed not ~~be so fully~~ to completely to know the writer's belief, or settled representation, of that state of things ~~that~~ he cannot receive further information. And it is ~~[illegible]~~ hoped that further experience ~~will~~ would establish the truth or falsity of the graph.

2. This ~~above~~ descriptiveness is understood not merely of the whole graph collectively but of ~~all~~ each parts distributively.

3. Every ~~gen~~ ordinary graph ~~description~~ is equivalent to ~~an~~ a ~~assertion of the identity of an individual with an object of experience with~~ representation that a vagner description applies to an individual.

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1898 June 10

106r

Existential Graphs:

a system of logical expression

Chapter I. The Constitutive Conventions of the Language of Graphs.

1. A certain place is called the sheet of the graph, and what is there written is called the graph.

We pretend that the graph is a general description of a certain recognized state of things.

~~I say~~ We "pretend" it is so, ~~because~~ for our purpose in experimenting with graphs is merely to study formal logic; ~~not to aver any real convictions of positive science. We therefore do not care whether we really believe what we pretend to assert or not.~~ ~~It is a mere example of an assertion.~~

The graph is a sign. That is, we do not care for its ~~character~~ nature or quality in itself, nor for its dynamic reactions which pair it with other things, but we care for it as a medium whereby one thing, the idea in our mind, is brought into correspondence with an object. Every triadic relation is somewhat intellectual. Thus, if I accidentally upset my inkstand and make a spot on the table cloth, this purely physical ~~event~~ act is upsetting the ~~cold~~ inkstand. The effect on the table cloth is a separate transaction between the ink and the cloth ~~with~~ in which I have no hand. I am only responsible in that I might have known what would result; that is, it is an affair of knowledge. Even if the wind had upset the inkstand, it would have produced the effect only so far as the effect was necessary. But this supposes a law; and a law is an affair of intellect. Let us call a triadic fact genuine if it is not a mere ~~aggregate~~ sum of dyadic facts. Signification or representation is the principal kind of genuine triadic fact.

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Existential Graphs:

a system of logical expression.

I. The Constitutive Conventions of the Language.

I. We pretend that the "graph", that is, what is written in a certain place called the "sheet of the graph" is a general description of a certain recognized state of things.

With this state of things it is essential that both the writer and the reader of the graph should have sufficient common experience to identify it. For this identification, the writer must act upon the reader so that the latter shall be forced into an experiential reaction with that state of things, either ~~by~~ then first becoming acquainted with it or having his attention directed to it. Not only that, but furthermore the reader must be forced to regard the graph as standing for that state of things.

A general description is a sign having several essential characters. In the first place, it calls up in the mind the idea of a quality like that of the object described. To say that an idea is like another is to say that by virtue of an inward occult disposition of mind it is associated with that other idea. But, in the second place, not only is the idea called up by the general description more or less like the ~~proper idea~~ true idea of the object, but a certain respect is isolated, or emphasized, in the mind in which it specially is like the object, and whether it is so in other respects or not is of no consequence. The general sign has not only the power of directing the mind of the reader to particular sensitiveness to a special mode of likeness, but also has the power to make the reader see that

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Existential Graphs

a system of logical expression

The constitutive conventions of existential graphs.

1. A certain place may be called the "sheet of the graph" and what is there written may be called the graph.

We pretend that the graph is a general description of a certain recognized state of things.

We only "pretend" that it is so; for our purpose is merely to study formal logic, and the graph is a mere specimen of an assertion for whose matter we care nothing.

In the contents of consciousness we recognize three sorts of elements, Firstness, Secondness, Thirdness. A First is whatever it is in itself regardless of all else whether exterior to it or parts of it. It is feeling-quality. A Second is what it is depends partly but is in another, regardless of any third, and thus of any reason. It is brute reaction. A Third is what it is depends on two other things between which it mediates. Firstness is feeling-quality; secondness is brute reaction; thirdness is mediation. Secondness is generous or degenerate. A degenerate secondness is such a pairing as gives to each member of the pair only such a character as it would retain were the other nonexistent. Generous secondness imparts a character to which the existence of the other member is essential. Generous secondness is an accident of individuals. Existence is that mode of being which is constituted by generous secondness. It only belongs to individuals. An individual is an object determined

Degenerescent,

Degenerate

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[follows 108v] ~~2 Hr~~ 108A

in respect to every character. Thirdness is either generous or it is degenerate ~~to~~ a first or a ~~second~~ last degree. Thirdness degenerate to a ~~third~~ the last degree is a thirdness which imparts to each of its members only such characters as ~~they~~ it would retain ~~though both the others had never existed~~ no law nor reason. Thirdness degenerate to the first degree is a thirdness not degenerate to the last degree but ~~so deg~~ such that it imparts to each member characters ~~each~~ of which it would retain though one of the others or the triad were without law or ~~reason~~ reason. Generous thirdness is thirdness which imparts ~~to~~ each member of the triad a character which it ~~posses~~ can only possess through the simultaneous regularity, or entelechy of ~~both the others~~. By entelechy I mean ~~that~~ mode of being which is constituted by generous thirdness.

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in respect to every character. Thirdness is either generous, 109r
degenerescent or perdegenerate. Perdegenerate thirdness [Follows a 14]
imparts to its members as might belong to them though they
were not existent. Degenerescent thirdness is a thirdness
which imparts to its member such characters as ~~imple~~ involve their
existence but not their significance, or conformity to general law.
(brute.
Generous thirdness is such as involves the significance of the
members of the triad. By significance, I mean that mode
of ~~existence~~ being which is constituted by generous thirdness. ~~It involves~~
a place in a continuum. It is the mode of being of a continuum or
law.

A sign has an object and an interpretant. In the interpretant,
which is a partially indeterminate thing, the sign determines
a firstness, not absolute but relative to the object. The
pairedness it brings about is not absolute or brute, but recognizes
the sign as its creator.

Signs are of three kinds: Icons, Indices, Symbols. An icon is
a sign in so far as it is like its object and produces an idea which being like
itself is like its object. ~~To be~~ "Like" ~~means~~ ideas are ideas attracted to
one another by ~~the~~ an occult inward law. Indices are signs acting
by brute reactions. Symbols are signs which bring about ideas
like their objects in certain definitely designated respects.

~~Signs~~ Symbols are either terms, Propositions, or ~~Syllogisms~~ Arguments. A term is
a symbol which only ~~[illegible]~~ represents its object in so far as it
embodies an idea, which is formally a first. A proposition is
a symbol which separately indicates with more or less definiteness,
to what object it refers; it presents in form a first and second. An

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argument is a symbol which separately shows by what sign it is led to accept its proposition. 110r

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2 If a graph consists of ~~parts~~ graphs, that is, of parts that would have a meaning if written alone, then every such partial graph ~~goes to ser~~ has its full ~~mean~~ effect in rendering the description less vague

~~3. A heavy line signifies the identity of its~~

3. Continuity of a heavy line signifies the individual identity of all its parts. ~~Everything~~ The whole graph may be conceived as connected by a heavy line with an index of the individual state of things described, but this ~~ge~~ line is not written.

4. A general description within a lightly drawn oval applies to whatever there may be of that description and is not asserted of the state of things considered

5 A lightly drawn ~~oval~~ line crossing any graphs ~~denies they are all true.~~ ~~it reverses it.~~ Thus is a man is good this graph means "something is a man and is not identical with anything that is good".

But is a man is good means "something A is a man and something B is good and A is not identical with anything X or else B is not identical with anything, Y, if X is identical with Y.

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Questions

What is the connection between these two characteristics of symbols: first, that unlike an icon it has reference to a particular respect; second, that it represents itself as representing something otherwise known?

Answer: the latter ~~does not~~ is a characteristic of all symbols, but only of propositions.

But as an icon represents the simple idea which it excites by inward association and the index represents the individual object which it excites by outward association, so the symbol represents that some individual ~~[illegible]~~ or a collection of indicated ~~possesses~~ resembles certain ideas in so far as they resemble one another.

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Basic Formal Rules

from which, without reference to the Constitutive Conventions, all illative transformations can be deduced.

Replaced by here on

I. The whole graph may remain. ~~be erased~~

II The whole graph may be erased.

III. Two graphs that can be written separately can be written side by side.

~~III~~ IV. All rules for the transformation of graphs apply to unenclosed parts of graphs.

~~IV~~ V If to a graph A could be illatively added an oval containing only a graph B, then to B were it unenclosed an oval containing only A could be added illatively

~~VI~~ If, to an oval enclosing only a graph A could be illatively added a graph B then to an oval enclosing only B could be illatively added ~~the~~ graph A.

VII Every heavy line can be ~~broken and its broken ends joined~~ have attached to it

~~to~~ iterations of the same capital letter not elsewhere used

VIII Any ~~two~~ such letters ~~transformable~~ transformable into one another can be joined by a heavy line

~~VIII~~ ~~IX~~ Any capital letter may be written unenclosed

~~IX~~ X Nothing can be written both unenclosed and singly enclosed with the same connections.

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18 & 19 June 15

The fact that if $A \prec B$ then $(B) \prec (A)$ can be proved two ways is a defect of the statement of basic rules.

Theorems

<u>Notation</u> $X \prec Y$ means X ~~may~~ might (were it written) be illatively transformed into Y

X. Any ~~unenclosed~~ part of a graph may have two ovals drawn round it, and two ovals one enclosing only the other and its contents may be erased, however enclosed.

<u>Proof.</u> 1st, let A be any graph.

Then, by I, $(A) \prec (A)$

$\therefore$ by V $\quad A \prec ((A))$

$\therefore$ by IV Any unenclosed part of a graph may be doubly enclosed, and $AB \prec A((B))$.

2nd, let A be any graph.

Then, by I, $(A) \prec (A)$

$\therefore$ by VI $\quad ((A)) \prec A$

$\therefore$ by IV Any two ovals one enclosing only the other and its contents may if unenclosed be erased, and $((A))B \prec AB$.

3rd, let A and B be any two graphs, then,

by 1st above, if $A \prec B$ since $B \prec ((B))$, $A \prec ((B))$ might be proved otherwise

and by V, if $A \prec B$, $(B) \prec (A)$

and by IV whatever graph C may be

if $AC \prec BC$ then $(B)C \prec (A)C$

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1898 June 15

Basic ~~Rules~~ Formal Rules

from which ~~irregardless~~ of the constitutive conventions all illative transformations are deducible

I. ~~The~~ A graph, ~~written~~ being made, may remain.

II. The graph may be erased.

III. Graphs which can be separately written may be written side by side.

IV. Every rule of illative transformation ~~permissible upon~~ of a whole graph ~~permissible upon~~ applies to every unenclosed part of a graph.

V. If any graph A is illatively transformable into any other B, then an ~~enclosure~~ enclosure consisting of an oval ~~enclosing~~ containing only B is transformable into an enclosure consisting of an oval containing A.

VI. Any graph may have two ovals drawn round it.

VII. Every graph is equivalent to ~~some~~ an enclosure consisting of an oval ~~containing~~ some graph.

VIII. Every heavy line is a graph and can have attached to it a capital letter (~~individual~~ index of ~~a designate~~ some individual).

IX. Any two capital letters, transformable into one another, can be joined by a heavy line.

X. Any capital letter may be written unenclosed.

XI. ~~Nothing can be written~~ A ~~Graph~~ rule ~~unenclosed and singly enclosed with the same connections~~ Some possible graph cannot be written

Theorems

Notation $A \prec B$ means A is illatively transformable into B.

~~XII. If $A \prec (B)$ then $B \prec (A)$~~

If a graph is transformable into an ~~oval~~ enclosure consisting of an oval enclosing a second graph, then the second graph is transformable into an ~~oval~~ enclosure consisting of an oval containing the first graph.

~~Proof.~~

Proof. Let A be the first graph, B the second graph.

And let $A \prec (B)$

Then by V $(B) \prec (A)$

But by VI $B \prec (B)$ so that $B \prec (A)$. Q.E.D.

XIII. If an enclosure consisting of an oval enclosing a graph is transformable into a second graph, then an ~~oval~~ enclosure consisting of an oval containing the second graph is transformable into the first graph.

Proof Let A be the first graph, B the second graph.

And let $(A) \prec B$

Then by VII there is a graph x such that $A = (x)$.

Hence, $(x) \prec B$

Whence by VI $x \prec B$

$\therefore$ by V $(B) \prec (x)$

$\therefore$ by hypothesis $(B) \prec A$. Q.E.D.

XIV. An unenclosed enclosure consisting of an oval containing only another enclosure consisting of an oval containing any graph is transformable into that graph.

Proof. Let a be the doubly enclosed graph

Then by I $(a) \prec (a)$

$\therefore$ by XIII $(a) \prec a$. Q.E.D.

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XV If an enclosure consisting of an oval containing a graph is transformable into an enclosure consisting of an oval containing a second graph, the second graph is transformable into the first.

Proof. Let A and B be the first and second graphs, respectively.

Let $(A) \prec (B)$

Then by V $(B) \prec (A)$

$\therefore$ by VI $B \prec (A)$

$\therefore$ by XIV $B \prec A$ Q.E.D.

XVI. If one graph, ~~is transf~~ when unenclosed and alone is transformable into a second, it is so transformable wherever it is evenly enclosed, and the second is transformable into the first wherever it is oddly enclosed.

Proof Let $\underline{a}$ and $\underline{b}$ be the first and second graphs respectively; so that

$a \prec b$.

Then, by IV, whatever graph $\underline{c}_0$ may be

$ac \prec bc$

$\therefore$ by V, $(bc) \prec (ac)$

$\therefore$ by IV, whatever graph $\underline{c}_1$ may be $(bc_0)c_1 \prec (ac_0)c_1$

$\therefore$ by V $(ac_0)c_1 \prec (bc_0)c_1$

$\therefore$ by IV, whatever graph $\underline{c}_2$ may be $(ac_0)c_1)c_2 \prec (bc_0)c_1)c_2$.

Now suppose it were proved that, n being a certain whole number, if any graph, when unenclosed and alone, were transformable into a second it would necessarily be so transformable wherever it is enclosed within an even number of ovals not exceeding $2n$. Then let $\underline{a}_n$ be any graph containing $\underline{a}$ enclosed within $2n$ ovals, and let b_n be the graph resulting from the transformation in a_n of a into b. Then $a_n \prec b_n$ and as above $(a_n c_n) c_{n+1}) c_{n+2} \prec (b_n c_n) c_{n+1}) c_{n+2}$. That is, the ~~same~~ proposition is true of $n+1$. But we have proved it is true if $n=0$ ~~Hence~~ it is true whatever whole number $\underline{n}$ may be. Moreover, whatever whole number $\underline{n}$ may be if $a_n \prec b_n$ then $(b_n c_n) c_{n+1} \prec (a_n c_n) c_{n+1}$. That is the reverse proposition (transformation) may be made under any odd number of ovals.

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XVII. Any evenly enclosed part of a graph may be erased, and anything may be inserted under odd enclosures.

Proof. Let $\underline{a}$ be any graph. Then by II $\underline{a}$ is transformable into a blank. Hence, by XVI, it is so transformable anywhere within even enclosures while any blank place ~~within odd~~ oddly enclosed is transformable into $\underline{a}$. Q.E.D.

XVIII. Every possible graph can be written either unenclosed or singly enclosed, in any connection.

Proof. Let $\underline{f}$ be a graph which cannot be written unenclosed. Then I will show that it can be written enclosed.

For upon that which cannot happen there is no falsity in ~~supposing~~ assuming that anything would ensue. Hence, it may be assumed that $f \prec \bigcirc$

Hence, by XII, a blank place is transformable into (f)

But by II, we always have a right to a blank, so that (f) may be written alone Q.E.D.

XIX. The same graph cannot be written at once enclosed and unenclosed with the same connections.

Proof. By XVIII there is a graph which can be written. Let $\underline{t}$ be such a graph. Then a blank place can be transformed into $\underline{t}$. Hence, by XVII $\underline{t}$ can be erased when oddly enclosed.

Let $\underline{a}$ be any graph. Then by XVIII either $\underline{a}$ or (a) can be written. ∴ by VI ~~and~~ either (a) or $((a))$ may be written.

Hence by XVII in either case $(a)\,a$ may be written.

Hence $t \prec (a)\,a$. Hence, by XII $(a)\,a \prec (t)$

But by XI some possible graph cannot be written. Let f be such a graph. Then by VII there is a graph $\underline{x}$ such that $f = (\underline{x})$. Then by XVII $(a)\,a \prec ((\underline{x}))$ and since as we have seen $\underline{t}$ may be written under odd enclosure $(a)\,a \prec (\underline{x})$ or $(a)\,a \prec f$. But t cannot be written. Hence $(a)\,a$ cannot be written.

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is a man — ~~human~~ — is a man

$\Sigma_i \Sigma_j \; m_i \cdot (\bar{m}_i + \bar{l}_{ij}) \cdot w_j$

1

d.

XX Any graph may be written enclosed and unclosed in any connection both being oddly enclosed. 118r

Corollary from proof of XIX.

XXI. If one graph can be illatively transformed into another an enclosure may be written consisting of an oval enclosing the former graph and an oval enclosing nothing but the latter.

Proof. Let a ~~and~~ b be the first and second graphs respectively. Then I say that if $a \prec b$, we may write $(a(b))$.

For by XX, we can write $(a(a))$

and by XVI if $a \prec b$ we can transform $(a(a))$ into $(a(b))$, so that the latter can in that case be written. Q.E.D.

XXII. If a graph is written outside any number of ovals, it makes no difference whether it is written inside of them or not, nor whether it is repeated outside of them.

Proof. First, ~~to~~ If a graph is written outside an oval it may be erased if written inside that oval. Whatever graphs a and b may be, I say that $a(ab) \prec a(b)$.

For $ab \prec ab$ by I

and $ab \prec a$ by XVII

Hence $ab \prec aab$ by III

Hence $a(ab) \prec a(b)$ by V and IV. Q.E.D.

Second, But $a(b) \prec a(ab)$ by XVII. Hence it makes no difference whether a is written inside the oval, so long as it is written outside.

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XXIII. An evenly enclosed part of the graph may be thrust into any number of ovals outside of which it stands, and a graph inside any number of ovals may be brought out so as to be oddly enclosed.

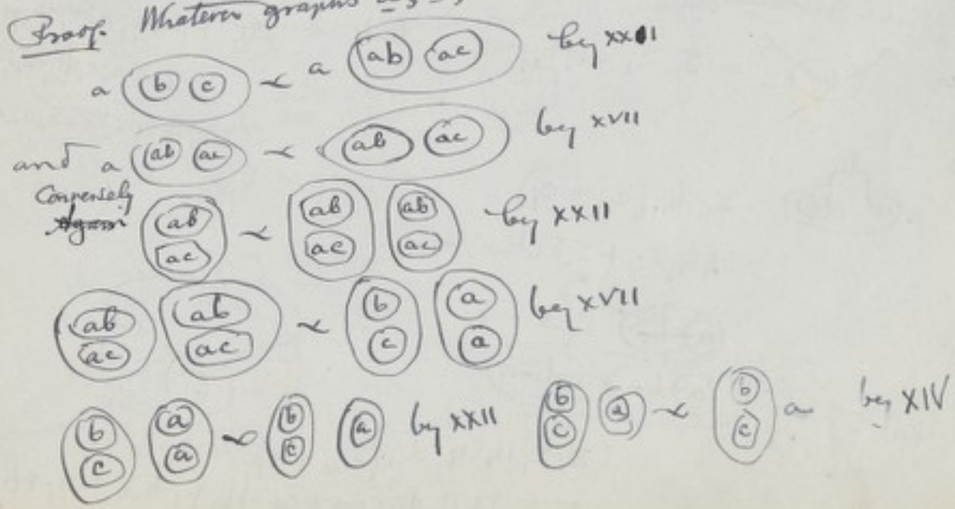
Proof. For it makes no difference whether or not an evenly enclosed graph is repeated inside, and by XVII it may then be erased outside. And a graph by XVII may be inserted in any odd number of ovals and then it makes no difference whether or not it exists still further in.

Scholium. This theorem is useless unless the number of ovals passed through is even.

XXIV. If an unenclosed enclosure contains only enclosures each containing a given graph, this graph may be written outside the whole; and if an unenclosed enclosure contains only enclosures

XXIV. If an enclosure contains only enclosures it makes no difference whether a graph is written outside the whole or inside each of the inner enclosures.

Proof. Whatever graphs $\underline{a}$, $\underline{b}$, and $\underline{c}$ may be



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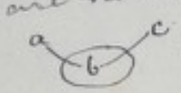
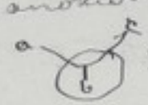
1903 June 9. Theorem XXVI may be ~~general~~ extended as follows:

Two graphs not connected in their innermost common enclosure ~~(whether through another graph or not)~~ and not so connected without entering any other enclosure are not connected (even through another graph at all)

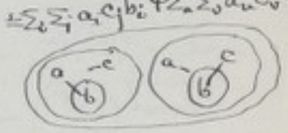
Thus  $= \Sigma_i \Sigma_j a_i \cdot \bar{b}_{ij} \cdot c_j$

But 

$\Sigma_i \Sigma_j a_i c_j (\bar{b}_i + \bar{b}_j)$

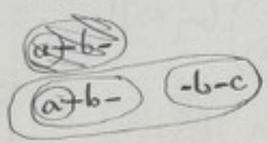
$= \Sigma_i \Sigma_j a_i c_j \bar{b}_i + \Sigma_i \Sigma_j a_i c_j \bar{b}_j$

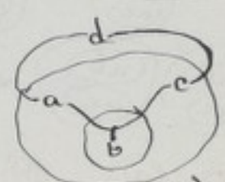
$= \Sigma_i \Sigma_j a_i c_j \bar{b}_i + \Sigma_u \Sigma_v a_u c_v \bar{b}_v$



$= \Sigma_{ij} b_{ij} (\bar{a}_i + c_j)$

$= \Sigma_i \Sigma_j b_{ij} \bar{a}_i + \Sigma_u \Sigma_v b_{uv} \cdot c_v$

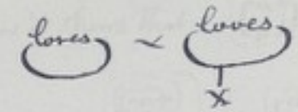


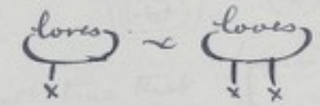


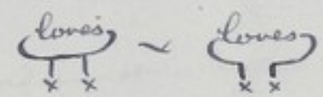
$\Sigma_i \Sigma_j \Pi_k \Pi_l \, d_{ij} (\bar{a}_{ik} + \bar{c}_{lj} + b_k \cdot b_l)$

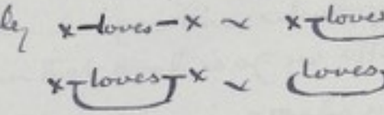
$\Sigma_i \Sigma_j \Pi_k \Pi_l \, d_{ij} (\bar{a}_{ik} + \bar{c}_{lj} + b_k) \cdot (\bar{a}_{ik} + \bar{c}_{lj} + b_l)$

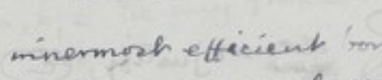
XXV. A heavy line of connection is equivalent to connections of all its extremities to mutually transformable but otherwise unknown individual indices. 120r

Proof.  by VIII

 by XXII

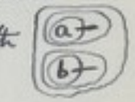
 by XVII

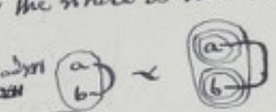
And conversely  by IX

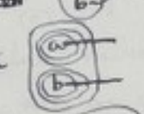
 by XVII.

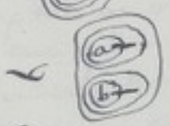
XXVI. The innermost efficient ~~and~~ between two graphs is inside their innermost common enclosure.

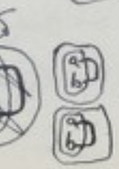
Proof. Let two graphs $\underline{a}$ and $\underline{b}$ be enclosed in one oval and connected by a heavy line extending beyond that oval.

Then I say that the whole is mutually transformable with 

For on the one hand by VI and XXII $\prec$ 

$\therefore$ by XVII $\prec$ 

$\therefore$ by XXIII $\prec$ 

And on the other hand by XVII $\prec$  $\therefore$ by XVII $\therefore$ by XIII $\prec$

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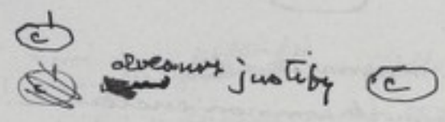
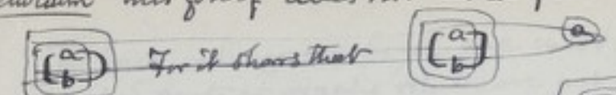
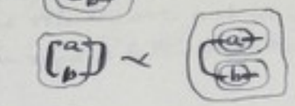
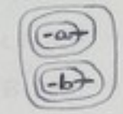
This is wrong. For  always justify

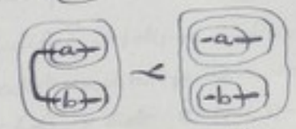
Yes it does. It is correct.

Scholium This proof does not hold for

~~For it shows that~~ 

For it shows that 

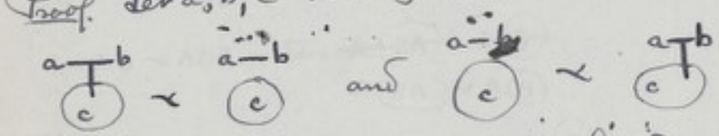
while it is 

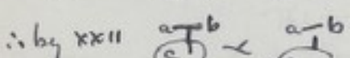
Now it is not true that 

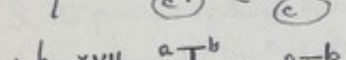
For the bond cannot be broken when addly enclosed.

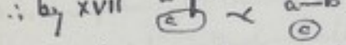
XXVII A branch of a line extending into an oval and not joining any graph in that oval is of no effect.

Proof. Let a, b, c be any graphs whatever, then I say that



For by XVII 

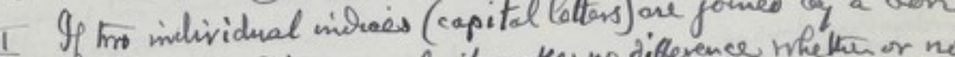
∴ by XXII 

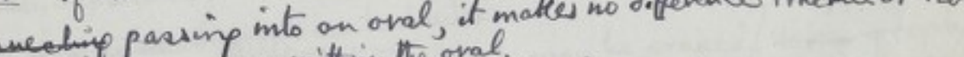
∴ by XVII 

On the other hand by XXII

XXVIII If two individual indices (capital letters) are joined by a bond ~~crossing~~ passing into an oval, it makes no difference whether or not either or both are ~~one~~ within the oval.

Proof. Whatever individuals A and B may be, I say that





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1898 June 10.

The basic rules given above are incorrect in regard to their effect on attached parts or graphs which are not in all respects like other parts.

The are also ~~defective~~ requires out in regard to this that contraposition can be proved ~~two ways~~

If ~~from~~ if $A \prec B$ it is true that $C-A \prec C-B$

But if $C-A \prec C-B$ it does not follow that $C-(B) \prec C-(A)$

Thus if ~~there~~ some cockatrice is hatched it follows that some cockatrice is ~~male~~ female

But it does not follow that if some cockatrice is not female some cockatrice is not hatched.

If $-A \prec -B$ it does not follow that $C-A \prec C-B$

All ~~whole~~ relative transformations ~~which~~ can be effected by insertions and erasures; and every ~~relative~~ insertion or erasure relative for ~~a whole~~ the whole graph is ~~relative~~ for every unenclosed partial graph ~~of the universe of graph having the same attachment to~~ ~~everywhere end of the inserted graph being attached to the~~ correspond

If $C-A \prec C-\underset{B}{A}$ then $C-(B) \prec C-\underset{(A)}{(B)}$

If $-A \prec \begin{matrix}-A\\-B\end{matrix}$ then ~~$C-A$ $-B$~~ $C-A \prec \begin{matrix}C-A\\-B\end{matrix}$

If $AB \prec ABA$ then ~~$A-(BA)$ $A-(B)$~~

$A(BA) \prec A(B)$

Because

~~If~~ $A-B \prec A-\underset{A}{B}$ ~~then~~ $A-\underset{A}{(B)} \prec A-(B)$

Theorems ~~XIII~~.

In the proofs of ~~these~~ theorems attached parts are considered separately (although this is simplicity) but ~~it has not been deemed~~ to avoid awkward verbosity only cases of ~~two~~ attachments are considered, those of one, or three or more being evidently of the same nature.

~~XIII If a attached graph can be inserted~~

~~XIII Every unenclosed part of a~~ Under even enclosures any graph may be erased, and under odd enclosures any graph may be inserted. ~~Let a graph consisting of two parts a and b doubly attached to one another~~ $\binom{a}{b}$. Then

~~I say~~ I say ~~that~~ $\begin{matrix}a\\b\end{matrix} \prec -a-$ For by III $-b-$ ~~could be all~~ ~~leave the whole~~ graph it could be erased. ∴ by V it can be erased when it is an unenclosed part of the graph.

The same reasoning holds when the attachments are ~~three~~ or more, or one, or none.

∴ By VIII ~~$a \prec$~~ $\begin{matrix}a\\b\end{matrix} \prec a$ $c-\begin{matrix}a\\b\end{matrix} \prec c-\begin{matrix}a\\b\end{matrix}$

∴ etc.

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XIV. A graph already written may be iterated provided the iteration is not within any enclosure which the original graph is within, or being ~~within so much~~ iterated may be omitted.

Proof. 1. Let the whole graph be $\begin{bmatrix} a \\ b \end{bmatrix}$. ~~Then by XIII so may be written. Hence, by IV~~ $\begin{bmatrix} a \\ b \end{bmatrix}$ $\begin{bmatrix} a \\ b \end{bmatrix}$ ~~may be written~~

Then by XI $X - \begin{bmatrix} a \\ b \end{bmatrix} - Y$ may be written

Then by IV $X - \begin{bmatrix} a \\ b \end{bmatrix} - Y$ may be written.

$X - \begin{bmatrix} a \\ b \end{bmatrix} - Y$

Then by X $X - \begin{bmatrix} a \\ b \end{bmatrix} - Y$ may be written

$X - \begin{bmatrix} a \\ b \end{bmatrix} - Y$

Then by XIII $\begin{bmatrix} a \\ b \\ a \end{bmatrix}$ may be written. So that $\begin{bmatrix} a \\ b \end{bmatrix} \prec \begin{bmatrix} a \\ b \\ a \end{bmatrix}$

Conversely by XIII $\begin{bmatrix} a \\ b \\ a \end{bmatrix} \prec \begin{bmatrix} a \\ b \end{bmatrix}$

Let the whole graph be $\begin{bmatrix} a \\ b \\ c \end{bmatrix}$ Then by XIII ~~$\begin{bmatrix} a \\ b \\ c \\ a \end{bmatrix}$ may be written~~

It has just been shown that $\begin{bmatrix} c \\ a \\ b \end{bmatrix} \prec \begin{bmatrix} c \\ a \\ b \\ a \end{bmatrix}$

∴ by VIII and V $\begin{bmatrix} c \\ a \\ b \\ a \end{bmatrix} \prec \begin{bmatrix} c \\ a \\ b \end{bmatrix}$

Conversely by XIII $\begin{bmatrix} c \\ a \\ b \end{bmatrix} \prec \begin{bmatrix} c \\ a \\ b \\ a \end{bmatrix}$

We have seen $\begin{bmatrix} c \\ b \\ a \end{bmatrix} \prec \begin{bmatrix} c \\ b \\ a \\ a \end{bmatrix}$ ∴ by VIII & V $\begin{bmatrix} c \\ b \\ a \\ a \end{bmatrix} \prec \begin{bmatrix} c \\ b \\ a \end{bmatrix}$

Conversely by XIII $\begin{bmatrix} c \\ b \\ a \end{bmatrix} \prec \begin{bmatrix} c \\ b \\ a \\ a \end{bmatrix}$ etc.

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XV. If any unenclosed and detached graph ~~is~~ would be relatively transformable into another then ~~an oval enclosing~~ an enclosure containing nothing but the latter ~~is~~ would be relatively transformable into an ~~oval enclosing~~ enclosure containing nothing but the former

Proof. Let a and b be any two graphs and let

	$a \prec b$		$ac \prec bc$
Then by ~~XIV~~ IV	$a \prec ab$	Then by IV	$ac \prec acb$
Then by VIII	$b \prec b\,a$	Then by VIII and V	$c\,b \prec c\,a\,b$
Then by XIII	$b \prec a$ Q.E.D.	Then by XIII	$c\,b \prec c\,a$ Q.E.D.

Scholium. This does not apply to attached parts because if $a-c \prec b-c$ it is not necessarily true that $a-c \prec \begin{smallmatrix} b \\ a \end{smallmatrix} c$. If, however, this happens to be the case, then by VIII and V $b-c \prec \begin{smallmatrix} b \\ a \end{smallmatrix} c$

and by XIII $b-c \prec a-c$

XVI. If any unenclosed and detached graph ~~is~~ would be relatively transformable into an enclosure containing nothing but a second graph, then this second is illatively transformable into an enclosure containing only the first.

1898 June 19. 125r

The Dozen Basic Formal Rules.

I. Some possible graph cannot be written unenclosed.

II. A graph, once written, may ~~remain~~ be written

III. Any enclosed part of the ~~whole~~ graph may be erased.

IV. Graphs that might be written separately may be written together.

V. Any graph which, standing alone, might be transformed into another may be ~~transposed~~ transformed wherever it is unenclosed, and detached

VI. Every graph is equivalent to an enclosure containing some graph.

VII. Every graph may have two ovals drawn round it.

~~VIII. If any partial or entire graph, A, is illatively transformable by the insertion of another graph B~~

VIII If any graph is transformable ~~by insertion~~ into another, then an enclosure containing only the transformed graph is transformable into an enclosure containing only the untransformed graph.

IX Any graph of the kind called an index may be written unenclosed.

X Any two indices transformable into one another may be joined by a heavy line, such line being a graph

XI Every heavy line can have some index attached to it.

XII. The shape of a heavy line (especially whether a furcation occurs at an enclosure or unenclosed part) is indifferent.

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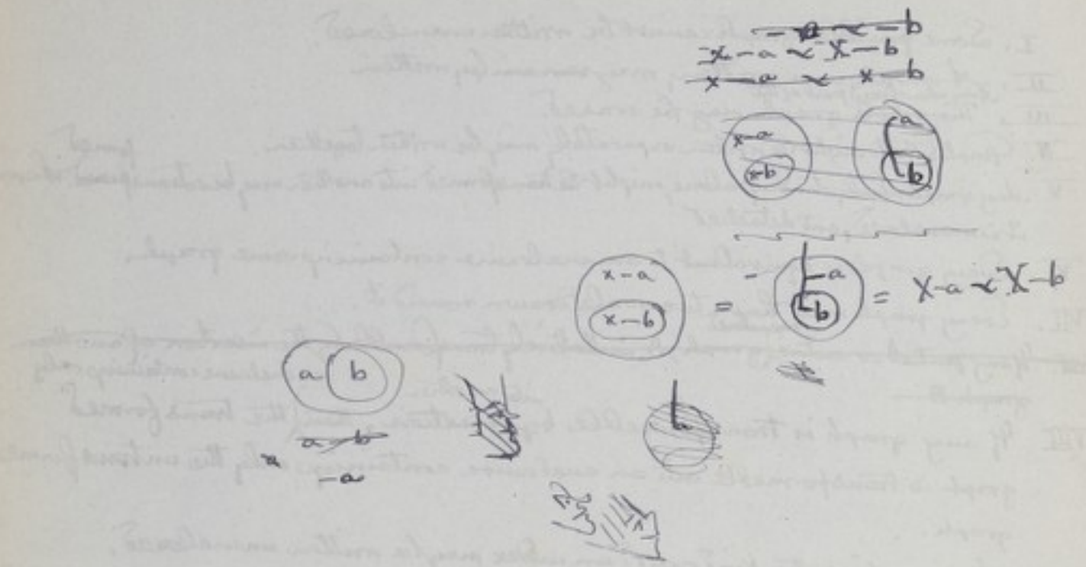


4)1778
444

1779
444
4
304
2531
23
2556
17
7)2539
5

126r

Edd James 20

The list of basic rules seems to be very bad.

I. Any ~~part of the~~ unenclosed partial graph may be erased.

always

Enoch — was swallowed by a whale

Enoch — was translated

Same as

Enoch — was sw

Enoch — was tr.

I. Any unenclosed ~~partial~~ partial graph can be erased.

II. Graphs separately scriptible are scriptible together.

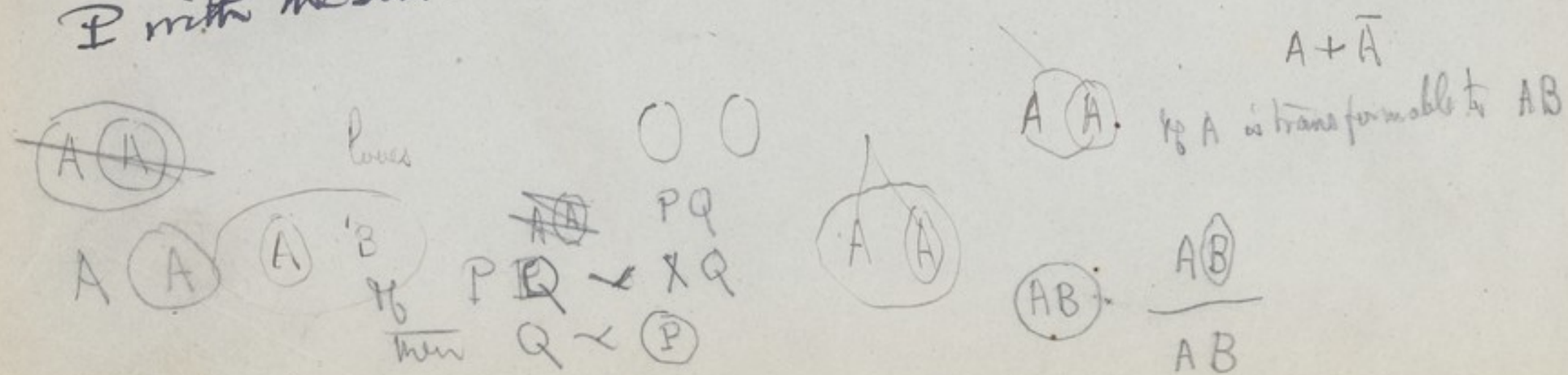
III. Every heavy line can be joined to some ~~individual~~ index after all less enclosed lines are so joined; but the individual denoted by the index may not be known.

IV Mutually transformable indices can always be joined by a heavy line.

V ~~Individual~~ Indices joined by a heavy line, unenclosed and uncrossed, are mutually transformable.

VI. If from an unenclosed oval nothing protrudes but lines each joined to an index, then were the oval ~~not it~~ removed, its ~~actual~~ present contents would, in the resulting graph, be transformable into any graph at pleasure. (A) That is $(a) - X \prec (a - X)$

VII. If in a ~~graph~~ conceivable graph consisting of two graphs, P and Q, joined, if at all, only by lines each attached to an index in Q, P could be transformed into any graph at pleasure, then to Q, were it written, could be attached an oval containing P with the same attachments as before. If $PQ \prec 0$ then $Q \prec (P)$



1898 Aug 4

The Basic Rules of Existential Graphs are only ~~Eight~~ Seven

~~I. Any partial graph (including part of a line~~

I. Any unenclosed part of a graph, ~~(except an oval line with~~ (except a part of an oval) ~~with~~ can be erased (with all it encloses if it encloses anything) whether attached or detached.

II. Graphs ~~that can be written~~ scriptible separately can be written side by side.

III. Every heavy line can be joined to some individual index, after all less enclosed lines are so joined; but the individual may not be known.

IV Mutually transformable indices can always be joined by a heavy line.

V. Two individual indices joined by a heavy line unenclosed and uncrossed by any light ly drawn line are mutually transformable

VI If from an unenclosed oval nothing protrudes but lines joined to indices, then were the oval removed, in the resulting graph its former contents could be transformed into any graph at pleasure.

VII. If in a graph (not actually written) ~~consists~~ ~~would consist~~ consisting of two graphs P and Q, joined, if at all, only by heavy lines each attached to an index in Q, P is scriptible, could be transformed into any graph at pleasure, while Q ~~can be written alone~~ ~~then the whole graph can be written with~~ is scriptible. Then a graph differing from this only in that P is in an oval can be written.

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(to do the abstractive power of ordinary speech which renders it more logically powerful than any algebra or logic hitherto developed –

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1890 Aug 4

We now come to
An Extension of Existential Graphs, permitting Abstraction.

Abstraction consists essentially in regarding a set of things, ordered or unordered, as an individual object, and denoting it by an index.

But it is hard to define a "set" of things. Since, then, the idea of a sign is presupposed in logic, it is best to endeavor to define abstraction in terms of signs instead of sets. Abstraction consists in asserting that a given sign is applicable instead of merely applying it. Thus, I say Napoleon was a man to whom the term great could be applied, instead of merely saying Napoleon was a great man.

Instead of saying A loves B, we may first say A as first and B as second may be applied the terms lover and loved. Or, what amounts to the same thing "A represents B in so far as the lover represents the loved," where "represents" is used in a very wide sense. "A is a sign of B & thing for whom the lover is the sign of the loved."

Now we can carry abstraction one step further and say, A as first and B as second may be applied a sign of which lover and loved is a sign. Or A is a sign of B & a representing sign represented by the sign of lover and loved.

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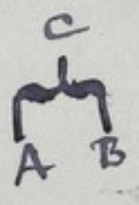
Continued from last page

What I mean is that A and B form an ordered pair which belongs to the set of pairs designated by lover and loved.

Try to define a pair, an ordered pair. You are driven to the idea of a sign. An ordered pair, or couple, is an object of which whatever is true is ipso facto true of a first object in one sense and of a second object in another sense. Or an ordered pair is an object in respect to which one object corresponds to another.

An ordered pair is an object whose essence consists in one existing object being taken as first and another as second.

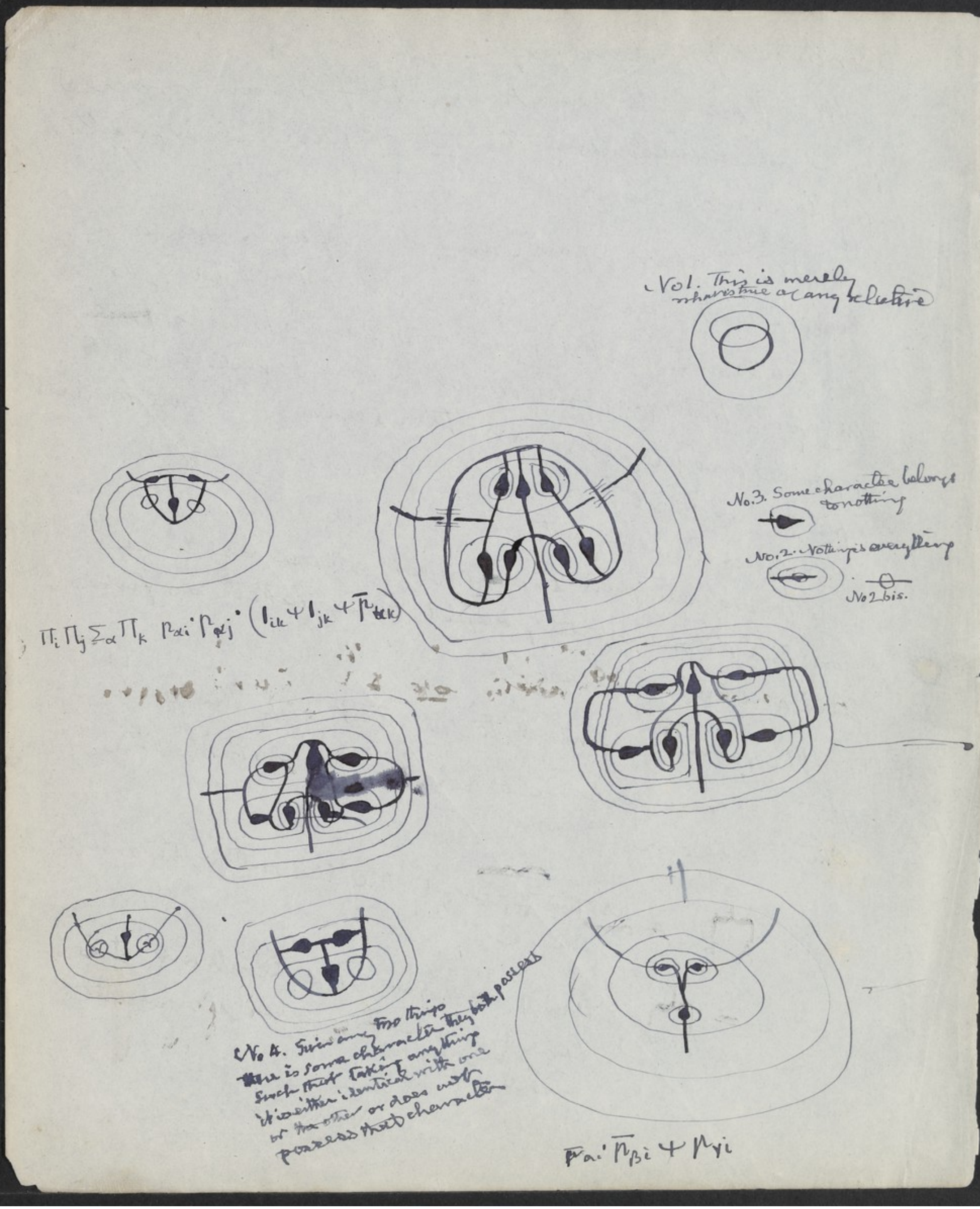
We want a symbol to say that one thing is the first in a certain ordered pair of which the other is second



A is the first, B the second of the ordered pair C

It will be convenient to allow the line from C to emerge on either side.

Transcriber



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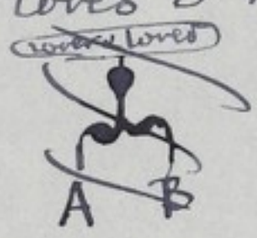
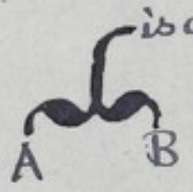
We also need a ~~sign~~ symbol ~~to~~ express that A belongs to ~~the~~ general unordered collection B

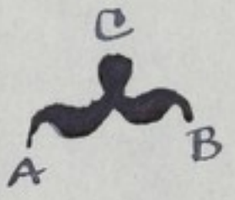
Thus A loves B may be written





or

These two signs may be joined in one



meaning

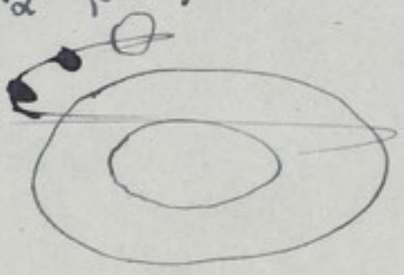
A stands to B in the relation C.

Take any two characters

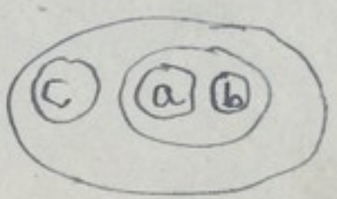
there is some character such that taking any thing whatever either it has neither of the first characters and does not have the third or it has one of the first characters and has the third

$\bar{p}_{\gamma i} + p_{\alpha i} + p_{\beta i}$

$\Pi_\alpha \Pi_\beta \Sigma_\gamma \Pi_i \bar{p}_{\alpha i} \cdot \bar{p}_{\beta i} \cdot \bar{p}_{\gamma i} + (p_{\alpha i} + p_{\beta i}) \cdot p_{\gamma i}$



$\bar{a}\,\bar{b} + c$



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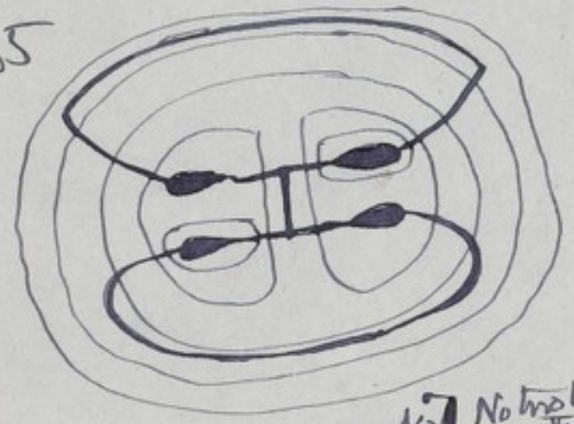
No 5 Given any character
there is another such that
taking anything whatever
it either possesses the second & not the first
or the first and not the second

No 5



No 11

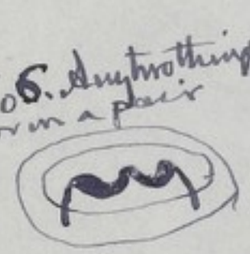
No 10

The universe here requires attention
But for simplicity
in these graph different
universes are not
distinguished

The facile abstraction
of ordinary language
brings these two into one
proposition.

No 7. No two things form more than one pair

No 6. Any two things form a pair



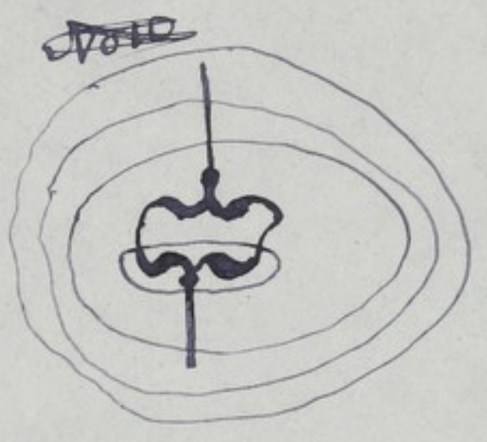
=

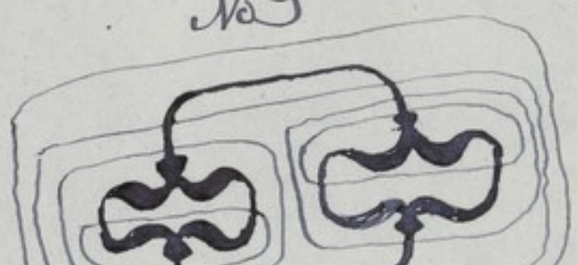
No 8 The same pair is formed by one only two things in a given order.

No 9 Given any relation
there is a relation such that
taking any two things
either the first is not in the first relation to the second
or the second is in the second relation to the first

and either the first is
~~not~~ in the first relation
to the second
or the second is not
in the second relation
to the first

No 9





Lockwood

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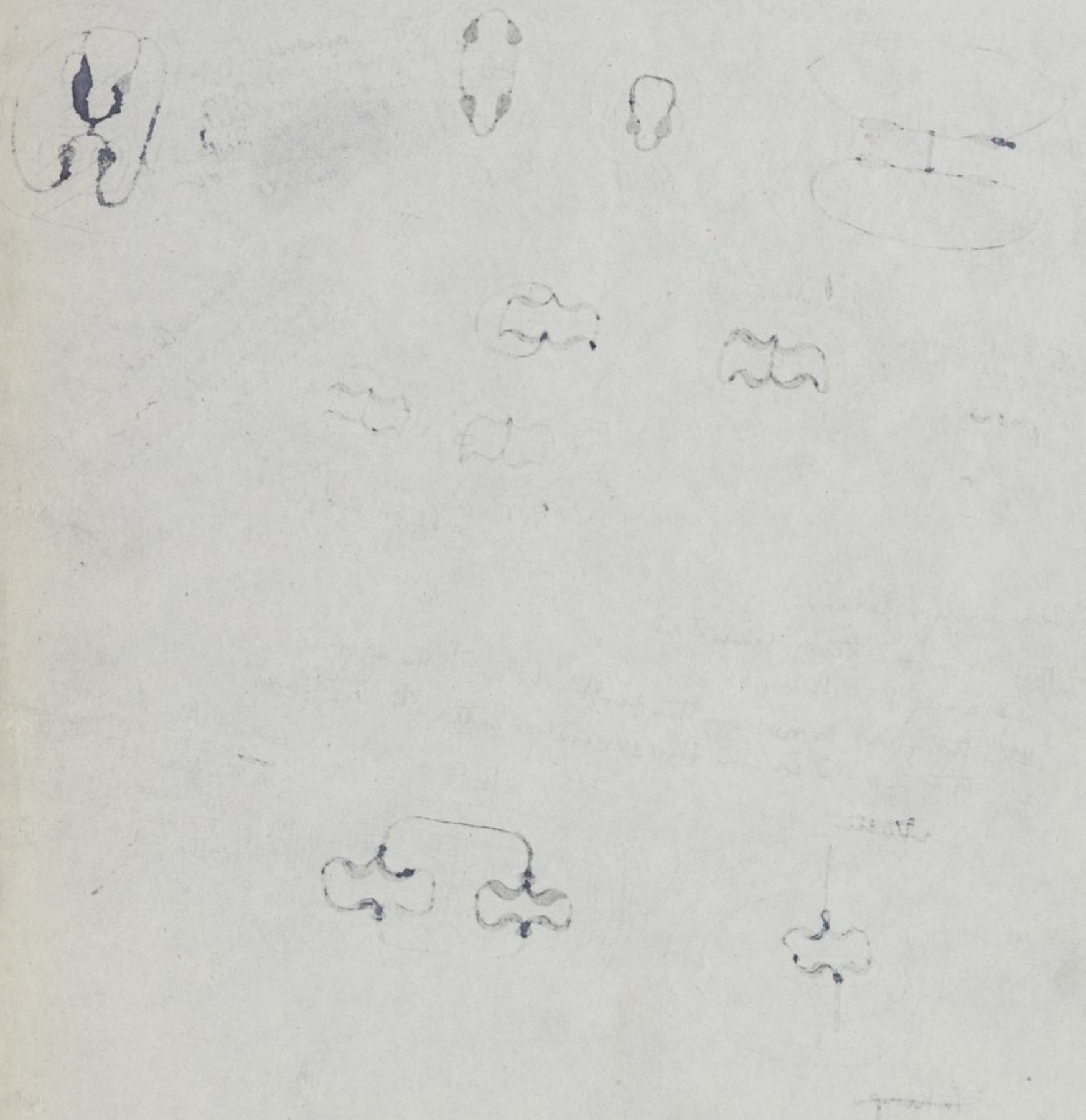

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1898 Aug 5

1321

Let a sequence be defined as follows:

1st ~~any object is either~~ take any object. Then,

it is either not a sequence

or there is a relation such that

1st there is another relation

and taking any two objects whatever

either the one is not in the former relation to the other

or taking any object whatever

either the former of the first two is in the latter relation to this third

or the latter of the first two is not in the latter relation to this

~~and further~~ and further there is something such that

the former of the first two is in the latter relation to the fourth

while the latter of the first two is not in the latter relation to the fourth

and further taking any two objects whatever

either the former of the ~~first~~ two ~~objects~~ is in the former relation to the second

or there is an object such that

the former of the first two is not in the latter relation to this fifth

while the latter of the first two is in the latter relation to this fifth

or taking any object whatever

either the former of the first two is not in the latter relation to this sixth

or the latter of the first two is in the latter relation to this sixth

and 2nd taking any two objects whatever

either ~~they do~~ one or the other does not belong to that sequence

or they are identical

or the one is in that first relation to the other

or the ~~former~~ latter is that relation to the former

2nd Take any object.

it either is a sequence

or taking any object

it is not a relation of the above description

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But it is not necessary to introduce the ~~second~~ first relation

1st Take any object

A It is either not a sequence

B Or else — There is a relation such that two things are true

C 1st Taking any two objects

E Either the one or the other does belong to the sequence

F or two things are true

G 1st Taking any third object the first is in that relation to this object

J Or The second is not in that relation to the third object

H And 2nd

K There is an object such that

L The first is in that relation to this fourth object

and the second is not in that relation to this fourth object

D 2nd Taking any two objects, one or other of 3 things is true

M 1 Either both belong to the sequence

N 2 Or there is an object of which two things are true

~~Or the first~~

~~Or two things are true~~.

I 1st the first object is not in that relation to this

Q 2nd the second object is not in that relation to this

O 3. Or taking any object whatever

R Either the first is not in that relation to it

S Or the second is in that relation to it

2nd Take any object

It either is a sequence

Or there is no relation of that description

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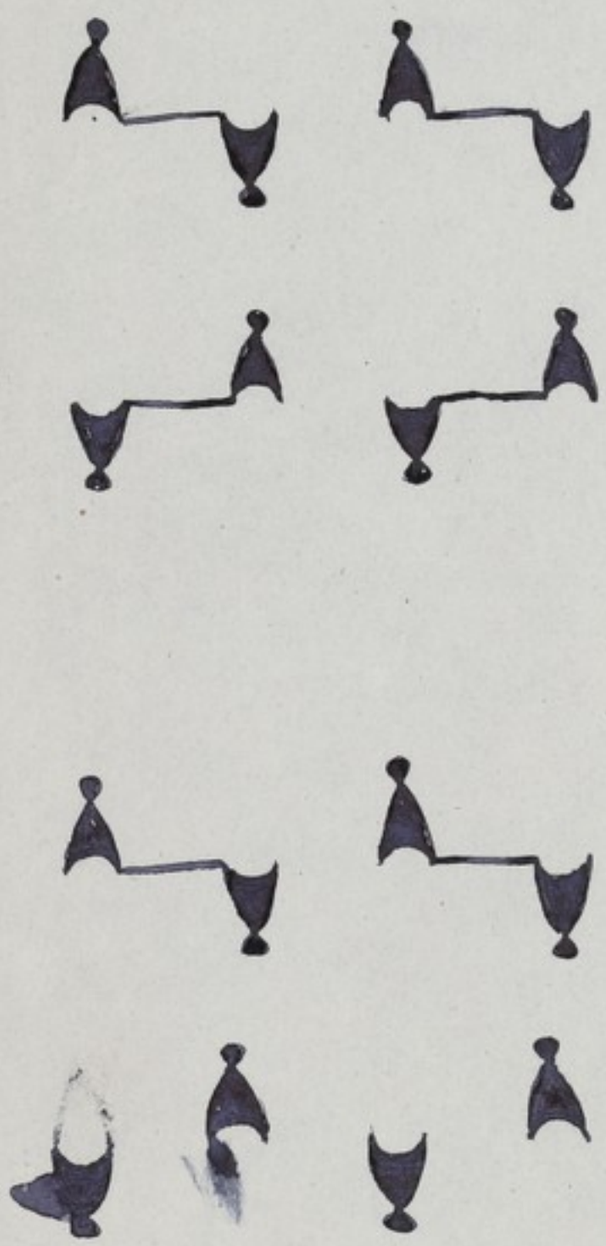

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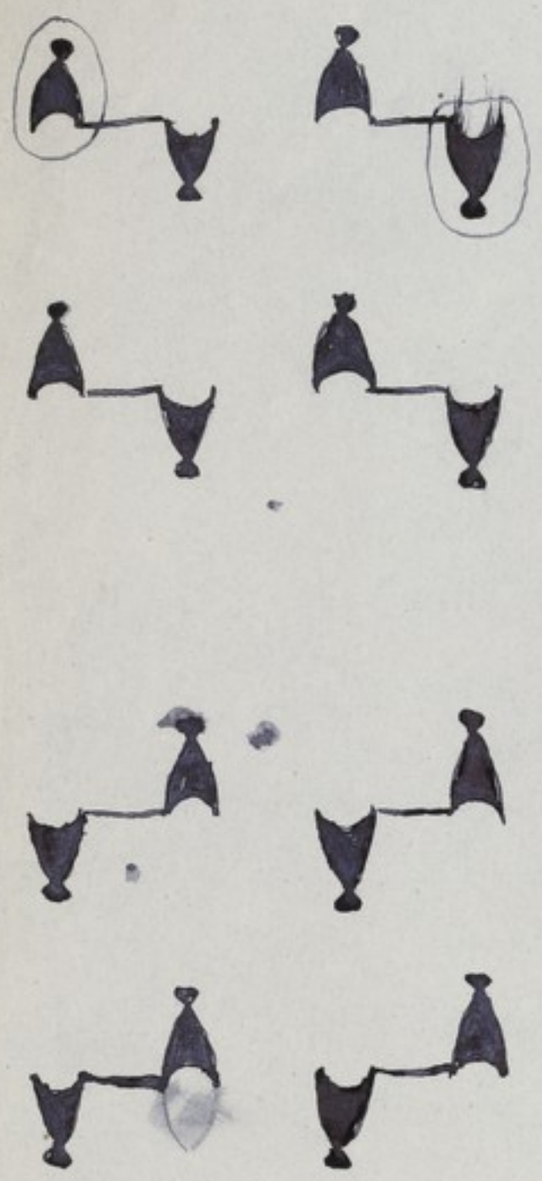

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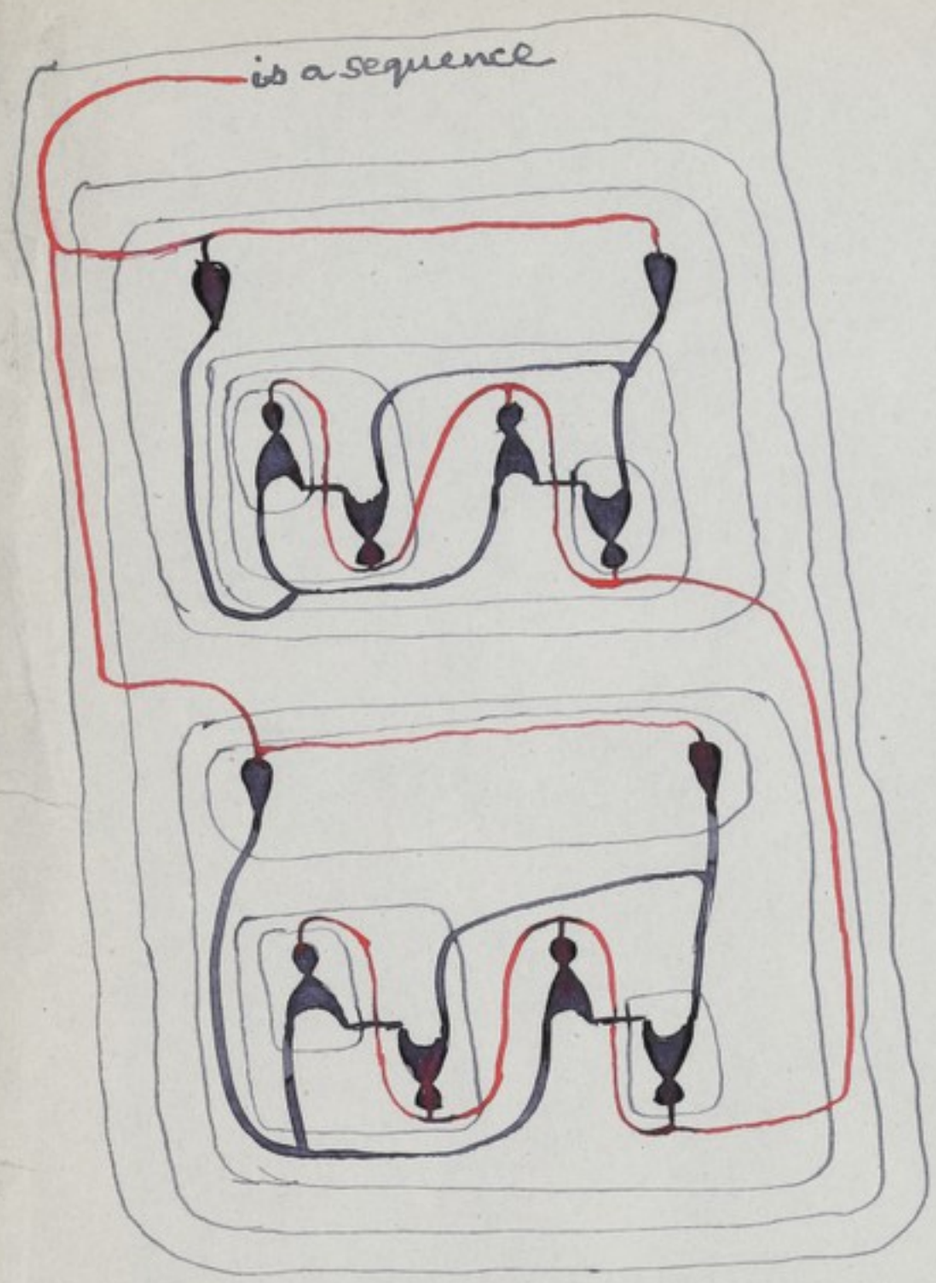

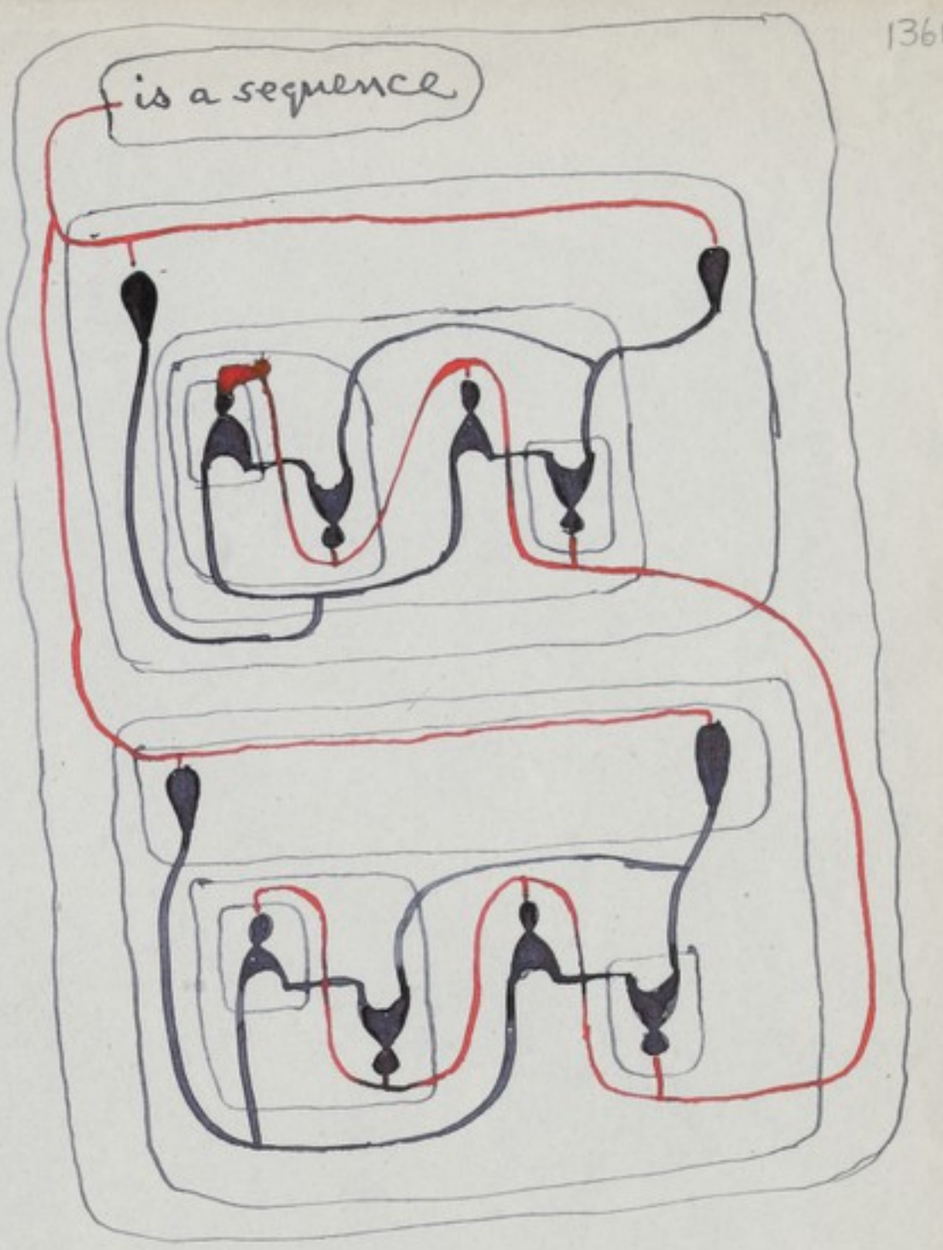

~~The system of numbers is such that taking any two things either one or other is not a number~~

or But the above leaves out an alternative namely that it may be the second that is in the relation to the first.

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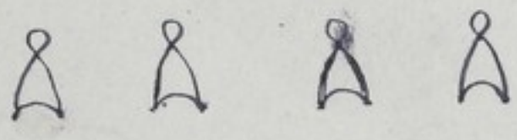
[Follows 136]

~~a 13r~~
136 A



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1B2 box 6

My dear Mrs. Jacobi

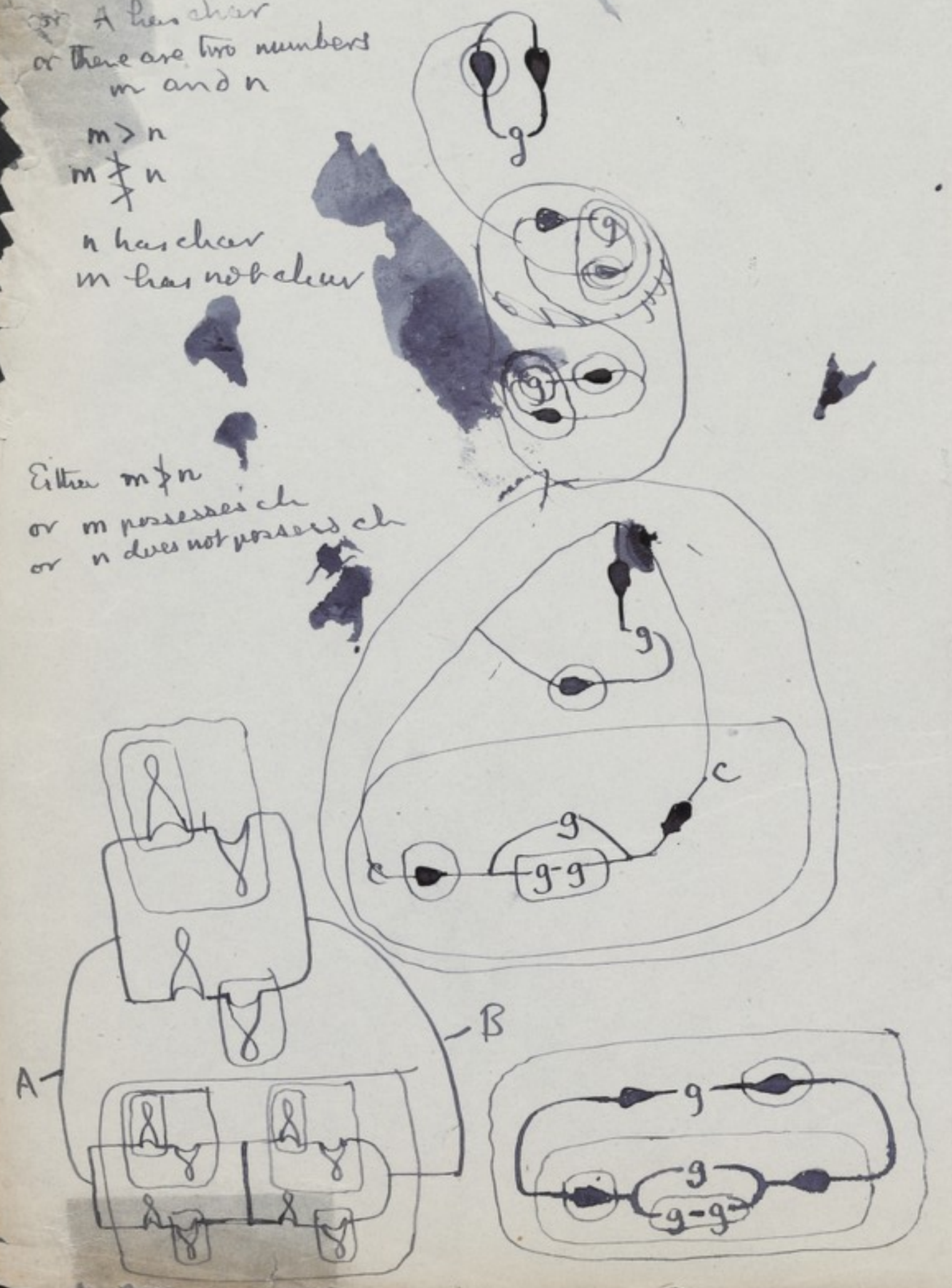
I thank you very much for the prescription. ~~My state~~ You are mistaken in thus

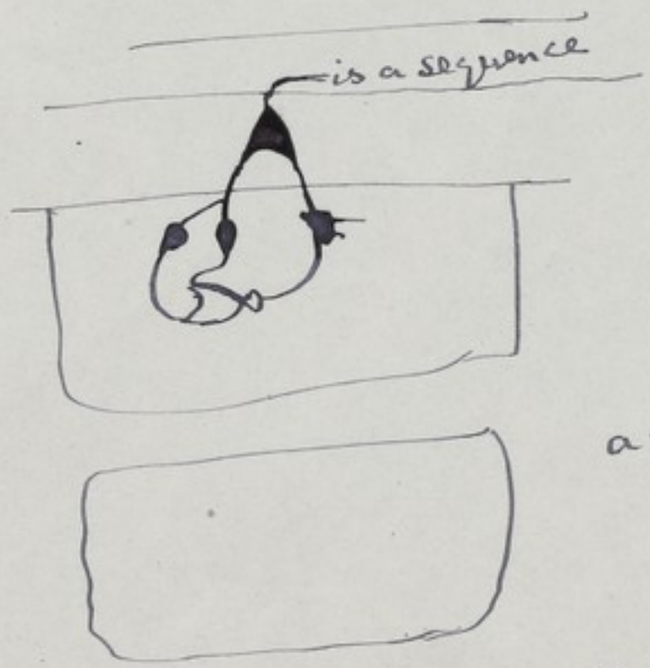
Either B > a
or B has not char.
or A has char
or there are two numbers m and n

m > n
m ≯ n

n has char
m has not char

Either m ≯ n
or m possesses ch
or n does not possess ch





$$(\ell+\breve{\bar{\ell}})\cdot\ell\breve{\bar{\ell}}\cdot\{[\bar{\ell}\breve{\ell}+(\bar{\ell}+\breve{\ell})]+[\bar{\ell}\breve{\ell}+(\bar{\ell}+\breve{\ell})]\}$$

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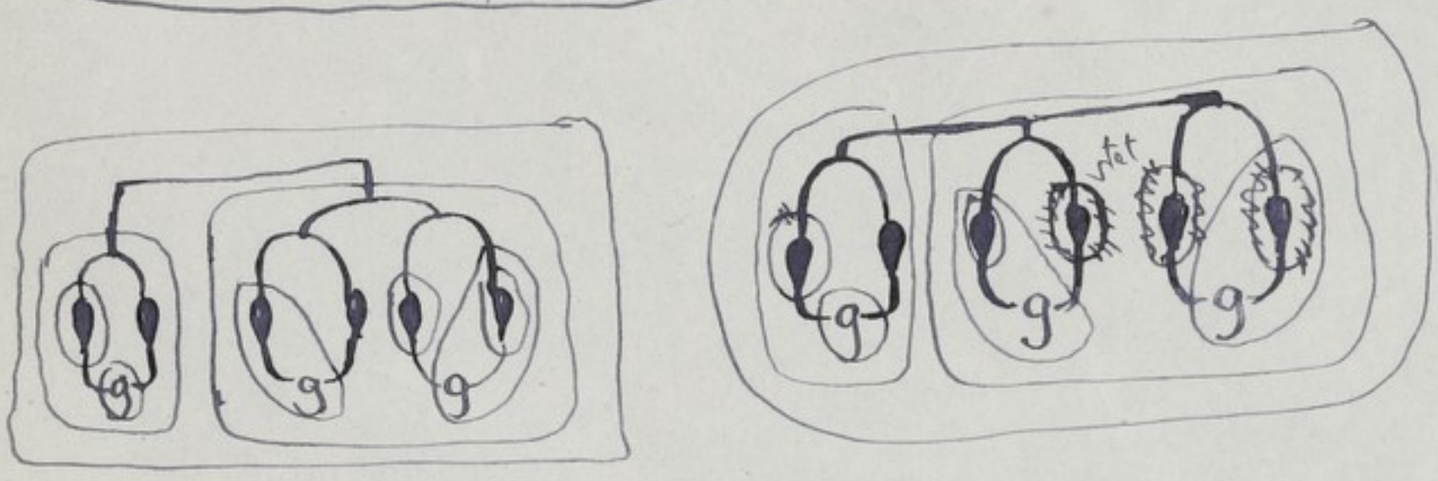

If $\bar{c} > c$

~~If every $\bar{c}$ > every c~~

Either there is a $\bar{c}$ not greater than a c

or there is $\bar{c}$ not less that anything ~~unless it is~~ not c not c

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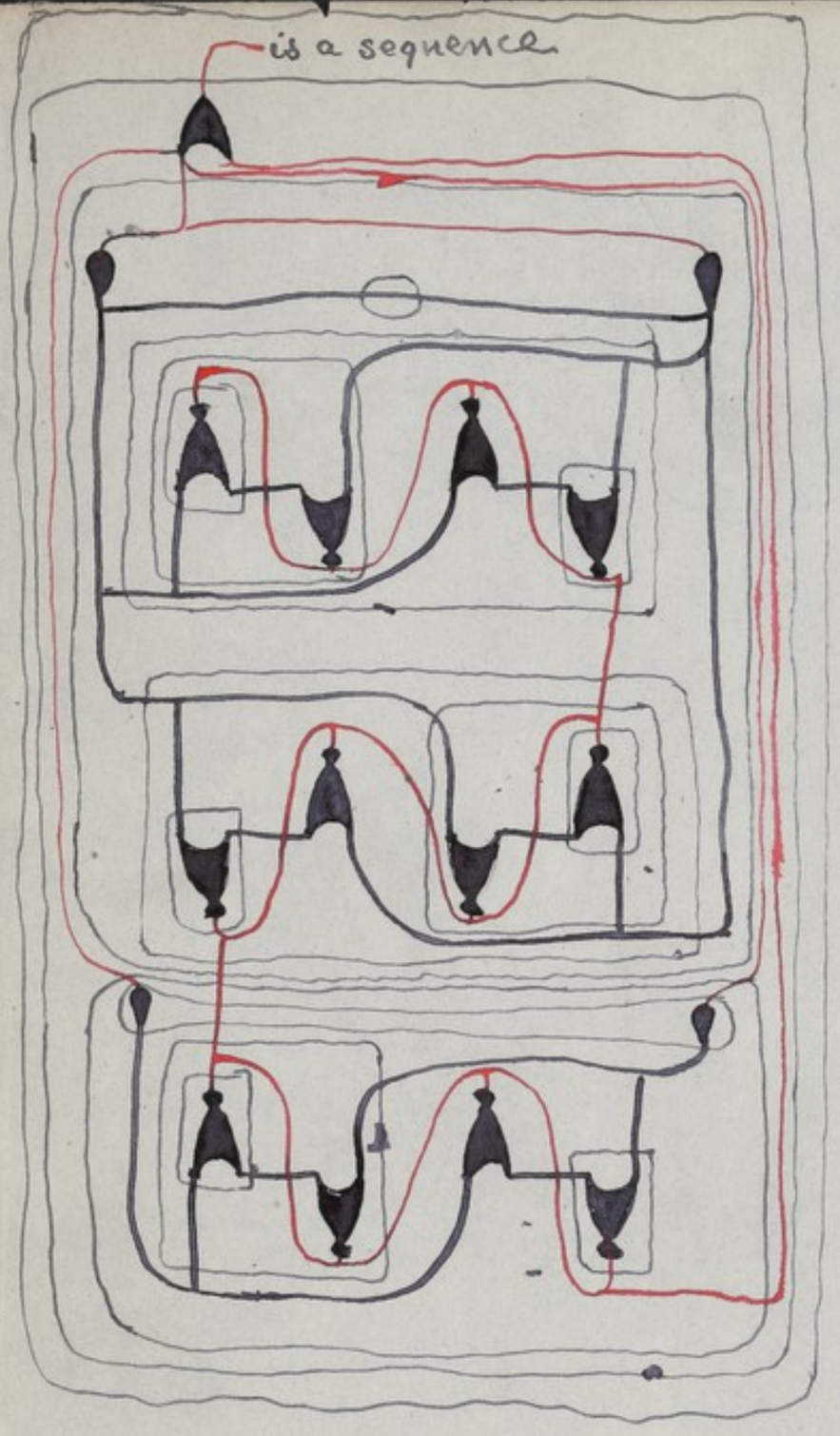

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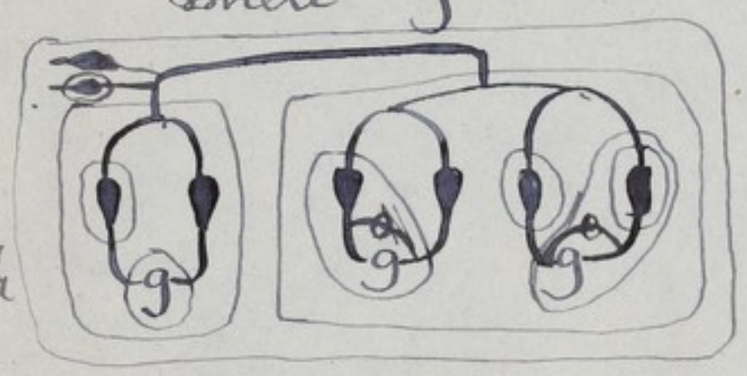
1890 Aug 6

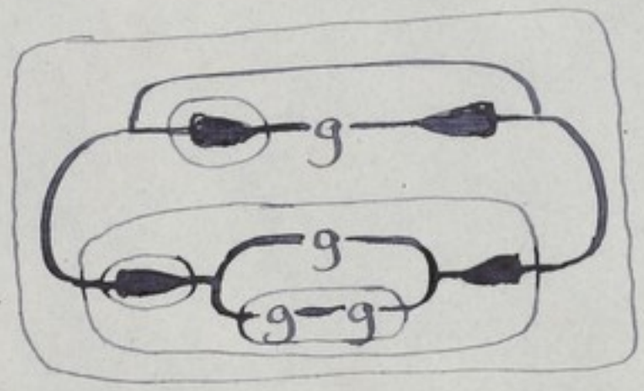
The whole numbers form a sequence which has this property

where -g- means -exceeds-



The minimum is that of the numbers

Hence follows the important Fermatian theorem:



Addition of whole numbers defined by

$$0+0=0$$

~~$0+Ex=E$~~

Let Ex be no. next greater than x

$$x+Ey=E(x+y)$$

$$Ex+y=E(x+y)$$

Multiplication is defined by

$$0\times 0=0$$

$$x\times Ey=(x\times y)+x$$

$$Ex\times y=y+(x\times y)$$

Involution

$$x^1=x$$

$$x^{Ey}=x.x^y$$

$$\cancel{(xx)^y=x^y.x^y}$$

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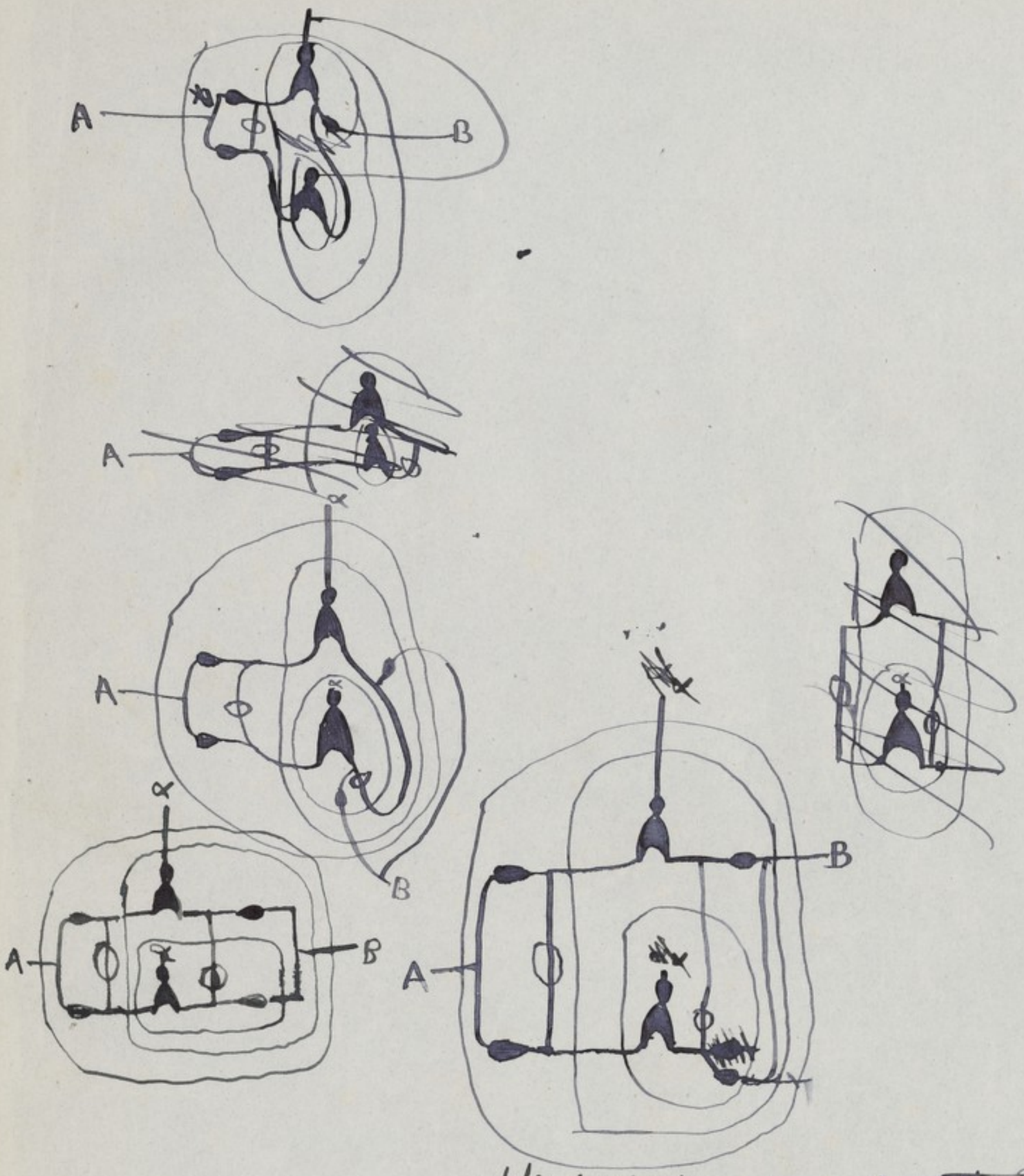
1898 Aug 8.

140r



at least as small
As are ~~less~~ in multitude than the Bs.

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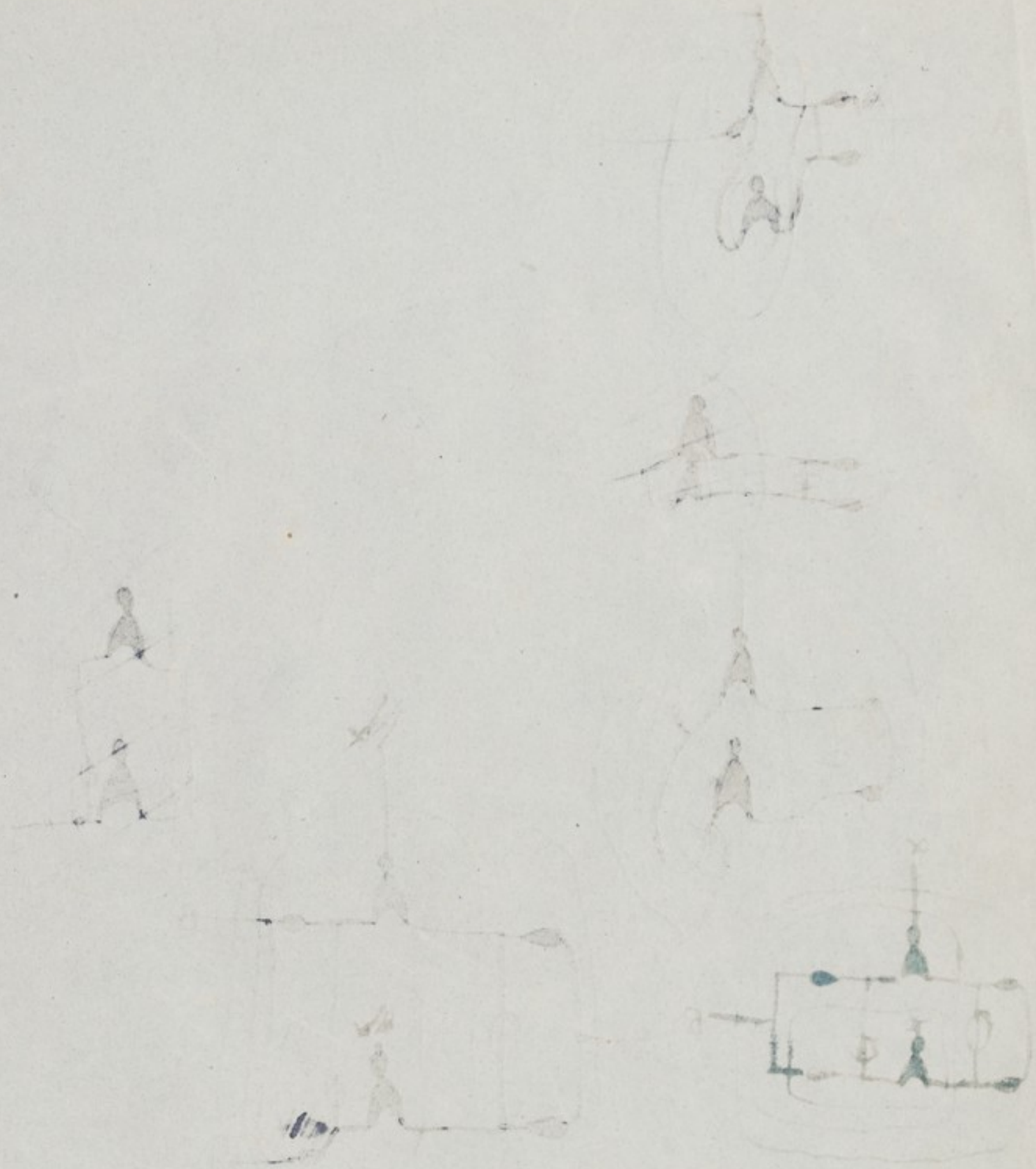

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1898 Aug 9. 141r

The Multitudes are ~~classes, class-names~~ characters of collections. So that each multitude is applicable to a collection of collections, and multitude itself is applicable to a collection of collections of collections.

The different collections of each multitude are characterized by being in the relation of the last page to the same collections.

Given any two collections whatever one of them must be in that relation to the other. For if not there would be a ~~relation~~ collection of pairs which would not constitute the pairs of any relation, which is absurd & contrary to the idea of a relation; for a relation is nothing but any collection of pairs.

But it is impossible (I believe) to express this reasoning in any logical system yet invented, for the reason that no system of algebra or graphs can analytically express "every possible collection of objects formed from the objects of the collection q." The impossibility of this will become apparent when we come to study multitude further.

¶ The collection of the As stands in the relation of the collection of the Bs, let us say that the collection of the Cs is "countable" by the collection of the Bs. That is, there is a mode of

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ordered pairing (or coupling) ~~in~~ according to which every A is the first member of a pair of which a B is the other member while no two different As are the first members of pairs of which the same B is the second member.

If one collection is countable by another then the former is countable by every collection by which the latter is countable; and conversely if a ~~relation~~ collection is countable by every collection ~~of~~ by which another is countable, the former is countable by the latter —

This is easily shown —

Hence, this relation of countability is transitive and a self relation; one collection is countable by a second not countable by it, it is said to be of lower multitude than that second.

A non-existent class (i.e. nonexistent in the universe of discourse) is countable by every collection. Hence its multitude is the lowest possible. It is called ~~zero~~ nullity.

The next higher multitude is that of an individual considered as a collection, which is called unity, ~~etc~~ the next the multitude of any pair etc.

The sum of two multitudes is the multitude of a collection ~~composed of~~ containing the individuals of two mutually exclusive collections and no other individuals, those two collections having the multitudes of which the other is the sum. There is no multitude higher than a given multitude and lower than the sum of that multitude and unity. ~~There is no multitude~~

It is plain that the sum of nullity and nullity is nullity. It is also plain that if the sum of two ~~collections~~ multitudes is s then the sum of one of them and of the sum of the other and unity is the sum of s and unity. Hence addition of multitude follows the law of addition of numbers.

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Every multitude is distinguished from all lower multitudes by the invalidity of some mode of inference applicable to collections of all those lower multitudes

Thus of a null collection every proposition is true. Of a unit collection everything is wholly true or wholly false, etc

The multitude of all multitudes which are increased by the addition of unity is greater than any such multitude.

Of the multitude of all such multitudes the syllogism of transposed quantity does not hold which holds for all lower multitudes.

These lower are called enumerable multitudes. Their multitude is called the denumeral multitude.

Multiplication. The product of two multitudes is the multitude of ordered pairs of which the first belongs to ~~one~~ a collection of the one multitude and the other of the other.

$0 \times 0 = 0$

$x \times (y+1) = (x \times y) + x$

The product of two enumerable multitudes is enumerable. The product of the denumeral multitude with itself or with an enumerable multitude is itself.

x^y is the multitude of all ways of distributing y objects into x collections.

Laws of this operation

$2^x > x$ whatever multitude x maybe so long.

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as x is the multitude of such a collection that ~~the presence or absence of~~ a single individual can be added or removed making it a different collection. And if this is true of x it is also true of the collection of distributions of x into two classes.

But if the multitude of a collection composed of ~~all~~ all the individuals of a collection ~~from~~ of each of those multitudes it is not true that $2^x > x$. Hence, in such a collection it is not true that a single individual can be changed thus changing the collection. Such a collection has not, properly speaking, any multitude. It is continuous.

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1898 Sep 29

I am convinced one cannot, after all, distribute even a small logic better than thus:

I. Speculative Grammar
Introduction on the Nature and purpose of logic.
Explaining quality, collection
~~dual~~ dyadic relation and its kinds
Triadic relation – Signs
Copies' – Signs – Symbols.
what is necessary for the expression of thought
system of graphs & of algebra –

II. Logic proper (Stoicheology)
Doctrine of Terms
" " Propositions
" " Inferences

III Speculative rhetoric (only the term is bad)
Methodology
Applications of logic & mathematics etc.
Objective Logic.

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1898 Sep 29.

Logical Analysis of the Properties of Time.

1. Time is continuous. That is to say, taking any multitude M, whatsoever, numerable or innumerable, ~~it is possible~~ ~~there~~ it is possible that time should be so separated into ~~are~~ parts, ~~of time~~ that some of these, no two having ~~no~~ any parts in common, ~~whose~~ multitude exceeds M.

1. Time is continuous. That is to say, taking any multitude, ~~in common~~ M, whatsoever, numerable or innumerable, it is possible ~~that~~ time should be so divided into parts, that some of these, of which no two have any parts in common, should exceed M in multitude, while each of them is such that the same thing is true of it.

It follows that time cannot consist of indivisible times. For if it did, the multitude of them being taken for M, the above would evidently not be true.

2. Every continuous ~~time~~ part of time (aside ~~apart~~ from its "contents", for the meaning of which, see below) is exactly like every other, and its relations to other continuous parts of time (with which it has no part in common) are precisely analogous to those of every other (aside from the "contents" of the different times.) This may be expressed by saying that time is typically non-singular.

3. Taking any four parts of time, ♠, ♢, ♣, ♡, supposed to have no two of them any part in common, this tetrad may, of course, be separated into two pairs in three ways, thus:

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♠◇ ♣♡

♠♣ ◇♡

♠♡ ♣◇

If we ~~imagine~~ compare the four times to the four summits of a tetrahedron, the three modes of partition correspond to the three pairs of opposite edges. So far, there appears no distinction between them. But the present property of time consists in this: that in every case one of those three partitions is of a different quality from the other two, which are alike; and I proceed to define the difference. Let us assume, then, that it is the partition ♠♣ ◇♡ that is peculiar. Then I say ~~that it~~ ~~is a~~ 1st that it is always possible to find a fifth time, ♥ ♛, such that of the tetrad ♠♡ ♣♛ it is the partition here represented that is the peculiar one, and

2nd of the tetrad (♠♡ ◇♛) it will be the partition here represented that is the peculiar one. tr. (Not absolutely necessary but facilitates)

It follows that of the tetrad (◇♡ ♣♛) this is the peculiar partition, and that of the tetrad ♠♣ ◇♛ this the peculiar partition.

This property may be familiarly stated by saying that times are related like the parts of a ~~topically non-singular~~ line. (For that this line is non-singular and therefore sing shaped appears from the 2nd property.)

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1898 Sep 30

Logical Analysis of the Properties of Time

1st, taking any four mutually exclusive times, ♠, ♣, ◇, ♡, of the three partitions of the tetrad into pairs, one, ~~say ♠♣:◇♡~~, is peculiar, while the other two are alike. Namely, if ♂ is any fifth time having no part in common with either of the first four, and

if ◇♣ : ♠♂ is not the peculiar partition of this tetrad

and if ◇♣ : ♡♂ is not the peculiar partition of this tetrad.

then neither is ◇♣ : ♠♡ the peculiar ~~tetrad~~ partition of this tetrad. If for any of the tetrad of mutually exclusive times a part of it be substituted the peculiar partition remains the same.

2nd, the relations of every time to other times (irrespective of their contents) are strictly analogous to those of every other time, that is like it either in being protended or in being unprotended.

3rd, if ♠, ◇, ♣, are any three mutually exclusive times, and if M be any multitude whatsoever, numerable or innumerable, then there are capable of being isolated ~~is a collection~~ ~~are~~ mutually exclusive times exceeding M in multitude, such that, if ♡ be any one of them, ♡ has no part in common with ♠, ◇, or ♣, and such that ♠♣ : ◇♡ is the ~~partial~~ peculiar partition of this tetrad.

4th, an instant, or unprotended time, is such a time that if ♠, ◇, ♡, are any three mutually exclusive times, no matter what, ~~and if~~ then the instant cannot contain every fourth time, ♣, having no part in common with ♠, ◇, or ♡, and such that ♠♣ : ◇♡ is the peculiar partition of this tetrad. Given any protended time, or duration, and any multitude M, ~~a multitude of~~ instants exceeding M in multitude are capable of being isolated ~~as~~ parts of that duration.

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and let P be a certain charac

5", let ♠, ♡ ♐ be ~~two~~ three mutually exclusive times; Then, if it be 1498

true that taking any two mutually exclusive durations ◇, ♣,

~~each~~ such that ♠♡ : ♐◇ is the peculiar partition of that tetrad,

and ♠♡ : ♐♣ is the peculiar partition of that tetrad, and

such that every part of ◇ possesses P while no part of ♣

possesses that character, it is always the case that ♠♣ : ♡◇

is the peculiar partition of that tetrad, then there is always an

instant, and not more (mutually exclusive), which we may

denote by ♣ which partly possesses and partly does not

possess the character P; and every instant, A, such that

♠♡ : A♐ is the peculiar partition of that tetrad, while

♠♣ : A♡ is the peculiar partition of that tetrad, altogether possesses

the character P; every instant, Φ, such that

♠♡ : Φ♐ is the peculiar partition of that tetrad, while

♡♣ : Φ♠ is the peculiar partition of that tetrad, altogether

non-possesses the character P.

No instant exists in Time except so far as it has been

developed like ♣; so that duality is essential to an instant.

6", the above seems to complete the properties of time in

itself. It remains to consider its properties relative to its

contents. The content of an instant is a reaction. This

reaction produces a state which endures. But the

characteristic content of a protended time is the em-

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bodiment of an idea, intelligible to us. That is the fact at the bottom of the 150r statement that the past affects the future. This takes place by means of a general tendency of ideas to spread and strengthen themselves.

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1898 Oct 1.

I am writing in this book, not this time parce que j'ai quelque chose de nouveux à laquelle je veux fixer la date, mais simplement parce que le papier que j'ai commandé pour écrire mon histoire de la science n'étant pas venu, je m'occupe cependant en faisant des notes pour un traité de logique.

L'introduction doit expliquer ce que c'est de la logique.

C'est la théorie de l'œuvre de la pensée considérée en son produit, c'est-à-dire, en sa signification. Pas le sentiment de la pensée, pas la pensée comme phénomène intérieur. Mais la pensée comme ce qui s'exprime, qui ne change pas en passant d'une tête dans une autre, mais reste toujours la même pensée.

Il y a là-dessus trois questions principales à étudier

1°. Comment la pensée trouve-t-elle existance, c'est-à-dire, comment s'exprime-t-elle ?

2°. Comment devient-elle et reste-t-elle vraie ?

3°. Comment developpe-t-elle et comment une pensée agit-elle sur une autre ?

Il faut jeter un coup d'œuil sur ~~chaque~~ chacune de ces questions, de lui répondre en quelque sorte au commencement de nos recherches.

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D'abord on remarquera que la logique maintient ~~et fait savoir~~ certains faits positifs. Elle n'est pas comme la mathématique une pure affaire d'hypothèses. Mais en même temps on ne pourrait ~~guère~~ guère dire que la logique fait savoir aucun fait positifs puisque les faits sur lequels elle se repose sont bien connus de tout le monde. Mais tout connus qu'ils le sont, ils ne le sont par le vulgaire que confusement. Il est une partie importante de la logique d'en faire une analyse strictement conforme à l'expérience. Sans doute la logique ayant appris quelque propriétés de son objet se détourne de l'observation extérieure en en déduit les conséquences tout comme on fait en mathématique avec une hypothèse. Cela n'est qu'à dire qu'il y a une partie mathématique de la logique comme il y en a dans toute science. Dans la logique cette partie est bien plus grande que dans aucune autre science, même dans la métaphysique.»

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1898 Oct 2. 17th Sunday after Trinity

153r

Traité de la Logique.

Introduction

Art. 1. Tandis que toute science spéciale, comme la physique, la linguistique, l'histoire, a pour but la découverte de la vérité par de l'observation, la mathématique seule refuse toute responsabilité quant à ce que peut être la vérité réelle et se borne strictement à déduire les conséquences d'hypothèses. Entre ces ordres de science, si opposés de nature l'un de l'autre, il y a la philosophie, qui enchaîne ces deux. La philosophie maintient que tel et tel est vrai sans néanmoins instituant des observations pour découvrir la vérité. Car elle se contente de cette partie de la vérité que l'analyse seule peut trouver dans ces connaissances qui sont partagées de tout le monde même des hommes les plus ignorants, après que celles-là ont été purifiées de tout ce dont on pourrait véritablement et sérieusement douter. On peut douter, par exemple, s'il vous plaît, de l'extériorité métaphysique des choses, si toutefois cela veut dire quelque chose. Mais on ne peut pas douter qu'il y a des choses qui offrent une résistance à la volonté de l'individu, de sorte que s'il veut en effectuer quelque chose cela lui coûte un effort.

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Art. 2 Dans toute connaissance, de quelle sorte qu'elle puisse être, il y a deux éléments, l'un ce que nous croyons déterminé par l'objet, l'autre ce que nous reconnaîtrons comme façon de penser. 154r 2

Les cultivateurs de chaque science spéciale se trouve également obligés aux soins assidus ~~vers~~ envers l'un et l'autre de ces éléments de leurs études. Si en feuilletant leurs journaux nous trouvons les mémoires sur les questions de méthode moindres en nombre ils suppléent à ce défaut par leur importance supérieure.

Non seulement trouvons-nous ces deux éléments dans chaque science spéciale, mais ils ~~par~~ font partition de tout le corps de ces sciences en deux grands départements, la physique et la psychique, c'est-à-dire la science des choses comme choses et la science des choses comme reglées de l'intelligence.

Dans la mathématique on ne retrouve guère quelques traces de cette distinction. Les différents mathématiciens ont leurs méthodes à eux, il est vrai, mais il y a peu de différence entre un mémoire sur une méthode et un autre mémoire mathématique. Certainement il n'y a rien dans la mathématique qui répond à la contraste entre la psychique et la physique.

Dans la philosophie nous trouvons un rudiment de la

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distinction dont nous parlons. Car il y a une partie 3
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de la philosophie qui étudie la théorie de la connaissance
sans distinction d'objets tandis qu'il y en a une autre
qui étudie ce qui sont les charactères généraux des
objets, des choses. Celle-là c'est la logique, celle-ci
c'est la métaphysique.

Mais la logique n'est bornée à la psychique pas plus
que la métaphysique soit bornée à la physique. La
psychologie découvrit, par exemple, comment une
groupe de pensées fait surgir des profondeurs de la
conscience d'autres pensées et comment cela peut exciter
un sentiment de plaisir d'un sens logique. Mais tout
cela n'intéresse point au logicien à qui il ne fait rien
qu'un raisonnement fait une gratification d'un
goût logique. Ce que le logicien demande ce n'est que
si les premisses d'un raisonnement peuvent ou non
être vraies sans que la conclusion en soit vraie; et
fait-il la joie à l'âme ou le dégout, pour cela il
reste tout ~~indifférent~~ insouciant. Appelez le sentiment
logique par nom de la conviction ou par quel autre que
vous voudriez: cela reste tout de même dehors des
intérêts de la logique, ce qui ne soucie que des relations
générales, des lois, des vérités de faits.

Cependant il faut avouer que nous pouvons nous

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apercevoir d'un certain rapprochement entre la logique et la pfychique à l'un côté, entre la métaphyfique et la phyfique à l'autre. Car, après tout, fi nous nous demandons en quoi cette vérité fur laquelle nous apuyons tant confiftetelle, nous ferons forcer à ~~devoir~~ la dernière analyse, que il y fe tapit une hypothèfe, l'hypothèse que des recherches fuffifantes amenèraient à la fin tout le monde à une opinion fixe et unanime, et c'est cette opinion idéale et fuppofée que nous appelons la vérité. Ainsi ce à quoi vise le logicien c'est de nature pfychique, bien que profondement modifié par une l'idéalisation contraire à l'imperfection essentielle de tout ce qui est vrai ment pfychique. A l'autre côté la metaphyfique en demandant quels font les charactères des chofes indépendamment de leur fignifications pour l'intelligence, les regarde au point de vue de la phyfique.

Art. 3. Dans ~~toutes~~ les difcuffions fur les méthodes dont chaque science fpéciale a à s'occuper de temps en temps il y a des nombreuses occafions pour l'application

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utile de la théorie générale de science, — c'est-à-dire de la logique. Mais il est surtout dans la métaphysique que cette théorie devient tout-à-indispensable. D'abord dans les sciences spéciales si l'on fait une erreur dans le raisonnement on est vite rapporté à la raison par des nouveaux faits qui sont continuellement versés sur toute conclusion; tandis qu'en métaphysique il n'y a pas une telle source inépuisable de ~~nouvelle~~ vérité fraiche. Une erreur une fois admise dans la métaphysique restera inaperçu jusqu'à ce que quelque logicien y met le doigt. Outre cela, toutes les conceptions propres à la métaphysique ~~étant~~ soumises à une analyse se montrent comme des conceptions de logique dans une application particulière. Il s'ensuit qu'il n'y a pas autre fondament rational pour la métaphysique que la logique. C'est pourquoi de chercher "une base philosophique" pour la logique à la mode ~~d~~ allemande c'est comme si l'on fondait une maison sur les toits.

La mathématique est la seule des sciences où il n'y a le moindre avantage à gagner de l'étude de la théorie du raisonnements. Les procédés de la mathématique doivent être évidements justes, et où ils ne

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tout-à-fait hors de doute ils ne valent rien. La logique peut donc tirer sans crainte sur les résultats de la mathématique. Elle ~~doit~~ ne doit se confier au fondé à autre raisonnement ~~au f~~ que le raisonnement de mathématique.

La physique est nécessairement fondée dans la métaphysique. Du point de vue de l'histoire, il faut l'avouer, cela ne paraît pas trop clair; puisque la métaphysique sur laquelle s'est fondé ~~la~~ notre physique d'aujourd'hui ne vaut pas grand chose même aux yeux de ceux qui se sont en servis. Mais il reste vrai que la théorie atomique, la doctrine de la conservation des forces, même la dynamique, sont bâtis sur des propositions de métaphysique. Il est facile à voir que l'arrêt que souffre aujourd'hui la théorie de la constitution de la matière a pour cause la manque totale d'une métaphysique assez forte pour servir comme pont pour une avance.

La psychologie, au contraire, ne demande ~~pas~~ rien de la métaphysique ~~excepté~~ si ce n'est que de se tenir loin et ne pas se mêler de l'affaire. Mais la psychologie et toutes les sciences psychiques ont beaucoup à gagner de la logique. Pour moi, je crois que toute cette confusion qu'on trouve dans les résultats

des investigations des fonctions des différentes parties du cortex du cerveau aurait été résolue il y a longs temps ~~est~~ si l'on avait su s'en servir de l'analyse logique. La distribution des "parties de l'âme," ~~que~~ ~~tes~~ en connaissance, sentiment, volonté, ~~que~~ dont tout le monde s'en sert, tout en reconnaissant qu'elle est dépourvue de toute exactitude, ~~aurait pu~~ serait facilement reconstituée en une distribution scientifique à l'aide de la logique. Les physiologistes ne sont pas même en état de nous expliquer clairement ce que c'est que de la conscience. Rien ne leur manquent pour cela excepté une maîtrise de la logique.

Selon ces opinions la logique doit se bâtir sur le fondament de la mathématique, et immédiatement sur la logique doit se bâtir la métaphysique. ~~Sur~~ De ces trois sciences les sciences spéciales tirent leurs principes, les sciences physiques surtout de la métaphysique, les sciences psychiques surtout de la logique. Mais il n'est pas à éviter que beaucoup de tout cela reste simple assertion jusqu'à ce que les développements de la suite nous permettent de revenir à ces questions.

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Art. 4. La logique préfente trois grands problèmes. La penfée est de telle nature qu'elle n'existe ~~point que tant~~ qu'en tant qu'elle trouve expreſsion et qu'~~pas~~ elle puiſse ſe traduire. Ainſi le premier des problèmes de la logique et le plus facile à résoudre eſt, comment la penſée s'exprime-t-elle ? Le ſecond problème eſt comment la penſée devient-elle et reste-t-elle vraie ? Le troiſième problème eſt comment ~~la~~ une pensée agit-elle ſur autres penſées et comment la pensée ſe développe-t-elle ?

Une mode de ſenſation, — diſons par exemple la couleur apellée magenta, — ~~est ce qu'elle~~ eſt en elle-même ~~tout~~ ce qu'elle eſt.

Une choſe actuelle, — diſons ~~le ſoleil~~ la lune, — eſt ce qu'elle eſt en vertu de ſes réactions avec les autres choſes de l'univers, dans ſes réactions donc contre l'univers. Chaque réaction eſt entre deux choſes. C'eſt donc les couples qui donnent à une ~~choſe~~ exiſtente ſa mode d'être.

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1898 Oct 3

Maintenant considérons le mode d'être d'une signification, c'est-à-dire d'une pensée dans le sens où la logique parle des pensées. Il ~~n'est~~ ne sera pas nécessaire de nous arrêter longtemps pour discuter si on peut penser sans signes. Avant hier en conduisant un bon cheval sur une route de campagne je fus dépassé par un chien qui sans doute avait été laissé en arrière par son maître bicycliste. Plus tard en arrivant à une fourche de la route j'ai retrouvé le chien qui s'y tenait tout indécis s'il devait prendre la route du droit ou celle du gauche. Il doit avoir hésité une bonne heure au moins, autrement je l'aurais revu, puisque les deux routes se réunissent à peu de distance. Maintenant je conviens parfaitement que ce chien n'avait pas autre objet devant sa conscience qu'un sens de barguigner, n'à moins qu'il ait eu l'idée d'attendre pour voir quelle route était préférée par d'autres bicyclistes. Je me contente ~~de~~ à faire remarquer au lecteur qu'aussi longtemps qu'on n'a plus de conscience de penser que cela, il reste hors de son pouvoir de critiquer ou de contrôler sa pensée. ~~Maintenant~~ Or, la logique ne commence que

quand on fait la critique de ses pensées. Pour faire cela il faut évidement qu'elle soit traitée comme si elle était d'autrui, et pour cela qu'elle soit exprimée.

Quant à la mode d'être d'une signification, trois différentes opinions ~~sont~~ paraissent à être plus ou moins repandues. Quelques personnes croient bien simplement que la signification c'est l'étât d'âme que le signe est apte à faire naître. Des autres disent qu'entre deux propositions qui dans n'importe quelles circonstances suggéraient toujours la même conduite il n'y a ~~pas~~ aucune différence de signification; d'où ils tirent la conclusion que la signification est l'acte de volonté que le signe suggère. D'autres encore pensent que la signification d'un signe c'est l'ensemble des différents signes dont l'emploi serait justifié dans les différents cas spéciaux par l'emploi du signe en question. Ces opinions nous montrent trois choses ayant rapport au signe. Un signe est quelque chose qui peut réagir sur les sens, qui représente une deuxième chose, et qui peut trouver ~~un~~ interprète. Sans ces trois, signe, objet, interprète, la signification n'est rien.

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La mode d'être d'une signification est donc la mode d'être d'un triade.

1898 Oct 4.

Le deux premiers articles précedants sont assez bien. Le troisième doit être modifié, pour éviter tant d'assertions douteuses. Le quatrième est tout-à-fait mauvais. Je vais essayer de le remplacer.

Art. 4. Selon ce que j'ai dit, la logique repose sur des faits bien connus de tout le monde et hors de doute réel. Quels sont ces faits?

1°. On ne peut jamais nier qu'il y a des qualités sensibles, des couleurs, des tons, des pressions, les sensations de chaleur et de froid, des saveurs, le salé, l'amer, l'acide, le doux, une grande diversité d'odeurs, différentes sortes de douleurs. Il y a ansi des qualités comme le beau, l'amusant, le terrible, le pitoyable, etc.

2°. Chaque qualité, chaque présentation a son degré d'intensité. Aussi ~~elles~~ les qualités se présentent en assemblages, en faisceaux, qui se distinguent par leurs différents lieux à chaque instant. Un tel faisceau est ce que nous appelons un objet aperçu, ou un percept.

~~3°. L'expérience nous apprend que les objets aperçus quelques uns, généralement agréables s'écroulent tandis que d'autres souvent désagréables, persistent, et nous apprennent que nous exerçons~~

une volonté en y s'opposant. Les objets qui s'écroulent 164r
nous appelons des fantaisies, des fausses idées. Les objets
qui persistent sans jamais faillir nous appelons des
choses réelles, des vérités. Les fausses idées dépendent
de moi ou d'autre intelligence; les vérités s'imposent
pas seulement à moi ou à une société d'intelligences,
mais à qui que ce soit, ~~pourvu qu'il~~ qui ait assez d'ex-
périence et de réflexion.

3°. Les objets aperçus s'appliquent, s'unissent, s'augmentent
s'augmentent, se développent. Je apprends où est un
petit vallon. J'y vais tous les jours. Un objet se présente.
Un jour, j'y remarque un certain arbre. ~~C'est~~ Cet objet
arbre prends place dans objet vallon, il s'y applique
parfaitement. Mais il y a des objets souvent bien agréables
qui ne s'appliquent pas bien aux autres. Ils se trouvent
rejetés des l'objet augmenté et remplacés pas d'autres
souvent fort désagréables. Dans ce procédé nous nous
éprouvons de la contrariété, ce qui nous apprend que
nous réagirons contre un pouvoir qui n'est pas nous.
Un objet destiné à être rejeté nous appelons une fausse
idée; un objet destiné à rester toujours dans l'objet
augmenté, nous appelons une chose réelle ou une vérité.
Mais il est à remarquer que tandis que nous sommes ~~forcés~~

contraints par ~~la force majeure~~ expérience à admettre ~~que qui~~ qu'il y a des idées fausses, nous ne sommes pas du tout obligés à convenir qu'il y a des idées ~~ne me~~ qui ne se montreront jamais ~~inapplicat~~ incongruentes à l'objet augmenté. Cela est une idée très agréable ~~et que~~ à qui rien dans l'expérience s'oppose. Nous pouvons nous la permettre jusqu'à nouvel ordre. Mais comme idée agréable elle restera suspecte.

Qu'il y a un moi qui apperçoit et qui veut est une hypothese qui explique très commondément les phénomènes des fausses idées. Qu'elle soit exactement vrai n'est pas à espérer, mais la prenant comme approximatif sans définition précise, elle est si forte que personne ne peut résister à elle. L'évidence de l'existences des autres personnes que moi est à peu près de la même force. Un des signes qu'il y a un moi qu'on exaggère ordinairement est la confience immédiate. C'est un bonne raison, mais il est peu de chose en comparaison des autres phénomènes des fausses idées. Il est une erreur de croire que cette signe manque pour l'existence des autres. Je ne me connait immédiatement qu'en très mince partie. Quand je cause avec un autre personne j'éprouve aussi un sentiment directe de son moi, — ou si vous voulez du toi. Que ma connaissance de moi est plus grande que mai connaissance de lui est

vrai; mais toutes les deux sont de la même espèce.
Quant à l'evidence des fausses idées, elle est de la même force dans les deux cas. Certes, quoi qu'il en soit, l'évidence de l'existence des autres a assez de force pour être pour moi, ou pour toi, lecteur, ~~tout-à-fait~~ irréfutable; et la question de la raison de grandeur entre deux forces irréfutables, pourvu qu'elles ~~qui sont~~ soient parfaitement d'accord, comme celles-ci le sont, ~~c'est une question~~ ce n'est ~~pas~~ point une question, ce n'est qu'une ~~fictive.~~ costume de question avec rien dedans.

Nous trouvons que pour les fausses idées chacun a les siennes. Néanmoins il y en a qui restent longtemps très-répandues. Mais le characté-risque des vérités c'est qu'enfin elles sont partagées par tout le monde, excepté par ceux à qui l'expérience est en défaut. Naturellement il y beaucoup d'idées dont nous sommes ignorants si elles sont vraies ou fausses; et de celles-ci nous ne pouvons pas être surs qu'il ne deviendra pas fixées pour quelques personnes et rejetées par d'autres. Mais cela serait une hypothèse gratuite.

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1899 Apr 7

The Place of Logic among the Sciences.

There are different branches of science. What most separates them is that they are pursued by different men. These men have different powers, natural and acquired, both of observation and of thought. Each one pursues ~~a subject which~~ the studies best adapted to his peculiar powers. And thus the different branches of science come to be differentiated by the different faculties that ~~which~~ their pursuit exercises.

Men pursuing ~~a~~ similar inquiries converse together, and their ideas become more and more assimilated; while men whose lines of study lie apart do not fully understand one another, and seeing ~~less~~ of one another acquire widely different series of conceptions. Thus the lines of demarcation between the sciences ~~become~~ get etched deeper.

No classes of men are more separated from those who live in different periods of history. Each generation stands upon the shoulders of the last; and the advance in methods of observation is greater than in methods of thought.

New branches of science, new ideas generally, in their first vagueness, are apt to be started by young men or relatively active men; and for that reason ~~is~~ their first beginnings ~~are~~ stand or are believed to stand in close relation to human life. But as a science is prosecuted the more abstract and unhuman it becomes; although there may be from time to time applications of its abstract principles to more concrete needs.

Before they have much consciousness, animals are already possessed of certain virtual knowledge necessary to the continuance of the species. This knowledge

is of two kinds, knowledge of things (which is requisite to feeding) and knowledge of beings like themselves (which is requisite to reproduction.) 168r

All science is the development of those two instincts, and is therefore split into Physics and Psychics, or knowledge of things and knowledge of men. On the ~~whole~~, Psychics is the more abstract, – its objects are less tangible; ~~and~~ but it is on the whole a little earlier in its development. Physics borrows somewhat more ideas from psychics than psychics does from physics.

If we are to rely upon the affinities and sympathies between different men to lead us to a natural classification of the sciences, then we must acknowledge that the essence of science does not lie in its truth, but in its striving after truth, and in the breadth and generality of the truth striven for. Pure science is the striving ~~for~~ after broad truth for its own sake; but in its beginning science is not pure, but is applied science, or art.

History carries us back before the beginnings of pure science; but what the first steps in science may have been we can only conjecture. No better basis for conjecture can be had as to the remote development of the race than the history of the development of the individual. That makes me think that at the time when man began to speak his mind was in a wonderfully bright condition about language. There must have been some rudiment of logic here. Something like mathematical thought may have preceded it; and it was no doubt soon followed by a philosophy.

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But probably the first science to begin to be studied for its own sake was arithmetic. Mathematical geometry and 169r
astronomy must have been very early.

1899 Apr 10.

~~But also~~

In general history shows that the more abstract sciences
and those whose observations are the least occult
are the first to get put into the right road and to advance
and that they lend their principles to those which follow.

But classification needs to ~~must~~ be ~~thoroughly~~ rational.
History is only in small measure and in its most general
features. Since history can only set us on the right track
toward a classification of the sciences.

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1899 Aug 16

Geometry of the Circle

§1.

Every ~~ambiguous~~ A definition is ~~always~~ referred ~~refers~~ to a universe which with it. ~~cannot~~ need to be defined but since ~~which~~ we are well acquainted. An unambiguous A definition may not precisely ~~unambiguously~~ determine an object of that universe to which it is alone true. But it always precisely determines ~~unambiguously~~ something connected with the universe called a collection in that universe, and every object of the universe of which the definition is true is said to belong to that collection and to be a member of it.

§2.

If every member of one collection is a member of another, the latter is said to contain the former. One collection only is contained by every collection, ~~having~~ since it has no member; it is the collection nothing. One collection only contains every collection. It is identical with the universe. A collection which contains one member and no other is identical with that member.

If ~~of three~~ a collection, C, is so related to collections A_1, A_2, etc. that ~~every ob~~ whatever is a member of a collection A is a member of C but nothing that is not a member of any collection A is a member of C, C is said to be ~~the aggregate of the~~ collections A_1, A_2, etc.

If a collection, C, is so related to collections A_1, A_2, etc., that whatever ~~is~~ a member of all the collections A_1, A_2, etc. is a member of C, but nothing that is not a member of any of ~~the collections~~ A is a member of C, C is said to be the common part of

the collections A_1, A_2, etc.

N.B. A collection may be so represented that it may appear that an object can be twice in the same collection. But this is only a form of representation without ~~only~~ material significance.

§ 3.

A definition may be ambiguous and so no determine precisely any collection. It may, in that case, precisely determine a collection of collections, and may then be called ambiguous in the first degree. If our only ultimate ~~we have no~~ interest lies in the ultimate individuals, we shall not care whether the result of precision of a definition is owing to its generality or its ambiguity, and we shall not distinguish between a collection of collections and the aggregate of those collections. But we may care to distinguish between the collections of those sets of collections which have the same aggregate. A collection of a collection of ultimate objects may be called a collection of the collection of the second order.

There may be a collection of collections of any order. The higher the order the less the importance of the individuals.

§ 4.

The collections are artificial objects added to the universe.

Other special artificial objects may be added to the universe.

Let P and Q be two peculiar objects, and let a and b be two ordinary objects. Then the collection which has two members of which one is a collection whose members are a and P while the other is a collection whose members are b and Q may be called the ordered pair of a and b, a being the

0	.0		
1	.00		
10			
11	.01	$2^0 = 1$	1
100	.011	$2^1 = 2$	10, 11
101		$2^2 = 4$	100, 101, 110, 111
110	.1		
111			
1000		$2^4 = 16$	10000

$2^{16} = 10000\ 0000\ 0000\ 0000$

relate and b the correlate of this pair.

A collection of such ordered pairs may be called a dyadic relation. Triadic relations are similar.

§5.

A dyadic relation such that every ~~object~~ member of a ~~contains~~ collection, A, is the relate of one of its ordered pairs, while the ~~every~~ correlate of ~~any~~ each of its ordered pairs is a member of a collection, B, but is other than ~~every~~ the correlate of any other of its ordered pairs, is called a correspondence of A to B.

Here to follow Cantor's defns of greater and equal and my proof that one or other of two collections must be greater than the other or else that they are equal.

Then my defns of addition, multiplication, & involution of multitudes.

Then my proof that the exponential of a multitude is greater than the multitude itself.

§6.

[Provisional definition of a continuum.] A continuum is a system of relationship which suffices to distinguish all the members of any multitude whatsoever.

1899 Aug 17.

What I wrote yesterday, although the result of many years meditation, shows an immature stage of thought. In several places I am endeavoring to get along with fewer elements than is possible. I ought to begin by laying down my categories. My definition of a collection is well enough as far as it goes, but it does not bring out the important point that a collection consists of ultimate, and therefore irrational, units.

1899 Aug 17.

A continuum is a system of relations determined by a general rule, which by virtue of its ~~ge~~ perfect generality does not suppose any ultimate units (indeed such a unit would involve a breach of the continuity, because introducing something not general), that which yet not only permits the distinction of units but provides relations by which ~~each~~ any multitude of ultimate units ~~may~~ would be perfectly distinguished from one another.

Ah! I had better say a system of connections rather than a system of relations.

"Posited", that is, supposed in a hypothesis, or thrusting itself into the world of existence. Whatever "posited" is posited into some universe.

Let A, B, C, etc be ~~each~~ objects arbitrarily posited into the universe in question. If A, B, C etc. are in the same relation (?) with an object α, they are thereby connected. Or if any one but α is ~~equally~~ thereby true alike of A, of B, of C, etc. A, B, C are connected. If α is an object ~~recalls~~ serving to distinguish this verb from others (~~both having attached~~ associated with) phrases by which it is called a "whole" of which A, B, C are "parts", it is called a collection. If A, B, C, etc are the only objects in the universe belonging to the collection α, they are the members constituting that collection. This is to be understood that if A for example were taken away it would be a different collection, the collection supposed to be quite irrational existential,

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1899 August 17

In place of §6 on the last page but one put the following:

§6.

A general is an object which however far it may be determined by further general definition yet leaves room for distinctions sufficient to distinguish all the members of any multitude whatsoever.

Or better. A general is an object such that everything of which it can be essentially predicated leaves room for distinctions sufficient to discriminate between all the members of any multitude whatsoever.

Or better: A genus is an object such that every one of the species which are its substantive parts leaves room etc.

N.B. If a collection of individuals forms a part of a genus, its general character is in so far destroyed, and it is only imperfectly a genus. See Kant on the law of affinity.

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Better expressed

The Termatian inference is ~~this~~: any inference proceeding upon the principle of the following

Whatever is r to, but not r to any r to, X, is a P;

But whatever, being r to X, is r to, but not r to any r to, a P, is a P;

∴ Whatever is r to X is a P

To justify this inference, it seems to be necessary and sufficient that r should be such a relation that

~~If anything, A, is r to, but not r to an~~

If anything, A, is r to an r to, and is also r to, anything, B, then, taking any character, Q, whatsoever, there is something, A', resembling A in respect to the character, Q, ~~which is r to B, this~~ A' ~~which~~ is r to B and also being r to, but not r to any r to, something, B', which differs from A in respect to the character, Q'.

~~Just to show it is sufficient.~~ If the Termatian inference were false, while this condition was satisfied, then because of the first premise, there would be something both r to, and r to an r to, X which was not P. Identify this something with A and X with B. Let being not P be the character Q. Then the condition is that

Something that is not P that r to X and r to, but not r to any r to, something that is P, which is contrary to the second premiss. Thus if the conclusion is false a premiss must be false, and if the premisses are true the conclusion must be true. Second to show that it is necessary. Suppose the conclusion always follows from the premisses. Then if the conclusion is false while the first premiss is true, the second premiss must be false. ~~that is, if some r to X is not P while every r to, that is not r to any r to, anything X~~

Not quite necessary

1900 Nov 27

The Formalian inference may be extended to relations not transitive

For suppose the relation r to be of such a character that if anything A is r to anything B, then

either A is not r to any r to B,

or, given any character, Q, whatever, there is something, A', ~~which~~ resembling A in ~~that~~ respect to Q and being r to something, B', which differs from A in respect to Q, while A' is not r to any r to B', but is r to B.

Then the following reasoning is valid:

Whatever is r to X without being r to any r to X is a P;

But whatever is r to X and at the same time is r to a P without being r to any r to that P, is a P;

∴ Whatever is r to X is a P.

For taking X as the B of the definition ~~and as r to X that is not an r to any r to X as A, the first alternative consequent is excluded~~ and as A some r to an X which is not P, if there be any. Then, by the first premiss, A is an r to an r to X, which excludes the first alternative consequent of the definition. Take the being P as the character Q. Then what resembles A in this respect is not-P and what differs from A in this respect is P. Consequently the second premiss declares that whatever is r to B, and is r to any B' that differs from A in respect to Q, while itself agreeing with A in respect to Q is not r to an r to that B'. This conflicts with the definition. Hence there is not such A as we have supposed. That is, there is not r to an X which is not P.

Q.E.D.

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If there be an individual, B, and a character Q,
such that something is r to B and has the character Q
though nothing r to ~~but~~ that has that character without being rr to B ~~has~~ that character
then there is something ~~that~~ is r to B and has not that character
to which something

If there be a character Q and an individual B
such that something of that character is r to B
though nothing of that character is r to B without being rr to B
then ~~there~~ is something not of that character is r to B
while something ~~not~~ of that character is r but not rr of it

If there be a character Q and an individual B such that
something r to B has that character
though everything r to B without being rr to B wants it
then something r to B wants that character
though something r to it but not rr to it has it

To justify the Termination inference

Whatever is r to, but not r to any r to, an X, is a P

~~But whatever, is r to, but not r to any r to, an X that is P~~

~~But whatever, being r to X~~

Fx But whatever is r to, but not r to any r to, a P that is r to X, is a P;

∴ Whatever is r to X is a P

the necessary and sufficient condition is that the relation expressed by r is of such a character that

Taking anything A which is, at once, r to, and r to something r to, anything, B;

if Q is any character, in respect to which A differs from everything which is r to, ~~but not~~ without being r to any r to, B;

then there is something A′ ~~resembling~~ which resembles A in respect to the character Q but which is r to, without being r to any r to, something, B′, which differs from A in this respect, although it is r to B.

Otherwise stated,

~~If Q is any~~ Every character, Q, in respect to which ~~anything~~ an individual, A, which is r to an individual, B, differs from everything which is r to, without being r to anything r to, B, is one in which something that is r to B, and ~~resembles A~~ differs from A, in respect to Q, differs also from something which is r to, but is not r to anything r to, it.

~~If an index~~ Anything A that r to ~~something~~ anything B but differs in any respect, ~~Q~~ from everything ~~that~~ is r to but not rr to, B, ~~then there is something~~ it differs in the same respect from something ~~that is~~ r to B, to which something resembling A in that respect is r but not rr.

~~there is a respect in which~~ ~~they~~

~~If everything which is r but not rr to any individual B~~

If there is a respect in which all things that are r but not rr to one and the same individual, B, differ from an individual A that is r to B, they differ in the same respect from something ~~that~~ is ~~to B~~ r but not rr to something agreeing with them in that respect and also in being r to B

any one given

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A ⊂ (B ⊂ C)

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1900 Dec 11 [Follows 176] 178r

A New Logical Algebra

1. $A \Rightarrow B$ means A may be transformed into B
2. $A \cdot B$ means both A and B are true

Subjacent indices are individual subjects known to be in the universe
The universe itself is such a subject.

3. A_i means A is true of i
4. $\boxed{}$ is a blank assertion
No more signs are needed to begin with except parentheses etc.
5. l_{ij} means ~~identic~~ i is identical with j.

~~Rules of transformation.~~

But $A \Rightarrow B \cdot C$ means $A \Rightarrow (B \cdot C)$

$A \Rightarrow B \Rightarrow C$ means $A \Rightarrow (B \Rightarrow C)$

$A \cdot B \cdot C$ means $A \cdot (B \cdot C)$

Rules of Transformation

I. $A \cdot B \Rightarrow B \cdot A$

II. $(A \cdot B) \cdot C \Rightarrow A \cdot (B \cdot C)$

III. $A \cdot (B \cdot C) \Rightarrow (A \cdot B) \cdot C$

IV. Also $A \Rightarrow A \cdot A$

V. $A \cdot B \Rightarrow A$

VI. If A and B then $(A \cdot B)$

If $A \Rightarrow B$ $\quad B \Rightarrow A \cdot B$

$A \cdot C \Rightarrow B \cdot C$

VII. $l_{ij} \Rightarrow l_{ji} \cdot l_{ij}$

VIII. $l_{ij} \cdot l_{ik} \Rightarrow l_{ij} \cdot l_{ik} \cdot l_{jk}$

IX. $l_{ij} \cdot A_i \Rightarrow l_{ij}$

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1900 Dec 11

179r

Logical Algebra

first take the following signs

~~1. A ⇐ B means A is transformable into B~~

~~2. A·B means both A and B are true~~

1. A means A is true

4. A.B means A and B are true. And A·B·C means A·(B·C)

~~3. A·B·C~~

3. A ⇐ B means A is transformable into B And A ⇐ B ⇐ C means A ⇐ (B ⇐ C)

6. A_i means that i, an individual known to be in the universe, A is true.

2. Parentheses, brackets, and braces are used to show that which they enclose is to be treated as a single letter.

5. ⓪ is a blank proposition always true

7. I_{ij} means i is identical with j.

Rules of Transformation.

I. X ⇐ X

II. If X ⇐ Y and Y ⇐ Z, then X ⇐ Z

III. If

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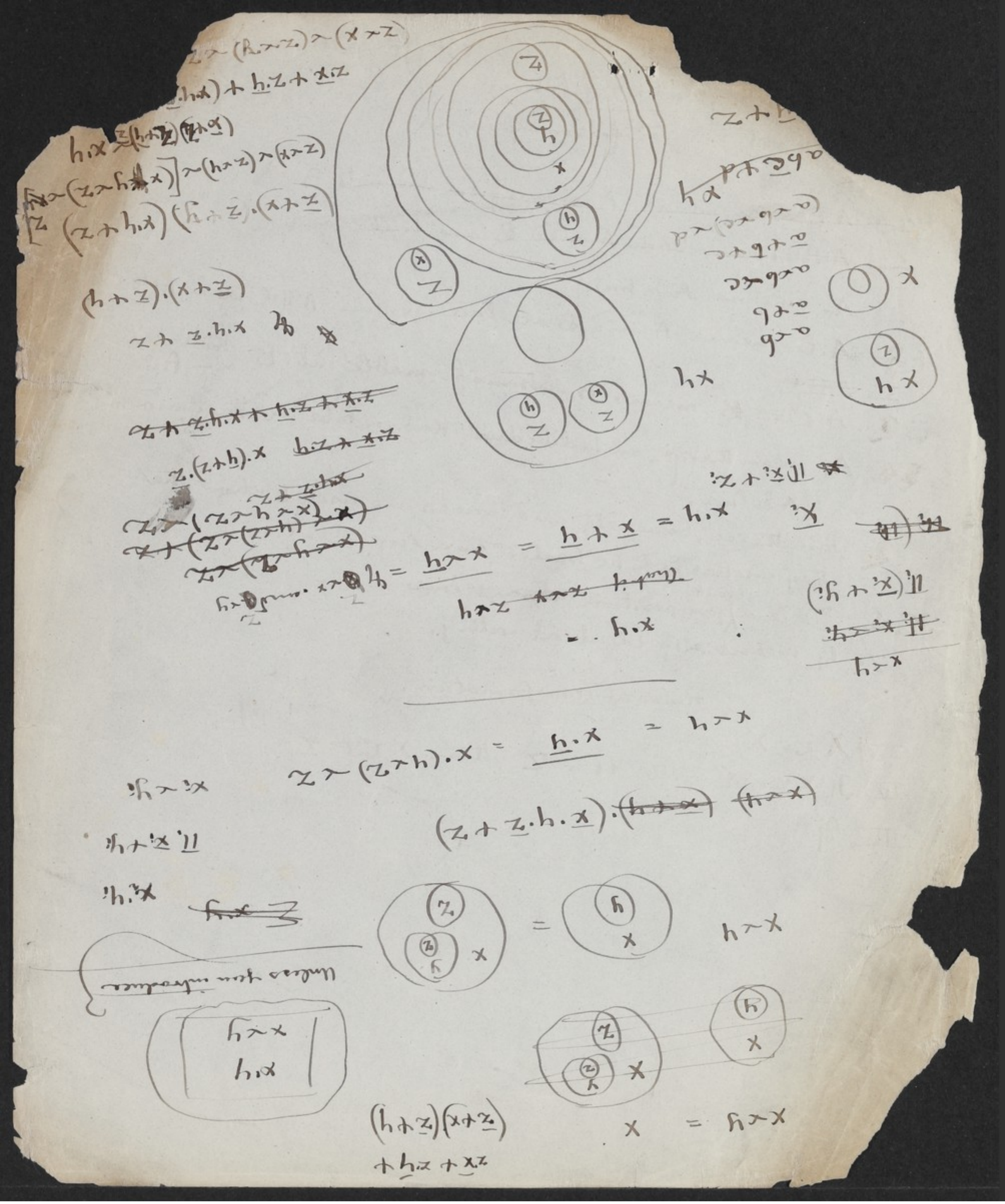

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1900 Dec 11 180r

A New Logical Algebra

We begin with the following signs (others further on)

1. Written A means A is ~~true~~ to be accepted.
2. What is written in parentheses, brackets, or braces is to be treated as one
3. $A \prec B$ means A is transfermable into B. And $A \prec B \prec C$ means $A \prec (B$
4. $A \cdot B$ means that A and B are both to be accepted. And $A \cdot B \cdot C$ means $A \cdot (B$
5. ~~O is a~~ Ω is a proposition ~~always~~ that is to be accepted
6. A_i means that A is to be accepted as to i, a universal known to be the universe.
7. 1_{ij} means that i is transformable into j and j into i.

( )?

Rules of Transformation.

I. ~~transfer of subscripts~~ A letter written alone may be erased.

II. Whatever transformation can be performed upon a letter written alone can be ~~then~~ performed upon any combination of letters in parentheses.

III. A is transfermable into (A) or [A] or {A}

IV. (A), [A] and {A} are transformable into A.

V. If A written alone is transformable into B, we can write alone $A \prec B$

VI. If $A \prec B$ is scriptible alone A written alone can be transformed into B

~~VII. A ≺ A is scriptible alone~~

VII. If A is scriptible alone and B is scriptible alone, A·B is scriptible al

~~B ≺ A·B~~

VIII If A·B is scriptible alone A is scriptible alone and B is s

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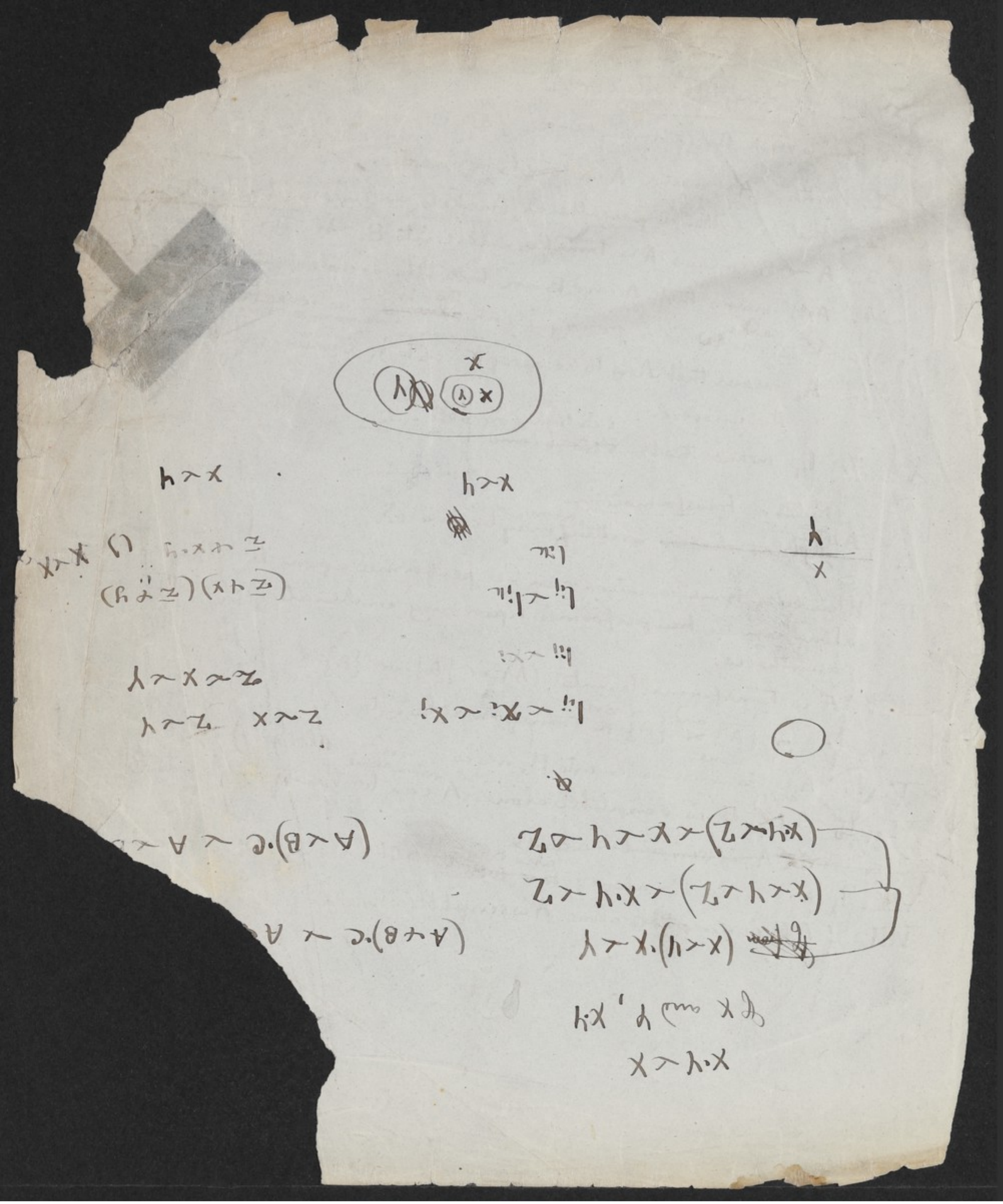

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1900 Dec 11.

1811

A New Logical Algebra

1. A letter written alone on the line means that what it means is to be accepted as true.
2. A combination of letters and signs in parentheses, brackets, or braces, is along with the letter to be treated as a single letter.
3. $A \prec B$ means that A written alone is transformable into B

   And $A \prec B \prec C$ means $A \prec (B \prec C)$.
4. $A \cdot B$ means that A and B are each scriptible alone.

   And $A \cdot B \cdot C$ means $A \cdot (B \cdot C)$ And $A \prec B \cdot C$ means $A \prec (B \cdot C)$ And $A \cdot B \prec C$ means $(A \cdot B) \prec C$.
5. ( ) is ~~always~~ scriptible alone, ~~so that~~
6. a_i means that i is a known individual of the universe and that a is to be accepted in reference to i
7. 1_{ij} means that i and j are everywhere transformable into one another

Rules of Transformation.

I. A letter written alone may be erased or transformed into ( ).

~~II. Every transformation that can be performed upon a letter written alone can be performed upon a pair of parentheses, brackets, or braces with all they enclose.~~

III. Any letter or combination of letters and signs, if it be written alone, may be enclosed in parentheses, brackets, or braces

III ~~IV.~~ Any pair of parentheses, brackets, or braces enclosing everything else that is written may be erased.

IV. ~~If X written~~ If any letter, X, written alone would be transformable into another, Y, then $X \prec Y$ is scriptible ~~alone~~ alone.

V. If $X \prec Y$ is scriptible alone, then whatever letters X and Y may be, X if written alone would be transformable into Y.

VI. ~~$X \prec Y \prec X \cdot Y$~~ is scriptible alone, whatever letters X and Y may be.

VII. Whatever letters X, Y, Z, may be, $(X \prec Y) \prec X \cdot Z \prec Y \cdot Z$

~~VIII Whatever letter X may be $X \prec ()$~~

VIII If X is scriptible alone $() \prec X$, whatever letter X may be

IX. $() \prec 1_{ii}$

X $1_{ij} \prec 1_{ji}$

~~X1 $1_{ij} \prec 1_{jk} \prec 1_{ki}$~~ X1 $1_{ij} \prec X_i \prec X_j$

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1900 Dec 11 [Follows 181] ~~177r~~ 181 A

A New System of Graphs

Writing propositions together means that each is verifiable alone

~~X means that from X is true Y is true~~

means that X is transformable into Y

I. Any unenclosed part of a graph may be erased

or X4 (Y)

II.

III.

IV

$(b \prec c) \prec a \quad c \cdot d$

$a \prec b \cdot c \quad c \prec d$ Celarent

$a \prec b \cdot c \quad d \prec a$

$a \prec b \cdot c \quad d \prec a$

$(a \prec b)(b \prec c)$ Barbara

$(a \prec b \prec c)(c \prec d)$ Celarent

$a \cdot (b \prec c) \quad (c \prec d)$

$a \prec b \cdot c \quad c \prec d$

$(a \prec b \prec c)(c \prec d) \prec (a \prec b \prec d)$

$(a \prec b \prec c)(c \prec d) \cdot e \quad \prec (a \prec b \prec d) \cdot e$

$a \prec b \cdot c = (a \prec b) \cdot (a \prec c)$

$(a + b + c)(\bar{c} + d) \quad a + b + d$

$(a + b + c)\bar{c} \cdot d \quad (a + b) \cdot d$

$(a + b) \cdot c \, (\bar{c} + d) \quad (a + b) \cdot d$

$(a + b) \cdot c \cdot \bar{c} \cdot d \quad a \cdot d$

$a \cdot (b + c)(\bar{c} + d) \quad a \cdot (b + d)$

$a \cdot (b + c) \cdot \bar{c} \cdot d \quad a \cdot b \cdot d$

$(a + b \cdot c)(\bar{c} + d) \quad a + b \cdot d$

$(a + b c)\bar{c} \cdot d \quad a \cdot d$

$(a \cdot b + c)(\bar{c} + d) \quad a \cdot b + d$

$(a \cdot b + c)\bar{c} \cdot d \quad a \cdot b \cdot d$

$(b \prec c) \prec a \quad c \cdot d$

$a \cdot b \cdot c \, (\bar{c} + d) \quad a \cdot b \cdot d$

$(a \prec b) \prec c$

$(ab + c)(\bar{d} + b) \prec \bar{d}a + c$

$(a \cdot b + c)(\bar{a} + d)$

$(\bar{a}b + c)\,d$

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$a_i : b_i$ means some a is b

$a_i \prec b_i$ means every a is b

$a_i : x_i$ means something is a

$x_i \prec b_i$ means everything is a

~~$a_i \prec$~~

$a_i \prec x_i$ ~~Every~~ Nothing is a

$a_i \prec b_i \prec x_i$ No a is b

$= a_i \cdot b_i \prec x_i$

$a_i : (b_i \prec x_i)$ Some a is not b

$= (a_i \prec b_i) \prec x_i$

$a \prec b \prec c$ Whatever ~~is~~ a If a then if b, c

$= a \cdot b \prec c$ If both a and b then c

$a \cdot (b \prec c)$ $a \cdot (b \prec c)$

$(a \prec b) \prec c$ $a \cdot b \prec c$.

$\cancel{(p^q)^r = p^{qr}}$ $\cancel{a_i}$ $a_i (b_i x_i)$

$= a_i \cdot b_i x_i$

$a_i \cdot (b_i x_i)$

$= (a_i b_i) x_i$

$m \prec p$ $m \prec p \prec q$

$s \prec m$ $s : m$

$s \prec p$ $s : (p \prec q)$ $s : p$

$s \prec p \prec q$ Celarent Barbara Mario Darii

(Felino Cesare Camestres (Baroko

$m \prec p \prec q$

$\bar{s} + m$

$(\bar{m} + p)(\bar{s}\bar{p} + q)$

$m \prec p$

$s : p(\bar{m} + \bar{p} \prec q$ ~~$m \prec s \prec q$~~

$s(\bar{m} + q)$ ~~$\bar{m} + p(\bar{p}s$~~ $\bar{m} + q$

$s : \bar{m} + q$

$(s \prec m) \prec q$

$(\bar{m} + p) s : (\bar{p} + q)$

$s : (p \prec q)$ $(s \prec p) \prec q$ Baroko

$(s \prec m) \prec q$

$\cancel{(s \prec m) \prec q}$

$s : (m \prec q)$

$s : p$ Felino

$a + b + c$ $a \prec b \prec c$

$(a + b) \cdot c$ $(a \prec b) \cdot c$

$a + b \cdot c$ $(a \prec b) \prec c$ $a \prec b \cdot c$

$a \cdot b \cdot c$ $a \cdot b \cdot c$

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4
4

$\bar{a}+\bar{b}\prec c$ $\qquad a\prec b\prec c = a\cdot b\prec c$

$(\bar{a}+b)\cdot c$ $\qquad (a\prec b)\,c$ $\qquad$ ~~$a\cdot b\prec c$~~ ~~$a\cdot b\prec c$~~ $\bar{a}$

$\bar{a}+b\cdot c$ $\qquad \{\ a\prec b\cdot c$

$\bar{a}\bar{b}+c$ $\qquad (b\prec a)\prec c$ ~~$a\cdot b\prec c = \bar{a}+\bar{b}\prec c$~~

abc

$\bar{a}b$

bc

$abc \prec (\bar{a}+b)\cdot c \prec \bar{a}+bc$ $\qquad \bar{a}+b \prec \bar{a}+\bar{b}+c$

$\prec c\cdot\bar{a}+b$

$\bar{A}+C+\bar{B}+C$

$\overline{A\cdot B}+C$

$(\bar{A}+C)(A$

$A\bar{C}$ $\quad B\bar{C}$

$A\cdot B\cdot\bar{C}$

Moods of two term prop. are

$(a\prec b)\cdot(b\prec c) \prec (a\prec c)$ Barbara

$(a\prec b)\cdot b\cdot c \prec b\cdot c$ Darii

Moods of three term prop.

I	$a\prec b\prec c$	$d\prec a$	$\prec d\prec b\prec c$
iii	$a\prec b\prec c$	$d\cdot a$	$\prec d\cdot(b\prec c)$
I	$a\prec b\prec c$	$c\prec d$	$a\prec b\prec d$
	~~$a\prec b\prec$~~		$d\cdot(b\prec c)$
iii	$a\cdot(b\prec c)$	$a\prec d$	$a\cdot(d\prec c)$
I	$a\cdot(b\prec c)$	$d\prec b$	$a\cdot(b\prec d)$
I	$a\cdot(b\prec c)$	$c\prec d$	$a\cdot b\cdot c$
ii	$a\cdot(b\prec c)$	bd	$d\prec b\cdot c$
I	$a\prec b\cdot c$	$d\prec a$	$a\prec b\cdot d$
I	$a\prec b\cdot c$	$c\prec d$	$d\cdot b\cdot c$
iii	$a\prec b\cdot c$	da	$b\cdot c\cdot d$
iii	$a\cdot b\cdot c$	$a\prec d$	
	$(a\prec b)\prec c$	$c\prec d$	$(a\prec b)\prec d$
	$(a\prec b)\prec c$	$d\prec b$	$(a\prec d)\prec c$
	$(a\prec b)\prec c$	$a\prec b$	$(d\prec b)\prec c$
	$(a\prec b)\prec c$	$b\cdot d$	~~$(a\prec c)\prec d$~~ $c\cdot d$

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1901 Jan 12

The following was communicated some time ago to Mrs Franklin & neglected to retain a mem of it & don't know as I can now reproduce it correctly

Let $\eta_i : l_i$ mean that the individual i exists, or is meant, or is chosen, and it is l.

$\overline{\eta}_i + l_i$ either the individual i does not belong to the universe or it is l.

This was the way I had it. Suppose however

$\mathfrak{k}_i$ means i is suitably chosen (whatever it is)

$\overline{\mathfrak{k}}_i + m_i$ Some thing is m

$\mathfrak{k}_i : m_i$ Everything is m

$\overline{\mathfrak{k}}_i + w_i : \mathfrak{k}_j : (a_{ji} + \overline{c}_j)$ Some woman is adored by every catholic

$\mathfrak{k}_j : (\overline{\mathfrak{k}}_{ji} + \overline{c}_j + a_{ji} : w_i)$

$\mathfrak{k}_{ji}$ means i is chosen suitably after j is chosen, if j is suitably chosen

$\mathfrak{k}_i : \mathfrak{k}_{ij} : \mathfrak{k}_{jk} \prec \mathfrak{k}_i : \mathfrak{k}_{ik} : \mathfrak{k}_{ki}$ $\qquad$ $\mathfrak{k}_{ij} : \mathfrak{k}_{jk} = \mathfrak{k}_{ik} : \mathfrak{k}_{kj}$

$\mathfrak{k}_i : \mathfrak{k}_{ij} \prec \mathfrak{k}_i$ $\qquad$ $\mathfrak{k}_{ij} : \mathfrak{k}_{ik} \prec \mathfrak{k}_{ik}$

$\overline{\mathfrak{k}}_i \prec \mathfrak{k}_j$ $\qquad$ $\mathfrak{k}_{ij} : \overline{\mathfrak{k}}_{ik} \prec \overline{\mathfrak{k}}_{jk}$

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1901 Jan 13

The last plan seems by far the more easily intelligible.

The reason for abandoning the old Π and Σ is that these are not signs of ~~multiplication~~ productions & summations but are mere analogues of such signs, since the productions & summations they pretend to represent cannot be performed.

Now the distinction is very important in the logic of mathematics.

They are therefore signs of a radically different nature from any others employed. I prefer to replace them by signs of the same nature, more general terms.

$\mathfrak{R}_{ij}$ means that j (whatever it is) is suitably chosen, supposing that i has been suitably chosen

By "suitably" means favorably to the truth of the proposition.

$\mathfrak{R}_i$ means that i (whatever it is) is suitably chosen, ~~supposing the proposition~~ for the truth of the proposition that follows is represented by the Boolean.

~~$\overline{\mathfrak{R}}_i$ means that i is not suitably chosen.~~

$\mathfrak{R}_i$ means that the value i (whatever it is) does not render the Boolean false

$\mathfrak{R}_{ij}$ means that ~~if~~ if a particular i ~~having~~ has already been chosen, it (whatever it is) does not render the Boolean false.

$\overline{\mathfrak{R}}_i$ means that the choice of i does render the Boolean false

$\overline{\mathfrak{R}}_{ij}$ means that ~~the choice~~ after choice has been made of an i, the choice of j renders the Boolean false.

$\overline{\mathfrak{R}}_i \prec \mathfrak{R}_i$ for if the Boolean has already been rendered false by the choice of i, then the subsequent choice of j cannot render that false which is false already

$\mathfrak{R}_{ij} \cdot \mathfrak{R}_{jk} \prec \mathfrak{R}_{ik}$ By the principle of transitiveness.

$\therefore \mathfrak{R}_{ij} \cdot \overline{\mathfrak{R}}_{ik} \prec \overline{\mathfrak{R}}_{jk}$ and $\overline{\mathfrak{R}}_{ik} \cdot \mathfrak{R}_{jk} \prec \overline{\mathfrak{R}}_{ij}$

Also $\overline{\mathfrak{R}}_{ik} \prec \overline{\mathfrak{R}}_{ij} + \overline{\mathfrak{R}}_{jk}$ and $\mathfrak{R}_{jk} \prec \overline{\mathfrak{R}}_{ij} + \mathfrak{R}_{ik}$ and $\mathfrak{R}_{ij} \prec \mathfrak{R}_{ik} + \overline{\mathfrak{R}}_{jk}$

It is certain that $\Pi_i \Pi_j \Pi_k$ can be changed to $\Pi_i \Pi_j$. It would then

from seem that $\mathfrak{R}_{ij} \cdot \mathfrak{R}_{jk} \prec \mathfrak{R}_{ik} \cdot \mathfrak{R}_{kj}$

I suspect this indicates some confusion.

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Why should $\mathfrak{R}_{ij}$ not be the same as $\overline{\mathfrak{R}_i} + \mathfrak{R}_j$?

If so $\mathfrak{R}_{ij} \cdot \mathfrak{R}_{jk} = (\overline{\mathfrak{R}_i} + \mathfrak{R}_j) \cdot (\overline{\mathfrak{R}_j} + \mathfrak{R}_k)$

But since $\overline{\mathfrak{R}_i} \prec \mathfrak{R}_j$ we should have $\overline{\mathfrak{R}_i} + \mathfrak{R}_j = \mathfrak{R}_j$

Will that do or not?

$\overline{\mathfrak{R}_i} + \mathfrak{R}_j \cdot l_{ij}$ Something loves everything

$\mathfrak{R}_j \cdot (\overline{\mathfrak{R}_i} + l_{ij})$ Everything is loved by something

This results thus $(\overline{\mathfrak{R}_i} + \mathfrak{R}_j) \cdot (\overline{\mathfrak{R}_i} + l_{ij}) = \mathfrak{R}_j \cdot (\overline{\mathfrak{R}_i} + l_{ij})$

$\mathfrak{R}_i \cdot \mathfrak{R}_j \cdot l_{ij}$ Everything loves everything

$\overline{\mathfrak{R}_i} + \overline{\mathfrak{R}_j} + l_{ij}$ Something loves something

Since $(\overline{\mathfrak{R}_i} + \mathfrak{R}_j \cdot l_{ij}) = (\overline{\mathfrak{R}_i} + \mathfrak{R}_j) \cdot (\overline{\mathfrak{R}_i} + l_{ij})$

It follows that $(\overline{\mathfrak{R}_i} + \mathfrak{R}_j)$ is not equal to $\mathfrak{R}_j$

but that $\overline{\mathfrak{R}_i} + \mathfrak{R}_j \prec \mathfrak{R}_j$

which is absurd.

Hence $\mathfrak{R}_{ij}$ is not the same as $\overline{\mathfrak{R}_i} + \mathfrak{R}_j$

We have, then,

$\overline{\mathfrak{R}_i} + \mathfrak{R}_{ij} \cdot l_{ij}$ as the expression of Something loves everything

$\overline{\mathfrak{R}_i} + \mathfrak{R}_{ij} \cdot l_{ij} = (\overline{\mathfrak{R}_i} + \mathfrak{R}_{ij}) \cdot (\overline{\mathfrak{R}_i} + l_{ij})$

That we say $\overline{\mathfrak{R}_i} + \mathfrak{R}_{ij} \prec \mathfrak{R}_j$ $\quad \overline{\mathfrak{R}_i} \prec \overline{\mathfrak{R}_{ji}}$

$\therefore \mathfrak{R}_{ij} \prec \mathfrak{R}_j$

$\therefore \overline{\mathfrak{R}_i} \prec \mathfrak{R}_j$

$\mathfrak{R}_{ij}$ means ~~the~~ any particular choice of i does not necessarily falsify the proposition even when i has been chosen

$\mathfrak{R}_i \cdot \mathfrak{R}_{ij} \prec \mathfrak{R}_j \cdot \mathfrak{R}_{ji}$ that is $\mathfrak{R}_i \cdot \mathfrak{R}_{ij} \prec \mathfrak{R}_{ji}$

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$$\overline{\mathfrak{R}}_i + \mathfrak{R}_{ij}\cdot b_{ij} = \overline{b}_{ij}\cdot\overline{m}_i + (\overline{m}_i + m_i)\cdot b_{ij} = \overline{m}_i + m_i\cdot b_{ij}$$

$$= (\overline{m}_i + m_i)\cdot(\overline{m}_i + b_{ij})$$

$$\mathfrak{R}_j\cdot(\overline{\mathfrak{R}}_{ji} + b_{ij}) = (\overline{b}_{ij} + m_j)\cdot(\cancel{\overline{m}_i + m_i}\ (m_j\cdot\overline{m}_i + b_{ij})$$

$$= (\overline{b}_{ij} + m_i)\cdot(m_i + b_{ij})\cdot(\overline{m}_i + b_{ij}) = m_j\cdot(\overline{m}_i + b_{ij})$$

This will not do.

$\mathfrak{R}_i\cdot b_i$ Everything is b

$\overline{\mathfrak{R}}_i + b_i$ Something is b

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$\mathfrak{R}_i$ the particular choice of i actually made ~~allows~~ does not falsify the proposition to be true (other indices being suitably chosen)

$\overline{\mathfrak{R}}_i$ the particular choice of i actually made falsifies the proposition (no matter how other indices are chosen) which with a different choice would be true

$\mathfrak{R}_{ij}$ the particular choice of j actually made

$\mathfrak{R}_i$ either no choice of i ~~—~~ will allow the proposition to be true or the particular choice made will do so.

$\overline{\mathfrak{R}}_i$ some choice of i will allow the proposition to be true but not this choice.

$\mathfrak{R}_{ij}$ ~~will~~ either the choice of i actually made does not allow the proposition to be true, or the choice of i allows it to be true.

$\overline{\mathfrak{R}}_{ij}$ the choice of i actually made allows the proposition to be true but the actual choice of i prevents it.

m_i the choice of i actually made allows the proposition to be true

$$\mathfrak{R}_{ij} = \overline{m}_i + m_j$$

$$\mathfrak{R}_i = F + m_i$$

$$\mathfrak{R}_i\cdot\mathfrak{R}_{ij} = (F + m_i)\cdot(\overline{m}_i + m_j) = (F\cdot\overline{m}_i + m_i)\cdot(\overline{m}_i + m_j) = F\cdot\overline{m}_i + m_i m_j$$

We thus see that $\mathfrak{R}_i\cdot\mathfrak{R}_{ij}$ is not equal to $\mathfrak{R}_j\cdot\mathfrak{R}_{ji}$; but ~~the~~

$$\mathfrak{R}_i\cdot\mathfrak{R}_{ij}\cdot V_{ij} = \mathfrak{R}_j\cdot\mathfrak{R}_{ji}\cdot V_{ij}$$

~~Now~~ $\overline{\mathfrak{R}}_i + \overline{\mathfrak{R}}_j + V_{ij} = U\cdot\overline{m}_i + m_i\cdot\overline{m}_j + V_{ij}$

$$= (U + m_i)\cdot(\overline{m}_i + \overline{m}_j)\cdot V_{ij} + V_{ij}$$

$$\mathfrak{R}_i\cdot b_i = (\overline{b}_i + m_i)\cdot b_i = m_i\cdot b_i$$

$$\overline{\mathfrak{R}}_i + b_i = \overline{b}_i\cdot\overline{m}_i + b_i = \overline{m}_i + b_i$$

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13. Albert further says
Argumentatio logici instrumentum est. Logica autem generalis et docens de hoc est ut de subjecto. Per quod utens logicus in scientiam venit ignoti per ignotum. Argumentatio igitur logici docentis logicae proprium subjectum est. Et haec est trium philosophorum sententia Avicenna scilicet Alpharabius et Algazelis.

14. Avicenna says
Subjectum logicae sunt intentiones intellectae secundo, quae apponuntur intentionibus primo intellectis, secundum quod per eas perveniatur de cognito ad incognitum in quantum ipsae sunt intellectae et habent esse intelligibile quod esse nullo modo pendet ex materia vel pendet ex materia sed non corporea.
Prantl II p. 328 note 74 also Nova Pant. V. capitl p. 243

15 Algazelis says
Scientia logicae dat regulam quae discernitur an definitio et syllogismus sunt vitiosa annon ad hoc ut discernatur scientia vera a non vera.
Raymundus Lully says "Logica quae est de secundis intentionibus junctis tertiis" and Scotus in several places. So Walter Burleigh. Ed. mandus de Bologna

16 Levi-ben-Gerson says
Haec ars dirigit intellectum ut dijudicet inter verum et falsum.
Prantl II. p 399 Note 410.
Scotus Merling

17 Wm. Shyreswood says
Logica docet vere loqui Prantl III p 12, note 32
Lambert of Auxerre says
Logica circa sermonem considerat verum et falsum ut verum eligat et falsum fugiat Prantl III p 85 note 99

18 Petrus Hispanus says
Dyalectica est ars artium et scientia scientiarum ad omnia methodorum principia viam habens. Sola enim dyalectica probabiliter disputat de principiis omnium aliarum scientiarum

19 Vincentius Bellovacensis says
Logica scientia ordinandi propositiones enuntiativas secundum figuras logicas ad eliciendas conclusiones quibus perveniatur ad cognitionem dictorum et ad judicandum de illis utrum vera sint an falsa.

20 Grosteleste says
Officium logicae est quod formatum est in intellectu secundum triplicitatem rationem sui quale sit judicare et discutere
Prantl III p 86 note 343

21 Aquinas calls logic "rationalis scientia" as it is. So Laurentius Valla

22 Roger Bacon calls Logic "scientia arguendi" Opus Maj Ed Brewer II p 81

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(1) Logic may be defined as the science of the general conditions of truth and falsity. It is often called by its stoic name dialectic.

Other definitions.

× 2 οἱ μὲν ἀπὸ τῆς Στοᾶς ὁριζόμενοι τὴν διαλεκτικὴν ἐπιστήμην τοῦ εὖ λέγειν ὁρίζονται, τὸ δὲ εὖ λέγειν ἐν τῇ ἀληθῆ καὶ προσήκοντα λέγειν εἶναι τιθέμενοι.
Alexander Aph.
(See the whole passage in Berlin Aristotle IV. 251 a 22)

× 3 ἡ διαλεκτική ἐστιν, ὡς φησι Ποσειδώνιος, ἐπιστήμη ἀληθῶν καὶ ψευδῶν καὶ οὐδετέρων.
Diog. Laert. VII 42

4 It was early conceived as the investigation of riddles. See Athenaeus X.

5 λογική quam rationem disserendi voco Cicero De Fato 1.1
Porp. Isagogus says "dialectica disserendi ratio"

6 in altera ~~parte~~ philosophiae parte quae est quaerendi ac disserendi quae λογική dicitur Cicero. Fin. 4. 7. 22

7 Sextus amphibies a little, defining logica as philosophiae species rationalis definiendi quaerendi et disserendi potens while dialectica is disciplina ad discernendas rerum causas inventa. Etym II. xxii. 1.

× 8 Abelard regards it as the science of truth & falsity. "Haec est dialectica, cui quidem omnis veritatis seu falsitatis discretio ita subjecta est, ut omnis philosophiae principalem, dux universae doctrinae, atque regimen possideat. Dialectica p. 435

9 Philoponus treats logic as the ethics of ~~thought~~ the understanding. But it is a mere ~~line~~ at such a suggestion Brandis Scholia 36 a 43

× 10 Alpharabi says "logica intendit dare regulas quibus orationis veritatem deprehendimus vel intus vel apud alios vel alii apud nos. Prantl II page 309 n 13

11 Albertus cites Arist. and Averroes ~~that~~ as holding "omnis scientiae modum esse ipsam scientiam quae est et vocatur logica"

12 Albert says Logica docet quaeritur ignotum fiat notum

23 Raymund Lully gives various definitions

× Logica est ars qua logicus inuenit naturalem coniunctionem inter subiectum et praedicatum Art Brevis Part I. cap XXIII Forma 87 p. 28

So Ars Magna Pars X. cap ci.

Logica est ars qua rerum et falsum ratiocinando cognoscuntur et argumentative discernuntur Logica Brevis et Nova addit p 14)

In his Rhetorica p 198 he makes dialectica species rationalis philosophiae. Quae demonstrat

See also under No 14 above

24 ~~Subiectum~~ Scotus says

Subiectum primum et proprium logicae est syllogismus

So Thomas Hibernicus and Aegidius Romanus

Super Univ Porph qiii Dicendum

25 Petrus de Hibernia says logica est de modo scendi tanquam de subiecto

Prantl III p 239 note 240

(But this he retracted Ibid. note 244)

26 Hercules Natalis says

Dicendum, quod videtur quidam, quod logica non sit de actu intelligendi de obiecto sed de entibus rationis consequentibus res ut sunt obiective in intellectu quae non fiunt a nobis per habitum logicae sed fiunt in nobis ab ipsis rebus sic ex natura sua ordinate moventibus intellectum nostrum. Prantl III 365 note 395

27 Durandus a Sancto Porciano makes logic relate to entia rationis.

So also Gratiadeus Esculanus

28 Petrus Aureolus holds that logic treats of "vox conceptum expressiva".

Prantl III p 320 Note 697

29 Ockham perhaps does not say so but he makes logic the science of terms

30 Albert of Saxony says logic "solum est de signis"

31 Pataretus defines logic as "habitus inclinans ad speculationem modi scendi et omnium complexorum inclusorum in eo. Lipos in Summulas.

32 Lambertus de Monte says "Logica est scientia docens de sermone × vero vel falso" "Est principaliter de primis intentionibus"

33 Georgius Bruxellensis says "Logica artificialis totalis est scientia artificialiter docens diffinire, dividere, arguere et per rationes verum a falso discernere" Scaftenstaig Prantl IV 265 note 549

34 Joannes Tabor de Bordia says totius logicae subiectum primum, primitatis principalitatis est argumentatio" So the Hagenau Moderni "Subiectum attributionis totius logicae is ille terminus "argumentatio" capitus large."

35 The Conimbricentes make "modus disserendi" (i.e. Divisions, Definitions, argumentations) the subject of logic 27a.

× 37 Wolf (Logica) makes logic the science of bringing the understanding to knowledge of the truth scientia dirigendi facultatem cognoscitivam in cognoscenda veritate.

38 Kant makes it the science of the formal rules of all thought

39 Fischer makes logic a critical investigation of the faculty of cognition

40 Herbart does not explain himself very well. Logic according to him may be said to consider which compositions of concepts immediately of thought the objects themselves permit.

41 Bachmann says §20 it is the mathematics of the mind.

42 Ulrici says it is the science of the normative laws of human knowledge.

× 43 The ~~Port Royalist~~ makes it "l'Art de penser"

× 44 Isaac Watts says: "Logick is the art of using Reason well in our Enquiries after Truth, and the Communication of it to others"

— 45 Gassendi thinks the following definitions are equally good

Logica est ars ratiocinandi

ars disserendi

ars dirigendi actiones mentis

ars veri et falsi dijudicandi

ars bene agitandi

— 46 Augustine says "dialectica est bene disputandi scientia"

× 47 Clauberg calls it "ars rationis recte utendi" vel planius "ars quaerendi ac rei et mentis humanae in cognitione rerum.

× 48 Tschirnhausen "medicina mentis"

× 49 Lambert avoids the use of the word logic, but the title of his book contains a definition of it 'Neues Organon oder Gedanken über die Erforschung und Bezeichnung des Wahren und dessen Unterscheidung vom Irrthum und Schein.

× 50 Grundling 'Via ad veritatem'

× 51 Laurembergius 'Cognoscere hominem'

× 52 Thomus intellectus Grossius

× 53 Cathartica Intellectus.

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72 De Morgan: Logic analyzes the ~~mod~~ laws of action of thought

73 Sir. W. Hamilton. Dialectica est inventa ad regulandum discursum intellectus et rationis Hamilton Lectures on Logic 20.

× 54 Sanderson makes it an instrumentalis dirigens mentem nostram in cognitionem omnium intelligibilium. 1905

× 55 Mallet: Ars ratiocinandi

× 56 Burgersdicius: Logica est ars certificans instrumenta et iisque intellectum dirigens in cognitione rerum

— 57 Blundevile: Logicke is an art which teacheth us to dispute probably on both sides of any matter that is propounded.

Wilson: Logique is an arte to reason probable, on both p artes of al matiers that be putte foorth, so ferre as the nature of every thing can beare.

58 E. Reinhold Die allgemeine Denkformenlehre

× 59 Schleiermacher Die Kunstlehre des wissenschaftlichen Denkens.

× ~~58~~ 60 H. Ritter: Die philosophische Methodenlehre für das wissenschaftlichen Denken.

61 ~~59~~ Bosanquet: The Morphology of Knowledge

62 ~~60~~ Benno Erdmann: The Science of the formal postulates of scientific thought.

× 63 Whately The science and art of reasoning

64 Dühring Die Lehre von den Bestandtheilen und Verbindungsarten des wissenschaftlichen Zusammenhanges.

65 Sigwart The technical science of thought directing us how to arrive at certain and universally valid propositions

66 Ueberweg The science of the Normative laws of human cognition

67 Drobisch The investigation of the Normal laws of Thought.

⊗ 68 Bain: Logic is 1st a theoretical abstract science laying down the most fundamental laws of all affirmation and deducing inferences from these laws, embodying them in suitable formulas

2nd the practical science of Proof or Evidence

3rd a body of Method auxiliary to the search for Truth

69 Fr. Fischer: Logik ist die Wissenschaft von der Naturgesetzmässigkeit des allgemeinmenschlichen Denkens.

70 Miss Jones: Logic is the Science of the Important Relations of Propositions

71 Carveth Read Logic is the science that explains what conditions must be fulfilled in order that a proposition may be correct, if it admits of proof.

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Division of Logic

Stoics { Rhetoric
Logic { Dialectic { περὶ σημαινομένων
περὶ φωνῶν

See Zeller

Aristotle { Apodictic
Dialectic
Sophistic

Alexander { Analytic
Synthetic

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$p = \frac{\pi}{1+\pi}$ $\qquad \frac{p}{1-p} = \pi$ $\qquad p+q = \frac{\pi}{1+\pi} + \frac{\kappa}{1+\kappa}$

$p+(1-p)q$

$q = \frac{\kappa}{1+\kappa}$ $\qquad p = \pi - p\pi$ $\qquad = \frac{\pi+\kappa+2\pi\kappa}{(1+\pi)(1+\kappa)}$

$pq = \frac{\pi\kappa}{(1+\pi)(1+\kappa)}$ $\qquad \pi = p + p\pi$

$1-pq = \frac{1+\pi+\kappa}{(1+\pi)(1+\kappa)}$ $\qquad p = \frac{\pi}{1+\pi}$ $\qquad 1-(p+q) = \frac{1-\pi\kappa}{(1+\pi)(1+\kappa)}$

$\frac{pq}{1-pq} = \frac{\pi\kappa}{1+\pi+\kappa}$ $\qquad \frac{p+q}{1-(p+q)} = \frac{\pi+\kappa+2\pi\kappa}{1-\pi\kappa}$

$\frac{p+q-pq}{1-(p+q-pq)} = \frac{\pi+\kappa+\pi\kappa}{1+\pi+\kappa+\pi\kappa}$

Now what must be the value of a to make $\log\frac{\sigma^a+\sigma^b}{2}$ independent of b?

σ^a must be infinite

a must be infinite

What must be the value of b to make $\log\frac{2\sigma^a\sigma^b}{\sigma^a+\sigma^b}$ independent of a?

σ^b must be zero (Infinite would do if σ^a is zero)

b must be $-\infty$

$\log\frac{\sigma^a+\sigma^b}{2} = \infty$

$\log\frac{2\sigma^a\sigma^b}{\sigma^a+\sigma^b} = -\infty$

$\log\frac{2}{\sigma^{-a}+\sigma^{-b}}$

$\log\frac{\sigma^{-a}+\sigma^{-b}}{2\sigma^{-a}\sigma^{-b}}$

$\sigma^a+\sigma^b+\sigma^{a+b}$

$\frac{\sigma^a+\sigma^b}{2} = \pi$

$\frac{\frac{\sigma^a+\sigma^b}{2}}{1+\frac{\sigma^a+\sigma^b}{2}} = p\,\frac{\sigma^a+\sigma^b}{2+\sigma^a+\sigma^b}$

Let the logical aggregate of a and b be $\cancel{\log\frac{a+b}{2}}$ $\log\frac{\sigma^a+\sigma^b}{2}$

Let the logical composite of a and b be $\log\frac{2\sigma^a\sigma^b}{\sigma^a+\sigma^b}$

Then the sum of them will be

$$\log\frac{\sigma^a+\sigma^b}{2} + \log\frac{2\sigma^a\sigma^b}{\sigma^a+\sigma^b} = \log\sigma^a\sigma^b = a+b$$

The aggregate of the aggregate of a and b and of c will be

$$\log\frac{\frac{\sigma^a+\sigma^b}{2}+\sigma^c}{2}$$

In order that the weights should make no difference

σ^a ~~ob~~ must be infinite or zero.

Hence the logs. infinite

These quantities to which the logical operations apply are modular.

The arguments are indeterminate except for intermediate probabilities. Hence the arguments express the independence of the ~~given~~ events.

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Suppose
$[p,q]$ is a mean of p and q such that if
p is 1 it is independent of q

$\sqrt{\log p \cdot \log q}$

$\frac{2\log p \cdot \log q}{\log p + \log q}$

$$\frac{\left(\frac{p}{1-p} + \frac{q}{1-q}\right)}{2 + \frac{p}{1-p} + \frac{q}{1-q}} = \frac{p+q-2pq}{2-p-q}$$

$$\frac{2 - 2p - 2q + 2pq - p + q - p}{2-p-q}$$

$$\frac{p+q-2pq}{2-p-q}$$

If $p=1$

$$\frac{1+q}{1-q} = 1$$

~~$\{p,q\}$ is a mean of p and q such that~~

$[p,q] + \{p,q\} = p+q$

$$p+q - \frac{p+q-2pq}{2-p-q} = \frac{p+q-p^2-q^2}{2-p-q}$$

If $p=0$

$$\frac{q(1-q)}{2-q}$$

$$2p+2q-p^2-q^2-2pq+2pq-p-q$$

$$\frac{p+q-2pq}{2-2p-2q+2pq} = \frac{\frac{\pi}{1+\pi} + \frac{\kappa}{1+\kappa} - 2\frac{\pi\kappa}{(1+\pi)(1+\kappa)}}{\left(1-\frac{\pi}{1+\pi}\right)\left(1-\frac{\kappa}{1+\kappa}\right)}$$

$$= \frac{\frac{1}{2}\left(\pi(1+\kappa) + \kappa(1+\pi) - 2\pi\kappa\right)}{\frac{1}{2}(\pi+\kappa)}$$

$$\frac{p+q-p^2-q^2}{2-2p-2q+p^2+q^2} = \frac{\frac{\pi}{(1+\pi)^2} + \frac{\kappa}{(1+\kappa)^2}}{\frac{1}{1+\pi} + \frac{1}{1+\kappa} - \frac{\pi}{(1+\pi)^2} - \frac{\kappa}{(1+\kappa)^2}}$$

$$= \frac{\pi(1+\kappa)^2 + \kappa(1+\pi)^2}{(1+\pi)(1+\kappa)^2 + (1+\pi)^2(1+\kappa) - \pi(1+\kappa)^2 - \kappa(1+\pi)^2}$$

$$= \frac{\pi + \kappa + 2\pi\kappa + \pi\kappa^2 + \pi^2\kappa}{}$$

$p = \frac{\pi}{1+\pi}$

$1-p = \frac{1}{1+\pi}$

$$\frac{\frac{\pi(1+\pi)}{1+\pi} + \frac{\kappa(1+\pi)}{1+\kappa}}{2+\pi+\kappa - \frac{\pi(1+\kappa)}{1+\pi} + \kappa\frac{1+\pi}{1+\kappa}}$$

If $p=0$ $\frac{p+q-p^2-q^2}{2-2p-2q+p^2+q^2} = \frac{q(1-q)}{(1-q)^2}$

$$\frac{\frac{xy}{(1-x)(1-y)}\left(\frac{x}{1-x} + \frac{y}{1-y}\right)}{\left(\frac{x}{1-x}\right)^2 + \left(\frac{y}{1-y}\right)^2 + \frac{xy}{(1-x)(1-y)}\left(\frac{x}{1-x} + \frac{y}{1-y}\right)}$$

$$\frac{xy(x+y-2xy)}{x^2(1-y)^2 + (1-x)^2y^2 + xy(x+y-2xy)}$$

It is required to find a mean such that if $p=1$ it is independent of q and if $p=0$ it $=q$.

$$x^2(2y^2-2y+1) - 2xy^2 + y^2$$

$y^2-y+\frac{1}{4}$

$y^2-y=-\frac{1}{4}$

$+\frac{1}{4}$

$$\frac{x^2+y^2-2xy(x+y)+2x^2y^2}{x^2(2y+1)^2+(x-y)^2}$$

$F(1,q)=1$

$F(0,q)=q$

$F(q,q)=q$

$$\frac{x^3(1-y)+y^3(1-x)}{x^2(1-y)+y^2(1-x)+xy^2}$$

$$x^2-x^2y+y^2-xy^2$$

$$\frac{x^2(1-y)+y^2(1-x)}{x^2(1-y)+y^2(1-x)}$$

$$\frac{\xi^2+\eta^2}{\xi+\eta}$$

$$\frac{\frac{x}{1-x}+\frac{y}{1-y}}{\frac{x}{1-x}\frac{1}{y}+\frac{1}{x}\frac{y}{1-y}}$$

$$\frac{xy(1-y)+xy(1-x)}{x(1-y)+y(1-x)}$$

$$\frac{x^2(1-y)+y^2(1-x)+y}{x(1-y)+y(1-x)}$$

$$\frac{xy}{x+y}$$

$$\sqrt{\frac{x^2+y^2}{2}}$$

$$\frac{x+y}{x+y}$$

$$\frac{(x+a)(y+a)}{(x-b)(y+b)}$$

$$\frac{x(1-y)+y\left(\frac{x}{1-x}\right)^2+\left(\frac{y}{1-y}\right)^2}{1-y+1-x}$$

$$\frac{\frac{x}{1-x}+\frac{y}{1-y}}{\frac{x}{1-x}+\frac{y}{1-y}+\left(\frac{x}{1-x}\right)^2+\left(\frac{y}{1-y}\right)^2}$$

$$\frac{\frac{x}{1-x}+\frac{y}{1-y}}{}$$

$$\frac{\frac{1}{x}+\frac{1}{y}}{\frac{1}{x^2}+\frac{1}{y^2}}$$

$$\frac{x^2(1-y)^2+y^2(1-x)^2}{x(1-x)(1-y)^2+y(1-y)(1-x)^2+x^2(1-y)^2+y^2(1-x)^2}$$

$$\frac{\left(\frac{x}{1-x}\right)^2+\left(\frac{y}{1-y}\right)^2}{\frac{x}{1-x}+\frac{y}{1-y}}$$

$$\frac{xy^2+x^2y}{}$$

$$\frac{xy(x+y)}{x^2+y^2}$$

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$$\cancel{\frac{xy}{1-x-y}}$$

$$\cancel{\frac{xy}{xy+1}}$$

$$\frac{xy}{xy+(1-x)(1-y)} = \frac{xy}{1-x-y+2xy}$$

$$\cancel{\begin{array}{l} y \quad x=y \\ x \\ 1 \quad 2x \end{array}}$$

$$\frac{x^{2n}}{1-2x+2x^2}$$

$$\frac{xy(1-y)+xy(1-x)}{x(1-y)+y(1-x)}$$

The prob. that if two witnesses disagree the one that tells a lie will tell the truth next time

$$\frac{x^2(1-y)+y^2(1-x)}{x(1-y)+y(1-x)}$$

If one thing has always happened and the other never. the prob. that the same thing will happen again

$$\frac{x^{m+1}(1-y)^n+y^{p+1}(1-x)^q}{x^m(1-y)^n+y^p(1-x)^q}$$

$$\frac{x^5(1-y)^4+y^5(1-x)^4}{x^4(1-y)^4+y^4(1-x)^4}$$

$$x^{m+1}(1-y)^{t-m}+x^{n+1}(1-y)^{t-n}.$$

If out of m+n trials one thing has happened m times and the other n times the prob that the

$$\frac{x^{m+1}(1-y)^m+y^{m+1}(1-x)^m}{x^m(1-y)^m+y^m(1-x)^m}$$

If we know that in m trials one or other of two things has always happened but dont know which the probability that that same thing will happen again.

1901 Sep 10

On the opposite page I am making a table of possible ~~proposed~~ proposed ultimate goods. The lines as they descend contain more & more general goods. To the left are to be those most involving feeling to the right those most objective. I assume the number 28 from some imperfect essays.

On the first line, I should put, apparently, 1 simple desideratum, 2 hypnotic action, 3 energizing, 4 outward event. What else? Imitation?

On second line, pleasure, self-preservation, benevolence, ~~other~~ home, custom.

In my Pop. Sci. article of January 1901 I gave the following grades

Grades of feeling, A
1 Simple desire
2 Restrained desire
3 Action for self
4 Action for pleasure generalized
5 Retroconsciousness
6 Personification of community
7 Absence of feeling

Grades of Dependence, B.
1 Absence of secondness
2 Balancing of considerations
3 ~~Something~~ Partial opposition to feeling
4 External object
5 External exemplar
6 Generalized obedience
7 Express obedience

This is most crude, of course. I am inclined to think that the B's should relate to feeling & the As to secondness. B1, being ~~pure~~ feeling ~~fully~~ appreciated and A7 objectively fully appreciated

Suppose I make first line as follows:

Desideratum. Self. ~~Energizing~~ Play. ~~Fight.~~ Sympathy. Hypnosis. Making. Outward

But ~~Imitation~~ ought to come in. Self is dubious. Sympathy dubious.

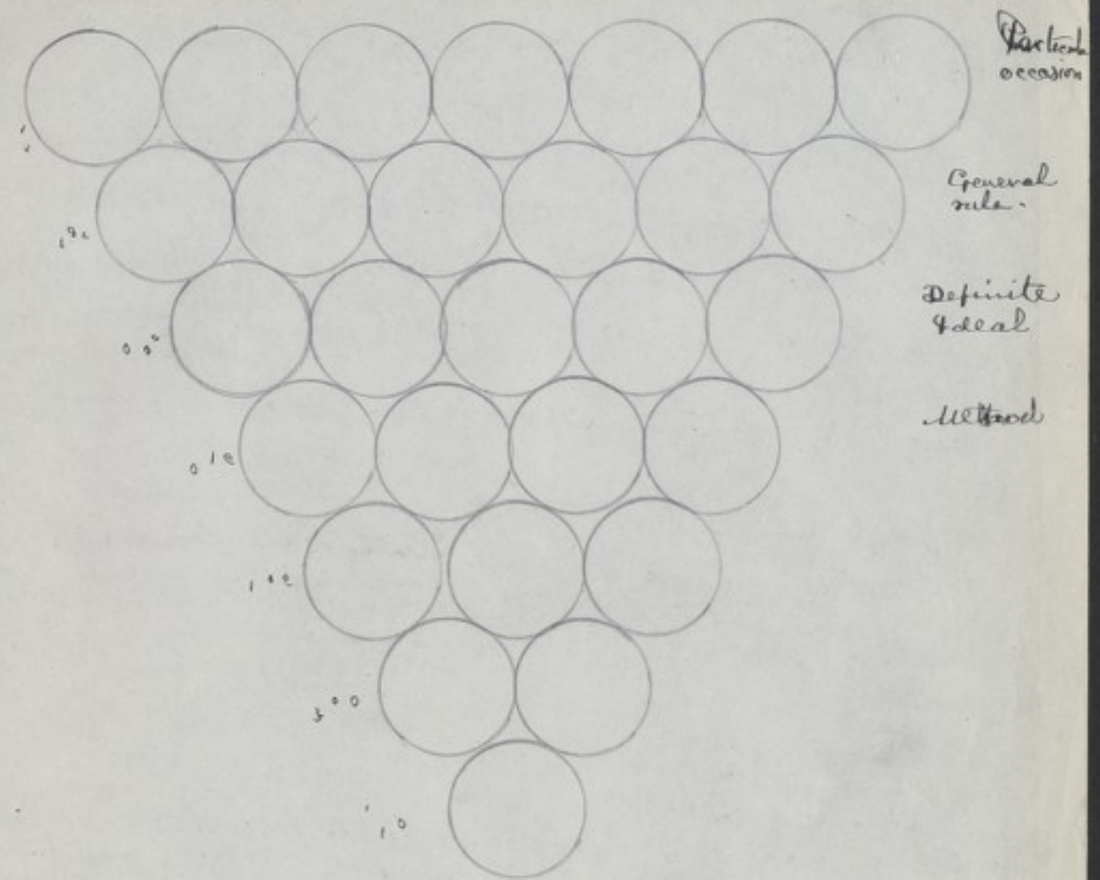
Suppose we say:

1st line Desideratum. Play. Imitation. Fight. Making. Hypnosis. Outward fact
Self Other

2nd line

1901 Sep 8

1757



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If my present view, held for four or five years, is right that Abduction Deduction Induction or Primarian, Secundarian, and Tertian, then there ought to be two types of Deduction & three of Induction — & the three figures of syllogism must sink into insignificance.

Now I don't recognize any such two types of deduction. I have since 1887 and earlier recognized three kinds of induction; but have never taken them to be fundamental. They are extensive, comprehensive, & protensive. I always considered the last to be a sort of complication of the first.

If the premiss of induction is a symbol of the conclusion, then it should be a term, proposition, or syllogism.

If the premiss of deduction is an index of the conclusion it should be a term or a proposition.

But if the premiss of abduction is an icon of the conclusion it can only be a term.

A propositional deduction should be a fact not merely indicating another fact to be true but indicating what sort of a fact it is.

A propositional induction should not only by virtue of having been considered as an argument tend to prove its conclusion but should tend to prove something to be true of that conclusion and an argumentative induction should tend to prove a reason for the conclusion.

We can distinguish deductions into those which are corollarific and those which are theorematic ~~genetic~~ genuous. The former merely require the careful consideration of the conclusion, the latter involve outside considerations, — subsidiary lines, etc. But this seems a methodentic not a critical distinction.

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$$\Pi_i \Pi_j \Pi_k \, a_{ij} \cdot (b_{ik} + c_{jk}) = \Pi_i \Pi_j \{ a_{ij} \cdot \Pi_k (b_{ik} + c_{jk}) \} = \Pi_i \Pi_j \, a_{ij} \cdot \Pi_u \Pi_v \Pi_k (b_{uk} + c_{vk})$$

$$\Pi_k \Pi_u \Pi_v (b_{uk} + c_{vk}) = \Pi_k (b_{1k} + c_{1k}) \cdot (b_{2k} + c_{2k}) \cdot (b_{3k} + c_{3k}) \cdot \text{etc}$$
$$(b_{2k} + c_{1k} \cdot (b_{2k} + c_{2k}) \cdot (b_{2k} + c_{3k}) \cdot \text{etc}$$
$$(b_{3k} + c_{1k}) \cdot (b_{3k} + c_{2k}) \cdot (b_{3k} + c_{3k}) \cdot \text{etc}$$
$$= \Pi_k (b_{1k} + \Pi_j c_{jk}) \cdot (b_{2k} + \Pi_j c_{jk}) \cdot \text{etc}$$
$$= \Pi_k (\Pi_i b_{ik} + \Pi_j c_{jk})$$

$$\Pi_i \Pi_j \, a_i b_j = \Pi_i a_i \cdot \Pi_j b_j$$
$$\Pi_i \Pi_j (a_i + b_j) = \Pi_i a_i + \Pi_j b_j$$

$$\Pi_i \Pi_j \Pi_k \, a_{ij} \cdot (b_{ik} + c_{jk})$$
$$= \Pi_i \Pi_j \, a_{ij} \cdot [\Pi_k (\Pi_u b_{uk} + \Pi_v c_{vk})]$$

$$\Pi_i \Pi_j \Sigma_k \, a_{ij} \cdot (b_{ik} + c_{jk}) = (\Pi_i \Pi_j a_{ij}) \cdot \Pi_u \Pi_v (\Sigma_k b_{uk} + \Sigma_k c_{vk})$$
$$= (\Pi_i \Pi_j a_{ij}) \cdot [(\Pi_u \Sigma_k b_{uk}) + (\Pi_v \Sigma_w c_{vw})]$$

$$\Pi_i \Sigma_k \Pi_j \, a_{ij} \cdot (b_{ik} + c_{jk}) = (\Pi_i \Pi_j a_{ij}) \cdot \Pi_u (\Sigma_k b_{uk} + \Sigma_w \Pi_v c_{vw})$$
$$= (\Pi_i \Pi_j a_{ij}) \cdot [(\Pi_u \Sigma_k b_{uk}) + (\Sigma_w \Pi_v c_{vw})]$$

$$\Sigma_i \Pi_j (g_i \cdot l_{ij} + \bar{c}_j) = \Sigma_i (g_i \cdot l_{i1} + \bar{c}_1) \cdot (g_i \cdot l_{i2} + \bar{c}_2) \cdot (g_i l_{i3} + \bar{c}_3)$$
$$= (g_1 l_{11} + \bar{c}_1) \cdot (g_1 \cdot l_{12} + \bar{c}_2) \cdot (g_1 \cdot l_{13} + \bar{c}_3)$$
$$+ (g_2 l_{21} + \bar{c}_1)(g_2 l_{22} + \bar{c}_2) \cdot (g_2 l_{23} + \bar{c}_3) + \text{etc}$$
$$= g_1 \cdot (l_{11} + l_{12} + l_{13} + \text{etc}) + \bar{c}_1 \cdot \bar{c}_2 \cdot \bar{c}_3 \cdot \text{etc}$$
$$+ g_2 \cdot (l_{21} + l_{22} + l_{23} + \text{etc}) + \bar{c}_1 \cdot \bar{c}_2 \cdot \bar{c}_3 \cdot \text{etc}$$
$$= \Sigma_i g_i (\Sigma_j l_{ij}) + \Pi_k \bar{c}_k$$

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1901 Oct 13

197r

The arithmetic of multitude

f = as ~~small~~ few as

If the m's are as few as the n's $\quad \sum_g \prod_i \sum_j \prod_k \left(\bar{m}_i + \bar{m}_k \overset{1_{ik}}{\vee} + r_{gij} \cdot \bar{r}_{gkj} \cdot n_j\right)$

Addition

If the x's are ~~equal~~ ~~as few~~ as few as the $(m+n)$s $\quad \sum_g \sum_\sigma \prod_i \sum_j \prod_k 1_{ik} + \bar{x}_i + \bar{x}_k$

$$+ m_j \cdot r_{gij} \cdot \bar{r}_{glj} + n_j \cdot r_{\sigma ij} \cdot \bar{r}_{\sigma lj}$$

If the $(m+n)$s are as few as the x's $\quad \cancel{\sum_\tau \sum_v}$

$$\sum_\phi \sum_\psi \prod_u \sum_v \prod_w \left\{\bar{m}_u + x_v \cdot r_{\phi uv} \cdot (1_{uw} + \bar{m}_w + \bar{r}_{\phi wv}) \cdot (\bar{n}_w + \bar{r}_{\psi wv})\right\}$$

$$\cdot \left\{\bar{n}_u + x_v \cdot r_{\psi uv} \cdot (1_{uw} + \bar{n}_w + \bar{r}_{\psi wv}) \cdot (\bar{m}_w + \bar{r}_{\phi wv})\right\}$$

$$\cancel{= \bar{m}_u \bar{n}_u + x_v \cdot (\bar{r}_{\phi uv} \cdot r_{\psi uv} + r_{\phi uv} \cdot \bar{r}_{\psi uv})}$$

$$\cancel{x_v \cdot (\bar{r}_{\phi uv} \cdot r_{\psi uv} + r_{\phi uv} \cdot \bar{r}_{\psi uv})}$$

$$\sum_\phi \sum_\psi \prod_u \sum_v \sum_v \prod_w \quad x_v \cdot x_v$$

$$= \bar{m}_u \cdot \bar{n}_u + m_u \cdot n_u \cdot (r_{\phi uv} \cdot \bar{r}_{\psi uv} \cdot \bar{r}_{\phi uv} \cdot r_{\psi uv}) \cdot (1_{uw} + \bar{m}_w + \bar{r}_{\phi wv}) \cdot (1_{uw} + \bar{n}_w + \bar{r}_{\psi wv})$$

$$+ m_u \cdot x_v \cdot r_{\phi uv} \cdot (1_{uw} + \bar{m}_w + \bar{r}_{\phi wv})$$

$$\sum_\phi \sum_\psi \prod_u \sum_v \prod_w \quad \bar{m}_u \bar{n}_u + m_u \cdot r_{\phi uv} \cdot x_v \cdot (1_{uw} + \bar{m}_w + \bar{r}_{\phi wv}) \cdot (\bar{n}_w + \bar{r}_{\psi wv})$$

$$+ m_v \cdot r_{\psi uv} \cdot x_v \cdot (1_{uw} + \bar{n}_w + \bar{r}_{\psi wv}) \cdot (\bar{m}_w + \bar{r}_{\phi uv})$$

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1901 Dec 10

To prove that if $(\bar{a} \prec b) \prec c$ ~~$(a+b) \prec c$~~ then $(a+b) \prec c$ ~~$(\bar{a} \prec b) \prec c$~~

For if $\prod_t (a \prec t)$ then $(a \prec b)$

But $b \prec b$

And, therefore, by definition of Mult. (Alg. of Logic p. 33),

If $\prod_t (a \prec t)$ $(a+b) \prec b$

i.e. $\bar{a} \prec (a+b) \prec b$

$\therefore$ $(a+b) \prec \bar{a} \prec b$

$\therefore$ If then $[(\bar{a} \prec b) \prec c] \prec (a+b) \prec c$

Another proof: (differently arranged merely)

$\bar{a} \prec \prod_t (a \prec t) \prec a \prec b$

$\therefore$ $a \prec \bar{a} \prec b$

$\therefore$ $[(\bar{a} \prec b) \prec c] \prec a \prec c$

$b \prec b$ is true

$\therefore$ $\prod_t t \prec (b \prec b)$

$\therefore$ $\bar{a} \prec b \prec b$

$b \prec \bar{a} \prec b$

$\therefore$ $[(\bar{a} \prec b) \prec c] \prec b \prec c$

$\therefore$ By definition $[(\bar{a} \prec b) \prec c] \prec (a+b) \prec c$

The fruit is the letter.

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To prove that $(a \bar{\prec} \bar{b}) \prec (a \cdot b)$

This depends on the formula

$$(x \bar{\prec} \bar{y}) \prec z = x \prec y \prec z$$

or $\begin{cases} \{[(x \prec y \prec 0) \prec 0] \prec z\} \prec x \prec y \prec z \\ (x \prec y \prec z) \prec [(x \prec y \prec 0) \prec 0] \prec z \end{cases}$

$[(x \prec y \prec u) \prec v] \prec z$

$\cancel{x y \bar{u} + \bar{v} + z}$

$(\bar{x} + \bar{y} + u)\bar{v} \prec z$

$[(x \prec y) \prec u] \prec v$

$(\bar{x} + y)\bar{u} + v$

$\bar{x} + \bar{y} + u$

$x \bar{y} + u$

~~The first is proved if we prove~~

$\cancel{(x \prec y) \prec (x \prec y \prec u) \prec u}$

~~which is simply~~ $\cancel{(x \prec y \prec u) \prec (x \prec y) \prec u}$

~~The second is proved by~~

$\cancel{[(x \prec y \prec 0) \prec 0] \prec}$

Strictly speaking $(a \bar{\prec} \bar{b}) \prec (a \cdot b)$

only depends on $(a \bar{\prec} \bar{b}) \prec a$ or $\bar{a} \prec (a \prec b)$ because $\bar{a} \prec \prod_t t$

and $(a \bar{\prec} \bar{b}) \prec b$

That is $(a \bar{\prec} b) \prec \bar{b} \prec \prod_t t$

or $b \prec (a \prec b)$

or $a \prec (b \prec b)$

We prove $(a \cdot b) \prec (a \bar{\prec} \bar{b})$

if we prove $\prod_s (s \prec a) \prec (s \prec b) \prec [s \prec (a \bar{\prec} \bar{b})]$

or $\prod_s s \prec (s \prec a) \prec (s \prec b) \prec (a \bar{\prec} \bar{b})$

or $\prod_s s \prec s \prec (s \prec a) \prec (s \prec b) \prec (a \bar{\prec} \bar{b})$

or $\prod_s s \prec (s \prec a) \prec s \prec (s \prec b) \prec (a \bar{\prec} \bar{b})$?

or $a \prec b \prec (a \bar{\prec} \bar{b})$

or $a \prec b \prec (a \prec \bar{b}) \prec 0$

or $a \prec b \prec (a \prec b \prec 0) \prec 0$

or $(a \prec b \prec 0) \prec \cancel{(a \prec b)} \prec 0$

Proof.

$(a \prec b \prec 0) \prec (a \prec b \prec 0)$

$\therefore a \prec b \prec (a \prec b \prec 0) \prec 0$

$a \prec b \prec (a \bar{\prec} \bar{b})$

Suppose we have $x \prec y$

then $\cancel{s \prec (s \prec x) \prec y}$

$(s \prec x) \prec (s \prec y)$

or $s \prec (s \prec x) \prec y$

$s \prec (s \prec a) \prec b \prec (a \bar{\prec} \bar{b})$

$\therefore \prod_s s \prec (s \prec a) \prec (s \prec b) \prec (a \bar{\prec} \bar{b})$

$\therefore \prod_s (s \prec a) \prec (s \prec b) \prec [s \prec (a \bar{\prec} \bar{b})]$

By def. $a \cdot b \prec (a \bar{\prec} \bar{b})$

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1901 Dec 10

To prove that if $(a+b)\prec c$ then $(\bar{a}\prec b)\prec c$

$$\prod_t (a\prec t) \prec \bar{a}$$

$$\therefore \prod_t (\bar{a}\prec b)\prec(a\prec t)\prec b$$

$$\therefore \prod_t (\bar{a}\prec b)\prec(b\prec t)\prec(a\prec t)\prec t$$

$$\therefore \prod_t \cancel{(\bar{a}\prec b)\prec}\ (a\prec t)\prec(b\prec t)\prec(\bar{a}\prec b)\prec t$$

or by definition $(\bar{a}\prec b)\prec(a+b)$ ——— ||

$$\therefore [(a+b)\prec c]\prec(\bar{a}\prec b)\prec c$$

To prove that if $c\prec(a+b)$ then $c\prec(\bar{a}\prec b)$

That ~~$(a+b)\prec(\bar{a}\prec b)$ is prove~~

$(a+b)\prec(\bar{a}\prec b)$ is proved on last page

Hence if $c\prec(a+b)$ $c\prec\bar{a}\prec b$

To prove that if $c\prec(\bar{a}\prec b)$ $c\prec(a+b)$

It is proved above that $(\bar{a}\prec b)\prec(a+b)$ $\therefore$ $\therefore$ etc

---

To prove that $a\cdot b\prec(a\bar{\prec}\bar{b})$

Requires the proof that

$$\{[(x\prec y)\prec z]\prec w\}\prec[x\prec(y\prec z)\prec w]$$

Now $b\prec b$ is true

$$\prod_v v\prec b\prec b$$

$$\therefore [(b\prec b)\prec \prod_u u]\prec \prod_v v\prec \prod_u u$$

$$\therefore \prod_v v\prec[(b\prec b)\prec 0]\prec 0$$

$$\therefore [(b\prec b)\prec 0]\prec 0$$

$$\therefore b\prec(b\prec 0)\prec 0$$

$$\therefore a\prec b\prec(a\prec b\prec 0)\prec 0$$

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$$[a \prec (b \prec c)] \prec (a \prec b) \prec c$$

$$[(a \prec b) \prec c] \prec a \prec (b \prec c)$$

$$(b \prec c) \prec a \prec (a \prec b) \prec c$$

$$a \prec (a \prec b) \prec (b \prec c) \prec c$$

The proof is this:

By syllogism $(a \prec b) \prec (b \prec c) \prec a \prec c$

Transposing $\cancel{(b \prec c)}$ $a \prec (b \prec c) \prec (a \prec b) \prec c$

By contraposition $a \prec [(a \prec b) \prec c) \prec (b \prec c)$

Transposing $[(a \prec b) \prec c] \prec a \prec (b \prec c)$ i.e. $(\bar{a} + b) \cdot \bar{c} \prec [\bar{a} + b \cdot \bar{c}]$

By contraposition $[a \prec (b \prec c)] \prec [(a \prec b) \prec c)$ i.e $a \cdot (\bar{b} + c) \prec [a \cdot \bar{b} + c]$

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Now to prove $(a+b)\cdot c \prec a+b\cdot c$

$[(\bar{a} \prec b) \bar{\prec} \bar{c}] \prec \bar{a} \prec (b \bar{\prec} \bar{c})$

or say $[(a \prec b) \bar{\prec} c] \prec a \prec (b \bar{\prec} c)$

i.e $[a \bar{\prec} (b \bar{\prec} c)] \prec (a \prec b) \prec c$

$a\cdot(\bar{b}+c) \prec a\cdot\bar{b}+c$

$[a \bar{\prec} (b \bar{\prec} c)] \prec (a \prec b) \prec c$

$\prod_t a \prec$

$\cancel{\bar{a}\cdot(\bar{b}+\bar{b}) \prec \bar{a}\bar{b}+\bar{c}}$

$\boxed{(\bar{b}+c)\cdot\bar{a} \prec \cancel{\bar{a}\cdot\bar{b}+c}}$ $\quad a \bar{\prec} b$

$\bar{b}+c\cdot\bar{a}$ $\quad a\cdot\bar{b}$

$[(b \prec c) \bar{\prec} a] \prec b \prec (c \bar{\prec} a)$

$[(a \prec b) \bar{\prec} c] \prec a \prec (b \bar{\prec} c)$

$\prod_t \{[(a \prec b) \prec c] \prec t\} \prec a \prec [(b \prec c) \prec t]$

$\cancel{[a \prec (b \prec c)]}$

$(\bar{a}+b)\bar{c}+t$

$\bar{a}+b\bar{c}+t$

This depends on

$[(a \prec b) \bar{\prec} c] \prec [a \prec (b \bar{\prec} c)]$

$[(a \prec b) \bar{\prec} c] \prec a \prec (b \bar{\prec} c)$

or $(a \prec b) \bar{\prec} c$

a

$\therefore b \bar{\prec} c$

$a \bar{\prec} b$

$\therefore a$

$(a \prec b) \prec 0$

That is if $\prod_t a \prec t$

$a \prec b$ then $a \prec b$

$\therefore$ if $a \bar{\prec} b$

a)

$a \bar{\prec} b$

$b \prec 0$

that is $b \prec a \prec b$

for $a \prec b \prec b$

$[(a \prec b) \prec 0] \prec b \prec 0]$

DEC 16 1901

Follows last page

Starting with

(1) If q, then $p \prec q$

(2) Either p m or $m \prec n$

(3) If s and $s \prec t$, then t

We get from (1) alone

(4) If q then $r \prec p \prec q$ etc

From (2) alone

(5) Either $(l \prec m)$ or $(l \prec m) \prec n$

From (3) alone

(6) If $a \prec b$ and $(a \prec b) \prec c \prec d$ then $c \prec d$

~~(7) If a and (b≺c) and b~~

(7) If a and b ~~then~~ and $a \prec b \prec c$ then c

(8) If $(a \prec b)$ and ~~(b≺c)~~ and $(a \prec b) \prec (b \prec c)$ then $(b \prec c)$

(9) If $(a \prec b)$ and $(b \prec c)$ and $(a \prec b) \prec (b \prec c) \prec a \prec c$ then $a \prec c$

$(m \prec b) \prec (c \prec d)$

~~a≺b~~

From (1) and (2)

Putting $q = m$ If q then $p \prec q$

Either q or $q \prec n$

(10) $\therefore$ Either $p \prec q$ or $q \prec n$

Put $n = p$

(11) $\therefore$ Either $p \prec q$ or $q \prec p$

Put $n = p = q$

(12) $\therefore$ $p \prec p$

Put $q = (m \prec n)$

(13) Either m ~~or~~ $p \prec m \prec n$

(14) $p \prec (m \prec m) \prec n$

(15) $p \prec q \prec q$

(16) $r \prec p \prec q \prec q$

turn over

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Algebra of The Copula

$a \prec a$

~~$a \prec (b \prec a)$~~ $a \prec b \prec a$ ~~or $b \prec a \prec a$~~ ~~Derived from~~ $a \prec$ By contrap $(\overline{b \prec a}) \prec a$

By contra $(\overline{a \prec b}) \prec a$

$\bar{a} \prec a \prec b$ [Principle of contrad] $\bar{a} = a \prec \prod_t t$

$[a \prec b \prec c] \prec [b \prec a \prec c]$

$(a \prec b) \prec (b \prec c) \prec (a \prec c)$

~~$(\underset{b}{a} \prec \underset{c}{b}) \prec (\underset{a}{c} \prec \underset{b}{a}) \prec (\underset{a}{c} \prec \underset{c}{b})$~~

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The algebra of the copula is deducible from the definition of the copula. This definition positively asserts that some things can be written.

For it says if q then $p \prec q$

Either p or $p \prec q$

For q put p, then this becomes if p then $p \prec p$

Either p or $p \prec p$

Therefore $p \prec p$ is positively asserted to be permissibly scriptible

But the definition of the copula does not positively ~~deny~~ say that ~~anything can be written~~ there is anything that cannot be written.

It only distinguishes between what we know to be scriptible and what we do not know to be scriptible

The definition seems to be

(1) If q, then $p \prec q$

(2) Either p or $p \prec q$

(3) If p and $p \prec q$, then q

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Start again

(A) Either m or $m \prec n$

(B) If p, then $p \prec q$

(C) If s and $s \prec t$, then t

From A alone nothing follows

From B alone.

~~If p then (p≺q)≺r~~

(1) If q then $r \prec p \prec q$ etc.

~~∴ If q If p≺q then p≺p≺q~~

From C alone.

(2) If s and $s \prec t$ and $t \prec u$ then u etc. If s_1 and $s_1 \prec s_2$ and $s_2 \prec s_3$ ... $s_{n-1} \prec s_n$ then s_n

(3) If s and t and $s \prec t \prec u$ then u etc. [If s_1 and s_2 and $s_3 \ldots s_n$ and $(s_1 \prec s_2 \prec s_3 \ldots s_n \prec u)$ then u

(4) If $(s \prec t)$ and $(t \prec u)$ and $(s \prec t) \prec (t \prec u) \prec (s \prec u)$ then $(s \prec u)$

merely same thing as (3)

~~(5) (4') If (s≺t) and (t≺~~

(5) If s and $(s \prec t)$ and $(s \prec t \prec u)$ then u etc.

If s_1 and $s_1 \prec s_2$ and $s_1 \prec s_2 \prec s_3$ and ... $s_1 \prec s_2 \prec \ldots \prec s_n$ then s_n

---

From A and B alone

(6) Either $p \prec m$ or $m \prec n$

(7) ∴ ~~Either~~ $p \prec m$

(8) Either m or $p \prec m \prec n$

Either m or $p_1 \prec p_2 \prec m \prec n_1 \prec n_2$ etc

From A and C alone.

(9) If $m \prec t$ either $m \prec n$ or t

(10) If s then either $(s \prec t) \prec n$ or t

(11) If $(m \prec n) \prec t$ then either m or t

(12) If $m \prec (m \prec n$ then $m \prec n$

(13) If $(m \prec n) \prec m$ then m

~~p+q~~

~~p̄+q̄+r~~

r+q

r̄+q̄+r

q+r+r

m+(m≺n)

m̄+m̄≺t+t

If m̄≺t either r or (m≺n).

m+(m≺n)

m̄+m̄≺t+t

~~m+(m≺n)~~

~~m̄+m̄≺n+n~~

(s≺t)+[(s≺t)≺n]

s̄+s̄≺t+t

m+(m≺n)

m̄≺n+(m≺n)≺t+t

From B and C alone

(14) ~~From~~ If q and $(p \prec q) \prec t$ then t

(15) If s and $(s \prec t)$, then $(p \prec t)$

~~(14) If q and r then p~~

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Additional from B alone

If q then $q \prec q$

If $p \prec q$ then $r \prec p \prec q$

$p \prec p \prec q$

$r \prec p \prec q$

$(p \prec r) \prec (p \prec q)$ etc

From A, B and C

Start again

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A. Either m or $m \prec n$

B. If q, then $p \prec q$

C If s and $s \prec t$, then t

From A alone.

~~(1) $\{\{[(n \prec m) \prec m] \prec m\} \prec m\} \prec$ etc. ad inf. is true.~~

$\langle\{[(m \prec n) \prec n] \prec n\} \prec n\rangle \prec$ etc ad inf

That is, if $n_{i+1} \ni n_i \prec n$ then n_∞ is true

(2) Either m or $m \prec m$

(3) Either $m \prec n$ or both m and $(m \prec n) \prec l$

(4) Either m or both $m \prec n$ and $m \prec l$. Either m or $m \prec l_1$, $m \prec l_2$ ~~$m \prec l_3$~~ etc.

(5) Either $m \prec m$ or both m and $(m \prec m) \prec l$

(6) ~~Either $m \prec m \prec m \prec m$~~

$m \prec n \quad \bar{m} + n$

$(m \prec n) \prec n \quad m + n$

$[(m \prec n) \prec n] \prec n \quad \bar{m} + n$

From B alone.

(7) If q, then $p_2 \prec p_1 \prec q$
and $p_3 \prec p_2 \prec p_1 \prec q$ etc.

(8) If q then $q \prec q$
and $q \prec p \prec q$

(9) If $p \prec r$ then $p \prec q \prec r$
and $r \prec q \prec r$

From C alone

(10) If s and $s \prec t$ and $t \prec u$ then u

If s_0 and $s_0 \prec s_1$ and $s_1 \prec s_2$ etc then s_n

(11) If s and $s \prec t_1$ and $t_1 \prec t_2$ etc - - then t_∞

~~(12) If s and $s \prec (t \prec s)$ then $t \prec s$~~
$s \prec t \prec s$

~~$\bar{s} + st\bar{s}$~~
$\bar{s} + st\bar{s} + \bar{t} + s$

(12) If s and t and $s \prec t \prec u$ then u

If s_1 and s_2 and s_3 etc and $s_1 \prec s_2 \prec s_3 \prec$ etc $\prec u$ then u

(13) $(s \prec u)$ and $(s \prec u) \prec t$ then t

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From A and B alone.

(14) Identify $m = q$ — Either $m \prec n$ or $p \prec m$

(15) $\therefore$ Either $m \prec n$ or $n \prec m$

(16) $\therefore$ $m \prec m$

(16½) $\therefore$ $p \prec m \prec m$

Identify $(m \prec n) = q$

(17) Either m or $p \prec m \prec n$

~~$\therefore n_2 \prec n_1 \prec m \prec n_1 \prec n_2$~~

(18) $p \prec m \prec m$

(19) $p \prec n_\infty$

(20) $n_\infty \prec m \prec m$ $\quad (m \prec m) \prec n_\infty$

(20½) Granter that if p is true q is true, then $p \prec q$

$p \prec q \prec r$

$q \prec p \prec r$ $\quad p \prec q$

$p \prec q$ $\quad (p \prec q) \prec r$

From A and C alone.

(21) $m = s$ | Either $m \prec n$ or if $m \prec t$ then t

(22) $m = s \prec t$ | Either $(s \prec t) \prec n$ or if ~~s is true~~ s is true t is true

(23) $m \prec n = s$ | Either m is true or if $(m \prec n) \prec t$ is true t

$x \prec (x \prec y) \prec z \not\prec z$

$[(x \prec y) \prec z] \not\prec x \not\prec y$

~~$x \prec x \prec y \not\prec y$~~

~~From (22) and (23)~~

From (22) and (23) either $(x \prec y) \prec y$ and x are both true or both false or y is true

(24) $m \prec n = s \prec t$ | Either m is true or if m is true, t is true — Nothing

(25) If $m \prec s$ — either ~~m is true~~ $m \prec n$ or if $s \prec t$, t is true

(26) If $m \prec s \prec t$ — either $m \prec n$ or if s is true, t is true

(27) If $(m \prec n) \prec s$ — either m is true or if $s \prec t$, t is true

(28) If $(m \prec n) \prec s \prec t$ — either m is true or if s is true, t is true

From (25) (29) If $m \prec s$ and $s \prec (m \prec n)$ then $(m \prec n)$ [If $m \prec s$ then $(s \prec m \prec n) \prec m \prec n$; If $s \prec m \prec n$ then $(m \prec s) \prec m \prec n$]

(30) From (26) If $m \prec s \prec m \prec n$ if s is true $m \prec n$ is true [whence by B if $m \prec s \prec m \prec n$ then $s \prec m \prec n$; If s is true $(m \prec s \prec m \prec n) \prec m \prec n$]

(31) From (27) If $(m \prec n) \prec s$ if $s \prec m$ then m is true [If $(m \prec n) \prec s$ then $(s \prec m) \prec m$; If $s \prec m$ then $[(m \prec n) \prec s] \prec m$]

(32) From 28) If $(m \prec n) \prec s \prec m$ if s is true m is true If $(m \prec n) \prec s \prec m$ then $s \prec m$

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I am much inclined to think that the key of the subject is these four theorems

$(m \prec s) \prec (s \prec m \prec n) \prec m \prec n$ $\qquad$ $m\bar{s} + sm\bar{n} + \bar{m} + n$

$(m \prec s \prec m \prec n) \prec s \prec m \prec n$ $\qquad$ $msm\bar{n} + \bar{s} + \bar{m} + n$

$[(m \prec n) \prec s] \prec (s \prec m) \prec m$ $\qquad$ $(\bar{m} + n)\bar{s} + s\bar{m} + m$

$[(t \prec n) \prec s \prec t] \prec s \prec t$ $\qquad$ $(\bar{t} + n)s\bar{t} + \bar{s} + t$

$(\bar{m} + s)(\bar{s} + \bar{m} + n) \prec \bar{m} + n$

$(\bar{m} + \bar{s} + \bar{m} + n) \prec \bar{s} + \bar{m} + \bar{n}$

$m\bar{n} + s \prec s\bar{m} + m$

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From A, B, C

From (25) Either $m \prec n$ or if $m \prec s$ and $s \prec t$, then t

(33) $(m \prec s) \prec (s \prec m \prec n) \prec m \prec n$

(34) $(s \prec m \prec n) \prec (m \prec s) \prec m \prec n$

From (26) Either $m \prec n$ if $m \prec s \prec t$ and s, then t

(35) $(m \prec s \prec m \prec n) \prec s \prec m \prec n$

(36) $s \prec (m \prec s \prec m \prec n) \prec m \prec n$

From (27) Either m or if $(m \prec n) \prec s$ and $s \prec t$ then t

(37) $[(m \prec n) \prec s] \prec (s \prec m) \prec m$ $\left(\begin{matrix} m\bar{n} + s \\ \bar{s} + m \end{matrix}\right.$

(38) $(s \prec m) \prec [(m \prec n) \prec s] \prec m$

~~From (28)~~

(39) $\{[(s \prec t) \prec t] \prec n\} \prec s \prec (s \prec t) \prec t$

(40) $(s \prec t) \prec \{[(s \prec t) \prec t] \prec n\} \prec s \prec t$

From (28) Either m or if $(m \prec n) \prec s \prec t$ and s then t

(41) $[(t \prec n) \prec s \prec t] \prec s \prec t$

(42) $s \prec [(t \prec n) \prec s \prec t] \prec t$

(43) $\{[(s \prec t) \prec n] \prec s \prec t\} \prec s \prec t$ ~~$(\bar{x} + n)\bar{x} + x$~~

$[(x \prec n) \prec x] \prec x$

(33) would give the Barbara formula if $(s \prec m) \prec (s \prec m \prec n)$
Unfortunately so far no way of doing this is apparent

(34) Deiterates but unfortunately leaves the wrong m

(37) might be made use of it concludes $(s \prec m) \prec m$ i.e. $s + m$

It is on the whole surprising how impossible it seems to get anything out of these formulae

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That if $p \prec q \prec r$ then $q \prec p \prec r$
is proved as follows

By (17) Either p or $q \prec p \prec r$

By C If p then $q \prec r$

But by C if $q \prec r$ then if q then r whence by B $p \prec r$ and $q \prec p \prec r$

But by A either q or $q \prec p \prec r$

Probable the best way is one of these

1st ~~If~~ By C If p and $p \prec q \prec r$ then if p, $q \prec r$

By C If q and $q \prec r$ then r

$\therefore$ If p and q and $p \prec q \prec r$, then r whence by B $p \prec r$ and $q \prec p \prec r$

By A But either q or $q \prec p \prec r$

By A either p or $p \prec r$ whence by B $q \prec p \prec r$

This involves the theorem

If p and q and ~~$q \prec p \prec r$~~ r

then ~~If~~ $q \prec p \prec r$

2nd If $p \prec q \prec r$

Either p or $q \prec p \prec r$ by (17)

If p then $q \prec r$

Now either q or $q \prec p \prec r$

But if q then r whence $p \prec r$ and $q \prec p \prec r$

This must be the same as at the top of page 15

From (10) with A & B If $s \prec t$ and $t \prec u$ then $s \prec u$

$\therefore$ also If $s \prec t$ $(t \prec u) \prec (s \prec u)$

If $t \prec u$ $(s \prec t) \prec (s \prec u)$

~~If $(s \prec t) \prec p$ $t \prec u$~~

~~$s \prec u$~~

$(s \prec t \prec p) \prec q$

$(s \prec u \prec p) \prec q$

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The ultimate consequent must be identical with some oddly antecedental term

If that oddly antecedental term has an antecedent, either that antecedent must be capable of being written by itself as in

$[(a \prec a) \prec b] \prec b$

~~or it must be the whole~~ ~~or the whole~~ ~~it must be possible to write by itself~~ ~~that antecedental with its antecedent as its consequent as in~~

$[(a \prec b) \prec a] \prec b$

or substituting the ultimate consequent of the consequence for the ultimate consequent of that antecedent of the oddly antecedental term

$(a \prec a)$

$a \prec b \prec b$

$a \prec b \prec a$

$a \prec b \prec c \prec a$

$a \prec b \prec c \prec b$

$a \prec b \prec c \prec c$

$(a \prec b) \prec c \prec c$

$(a \prec b) \prec a \prec b$

$a \prec (b \prec c) \prec a$

$a \prec (a \prec b) \prec b$ $\quad ab\bar{c}+d$

$[(a \prec a) \prec b] \prec b$ $\quad (\bar{a}+b)\bar{c}+d$

$[(a \prec b) \prec a] \prec a$

$a \prec b \prec c \prec d \prec a$

$a \prec b \prec c \prec d \prec b$

$a \prec b \prec c \prec d \prec c$

$a \prec b \prec c \prec d \prec d$

3 times

$(a \prec b) \prec c \prec d \prec c$ $\quad a\bar{b}+\bar{c}+d+e$

$(a \prec b) \prec c \prec d \prec d$

$(a \prec b) \prec a \prec c \prec b$

$(a \prec b) \prec c \prec a \prec b$

Twice

$(a \prec b \prec c) \prec d \prec d$ $\quad a\bar{b}+c\bar{d}+e$

$(a \prec a \prec b) \prec a \prec b$ $\quad ab\bar{c}+d+e$

$[(a \prec b) \prec c] \prec d \prec d$ $\quad (a+\bar{b})\bar{c}+\bar{d}+e$

$[(a \prec b) \prec b] \prec c \prec b$

$[(a \prec a) \prec b] \prec c \prec b$ $\quad abc\bar{d}+e$

$(\bar{a}+\bar{b})c\bar{d}+e$

~~$(a \prec b \prec c) \prec$~~

$[(a \prec b \prec c) \prec d] \prec a$ $\quad (\bar{a}+\bar{b}+c)\bar{d}+e$

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The algebra of the copula should be presented merely in the form of propositions which may be written

$a \prec a$

$a \prec b \prec a$ — Arrangement of antecedentals indifferent

$b \prec a \prec a$ — Any thing that can be written may be consequent

$[(a \prec a) \prec b] \prec b$

~~$(a \prec a)$~~

$(a \prec a \prec b) \prec a \prec b$ — ~~Anything may be written where consequent~~

Possible forms

$a \prec b \prec c$ $\qquad ab \nprec c$

$(a \prec b) \prec c$

$a \prec b \prec c \prec d$ $\qquad ab \nprec \bar{c} \nprec d$

$(a \prec b) \prec c \prec d$

$a \prec (b \prec c) \prec d$

$(a \prec b \prec c) \prec d$

$[(a \prec b) \prec c] \prec d$ $\qquad (\bar{a}+b)\bar{c} \nprec d$

$\cancel{\bar{a}\bar{c}+b\bar{c} \nprec d}$

$a \cancel{\prec} b \prec c \cancel{\prec} d \cancel{\prec} e$

$(a \prec b) \prec c \prec d \prec e$ $\qquad a\bar{b} \nprec \bar{c} \nprec \bar{d} \nprec e$

$\cancel{(a \prec b) \prec a \prec b}$ $\qquad a\bar{b} \nprec c\bar{d} \nprec e$

$(a \prec b) \prec (a \prec d) \prec e$ $\qquad ab\bar{c} \nprec \bar{d} \nprec e$

$(a \prec b \prec c) \prec d \prec e$ $\qquad (\bar{a}+b)\bar{c} \nprec \bar{d} \nprec e$

$[(a \prec b) \prec c] \prec d \prec e$

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A consequence may be written

1st If the ultimate consequent is identical with a first antecedental which has no antecedent that cannot be written by itself; as

$$b \prec a \prec a$$

or $c \prec [(a \prec a) \prec b] \prec b$

2nd If every first antecedental of that antecedental ~~being itself antecedent is capable by itself~~ is itself a first antecedental without an antecedent not capable of being written by itself; as

$$g \prec (f \prec e \prec d) \prec [(c \prec c) \prec f] \prec e \prec d$$

$$\Big(\Big\{\Big[(\bar{a}+\bar{b}+c)(\bar{d}+\bar{e}+f)\,g\,\bar{h}+\bar{i}+j\Big]\,k\,\bar{l}+\bar{m}+n\Big\}\,o\,\bar{p}+\bar{q}+r\Big)\,(\bar{s}+\bar{t})\,u\,\bar{v}+\bar{w}+x$$

Prime factors

$$\Big[\Big(\Big[\Big(\Big[\Big(\Big[(a \prec b \prec c) \prec (d \prec e \prec f) \prec g \prec h\Big] \prec i \prec j\Big) \prec k \prec l\Big] \prec m \prec n\Big) \prec o \prec p\Big] \prec q \prec r\Big) \prec (s \prec t) \prec u \prec v \prec w \prec x$$

$x+\bar{w}+\bar{v}$

$x+\bar{w}+u$

$x+\bar{w}+t+s$

$x+\bar{w}+r+q+p$

$x+\bar{w}+r+q+o$

$x+\bar{w}+r+q+n+m+l$

$x+\bar{w}+r+q+n+m+k$

$x+\bar{w}+r+q+n+m+j+i+h$

$+g$

$+f+e+d$

$+c+b+a$

$v \prec w \prec x$

$(u \prec x) \prec w \prec x$

$s \prec (t \prec x) \prec w \prec x$

$p \prec q \prec (r \prec x) \prec w \prec x$

$(o \prec x) \prec q \prec (r \prec x) \prec w \prec x$

$l \prec m \prec (n \prec x) \prec q \prec (r \prec x) \prec w \prec x$

$(\alpha \prec \beta) \prec (\gamma \prec \delta) \prec i$

$(\alpha \prec \beta \prec \gamma) \prec (\delta \prec \varepsilon \prec \zeta) \prec \eta \prec \theta \prec i$

$\beta+\delta+\bar{\eta}+\bar{\theta}+i$

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$$\{[(\bar{a}+\bar{b}+c)(\bar{d}+\bar{e}+f)\bar{g}+(\bar{h}+\bar{i}+j)\bar{k}\}+l]$$
$$[(\bar{m}+\bar{n}+o)(\bar{p}+\bar{q}+r)\bar{s}+(\bar{s}+\bar{t}+u)\bar{v}+w]\bar{x}+y\}\bar{z}+\&$$

1st The ultimate consequent must be identical with a 1st antecedental

~~Each second antecedental must be identical~~

2nd Unless the ultimate consequent is identical with a solitary 1st antecedental, each 1st antecedental of some 1st antecedental with which the ultimate consequent is identical must be identical with a solitary 1st antecedental ~~or with a first antecedental of its own~~ or else it is subject to the same conditions as the ultimate consequent

or else some solitary first antecedental of that antecedental of an antecedental is identical with the last named

$$\{[(\alpha+\beta+\gamma)+\delta+\varepsilon]+\zeta\}+\eta+\theta+\iota$$

$$(\bar{\alpha}+\bar{\beta}+\gamma)\delta\bar{\varepsilon}+\zeta+\eta$$

$$\theta+\bar{\eta}+\bar{\zeta}+\bar{\varepsilon}+\delta$$

$$\theta+\bar{\eta}+\varepsilon+\bar{\delta}+\alpha$$

$$\theta+\bar{\eta}+\varepsilon+\bar{\delta}+\beta$$

$$\theta+\bar{\eta}+\varepsilon+\bar{\delta}+\bar{\alpha}$$

$$\varepsilon+\bar{\beta}+\bar{\alpha}+\varepsilon(\beta+\bar{\gamma}+\bar{\beta}+\bar{\gamma})$$

$$\{[(\alpha+\beta+\gamma)+\varepsilon]+\alpha+\beta+\varepsilon$$

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$a \prec b(c +$

$a + \bar{b}a$

$a \prec b$

$(a \prec b) \prec c \prec d = \begin{cases} \cancel{(a \prec b)} \\ b \prec c \prec d \\ (a \prec b) \prec c \prec d \end{cases}$

$(a \prec b \prec c) \prec (d \prec e) \prec f \begin{cases} c \prec e \prec f \\ c \prec (d \prec f) \prec f \\ (b \prec f) \prec e \prec f \\ (b \prec f) \prec (d \prec f) \prec f \\ (a \prec f) \prec e \prec f \\ (a \prec f) \prec (d \prec f) \prec f \end{cases}$

$[(a \prec b \prec c) \prec d \prec e] \prec f \prec g$

$(\bar{a} + \bar{b} + c) d \bar{e} + \bar{f} + g$

$\bar{a} + \bar{b} + c + \bar{f} + g$

$e \prec f \prec g$

$(d \prec f) \prec f \prec g$

$a \prec b \prec (c \prec g) \prec f \prec g$

$(\bar{f} + \bar{e} + d)\bar{c} + \bar{b} + a$

$[(f \prec e \prec \delta) \prec c] \prec b \prec a$

$[([b \prec c] \prec [d \prec e]) \prec f) \prec [([g \prec h] \prec [i \prec j]) \prec k] \prec l] \prec m$ c * b * a

$(d\bar{c} + d\bar{e} + f)(\bar{g}\bar{h} + \bar{i}\bar{j} * k)\bar{l} + m$ $f \prec e \prec (\delta \prec a) \prec b \prec a$

~~Form every consequence which can be formed by replacing every~~

~~Begin with the~~ innermost evenly enclosed partial consequence, T, by a consequence

~~Write under each of those a consequence~~ ~~T every~~

having the same ultimate consequent and for its antecedentals all the first antecedentals of T

or with any or all of those antecedentals replaced

by a simple consequence having for its ~~consequent~~ antecedent an antecedental of that antecedental of T which it replaces and for its consequent ~~the consequent of T~~

DEC 19 1901 DEC 19 1901

I will now apply the rules on the last ~~pight~~ right hand page ~~to~~ getting all the essentially different cases

$b \prec a \prec a$ (Including $a \prec a$ and $a \prec b \prec a$)

$a + \bar{b} + \bar{c} + \bar{a}bc$

$(c \prec b \prec a) \prec c \prec b \prec a$

$a + \bar{b} + \bar{a}b$

$c \prec (a \prec b) \prec a \prec b$ [Reduces to $a \prec a$

~~and~~ $[(d \prec c) \prec b] \prec a$ ~~$d \prec (c \prec b) \prec a$~~

~~$a + \bar{b} + c$~~ ~~$c \prec a \prec b$~~ $a + \bar{b}(c + \bar{d})$ ∴ ~~$a + \bar{b}c + \bar{d}$~~

$\underset{0}{a} + \underset{1}{\bar{a}}(\underset{2}{c} + \underset{3}{\bar{c}})$

$a + [(b \prec b) \prec c] \prec c$ The simplest case is $[(b \prec b) \prec c] \prec c$

$\underset{0}{a} + \underset{1}{\bar{a}}(\underset{2}{b} + \underset{3}{\bar{a}} + \underset{3}{\bar{c}}) + \bar{d}$

$d + [(c \prec a \prec b) \prec a] \prec a$ The simplest case is $[(a \prec b) \prec a] \prec a$

$a + \bar{b} + \bar{a}(c + \bar{a} \cdot b)$

$\{[(b \prec a) \prec c] \prec a\} \prec b \prec a$

The best way is to ~~get~~ make a ~~the~~ resolution into prime factors

~~Strike out all but the consequent and its first antecedentals. Call this~~ T_1

~~In T_1 for each antecedental~~ Start with consequence T

Form ~~all the~~ every consequence having the same ultimate consequent, c, as T, and having all the prior antecedentals of T as its only antecedentals, or which can be produced by replacing any or all those antecedentals, by a consequence having, c, for its consequent and for its antecedent

$$\overline{(p \prec q)} \prec \prod_m (m \prec p) \cdot (m \prec \bar{q})$$

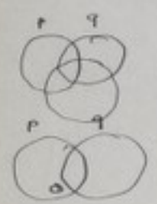
This doesn't follow

$$\prod_m \left\{ (\overline{m \prec p}) + (\overline{m \prec \bar{q}}) \right\} \prec (p \prec q)$$

But what follows is

$$\prod_m \left\{ (m \prec p) + \overline{m \prec \bar{q}} \right\}$$

Either ~~nothing~~ from anything x
$x \prec q$
or there is something m
$m \prec \bar{q}$
$m \not\prec 0$



The principle is that if
$\overline{p \prec q}$
there must be something m such that
$m \prec p$
$m \prec \bar{q}$
$m \not\prec 0$

The principle is that if whatever m may be
~~such that~~ $m \prec$ ~~(a+b)~~ p
And if $p \prec q$

That is if
$(p \prec q) \prec x$
then there is something m such that
$m \prec p$
$m \prec (q \prec y)$
That is if whatever be z
$(z \prec p) \prec u$
or $(z \prec q \prec y) \prec v$
then $p \prec q$

For
$p \prec q$
is true if whatever ~~about~~ term m you take such that
$m \prec p$
$m \not\prec 0$
$m \prec q$
and if $m \not\prec 0$
$\overline{m \prec \bar{q}}$

For if $m \prec q$
$m \prec (q \prec x)$
then $m \prec x$

1902 Jan 31

I record here the "tedious" proof of the distributive principle which I omitted Am. J. Math. III. 33, and which requires a premiss I called D lay down

~~$a \prec b+c$~~
~~$a \prec c$~~
$a \cdot c \prec c$
$b \cdot c \prec c$
$\therefore\ a \cdot c + b \cdot c \prec c$
$a \cdot c \prec a \prec a+b$
$b \cdot c \prec b \prec a+b$
$\therefore\ a \cdot c + b \cdot c \prec a+b$
$\therefore\ a \cdot c + b \cdot c \prec (a+b) \cdot c$

Now if $\overline{(a+b) \cdot c \prec a + b \cdot c}$
then there must be something m such that
$m \prec (a+b) \cdot c$
and $m \prec \overline{a + b \cdot c}$
From the first it follows that
$m \prec a+b$
$m \prec c$
From the second
$a + b \cdot c \prec \bar{m}$
whence $a \prec \bar{m}$ i.e. $m \prec \bar{a}$
$b \cdot c \prec \bar{m}$
i.e. $m \prec \overline{b \cdot c}$
whence either $\overline{m \prec c}$ which is contrary to above
or (whatever are forced to)
$\overline{m \prec b}$

Unless, indeed, $m = 0$ when $m \prec b$, $m \prec c$, $m \prec b \cdot c$

Now if $\overline{m \prec b}$ there must be something, l, such that
$l \prec m$ $l \prec \bar{b}$ i.e. $b \prec \bar{l}$
whence since $m \prec \bar{a}$ $l \prec \bar{a}$ i.e. $a \prec \bar{l}$
$\therefore\ a + b \prec \bar{l}$ i.e. $l \prec \overline{a+b}$
But since $l \prec m$ and $m \prec a+b$ $l \prec a+b$
Thus the idea that ~~$(a+b) \cdot c \prec a + b \cdot c$~~ is reduced to absurdity

We have $\overline{(a+b) \cdot c \prec a + b \cdot c}$
whence $c \cdot (a+b) \prec (b+a) \cdot c \prec a \cdot c + b \cdot c$
and $(a+b) \cdot c \prec c \cdot (a+b) \cdot c$ we have $(a+b) \cdot c =$
and since we found

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MAR 19 1902

A general is whatever there may be of ~~a kind~~ any given description

One has to come back to the dictum de omni

To say that something is true of a general is to say that it is true of whatever that general is true.

Take the general "massive" to say

All massive is Q

is simply ~~to say~~

If P is massive, then P is Q

Thus the transitive relation is implied in the very idea of a general.

~~"All massive is Q" = There is a relation r such that whatever there may be that is r to a something massive object is r to a Q. But will there not always be some relation r such that everything is non-r to whatever there may be that is massive?~~

We ~~must~~ may generalize (superficially) this and say that

Any "massive thing" there may be is Q

means precisely, that whatever relation r may be and whatever object P may be

If P is r to something massive, then P is r to a Q

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I think on the whole that the definition is sufficiently limited for the definitum had better be regarded as a hypothesis obtained by abduction and a matter always to be tried.

MAR 20 1902

The analytic definition is where we imagine things of which the definitum is predicate.

~~A, B, C, are definitum~~

~~A, B, C, are definition~~

Let X be the definitum P, Q, R the items of the definition

~~Then that~~ We also have A, B, C, etc subjects to which the definitum is predicate. We see that

A, B, C are all P, Q, R.

Definition is P, Q, R

A, B, C are definitum

∴ (By analogy) Definition is the definitum

Definition

While

A, B, C, are samples of definitum X

A, B, C are found to be P, Q, R

∴ Definitum X is P, Q, R by induction.

The argument that the definition applies universally to the definitum ~~induction~~ is simple induction.

The argument that the definition is sufficiently limited to make the definitum apply to it is simple ~~abduction~~ abducting induction

The definitum has as sample characters π, ρ, σ.

But the definition is found to have these characters π, ρ, σ

∴ (By ~~abductive~~ induction) The definition is the definitum

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MAR 20 1902

Now I do not quite like my definition of a General. I have not sufficiently distinguished between a General and a Collection. A Collection consists of Individuals, or rather of whatever individuals of a certain kind actually exist. If there are no such individuals, still the collection has a mode of being. A general is something capable of determination, and having none the more being ~~A~~ or reality that individuals corresponding to it exist. Future time is just as real as past time.

I must define in terms of my three categories. Quality. Reaction. Representation. or that which is ~~the~~ in itself what it is. That ~~which~~ whose mode of being consists in its being a member of a pair. That whose mode of being consists in its being the limit of an endless series.

MAR 21 1902

The ~~relation~~ form of relation by which A determines B and not reciprocally that B determines A seems to involve four objects and therefore ~~is~~ to be triadic. Is this true? Here is a very important question. I believe it is not true.

Here are A and B acting and reacting. There is the action of A on B and the action of B on A. These are two different actions and there are two different resistances. They are different and therefore we may consider one ~~abstracted~~ prescinded from the other. This seems to be done by virtue of the first category. But of this I am not quite sure. The type of the second category is in the sense of effort. A sense of effort is at the

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same time a sense of resistance; and is a sense that the effort is one thing the resistance another. And different qualities of feeling are connected with the two.

If the resulting motion ~~ch~~ is chiefly of A, then we ordinarily say that B acts on A and vice versa. So muscular effort and peripheral sensation (quite a different thing from the quality of feeling ~~as~~ the latter is in itself being an event not a state) differ only in degree. When we see something, there is a slight kick, as we now know, against ~~of~~ the object seen, when we perform a motion, there must be a slight sensation.

A mere general idea, considered merely as apprehended and as passive, will probably belong under the third category. But it will be clothed in the form of the first category, its other elements being in the back ground.

A general idea, as it really lives, — say for example the Truth or the idea of Right & Wrong, — is a power in the world. Any thing of the third category has this sort of power as its true mode of being. It is so even when this character is forgotten or overlooked & it is considered merely as a passive idea. But to regard an idea as a power in the world

is not to regard it ~~from~~ in its highest function. It is to look upon it from the standpoint of the second category. In its own higher way, it is more than merely a living thing, it is significant; that is, is creative of living mind.

There is what the General is. It is not any more real when it signifies than it was before. But it must be true or it is no General; and if it is true it is bound to create the living mind, & that, you may say, constitutes its being. Still that, if true, is only a metaphysical philosopheme not a definition.

Now what is a collection? Take for example the entire collection of gold rings. It is a single individual. There is absolutely only one collection of whatever gold rings there may be, although it is described in general terms, and although it has its being just the same whether it happens that there actually ~~are~~ exist any gold rings or not. At the same time, if there are no gold rings and there are no phoenixes, the entire collection of all gold rings is absolutely identical with the collection of all phoenixes, although the General used to describe them ~~are~~ different

Take lovers of whatever gold rings there may be.

These also remain ~~just the~~ whether there are any gold rings or not. But they are, or may be many; and are likely to be more numerous the more gold rings there are. Indeed if there are no gold rings, everything is a lover of all gold rings. So if "including," as a possible determination be ~~an ordinary~~ a relation in the proper sense, then what includes all gold rings is everything, if there are no gold rings.

But the entire collection of gold rings not only includes whatever gold ring there may be, but it ~~non~~ includes only gold rings; that is, it not only does not exclude a gold ring but it does not include a non gold ring.

Now is a lover of whatever gold ring there may be who also loves gold rings only ~~in~~ if and only if

$$\Pi_j (l_{ij} + \bar{g}_j) \cdot \Pi_k (\bar{l}_{ik} + g_k)$$

i.e $$\Pi_j (l_{ij} \cdot g_j + \bar{l}_{ij} \cdot \bar{g}_j)$$

So now we come to something. A collection is an ens rationis, or abstraction, and like other such, when the general upon which it depends is freed from all vagueness, it becomes individual. But it differs from

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other abstractions in having a double mode of being. In its essence it depends only on the general; in its existence it depends only on the singulars

MAR 23 1902

There are three things to be studied:

1st, The collections which exclude everything but gold rings

2nd, The collections which include all gold rings

3rd, The single collection which includes all gold rings and excludes all else.

There may be many individuals who have seen or love all gold rings and nothing besides. There can at most be one who owns all gold rings, whether Burns anything else or not. But this is simply because the same gold ring cannot be owned by two different persons. It may, however, belong to multitudinous collections.

There is the peculiarity of this relation of including. It is not an ownership, or relation where each object is correlate to one relate at most. But

1st, if two collections (i.e. ~~lies~~ individual includers) are not identical, one includes some~~thing~~ the other does not.

2nd, given any general predicate, P there is a collection which includes ~~every~~ whatever there may be that is P and ~~P and excludes~~ ~~excludes if anything whatever~~ includes, if anything, only what is P.

It follows as a ~~co~~corollary that if C_1 and C_2 are

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collections, there is a collection, C_3, such that whatever is included under C_3 is either included under C_1 or is included under C_2 and whatever is included under C_1 is included under C_3 and whatever is included under C_2 is included under C_3. For this is a predicate.

Also, putting $\underline{i}$ for includes, there is a collection C_4 such that

$$\breve{i}C_4 \prec \breve{i}C_1 \quad \breve{i}C_4 \prec \breve{i}C_2$$

$$\breve{i}C_1 : \breve{i}C_2 \prec \breve{i}C_4$$

Thus it seems that a <u>collection</u> is just like say a crystal or a gold ring or any other individual thing except that it is ~~exists~~ ~~exists~~, not as ~~an~~ ~~other~~ a first substance, but by virtue of any predicate. It does not exist by virtue of its members; since it is a collection, even if it has no members, provided any predicate describes it. But still, when it once does exist, its identity is determined by its members. Thus, the predicate which defines it gives it <u>Being</u>; and then the members give it <u>Existence</u>.

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Let us consider the collection of all gold rings. It is a definite collection. Now suppose one of the rings is melted down into a button. The the collection of all the gold rings that did exist before is destroyed; or rather, it is now no longer a collection of gold rings but of all the gold rings that formerly existed together with whatever objects ~~any~~ of them have since been converted into. Perhaps one of them has been converted from a gold ring into a <u>collection</u> of beads.

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Every subject is either singular, general, or indefinite.

We assume that every fact with an indefinite subject ~~may be~~ is equivalent to some fact with a general subject.

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MAR 24 1902

Theory of collections

We start with perceptual facts.
~~What we start with are~~ These have general predicates.
each of which allows an object to be determined to have it or not have it.
~~Facts also have~~ subjects which are ~~We also have~~ singulars. I define a singular as something which is ~~individual~~ definite so that the principle of contradiction applies to it, and is individual, so that the principle of excluded middle applies to it.
That is, if S is a singular, and P a predicate,

S is either P or not P
and S is not both P and not P.

We further suppose ~~singul~~ our singulars to be independent.
That is, the ~~existence~~ any one can exist whether any other exists or not.
I further suppose they are first substances. That is, there is not anything else in which their ~~existence~~ being consists.
By an abstraction I mean ~~something~~ a singular whose being consists in the possibility of some fact, ~~but~~ that is in the possibility that a ~~certain~~ subject should have a given predicate.

Take any general predicate say being a gold ring.
A collection, ~~is an~~ say the collection of gold rings, is determined to be by the mere possibility that there should be gold rings. But what it is depends on what ~~is a~~ singular gold ring. There is, in any case, one collection of ~~[illegible]~~ whatever gold rings there may be, and only one.

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and so have singulars. Otherwise they could not be distinguished.

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Suppose A ~~loves~~ is loved by whatever ~~is loved by~~ loves B

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That fact is otherwise phrased by saying that the collec

lovers of A includes the collection of lovers of B

Suppose then that every lover of B strikes D

and suppose C is struck by every striker of D

Then the collection of strikers

$\therefore$

$0! = 1$

$1! = 1$

$2! = 2$

$3! = 6$

$4! = 24$

$5!$

$2^{-1} = \frac{1}{2}$

$2^0 = 1$

$2^1 = 2$

$2^2 =$

$\sqrt{2}^0 = 1$

$\sqrt{2}^1 = 1.414$

$\sqrt{2}^2 = 2$

$2^x = x$

$\sqrt{2} = x^{\frac{1}{x}}$

$x \log 2 = \log x$

$\sqrt{2} = 4^{\frac{1}{4}}$

$4)\ 1.3863$
$\quad 346$

2.3026
1.3863
$\log 2 \quad 0.9163$
$.36592$

σ^{ax}

$D\sigma^{ax} = a\sigma^{ax}$

$D^2 = a^2\sigma^{ax}$

$\sqrt{2} = \sigma^a$

$\frac{\log x}{x} \quad -1.386$

$\sigma^x = x$

$\frac{5}{2}\ \frac{8}{3}\ \frac{3}{1}$

$.70$

$\sigma^{.35}$

0.000
0.347
0.366
0.347
$.329$

$.366$
$.368$

2.0794
1.0986
$\log 3 \quad 0.9808$
$.3678$

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Suppose A is loved by every lover of B

i.e. every lover of B is a lover of A

We say the collection of lovers of B ~~includes~~ is included by every lover of A

or ~~every to~~ the collection of lovers of A includes every lover of B

Suppose C is struck by every lover of A

Then C is struck by every lover of B

The collection of strikers of C includes the collection of lovers of B.

Inclusion is the fundamental relation which is essential to the idea of a collection.

Every collection includes its singulars.

Given two collections, the Ps and the Qs if there is no relation, ξ, such that every P is ξ to a Q to which no other P is ξ, then the collection of Ps is greater, or more multitudinous than the collection of Qs.

Now we assume that the members of every collection whatsoever has ~~so found~~ an essential predicate common and peculiar to them.

And that ~~the aggregate of every~~ to every predicate whether simple, aggregated, or compounded, ~~there~~ is the defining essence of a collection. But in existence that collection may coincide with a collection otherwise defined.

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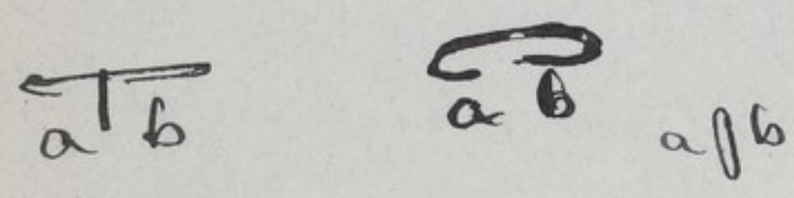

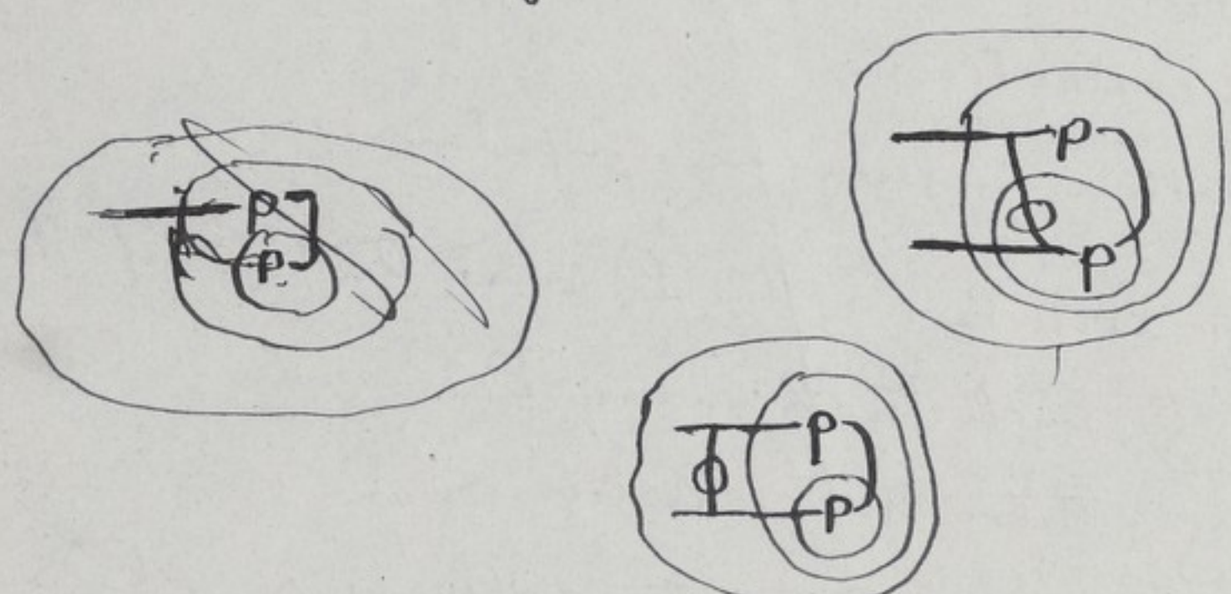

If there were a character that was applicable to all possible objects, there would be a collection of all possible objects and consequently a maximum multitude. All possible objects must form a continuum. Being is not a character.

But it is not only characters of second intention but also other desired characters which must be excepted.

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The doctrine of substantive possibility laid down in my article of Jan 1897 is certainly correct.

If i refers to a universe of substances, a proposition of the form

$$\sum_i m_i$$

is possible, unless its impossibility appears by some contradiction. [It cannot if so expressed offend against the principle of excluded middle.]

The same is true of a proposition of the form $\sum_i \sum_j l_{ij}$

Consequently all propositions of the forms $\prod_i m_i$ and $\prod_i \prod_j l_{ij}$ are impossible unless their denials involve contradiction.

But for the reason there explained propositions of the form $\prod_i \sum_j l_{ij}$ are possible unless they involve contradiction, and consequently propositions of the form $\sum_i \prod_j l_{ij}$ are impossible unless their denials involve contradiction.

As to non-relative characters the matter is not so clear. If p means possessing as a character by, are we to say that

$$\sum_\alpha \prod_i p_{\alpha i}$$

is possible? There is no contradiction involved; yet I am inclined to think that

$$\prod_\alpha \sum_i \bar{p}_{\alpha i}$$

is the truth. Certainly everyone would agree that

$$\prod_\alpha \sum_i p_{\alpha i}$$

is true and

$$\sum_\alpha \prod_i \bar{p}_{\alpha i}$$

is quite ridiculous, although there is no contradiction at all. But

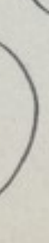
$$\prod_i \prod_j \sum_\alpha p_{\alpha i} \cdot (\bar{p}_{\alpha j} + l_{ij})$$

or shall we write?

$$\prod_i \prod_j \sum_\alpha p_{\alpha i} \cdot \bar{p}_{\alpha j} + l_{ij}$$

or even

$$\prod_i \sum_\alpha \prod_j p_{\alpha i} \cdot (\bar{p}_{\alpha j} + l_{ij})$$



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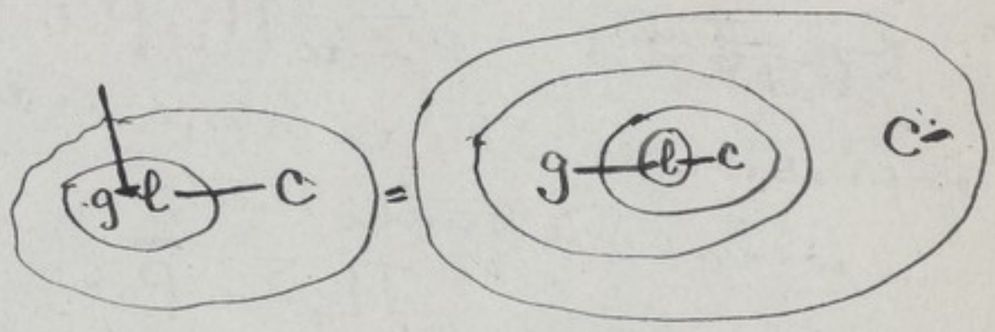

ℓ_{ij}

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We must acknowledge that the general doctrine is correct. There is nothing exceptional about strictly non-relative characters of first intention.

alter

But in regard to relations the case seems to be otherwise. Shall we not say

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$$\Sigma_g \Pi_i \Pi_j r_{gij} \quad ?$$

No nothing but a relation of second intention. Second intentions must be studied separately.

But are we not to say

$$\Pi_i \Sigma_g \Pi_j r_{gij} \quad ?$$

Or shall we say $\Sigma_i \Pi_g \Sigma_j r_{gij}$

Are we not to say

$$\Sigma_g \Pi_i \bar{r}_{gii} \quad ?$$

It seems ridiculous to say that this is impossible. Yet if we admit it why does not this constitute a character. Let the relation be that of self-generation. Is not self-generation a character? Again if we admit this as possible (I mean $\Sigma_g \Pi_i \bar{r}_{gii}$) then we must say that $\Pi_g \Sigma_i r_{gii}$ is impossible.

It appears that one non relative index does not count after an index of relation

$$\Sigma_i \Pi_j \Sigma_k \Pi_g \Sigma_\alpha \Sigma_\beta \quad p_{\alpha i} r_{gij} + p_{\beta k} \bar{r}_{gjk}$$

$$\Pi_i \Pi_j \Pi_g \Sigma_\alpha \Sigma_\beta \quad \bar{p}_{\alpha i} + r_{gij} + \bar{p}_{\beta j}$$

It is evident that the form of the Boolian has something to do with it.

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Now here about characters of characters? 212r

Let $\vdots$ be an indeterminate and use $\overline{w}$ to mean possessing such a char

$$\cancel{\Pi_\alpha \Pi_i \Sigma_{\vdots} \rho_{\alpha i} + \rho_{\vdots\alpha}}$$

$$\cancel{\Pi_\alpha \Pi_\beta \Sigma_i \Sigma_j \Pi_{\vdots} \rho_{\alpha i} \cdot \rho_{\beta i} \cdot \overline{\rho}_{\alpha j} \cdot \overline{\rho}_{\beta j} + \overline{w}_{\vdots\alpha} \overline{w}_{\vdots\beta} + \overline{\overline{w}}_{\vdots\alpha} \overline{\overline{w}}_{\vdots\beta}}$$

$$\Pi_\alpha \Pi_\beta \Sigma_i \Sigma_j \Pi_{\vdots} \rho_{\alpha i} \cdot \rho_{\beta i} + \overline{\rho}_{\alpha j} \cdot \overline{\rho}_{\beta j} + \overline{\overline{w}}_{\vdots\alpha} + \overline{\overline{w}}_{\vdots\beta}$$

221B

$$\Pi_\alpha \Pi_\beta \Sigma_\gamma \Pi_i \Pi_j \Pi_k \Sigma_l \Sigma$$

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JUL 22 1902

The business of collections enters into mathematics. It is represented in the theory of substantive possibility, and this flows from Categories. Therefore the doctrine of the categories must precede mathematics.

'Flavor' is that which is ~~what~~ as it is regardless of anything else. All that is present has its flavor. ~~It is its~~ All that is collectively ~~is flavor~~ taken in its absolute simplicity is flavor.

All that is is absolutely simple. To pick it to pieces is, from the point of view of flavor, mere aspect. The simplicity is the ~~real~~ ~~underlying subject, and~~ being itself.

So if you take any thing regardless of other things, it is as it is. It is nothing but a peculiar flavor.

This is true of anything though it be a phantom merely. It is flavor.

As long as we recognize nothing but flavor, there can be but one flavor

I would begin by noticing the elements of flavor, reaction, and representation, define them & then proceed as above to study flavor.

1. Flavor is all there is. ~~All else is mere aspects; the flavor is~~ ~~All there is~~ ~~The skill~~ Parts are mere aspects; the simplicity is alone being. This is true even if we have but a phantom. Of every part there is a flavor, and the flavor is what the part is.

2. In so far as there is nothing but flavor, there is but one flavor. And that is no flavor. 3. But ~~allowing~~ recognizing other elements we recognize a peculiar flavor, in ~~any~~ every thing. That there should be different flavors, involves opposition, which is not flavor. Though like anything else it has its flavor.

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Let a, b, c etc be flavors.

Now let us consider <u>reaction</u>. Here we have (A:B)

Take effort. Effort cannot exist without <u>resistance</u>. Action is a fact which can only exist in so far as there is a reaction against it.

Nothing exists except so far as it is opposed to something

And if the two (A:B) exists as a pair, it is only as opposed to something [(A:B):(C:D)]

The pair has its flavor a_{AB}. We can say that object has its flavor $(a_A)_B$ and we can look at the flavor of a_A as b and write b_B.

But this is only representation

Reaction requires that A to be anything must not only be opposed to B, but that its opposition to B should be opposed by an opposition to C

~~A — B — C~~ B — A — C

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Let is take any general term, say ~~animals~~ 'red thing'
That ~~term~~ term 'red thing' is a sign because it will
determine an interpretant icon and because if it
is attached to an index, such as there, and it be said
'There is a red thing'
it will create an expectation that in looking 'there' the
icon, or idea of ~~a~~ red' will find an object agreeing
with it.. If the expectation is fulfilled the thing is true.

A direction for an experiment being followed out
The prediction is either fulfilled or not. There is either
agreement or opposition.

Again, I say, ~~look~~ Here is a nail; there is a magnet.
Bring that nail to that magnet & you will feel a pull.

Or I say Here is a ~~the~~ ribbon. ~~you~~ There you have
your ~~list~~ pattern you want to match. Bring them together and
you will feel their likeness.

~~In~~ these cases attention is called to two things at once.
But attention is not called to this fact that attention is called
to two things at once. I might have said
The nail and magnet constitute a mutually attracting pair.
The pair of pattern and ribbon is a matching pair.
I here say nothing more because everybody knows that
any two things make a pair. They do so simply because
the mode of being of a pair, by the definition of a pair
simply consists in its being possible to represent the two

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as one. Now anything may be represented as one. 225r

To say that A and B are a pair is simply to say that they exist and are opposed in existence.

$$\Pi_i \Pi_j \left\{ p_{ij} = \Sigma_u \Sigma_v \, I_{iu} \cdot I_{jv} \cdot T_{uv} \right\}$$

This is better expressed by writing

$$\Pi_i \Pi_j \Sigma_\alpha \cancel{\Sigma_u \Sigma_v} \left\{ \bar{p}_{\alpha ij} + \bar{O}_i \cdot \bar{O}_j \cdot T_{ij} \right\} \cdot \left\{ O_i + O_j + I_{ij} + p_{\alpha ij} \right\}$$

or more simply

$$\Pi_i \Pi_j \Sigma_\alpha \left\{ \bar{p}_{\alpha ij} + T_{ij} \right\} \cdot \left\{ p_{\alpha ij} + I_{ij} \right\}$$

Therefore $\Sigma_\alpha p_{\alpha ij} = T_{ij}$ or $\Sigma_\alpha p_\alpha = T$

Consequently since $T_{ij} = T_{ji}$

it follows that $p_{\alpha ij} = p_{\alpha ji}$ (?) [No only $\Sigma_\alpha p_{\alpha ij} = \Sigma_\alpha p_{\alpha ji}$]

The <u>couple</u> of logic is a different idea.

Here $C_{\alpha ij}$ and $C_{\alpha ji}$

are different propositions but

$\Sigma_\alpha C_{\alpha ij}$ does not assert anything whatever since

$$\Pi_i \Pi_j \Sigma_\alpha C_{\alpha ij} \text{ is always true.}$$

To say that i and j ~~and~~ form a pair and k and l another quite different pair is to say, using $e_{\alpha\beta}$ to mean that α and β are mutually exclusive pairs.

$$\cancel{\Sigma_\alpha \Sigma_\beta \; \Pi_i \Pi_j \Pi_k \Pi_l \Sigma_\alpha \Sigma_\beta \left\{ \bar{p}_{\alpha ij} + \bar{p}_{\beta kl} + \bar{e}_{\alpha\beta} + \right.}$$

$$T_{ij} + T_{kl} \cdot T_{ik} \cdot T_{jl} \cdot T_{il} \cdot T_{jk}$$

$$= \Sigma_\alpha \Sigma_\beta \, p_{\alpha ij} \cdot p_{\beta kl} \cdot e_{\alpha\beta}$$

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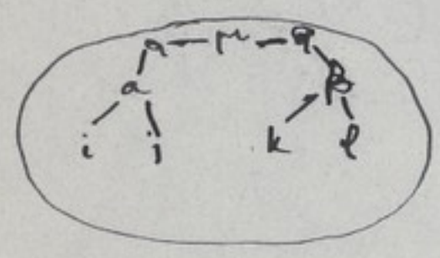
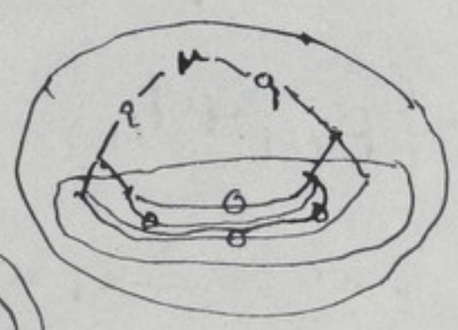
The next thing is to consider what it means to say that all the pairs of a certain class of pairs, μ, are mutually exclusive.

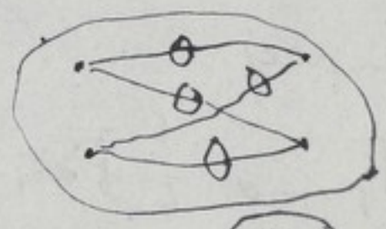
$$\Pi_\alpha \Pi_\beta \; \overline{q}_{\mu\alpha} + \overline{q}_{\mu\beta} + \varepsilon_{\alpha\beta}$$

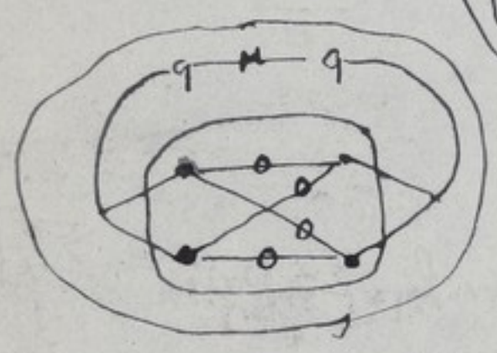
i.e. $\Pi_\alpha \Pi_\beta \Pi_i \Pi_j \Pi_k \Pi_l \; \overline{q}_{\mu\alpha} + \overline{q}_{\mu\beta} + \overline{\Phi}_{\alpha ij} + \overline{\Phi}_{\beta kl} + T_{ik} \cdot T_{il} \cdot T_{jk} \cdot T_{kl}$

$\Sigma_i \Sigma_j \Sigma_k \Sigma_l) \cdot l_{ik} + l_{il} + l_{jk} + l_{kl}$









To say that no relation of a certain description exists between certain objects is to say that a certain description of relation does exist between those objects.

To say that there is no way of pairing them such that every $\underline{a}$ is paired to a $\underline{b}$, is to say that a way of pairing them exists such that every $\underline{b}$ is paired to an $\underline{a}$.

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$\Pi_\mu \Sigma_\alpha \Sigma_\beta \Pi_\gamma \Sigma_i \Pi_j \quad q_{\mu\alpha} \cdot q_{\mu\beta} \cdot \bar{e}_{\alpha\beta} + \bar{q}_{\mu\gamma} + a_i \cdot (\bar{b}_j + \bar{p}_{\gamma ij})$

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elated means

rs

$\Pi_p \Pi_q \Pi_r \Pi_s \quad q_{\mu\alpha} \cdot q_{\mu\beta} \cdot p_{\alpha pq} \cdot p_{\beta rs} \cdot (l_{pr} + l_{ps} + l_{qr} + l_{qs})$

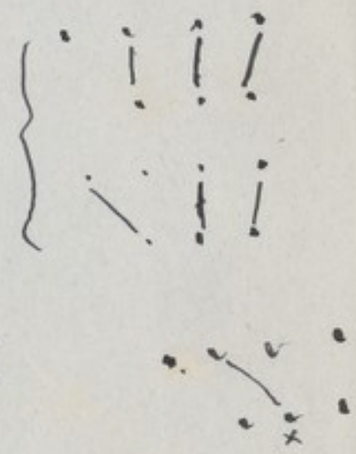
$+ \bar{q}_{\mu\gamma} + a_i \cdot (\bar{b}_j + \bar{p}_{\gamma ij})$

To say there is no mode of pairing which pairs every $\underline{a}$ to a $\underline{b}$

Let P_α mean α is a mode of pairing

Let $p_{\alpha ij}$ mean α pairs i with j

$\Pi_\alpha \Sigma_i \Pi_j \quad \bar{P}_\alpha + a_i \cdot (\bar{p}_{\alpha ij} + \bar{b}_j)$



To say that there is a mode of pairing which pairs every $\underline{b}$ with an $\underline{a}$

$\Sigma_\beta \Pi_j \Sigma_k \quad P_\beta \cdot (\bar{b}_j + p_{\beta kj} \cdot a_k)$

$$\left\{ \bar{P}_1 + \begin{array}{l} a_1 \cdot (\bar{p}_{111} + \bar{b}_1) \cdot (\bar{p}_{112} + \bar{b}_2) \cdot \text{etc} \\ a_2 \cdot (\bar{p}_{121} + \bar{b}_1) \cdot (\bar{p}_{122} + \bar{b}_2) \cdot \text{etc} \\ + \text{etc} \end{array} \right\}$$

$$\cdot \left\{ \bar{P}_2 + \begin{array}{l} a_1 (\bar{p}_{211} + \bar{b}_1) \cdot (\bar{p}_{212} + \bar{b}_2) \cdot \text{etc} \\ a_2 (\bar{p}_{221} + \bar{b}_1) \cdot (\bar{p}_{222} + \bar{b}_2) \cdot \text{etc} \\ + \text{etc} \end{array} \right\} \quad \text{etc}$$

$$\cdot (\bar{b}_1 + p_{111} \cdot a_1 + p_{121} \cdot a_2 + \text{etc})$$

$$P_1 \cdot (\bar{b}_2 + p_{112} \cdot a_1 + p_{122} \cdot a_2 + \text{etc})$$

$$+ \quad (\bar{b}_1 + p_{211} \cdot a_1 + p_{221} \cdot a_2 + \text{etc})$$

$$P_2 \cdot (\bar{b}_2 + p_{212} \cdot a_1 + p_{222} \cdot a_2 + \text{etc})$$

$\cancel{\Pi_k \Sigma_i \Pi} \quad \Pi_\alpha \Sigma_\beta \Sigma_i \Pi_j \Sigma_k \quad \bar{P}_\alpha \cdot P_\beta + a_i \cdot (\bar{p}_{\alpha ij}$

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$\bar{P}_1 + a_1 \bar{P}_{111} \cdot \bar{P}_{112} + a_1 \bar{P}_{111} \cdot \bar{b}_2 + a_1 \bar{b}_1 \cdot \bar{P}_{112} + a_1 \bar{b}_1 \cdot \bar{b}_2$

$+ a_2 \bar{P}_{121} \cdot \bar{P}_{122} + a_2 \bar{P}_{121} \cdot \bar{b}_2 + a_1 \bar{b}_1 \cdot \bar{P}_{122} + a_2 \bar{b}_1 \cdot \bar{b}_2$

$\bar{P}_2 + a_1 \bar{P}_{211} \cdot \bar{P}_{212} + a_1 P_{211} \cdot \bar{b}_2 + a_1 \bar{b}_1 \bar{P}_{212} + a_1 \bar{b}_1 \bar{b}_2$

$+ a_2 \bar{P}_{221} \cdot \bar{P}_{222} + a_2 \bar{P}_{221} \cdot \bar{b}_2 + a_1 \bar{b}_1 \cdot \bar{P}_{222} + a_2 \bar{b}_1 \cdot \bar{b}_2$

$\bar{P}_1 \cdot \bar{P}_2 + \bar{P}_1 \cdot a_1$

$P_1 \cdot \bar{b}_1 \cdot \bar{b}_2 + P_1 \bar{b}_1 \cdot P_{112} \cdot a_1 + P_1 \cdot \bar{b}_1 \cdot P_{122} \cdot a_2$

$+ P_1 P_{111} \cdot a_1 \cdot \bar{b}_2 + P_1 P_{111} \cdot a_1 \cdot P_{112} + P_1 P_{111} a_1 P_{122} \cdot a_2$

$+ P_1 P_{121} \cdot a_2 \bar{b}_2 + P_1 P_{121} \cdot a_2 \cdot P_{112} \cdot a_1 + P_1 P_{121} a_2 P_{122}$

$\bar{b}_1 \cdot \bar{b}_2$

be do some mode of pairing

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To say that a collection the a's is greater than and other collection the b's. is to see, that there is no collection of mutually exclusive such that in them ever a is paired with a b.

That is, taking any collection of pairs whatever either there are different two pairs ~~not~~ of that collection not mutually exclusive or ~~there is no~~ there is some a such that, taking any pair of which it is a member, either that pair does not belong to this collection or else ~~the other member of it is not a b.~~ no b belongs to it

$$\Pi_\mu \Sigma_\alpha \Sigma_\beta \left(\Sigma_i \Pi_\gamma\right) \Pi_j \; q_{\mu\alpha} \cdot q_{\mu\beta} \cdot \bar{e}_{\alpha\beta} + \cancel{\bar{q}_{\mu\gamma} + \bar{p}_{\gamma ij} \cdot a_i \cdot (\bar{p}_{\gamma ij} + \bar{b}_j)}$$

$$\cancel{a_i \cdot (\bar{q}_{\mu\gamma} + \bar{p}_{\gamma ij} + \bar{b}_j)}$$

$$\bar{q}_{\mu\gamma} + a_i \cdot (\bar{p}_{\gamma ij} + \bar{b}_j)$$

Translating this

$$\cancel{\Sigma_\xi \Pi_u \Sigma_i \Pi_t \Sigma_w \; \bar{b}_u + r_{\xi uw} \cdot a_v \cdot (\bar{r}_{\xi ut} + \bar{b}_i)}$$

$$\cancel{\Sigma_\xi \Pi_u \Sigma_w \Pi_t \Sigma_w \; \bar{b}_u + r_{\xi uw} \cdot a_a \cdot (\bar{r}_{\xi tv} + \bar{b}_t) + l_{ut}}$$

$$\cancel{\Pi_\xi \Sigma \quad \Sigma_\xi \Pi_u \Pi_v \; \bar{r}_{\xi uv} +}$$

$$\Sigma_\xi \Pi_u \Pi_v \Pi_x \Pi_y \; \bar{r}_{\xi uv} + \bar{r}_{\xi xy} + l_{ux} \cdot l_{vy} + T_{ux} \cdot T_{vy}$$

$$\Pi_\xi \Sigma_t \; \bar{b}_s + r_{\xi st} \cdot a_t$$

$$\Sigma_p \Pi_q \; a_p \cdot (\bar{r}_{\xi qp} + \bar{b}_q)$$

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We can reason in this

All b's are alike in respect to pairing

Therefore if there is no way of pairing all a's with bs

we can fix upon one b say b_0 and if any b remains

unpaired it shall be b_0.

But if an a say a_0 remains unpaired and b_0 was unpaired

then certainly there would be a way in which

a_0 and b_0 could be paired

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This seems to be highly important if it could be properly generalized.

~~If there is a number next greater than any~~

If given any number there is one next greater

then it ~~and not me~~

Then there is a special kind of next greater

so that only one is next greater than any

and any one is next greater than one alone –

And if there is a character such that if anything has that character a number next greater

then it has that character.

And a number 0 has that character

Then given any number N which in consequence of this has that character there is a character of the same description which does not belong to N but belongs to the number next greater than that

~~and~~

And it is possible that there should be something which possesses all the characters necessitated by this ~~to be~~ exists

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A collection which contains no more than is supposed in supposing that it is as large as every collection of a collection of collections cannot be larger than a collection larger than any collection of that collection of collections.

The collection of collections each equal to a given collection, the A's, which collections may be formed from the As and one individual beside is not larger than a collection larger than the collection of As.

i.e. If the B's are ~~gr~~ more than the A's they are as many as all the different collections of A's that are each as many as the A's.

That is if there is no relation r such that every A is r to a B which no other A is r, there every ~~B may wish to have~~ possible collection of unkilled As after each A has killed an A (that no other A kills) ~~without any~~ ~~two B's~~ could be wished by the different Bs

1.0110101000000101

1011010100000101

10110101000000101

101101010000000101

1011010100000000101

10110101000000000101

1011010100000000000101

1011010100000000000000101

1011010100000000000000000101

1011010100000000000000000000101

1011010100000000000000000000000101

1.0000000000000000000000100100000100 1

It is very nearly 1.011010100001001111001100101

The square of this falls short by about 1 in the 30th fractional place

1.0110101000000100101

1011010100000100101

10110101000000100101

101101010000001001010

1011010100000010010101

10110101000000100101010

101101010000001001010101

1011010100000010010101010

10110101000000100101010101

1.1111111111111100101011011011001

1111100101011011011011001

1.0110101000000100111

1011010100000100111

10110101000000100111

101101010000001001111

1011010100000010011111

10110101000000100111111

1011010100000001001111

1.1111111111111111111111011011011001

1011010100000010011

1011010100000100111

10110101000000100111

1.1111111111111111111111111100101011011011001

1011010100000010011

$1+\frac{3}{8}+\frac{5}{128}$, $\frac{83}{128}$

$\frac{32}{9}$ $\frac{8+28}{18}$

1902 Nov 21

In topical geometry it is necessary to adopt the principle that every motion has a beginning and end

---

In the theory of multitude we must use the principle that from the nature of generality every operation which does not create new subjects for itself can be carried to a ~~point~~ stage beyond which it can be carried (in the same way) no further.

$\sqrt{2} =$ 1.011010100000010101010

1011010100000101010

10110101000001010101

101101010000010101010

1011010100000101010101

10110101000001010101000001

1.1111111111111111010101010000001

1010101011010

~~010101~~ $(a^2+b)^2 = a^2+2ab$

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Given any character α, there is a character possessed by whatever does not possess α and by nothing that does possess α

Given any two characters α and β there is a character which is possessed by whatever possesses either α or β and by nothing else

Given any two characters, α and β there is a character which is possessed by whatever possesses them both and by nothing else.

Given any character α there is a character β such that if anything possesses α something possesses α and β and nothing <u>else</u> possesses α and β.

~~Given any character α not possess~~

AUG 10 1902

~~Theorem~~

Let us call a character consistent if it is possible that there should be an existing individual that possesses it.

Given any ~~character~~ character $\mathbb{N}$ whatever, ~~it is possible~~ there is a collection α of characters such that if i is an individual possessing $\mathbb{N}$ there is a character $\mathbb{N}_i$ which is possessed by i and by nothing else.

Given any description of character, whatever, even if it be indefinite there is such a character.

~~Given an indefinite individual there is some definite~~

Every indefinite individual is in its own nature definite, and may receive a proper name applicable to nothing else. For ~~that~~ an indefinite individual is one which ~~may~~ might be named, and if it might be named we may name it. And this applies to individual characters as well as to individual objects.

To be called by a name is to possess a character ~~so~~ peculiar to the individual.

Given any character $\mathbb{N}$ whose negative is consistent. Then ~~we~~ it is ~~may~~ supposable that $\mathbb{N}_i$ we can then attach a name, and say $\mathbb{N}_i$ then there is a character $\mathbb{I}$ common to $\mathbb{N}$ and to i

AUG 16 1902

Εὕρηκα

There is nothing like pegging away at things! After puzzling distractedly over the Algebra of the Copula for over 20 years, I believe I have the solution at last.

I caught at once to have defined the copula. I tried to do so, but could not. I overlooked the circumstance that one Aristoteles had done it for me, in the dictum de omni.

Namely, the copula expresses such a relation that if whatever term x we may take

If $x \prec a$ then $x \prec b$ or If $b \prec x$ then $a \prec x$

then, and only then, $a \prec b$

Now if $x \prec a$, then (no matter what the relation may be) $x \prec a$

Hence, by the definition $a \prec a$.

Let us define $\mathcal{V}$ as such that, whatever x may be,

$x \prec \mathcal{V}$

Let us define 0 as such that, whatever y may be

$0 \prec y$.

If then $\mathcal{V} \prec b$ it follows that $x \prec b$

If $a \prec 0$ it follows that $a \prec b$

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In order to prove that if the As are innumerable ~~the coll~~ there is no collection more multitudinous than them and less so than the collection of all possible collections of As, it is proper first to prove that the collection of all those collections of As each of which is less multitudinous than the As is no more so than the As themselves.

That being admitted, it is next to be proved that if the Cs are fewer than the collections of As they are no more than the collections of As of which each one is less multitudinous than the As.

It is therefore necessary to show that if the Ms are a collection of collections of As each as numerous as the As but the Ms are fewer than all such collections then the Ms are no more than the collection of all the collections of As that are each less multitudinous than the As.

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As to this matter of multitudes the great difficulty, as in so many other cases, is to prove that a thing is possible. Possibility is a may be while proof only makes a must be. We turn it round and say no contradiction is involved. But generally all we can say is that we don't perceive any, which is felt to be inadequate.

Having to show that a relation of a given kind is possible ~~exists~~, we must either show just how it exists, or we must reduce the hypothesis of its impossibility to any absurdity.

We shall tread on firmer ground if we go back to the very beginning. Mathematics starts with a hypothesis. Now how, in general, are we to assure ourselves that the hypothesis with which we start involves no contradiction? We must analyze the facts supposed and show that ~~nothing~~ no description of such is supposed to exist in the universe which is also supposed not to exist.

In the theory of multitudes we suppose a discrete universe. What does that hypothesis amount to?

It is that no matter what description X may be either Nothing is X or there is at least one description ξ such that Some X is ξ and whatever description Y may be either no X that is ξ is Y or Any X that is ξ is Y.

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A being an index $A-(x)$ is the same as $(A-x)$

~~For~~ $A-(x) \prec A-(A-x) \prec (A-x)$

$-(-x)$ ~~just~~ $-(x)$

Any oneness may be changed to an outer oneness evenly enclosed

Any oddly enclosed oneness may be changed to any outer oneness

Any two connecting lines may be connected, unless the outer is oddly the inner evenly enclosed

$x\ (y)$ $x\ (x\ y)$

$x\ (y\ (z\ w))$

~~M (loves N)~~

M (M loves N)

M (N (M P))

1903 June 11

Principle of contradiction (not) Nothing is other than itself

Principle of excluded middle (not) Everything is other than everything except itself

Curion (is a man (not) a fool)

By simple insertion (is a man (not) a fool)

By principle of contrad. (is a man (not) (not) is a fool)

By iteration (is a man (not) (not) (not) is a fool)

By deiteration (is a man (not) (not) is a fool)

By simple erasure (is a man (is a fool)

By two ovals (is a man (is a fool)

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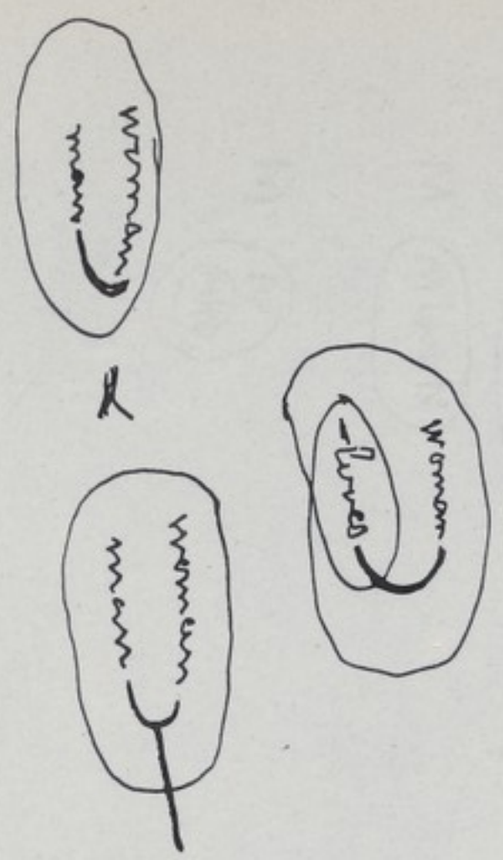

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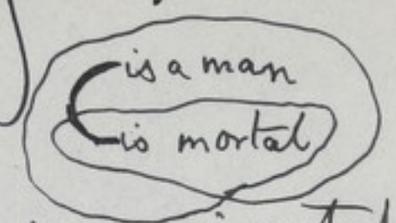
1903 June 27

There are 8 possible systems of Existential Graphs, as follows:

In System I, ~~is a man~~ —is beautiful
~~Sam~~ means Something is beautiful

If a Then c

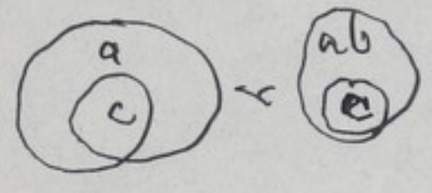


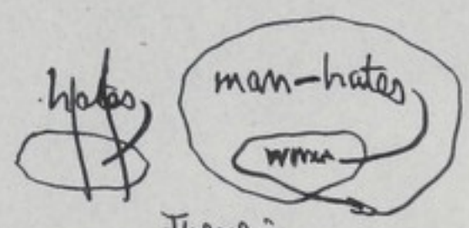
Any man is mortal

Then

ab ≺ a

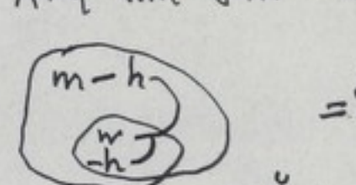
m—b ≺ m—b



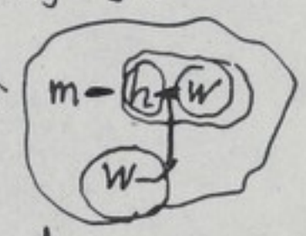


~~Theorem is~~
If there is a man who hates anybody it is a woman

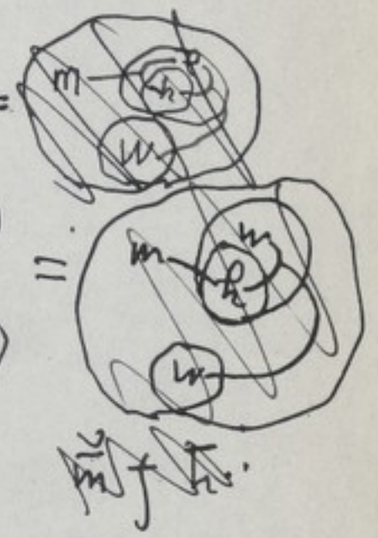
$\breve{m} \mathbin{;} h \mathbin{;} w$



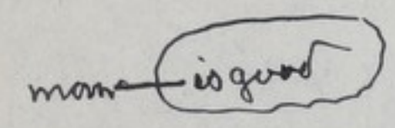
$\breve{m} \mathbin{;} h \mathbin{;} (w \cdot \breve{h} \infty)$

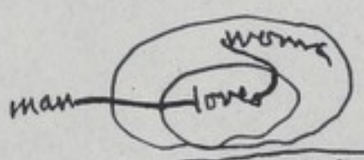


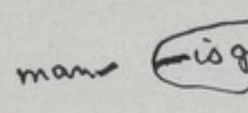
$\breve{m} \mathbin{;} h \cdot \breve{w} \mathbin{;} w$

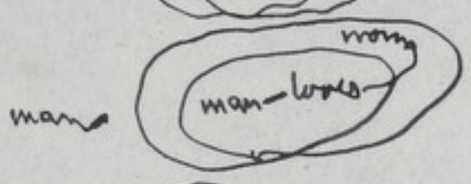


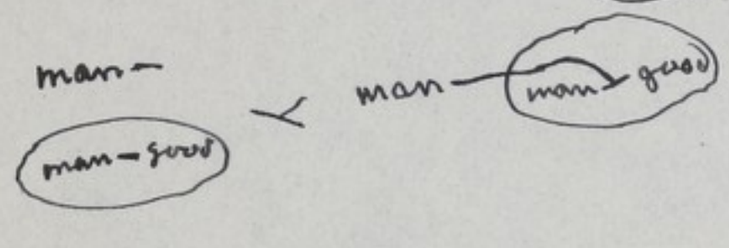
$\breve{m} \mathbin{;} h$

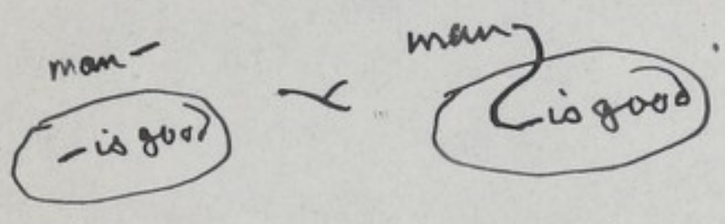


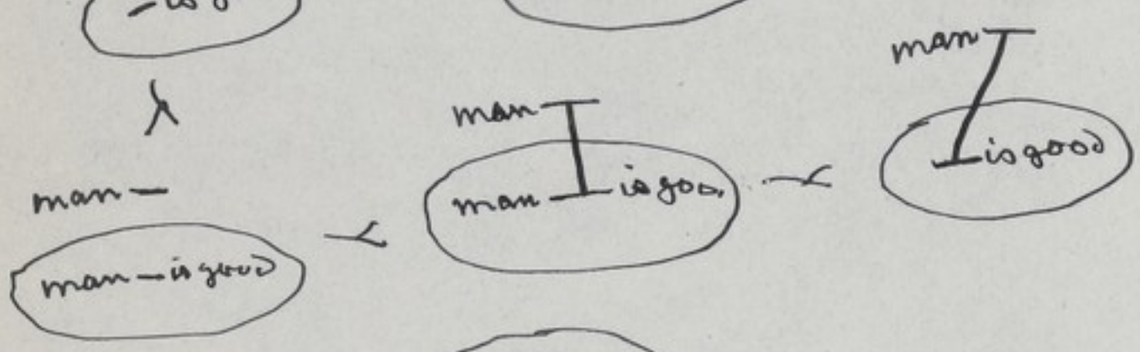


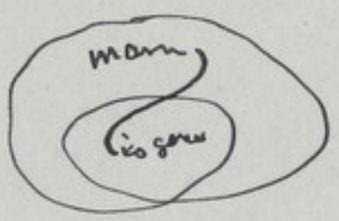


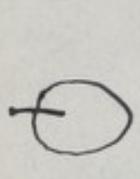




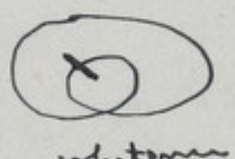








Something is nothing



whatever ~~man~~ is, is everything

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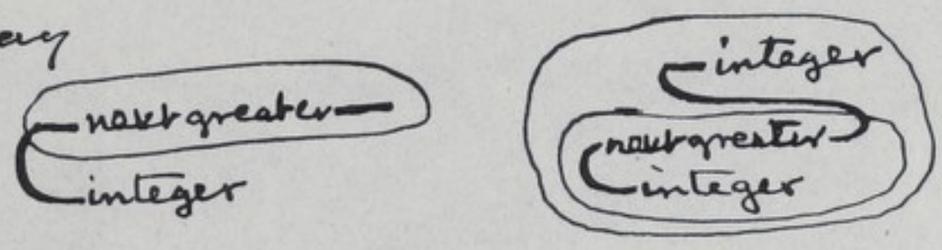
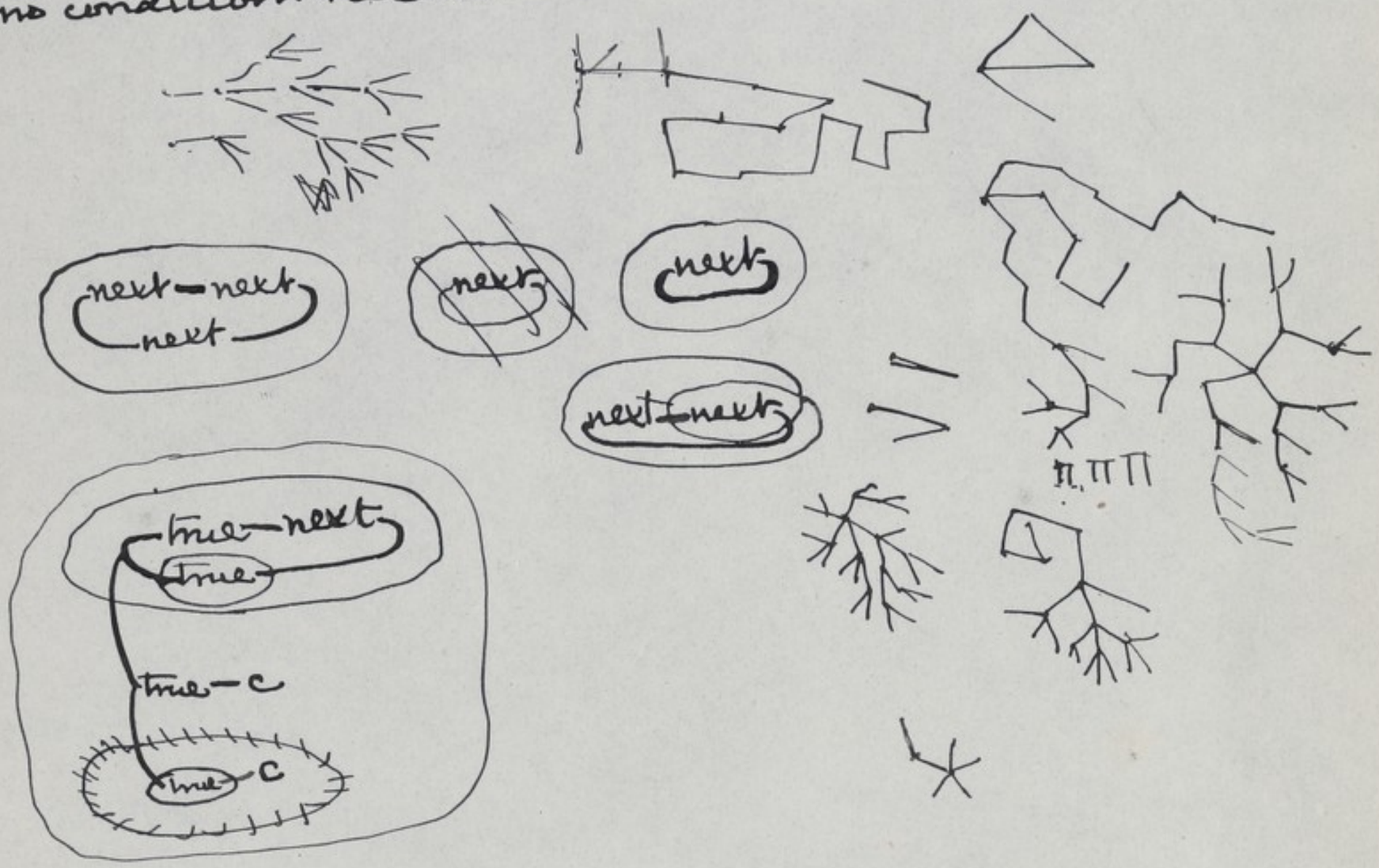
1903 June 29

The great <u>défaut</u> of my graphs (and of course of any logical algebras) is this:

I can say



But now I want to say that there is no integer except what these two conditions necessitate



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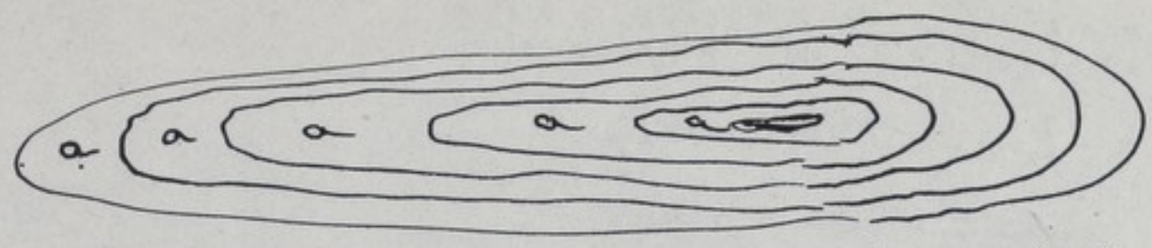
1903 July 10

Endless Nests of Seps

$x =$ 

$x = \bar{a} + \bar{x}$ The graph asserts nothing while $\underline{a}$ must be absurd

~~x~~ i.e. $\bar{a}\bar{x} + \bar{x} = 0$ since $\bar{x} < x$ so that it must be true

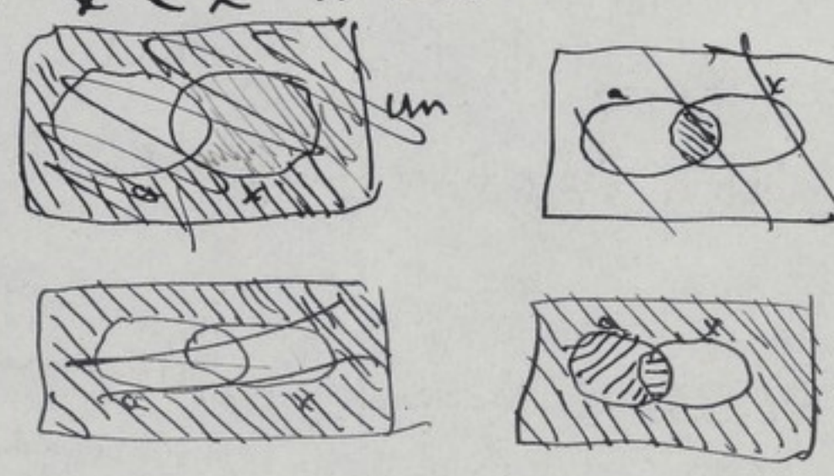
$\bar{x} = a \cdot x$

$x = \bar{a} + a \cdot x$

$\bar{x} = a \cdot (\bar{a} + \bar{x})$

$x < \bar{a} + \bar{x}$

$\bar{a} < x \quad \bar{x} < x$



~~$\infty = a \cdot x + \bar{a} + \bar{x}$~~

$x = \bar{a} + \bar{x}$

$x = x + x = \bar{a} + \bar{x} + x = \infty$

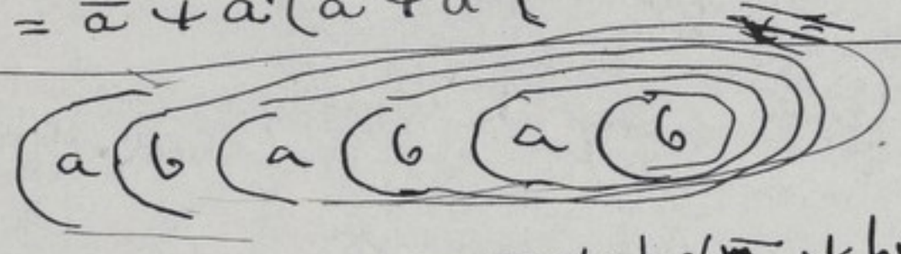
$\infty = x + \bar{x} = \bar{a} + \bar{x}$

$x = \bar{a} + a \cdot (\bar{a} + a \cdot ($

$x = \bar{a} + a \cdot x$

$\bar{a} < x \quad x < \bar{a} + x$

$\overline{x \cdot a} = x$

$x =$ 

$x = \bar{a} + b \cdot x \qquad x = \bar{a} + b \cdot (\bar{a} + b \cdot x)$

$\bar{a} < x$

$0 = \bar{a} \cdot \bar{x}$

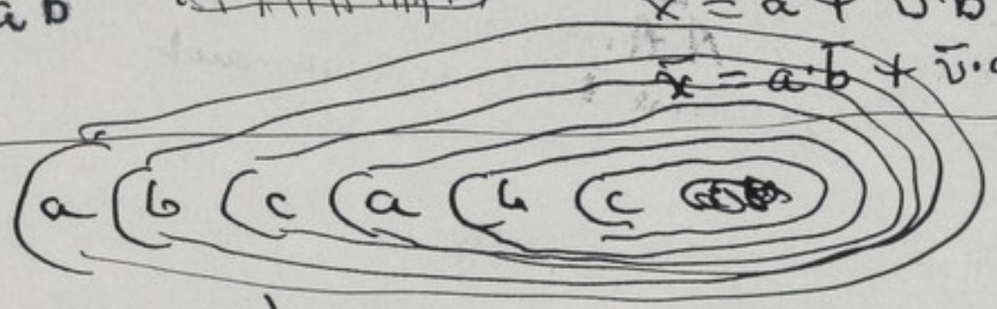
$\bar{b}x = \bar{a}\bar{b}$

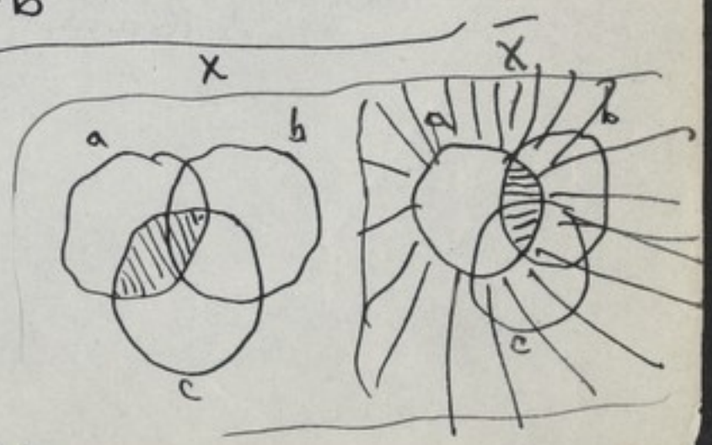
~~$x = \bar{a} \cdot b + v \cdot a$~~

$x = \bar{a} \cdot \bar{b} + \bar{a} \cdot b + v \cdot a \cdot b$

$x = \bar{a} + v \cdot b$

$\bar{x} = a \cdot \bar{b} + \bar{v} \cdot a \cdot b$

$x =$ 



$x = \bar{a} + b \cdot (\bar{c} + \bar{x}) \qquad x + \bar{b}\bar{x} = \bar{a} + b\bar{c} + \bar{x}$

$0 = \bar{a}\bar{x}$

$0 = b \cdot \bar{c} \cdot \bar{x}$

$0 = b \cdot \bar{x}$

$x b + \bar{b}$

abc absurd

$a\bar{b}\bar{c}$ doubtful

B Icon B Index B Symbol
are Icon Index Symbol
in the Genuine Sense

A Icon A Index A Symbol
are Icon Index Symbol
in the Degenerate Sense

C Rheme C Dicent C Argument
are Rheme Dicent Argument
in the Genuine Sense

Rheme is represented in the ~~proper~~ signified Interpretant as if a Quality ~~[illegible]~~
Dicent is represent in the signified Interpretant as if in a Real Relation to its Objects
Argument is represented in the signified Interpretant as if it were a Sign

Rheme professes to be described a Qualitative
Dicent has two ~~parts~~ terms professing to be Qualities or Existents
Argument has 3 terms professing to be Major Quality, Minor Existent, Middle Sign

B Rheme B Dicent B Argument
are Degenerate Rheme Dicent Argument

B Rheme determines its interpretant formally by definition making it one sign
B Dicent determines its interpretant by force
B Argument determines its dynamic interpretant by its being represented the sign as doing so
B Dicent has to be asserted C Dicent may be asserted

A Rhema A Dicent A Argument
are Dedegenerate Rheme Dicent Argument

Qualisign Sinsign Legisign
Icon Index Symbol
Rheme Dicisign Argument

Dicent can be asserted
Argument can be represented
can be asserted
can be reasoned
upon

1904 Aug 7

The distinction of Icon Index Symbol may be two ways defined:

1st
A – Icon
A – Index
A – Symbol
} has for its immediate object { Quality, Existent, Law

2nd
B Icon
B – Index
B – Symbol
} is determined by ~~refers to~~ its dynamic object by virtue of { Own Internal nature, Real Relation to Object, Being Interpreter as such

Imputed or interpretant

The distinction of Rheme Dicisign Argument should, then, be three ways defined

A – Rheme
A – Dicisign
A – Argument
} has for immediate Interpretant { Quality, Existence, Law

B – Rheme
B – Dicisign
B – Argument
} determines ~~refers to~~ its dynamic Interpretant by virtue of { Own Internal Nature, Real Relation to Interpreted as such

C – Rheme
C – Dicisign
C – Argument
} is represented by its signified ~~proper~~ Interpretant as { Quale, ~~Quale~~, ~~Second~~, Sign, ~~Sign~~

1904 Aug 13

A ~~Second~~ Relate in respect to its own firstness is either a Referate if intrinsically a Quale or a ~~Re~~Relate if intrinsically an Existent.

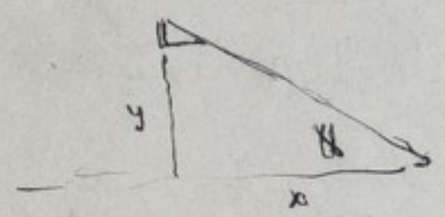
~~In respect to its Second~~

~~Dynamic Second it is either determined~~

~~It is~~

It is determined by its Dynamic Second by virtue either of { Its own intrinsic Nature / or / of its Real Relation to that Second

It has for its immediate Second { either a Quality / or an Existent



$$D_t^2 y = \frac{1}{x^2+y^2}\,\frac{y}{\sqrt{x^2+y^2}}$$

$$D_t^2 x = \frac{1}{x^2+y^2}\,\frac{x}{\sqrt{x^2+y^2}}$$

$$Ax^2 + Bxy + Cy^2 + Ex + Fy + G = 0$$

$$x^2 + \left(\frac{By+E}{A}\right)x = -\frac{C}{A}y^2 - \frac{F}{A}y - \frac{G}{A}$$

$$x + \frac{1}{2}\,\frac{By+E}{A} = \sqrt{\left(\frac{1}{4}\frac{B^2}{A^2} - \frac{C}{A}\right)y^2 + \left(\frac{1}{2}\frac{BE}{A^2} - \frac{F}{A}\right)y + \left(\frac{1}{4}\frac{E^2}{A^2} - \frac{G}{A}\right)}$$

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Improved

? ~~Primality~~ Primity Primality = Possibility

Primality

~~Secundosity~~ Secundity Secundality

Secundality

~~Primal Secundosity~~ Primary Secundality Primal Secundality

Secundity

Degenerate Secundness is ~~Firstness is~~ a Secundness composed of Firstness

Equiparance = ~~Primary~~ Secundness

Genuine Secundness is a Secundness composed of Secundness

Disequiparance Secundary Secundity Secundary Secundality

Secundal Secundality

Secundality

Secundo-Primality

~~Secundal primitivity~~

~~Primiform Secundality~~

~~Pri~~ Secundary Primality Secundarity = Secundary Primality = Actuality

Secundate Primality

Passivity ~~Passivity~~ Primity modified by ~~Primality~~ as Secundality

Primiform Secundality

Secundity

Actuality = ~~Secundity~~ as modifying Primity

1905 June 1.

Firstness is the Mode of Being of that which is such as it is positively and regardless of anything else. It is thus an abstract possibility.

It can therefore only be known to us immediately. In fact a quality of feeling as red is of this nature. But we may suppose Firsts which are not knowable by us. (?)

Secondness is the Mode of Being of that which is such as it is relatively to a Second but regardless of any third. That makes it of a brute nature.

It is degenerate or genuine.

Degenerate secondness is not a fact, for that involves Thirdness but is, as I originally stated, a relation consisting in ~~its~~ each correlate having a certain character (the same for both) and that embraces every equiparance.

Genuine secondness is disequiparance. If it is of a mental origin ~~It is either degenerate or genuine~~ it involves Thirdness. It must be a ~~ge~~ real action, an actual fact.

There are two kinds of secondary firstness, Activity and Passivity. Each is an ~~Actuality, but Activity~~ Actuality. Both Passiveness is degenerate ~~activity~~ actuality, that actuality which is more in the nature of Firstness. Activity is genuine actuality.

Passiveness is a Firstness as modified by ~~the~~ an Actuality.

Activity is Actuality in the aspect of Firstness, or better is ~~Secon~~ Genuine Secondness in so far as it modifies Firstness.

Existence is the Indeterminate activity of objects in our universe. There is a corresponding passiveness, but it has not been noticed.

over

Grade Quality of Quality

Composition

Abstraction

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~~Thirdness~~ Tertiality is ~~that~~ Mode of Being of anything in so far as ~~it is~~ such as it is <u>to</u> a Second <u>for</u> a third.

This Primary Secondary and Tertiary

Primary Tertiality

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[Follows 243] a/or
243A

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A primal is
that which is something that it is in itself regardless
of anything else

A Potential is anything which is in some respect determined but whose being is not ~~not~~ definite.

A

A Feeling is a state of determination of consciousness which apparently might in its own nature (neglecting our experience (polyphonic etc)) continue ~~ing~~ for some time unchanged and thus has no reference ~~and is regardless~~ of anything else.

I call ~~a condestate anything a~~ a state of consciousness immediate which does not refer to anything ~~beyond~~ not present in that very state.

I use the terms immediate and direct, not according to their etymologies but so that to say that A is immediate to B means that it is ~~prese~~ ~~in the~~ present in B. Direct as I use it means without ~~any~~ the ~~agency~~ aid of any subsidiary third, be it instrument ~~or operation~~.

1905 June 2. 4¼ AM [Follows a10] 244r

~~A primad~~

A Monadont is anything which is ~~such as~~ all that it is positively, in itself, regardless of anything else. Its ~~mode of~~ Being or mode of Being is a Monadousy.

A Problematical is a proposition not known not be true

A Question is a proposition is a proposition so enunciated as to tend to compel ~~the~~ its affirmation or denial truly, that is, tending to produce the knowledge that it is true or false.

A Possible is a state of things not determined ~~to be false~~ not to subsist

A Merely Possible is a state of things not determined to ~~be true~~ or subsist or not.

A Potential or Anything ~~is~~ in posse is that which is not determined to exist or not to exist. But this definition is bad because it is negative

~~A Monadont~~

~~A Potential or~~ In posse is the mode of being of a Monadont or a complex of Monadonts.

A Monadont is not relative to anything. Hence, it can only be known by immediate consciousness, and even so not in its strict Monadousy. ~~It is therefore~~ A known Monadont is therefore the substance of a feeling, i.e. the quality of the feeling. Monadousy is that wherein all Monadonts agree.

But we can indirectly and vaguely suppose other Monadonts, by supposing them to have something like an immediate consciousness of themselves, and still more vaguely otherwise.

~~A Dyadonts is anything which is all that it is in a second, regardless of anything third. Would it to express its represents denotes something~~

~~A Medad is a symbol which~~

~~in itself regardless of any addition.~~

A Medad is a ~~symbol~~ sign ~~proposition~~ complete in itself

~~A Proposition is a Dicisign symbol~~ A

~~A Primality is a state of determination in itself~~ posit

A Primality is a state of positive determination of a subject in itself regardless of anything else. Thorough primality ~~is~~ nearly amounts to monadousy.

A Monadont cannot have parts (because it would be in essential relation to them) and for the same reason two Monadonts cannot be ~~present~~ together.

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A Dyadont is anything which is ~~all that~~ something that it is in relation to a second and all ~~that~~ it is either in itself or in its second regardless of any third.

Dyadousy is that wherein all dyadonts would essentially agree.

~~Second~~ Secundality is a state of determination of a subject which is relative to a second subject but to ~~[illegible]~~ no third.

~~Dyadousy is therefore~~ Thus nearly amounts to Dyadousy through secundality

Externisense is a two-sided state of determination of consciousness together to the presence of an ego within an a non-ego without

~~struggle~~ ~~Internal is that which one has a direct power~~ ~~which actually goes on and~~ I mean an actual tendency to change an actual new state of things.

But an actual tendency to change may not bring about ~~a change~~.

I call a power direct which need not employ any means.

A struggle is an actual tendency to change in which one agent pushes and another pushes back

~~Volitionally Internal to consciousness is that~~ which one has ~~any~~ direct power to annul if one wishes. (seems to have more or less content or element of consciousness)

Volitionally ~~An~~ external is any content or element of consciousness ~~any content~~ which seems to be present in spite of all one can ~~do~~ directly do.

An externisensation is a two-sided ~~conscious content~~ ~~state of determination~~ containing a tendency to change ~~state of determination of consciousness to a struggle~~ actual tendency to a change ~~[illegible] of consciousness~~ in which a volitionally external and a volitionally internal power seem to be opposed, the one furthering, the other resisting the change.

A ~~[illegible]~~ effort is an externisensation in which the actual elements (that furthering the change) is volitionally internal, the resistance volitionally external.

A percepuation is an externisensation in which the active element is volitionally external and the passive element is volitionally internal.

A dyadont cannot be known to us through any sign. A knowndyadont must therefore itself be a determination of consciousness, and can only be an externisensation.

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A Triadont is anything which, as something that it is relatively to a Second for a Third

Triadonty is that which is common to all possible Triadonts

Tertiality is a state of determination of a subject ~~in~~ relatively to a second subject and for ~~all~~ (i.e. relatively to in a way possibly ~~different~~) ~~with~~ a Third.

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1905 July 7

A sign is a Priman which is Secundan to an Object
what? how what

and is Tertian in determining an Interpretant into Secundanity to that Object
how what whatever

It has two Objects, the immediate, ~~that~~ to which it is degenerately Secundan
, the dynamic, to which it is genuinely Secundan.

It has three Interpretants, the immediate, to which it is primarily Tertian,
the dynamic, to which it is secundarily Tertian,
& the rational, to which it is genuinely Tertian.

In itself a Sign is a Qualisign, if it is Priman Being i.e. a Possible Indefinite
Sinsign = Token Secundan i.e. An actual
Legisign = Type Tertian i.e. A general.

In its relation to its Immediate Object, it is Vagosign if it represents that Obj as possible existent
" " Actisign " " " " " " daw
" " General " " " " " " law

In its relation to its Dynamical Object
it is an Icon if it refers to ~~that~~ Object by virtue of its own Primanity
Index Secundity to Object
Symbol Tertianity to Interpretant

In its appeal to its Immediate Interpretant
it is Pathosign if it is interpreted in a Possibility = Priman
Ergosign Secundan
Logosign Tertian

In its appeal to its Dynamic Interpretant
it is if it acts on its interpretant by Primanity
Secundanity
Tertianity

In its appeal to its Rational Interpretant
it is Rheme if it is represented in its interpretant as Priman
Dicisign Secundan
~~Argument~~ Tertian

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1905 July 8

I will try using Type for "Legisign" and Token for "sinsign". The objection to Token is its not existing in other languages.

What precisely is a qualisign? How does it differ from a type? The only answer I see is that the type is pretty definite. It has certain ~~characters~~ essential characters and no others. The qualisign is not definite. It is more and more ~~a sign~~ like a type the more ~~marked~~ certain ~~characters~~ abstract it becomes by the ~~become perhaps~~ strong marking of certain characters & the fading of others. It is more like a sinsign the more concrete it becomes. It is in its own self vague unidentifiable. We might call it a Tone; so that the first triad would be

Tone Token Type.

But it is open to doubt whether such flatly material division ought to form one of these triads. These should be formal. The whole idea is formal. Retaining the names for the convenience of the moment, we should define

A Tone as that whose ~~[illegible]~~ essential being makes it a sign

A Token as that whose accidents of existence make it a sign

A Type as that thought upon which makes it a sign.

A similar criticism is of still greater weight against

VAGOSIGN PROPER GENERAL

This is elevating Modality too high. It should not be the question what the object is in itself but whether it is ~~signified~~ represented

The Vagosign should be a sign that represents its object as simply such and such

The Proper represents its object as compelled (or as an event) (or in some other way secundan)

The General represents its object as an aspect or as considered etc

The ICON INDEX SYMBOL trial seems beyond criticism.

The Pathoseme has to be interpreted in a Feeling

The Ergoseme has to be interpreted in Action

The Logoseme has to be interpreted in Thought

The communisign acts on its interpreter by community of them?

The mind forces forces the effect on the object itself

The means interpreter rationally convinced of the meaning

1905 Oct 8 Mass set of understood by sympathy

Mass set of understood by force

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1905 Sep 20

Probability-calculus depends upon an essential property of Time which ought to afford the key to the true nature of time.

This that the future is like the past, that is, either is or will become so in every respect to a certain degree of approximation which is the same in all cases.

That is to say, suppose a boy, Simon by name, in walking along a road has an impulse to see what is under a certain one morning stone. He lifts it and finds to his joy a bright gold eagle. Good! On the principle that the future is like the past, early in the afternoon he again walks along the road and lifts the stone which he has learned from his dear teacher again fully confident of finding a gold eagle. But what is this he beholds? on lifting it! astonishment! nothing but dirt! He endeavours to make out how so extraordinary a reversion was possible. He reflects that to say that the future is like the past means that a similar future will follow a similar past. Now the first time he lifted the stone he lifted what he had never lifted before, and at the second time he did not lift what he had never lifted before. In fact the two pasts were the reverse of each other and therefore according to the principle, the two futures should have been like the two pasts in being the reverse of each other as they were, in fact. Upon this, he proceeds to discourse with himself somewhat in this fashion: "Suppose I were to go and lift another stone that I never had lifted before. Still, the past would not be like the other past. Further I ought to be unlike while now I should not. Besides the two cases would be unlike in all those respects in which the two stones would be unlike

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and in any case the two times will be unlike in being in different places at the same time. If I lift the same stone a third time this will be unlike anything in the past in being the third time. How, then, shall I find a new past comparable to an old past. The only way is to take an event that has happened time upon time without beginning and always has been followed by the same result; as if I were to drop a stone and see whether it falls or not.

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1905 Oct 8

I jot down a few things relating to Phanerology.

The Primam may be called a Resentment for the present.

"The primum is that which is such as it is regardless of anything else. That is it is complete in itself and simple. But as every body knows in regard to character of men ~~that the only way to be~~ "teres, totus, atque rotundus" is to be ~~perfe~~ stupendously incomplete.

The only way to be complete, to refer to nothing else, in any way ~~is~~, and and the same time to be simple, which is essential to this completeness, is to ~~be~~ have a Protean indefiniteness.

~~The~~ Any primam, A, must be simple, Because that which is composite depends on its parts, and depends upon each part, and that part is not A itself. ~~To be anything at all it must~~ It cannot, its essentially possess any character not itself ~~and therefore~~ for that would be to depend on that character. Therefore it must itself be that character. It must, therefore, be an abstraction, and has no identity other than exactitudeness

It is vague in the sense of being unanalyzed, and as being unidentifiable is indefinite in logical form. For such is the nature of the indefinite. Its essential characters beyond its logical form, that is, its logically material characters, are positively, that it has ~~a certain~~ or relative positive character absolutely peculiar to itself, and negatively that it is devoid of existence.

Although the Primam is in itself simple, for it is what it appears to be is all that it is, yet it may be capable of analysis by

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As to the Secundary this is the Character of force in the sense of that action of A on B which ~~simpl~~ tends to alter the relation of A and B solely. It therefore tends in physical cases merely to ~~act~~ produce motions along the line between A and B

Logical form. Definite Indiv. durability
" matter Existence

Tertian
Logical form Rationality? Generality

~~Signs~~ Division of Signs
A. as to being of sign
Qualisign – Sign ~~Lorsign~~ is Resentment or other character
Sinsign – Sign is Existent
Legisign – Sign is General in itself
B As to Object
a. As to Immediate Object
Vague Sign Sign represents object as indefinite
Singular Sign Sign represents " " Definite Individual } Abstract, Concrete, Collective
General sign " " " " Distributive general
b. As to Dynamic Object
Icon Sign ~~effected~~ agrees with object by virtue of Common Quality
Index " " " " " " Being really acted on by it
Symbol " " " " " " Being so interpreted
C As to Interpretant ~~Interpretant~~
a As to Immediate Interpretant.
The sign represents interpretant as feeling (Interjection) Action (Imperative) ~~Thought~~ Sign (Indicative)
b. Dynamic Interpretant
Interprets by Sympathy, By Compulsion, by Reason
c Significant Interpretant
The interp. represents sign as in Rheme, Proposition, Argument.

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It is pretty clear that there are 4 more divisions that must be taken into account before order can be brought in. Perhaps even more

A. Division according to the matter of the Sign
Qualisign
Sinsign
Legisign

B. Divisions according to the Object (How represented)
a. According to the Immediate Object
Indefinite Sign { abstract / concrete
Singular Sign { Collective / General Sign
Distributively
b. According to the Dynamic Object
α. Matter of the Dynamic Object
Abstract
Concrete
Collection
β. Mode of ~~Representing~~ Representing object
Icon
Index
Symbol

Material form of Sign

C. Division according to Interpretant (How represented)
a. According to Immediate Interpretant
Immediate Interpretant represented as Vague / Singular / Distrib. general
" " " " " "
" " " " " "

Immediate Interpretant is the Interpretant as represented in the sign, as a determination of the sign, to which the sign appeals

Only Clarifying Representation

b. According to Dynamic Interpretant
α. Matter of Dynamic Interpretant
Feeling
Action, conduct (? Only)
Thought
β. Mode of ~~Represen~~ Affecting Dynamic Interp.
By sympathy
By compulsion
By reason

The Dynamic interpretant is the determination of ~~an extension~~ a field of representation exterior to the sign (such a field is an interpreter's consciousness) which determination is effected by the sign.

c. According to Representative Interpretant
α. Matter of Representative Interpretant
β. Mode of being ~~affected~~ represented by Representative Interpretant
γ. Mode of being represented to represent object by sign, Index

The representative interpretant is the interpretant that truly represents the object the sign represents its Object as it does

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Imperative signs ~~are su~~ have the person addressed & his conduct as their field of interpretation. The action sought to be produced is the Interpretant.

The action actually produced is certainly the Dynamic Interpretant. But whether the action as expressed is the Immediate interpretant or not is not clear.

What is the Object of an imperative sign? It is the occasion, & the desired state of things is the interpretant.

The commander ~~desires~~ act in the mere doing of it as ~~an~~ influenced by the command is the Dynamic Interpretant.

But in so far as that conduct involves the recognition of the command & is obed ent to it and recognizes this correctly, it is the Representative Interpretant.

In order to study the interpretant of a sign, one should regard the sign as a command.

"Blue" is a command to let the blue element of ~~consciousness~~ memory come ~~before~~ down to the foot lights of consciousness.

"Do this" (ποίησον τοῦτο, fac hoc) is a command to enter into a certain relation.

"Napoleon was a liar" or better "pluit" is a command to represent something.

"And he doeth it" καὶ ποιεῖ, et facit,

The commanded act as it is represented in the command itself is the immediate Interpretant, while the Occasion with or without that makes a part of it is the immediate Object.

It is perfectly correct to say that the word "blue" includes the proposition "there is a familiar quality called blue" for it is calculated to bring that fact to mind.

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If we look upon Sign, Object, & Interpretant in a sufficiently broad way they become indistinguishable

It is because they look upon Thought in this way, that some philosophers fail to distinguish it from its Object & many more from its Interpretant.

As it now seems to me the Representative Interpretant is that which correctly Represents the Sign to be a Sign of its Object. And the divisions are

α. According to the nature the Sign is Represented as having in itself or as having in reference to its immediate object

β According to the Nature of the Sign as Represented to be determined by ~~in agreement with~~ its Object

As Icon in a Term
" Index in a Proposition
as Symbol in an Argument

γ. According to the Nature of the Sign as represented in the Representative Interpretant ~~to be~~ as determining its Interpretants.

Represents to be exclamatory — Abductive
" " imperative — Deductive
" " enlightening — Inductive

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What little consideration illness has permitted me to give to the matter confirms the Science of yesterday & day before

A. Signs are divisible according to their matter.

1. There are signs each of which has all its significance in its abstract quality, regardless of the circumstances of its occurrence. Such a sign may be termed a Quali-sign

2. There are signs each of which from its very nature can occur but once, and its significance lies in the circumstances of that one occurrence. Such a sign may be called a Sinsign. But ~~this~~ it will be allowable to use this term a little loosely for a sign which is an individual thing. Such a sign may be termed a Sinsign (simbeny, the first syllable of semel, same, semper, singuli, ~~&c~~ simplexelo)

3. There are signs each of which is a type capable in its nature of existing, but ~~which~~ governing things which do exist and causing their existence to signify something about the character of what exists. Such a sign may be called a Legisign (It is not necessary that that which is signified should ~~have~~ be general?)

B. Signs are divisible according to their Objects

a. According to their immediate objects. The immediate object is that object which the sign ~~or~~ creates in representing it

1. There are signs of each of which the immediate object is only a possible presentment of a dynamic object, a fragment of it, the rest being held in reserve, so that there is nothing ~~other~~ in the immediate object to prevent contradictory attributes being ~~predicated~~ separately predicated. ~~This is saying~~ turn out to be true. Thus "A certain man" may be rich. (He may be poor.) ~~to the reserve which makes the immediate object not an entire dynamic object but~~ Such a sign may be termed an indefinite sign

2. There are signs of each of which the immediate object holds nothing in reserve, ~~which~~ signifying the utterer can afterward specify limiting ~~and allows~~ nor allows any freedom of interpretation, the immediate object precisely ~~owning~~ denoting the dynamical object. Such a sign is called a Singular sign, a term ~~which~~ in the use of which a certain latitude must be allowed, however, or else there will be no occasion on which it can be applied.

3. There are signs of each of which the immediate object is represented as exchangeable for any existent within specified or understood limits. ~~This~~ Such may be termed a distributive sign.

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b. According to ~~their~~ dynamical object, that is, the object having a being not derived from the sign, but influencing the sign to represent it.

α. As to the ~~real~~ nature of the dynamical object in itself.

1. ~~There are signs each of which~~ A sign may have for its object represented an abstract fragment of being not capable of existence by itself, or even of distinct apprehension ~~representation~~ without a sort of blurr attaching to it, the vague ~~expression~~ of what is omitted. Such a sign may be termed a hypostatically abstract sign, or a hypostatic ~~sign~~.

1905 Oct 12

2. The dynamic object represented may be an existent represented as existing regardless of any other existence. Such a sign may be termed a Concrete.

3. A sign may have for its dynamic object a type in its mode of being as object, that is, as existing in combining generalized existents. Such a sign is ~~may be~~ termed a Collective.

β. As to manner in which the sign is determined to represent the dynamical object.

1. A sign may represent its dynamical object simply by virtue of its own abstract quality. It thus represents whatever else has that quality. Such a sign is termed an Icon. Icons either represent unanalyzed qualities, when they are simple likenesses or they have structures like those of the object, when they are analogues or if ~~[illegible]~~ for the purpose are Diagrams.

2. A sign may represent its object in sequence of being connected with it independently of a law or habit according to which it will be interpreted as representing that object. Such a sign is called a Symbol.

There are signs which simply seek expression of what is within

There are signs which seek to produce effects respondere.

There are signs which seek to produce government ~~of~~ over signs.

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~~may be compelled simply to discover its own abstract quality~~ 258r 1905 Dec 12 continued

C. Signs are divisible according to their Interpretants

a. According to their Immediate Interpretants

1. A sign may ~~seek~~ simply to determine in the field of interpretation ~~an abstract~~ an abstract quality ~~its own~~. Such a sign may be termed an ejaculation.

2. A sign may have for its direct purpose to determine an actual event. The interpretant it desires may be a ~~pure~~ action. Such a sign may be termed an Imperative.

3. A sign may, as a sign proper, have for its ~~purpose~~ immediate expressed ~~to produce a sign~~ purpose the determination in the field of interpretation of a sign of its own object represented as represented in itself. Such a sign may be termed a Significative.

b. According to their Dynamic Interpretants.

α. According to the nature of the Dynamic Interpretant in itself.

1. A sign may simply ~~tend~~ to extend a vague ~~an~~ abstract quality of its own. Such a sign may be termed an ~~ejaculant~~ ejaculative.

2. A sign may simply give expression to an effort ~~strive~~ to produce then and there a definite fact. Such a sign may be termed a Imperative

3. A sign may, as a sign proper, seek to determine a sign in the field of interpretation. Such a sign may be termed a Significative.

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1905 Dec 27 Lecture

b. According to their Dynamic Interpretants. 259r

α. As to the nature of the Dynamic Interpretant in itself.

[The truth of the matter is that my division of the Interpretants is feeble and doesn't come out clearly nor effect what it should.

A sign may express a need { vague / definite } { as to its nature / as to the object to be affected

A sign instead of expressing a need may be itself the establishment of assent to a regulation, that is, may be a contract.

A sign may neither express a need nor be a transaction but may simply cause the interpreter to look. Or in general to produce an effect. { To be a carry in to effect upon the field of interpretation

According to this Signs may be divided into

Desiderative
Effective
Transactive

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The immediate interpretant is the interpretant as the sign expresses it, the interpretant that the sign likely creates; and it is to be taken into account in the classification in so far as its different ~~relations~~ functions (?) & effects different forms of the sign.

The dynamic interpretant is the sign or the object interpretant determined by the sign in ~~the~~ field of interpretation exterior to the sign; and it has to be taken into account in so far as different ~~kinds~~ forms of signs require different kinds of dynamic interpretants & also in so far as the signs or the object differentiates relations of the excited sign of the object to the exciting sign makes the latter to ~~be~~ function as a sign

The representative interpretant is ~~what the~~ the sign ~~one~~ that is required to signify the professed identity or agreement of the sign with its dynamic object.

2. As to the immediate interpretant

1. It may be what is required to fulfill a need expressed in the sign, but which is not itself definitely expressed. Such ~~2. It may be~~ a sign may be termed a ~~Desiderative~~ Potentive. If the interpretant needed is a sign, the Desiderative is an Interrogative. If it is a feeling it is an Ejaculative. If it is an action it is a Desiderative

2. It may be that what is required is a definitely ~~expressed~~ action on a definite occasion. ~~In that case~~ Such a sign may be termed an Imperative

3. It may be that the required interpretant is anything whatever that fulfills ~~gen~~ certain general conditions. Such a sign may well be termed Significative

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b. As to the Dynamic Interpretant.

α. In itself

1. The sign may be such that it can only be interpreted properly in feeling or in a possibility. [The reason why an abstract quality is indefinite is that what I mean by an abstract quality consists in the possibility of something ~~Now to say that anything is possible is to say that under some unspecified~~ conditions it will occur. The some is the mark of indefiniteness.]

Such a sign may be termed an eidoseme

2. The sign may be such that it can only be interpreted in an existential fact.

Such a sign may be termed an ergoseme

3. The sign may be such that it can only be interpreted primarily in a sign. Such a sign may be termed a logoseme.

β. In the ~~solution~~ nature of the appeal of the sign to it.

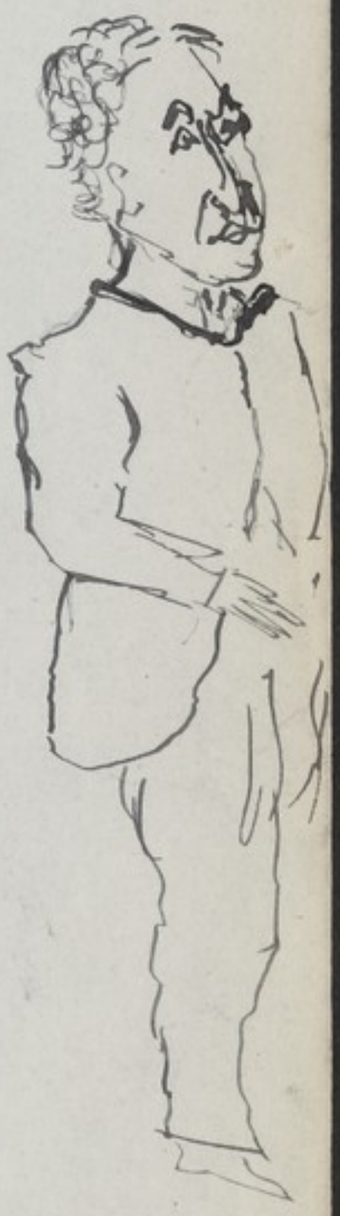
1. The sign may be such that its ~~can only be~~ natural mode of appeal to its dynamic interpretant is by sympathy

2. The sign may be such that its ~~can only~~ natural mode of appeal to its dynamic interpretant is by compulsion

3. The sign may be such that its natural mode of appeal to its dynamic interpretant is by reason

c. As to the Representative Interpretant

α. In itself



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1905 Oct 13

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A Nature of Sign in Itself
Abstraction = Qualisign
Existent = Sinsign
Combinant Signe --- = Legisign

B Of Object
a Immediate
In what form ~~How~~ object is represented in sign { Indef. / Sing. / General
as far as affects form of sign

b. Dynamical.
α Nature of Object in Itself { Abstraction / Concrete / Collection
As far as it affects nature of sign

β. ~~How signs~~ Cause of ~~is~~ being determined ~~to represent~~ Obj.
Causation of signs representing Obj

C Of Interpretant
a. Immediate
In what form ~~How~~ interpretant is repr. in sign { Interrog / Imper. / Significan
As far as it affects form of sign

b. Dynamical
α. Nature of Interpretant in Itself { Feeling / Fact / Sign
As far as this affects Nature of sign.

β. ~~Cause of sign being determined to be represented~~ ~~affect~~
Causation of signs affecting Interp. { Sympathy / Compulsion / Represental

c. Representative
α. In what form sign is represented in Interpretant
As far as this affects form of sign.

β. Causation of representation of Sign by the Interpretant
As far as this affects the nature of the Sign

γ. Rationale of Connection between Sign or Object affected by Interpretant

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1905 Oct 30

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Division of Signs.

I haven't distinctions enough.

The object of a sign is Internal or Immediate Object
External or Quasi-Real Object

But the latter is divisible into
The External Object as it is in itself
" " " in those respects in which it is represented

The External Object as it is in itself is denoted by the subject of a proposition
The External Object in its represented characters is the indefinite object of the predicate.

The interpretant is either the Interpretant expressed
the Interpretant ~~acted~~ affected
the Interpretant ~~rightly understood~~ representative

The interpretant affected is either the Dynamic Interpretant as it is in itself
or as it is represented

The interpretant representative is either
in Minor Premises — as the sign intends it to represent the sign as related to its object
Leading Principle — as it in fact it represents the relation of the sign to its object
Conclusion — as it ought to represent the relation of the sign to its object.

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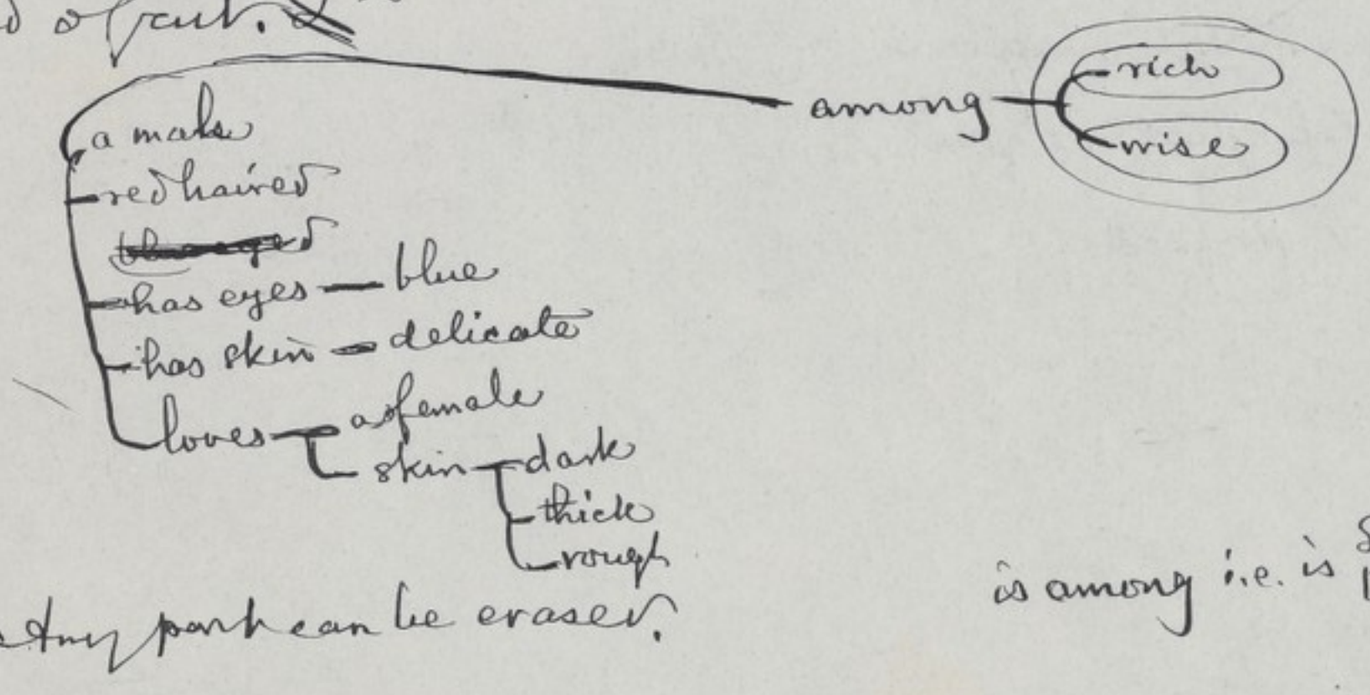
1905 Dec 14

In existential graphs on the sheet we erase what we like that is to say we erase depth, & therefore what is scribed on the sheet is scribed in depth. What is scribed oddly enclosed is on the other hand scribed in breadth. It may be that the negation element is essential & all that is scribed in breadth but one would suppose not & that many relations not to existents but possesses relations, as for example to qualities etc would be of the same nature; so that we should have some more elementary kind of part.

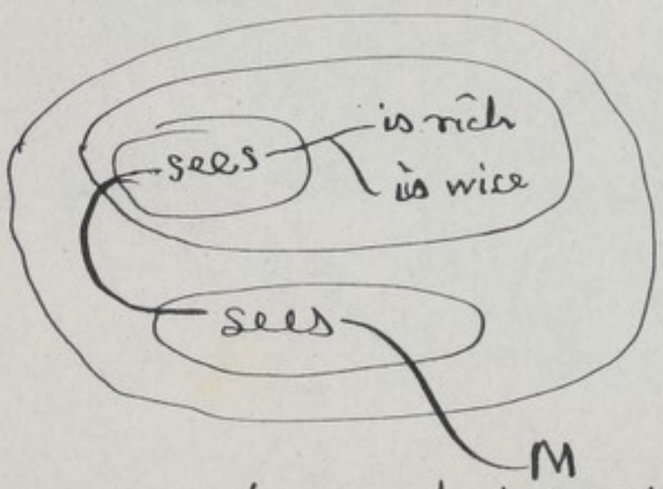


Any part can be erased.

is among i.e. is seen touched etc by everyone that sees touches every

something that is rich

& sees touches every one wise



If anyone X is rich A sees touches X
If anyone Y is wise A sees touches Y
If this be true A sees touches — M

If M is unseen by somebody that person does not see somebody who is both rich and wise.
But I want to make this necessary. As present it states a mere accidental fact.

Turn over

How is this? Pretty

How is this? Not so awful.

Not so awful. By any means —

This pen is the only one of the whole batch that is good. But this is not perfect

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What I am after is to remove the anomaly by which in existential graphs "other than" is expressed differently from any other relation, or appears to be so. Will not this anomaly be removed if (wise virtuous) be understood not merely to express the fact ~~de inesse~~ that there exists nothing that is wise and is not virtuous, but to express that the essential idea of the wise requires its object to be virtuous as part of its logical depth? But if so how shall we express the ~~fact~~ fact that a wise object not virtuous does not happen to exist? In answer to that I would suggest that we might make individual existence a predicate. (wise existent now virtuous) I do not know that I am prepared ~~efficient~~ definitively to pronounce that this would do. But I hardly believe it would do. I should be more inclined to have some special sign to show that the world spoken of in the general proposition is an ideal world.

Turn over

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1905 Dec 15
1:15 PM

At 5:30 this morning, as I was standing back to the heater ruminating upon the problem of the last page, it suddenly struck me that all my observations led logically to the idea that completely answer the riddle. I haven't any very definite idea of it as yet. But that I am going to proceed to evolve.

I set out from the remark that if I scribe on the sheet of assertion (is a woman / is an angel)

I do not therein assert that there is any such thing as an angel. But I do assert that there is such an idea as the idea of an angel. It means that the woman in question has some character that no angel has, or differs from angels in some respect in which all angels ~~agree, or~~ would necessarily agree. She lacks some essential character of an angel

(is a woman / possesses — is a character of — is an angel)

~~Therefore~~ women either does not possess X
or else X is a character of x
or else x is not an angel

This woman possesses no characters except such as are common to all angels

$p X^a$
$X \dagger \bar{a}$
$p \dagger \bar{X}^a$

~~To say the woman non-possesses~~

$\Sigma_i \Pi_j \Sigma_k \; p_{ji} + \bar{p}_{jk} \cdot a_k$

(is a woman / possesses / possesses / is an angel) ~~possesses~~

1905 Dec 20

Whatever is where its existence affirmed unconditionally must be scribed on the sheet.

Whatever has not its existence affirmed but only has it hypothetized is to be singly enclosed; as (man / fool)

Whatever is where its existence affirmed conditionally upon the existence of something B must be scribed on the same area as a cut upon the ~~area~~ area of a virgin if B is only of a virgin

B. (man / lover of — virgin)

"Some man is a lover of a virgin" this follows from the other but

(man / lover — / lover — virgin)

and so on

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1905 Dec 20

267r

§1. "Science" has 3 meanings

1. Θεωρία. The demonstrative character of certain cognition

2. (Formulated by Coleridge at the beginning of the XIXth century)
Systematized & organized knowledge. (Ordered knowledge)

3. By the end of the XIXth century. A concrete operation conducted by groups of men. It is a spirit which gives life to every other element of it & single-hearted desire to learn the truth, have one's errors corrected as speedily as possible.
Hence the methods of doing so are carefully studied & hence each man gets all the help possible from his fellows.

§2. "Philosophy" has 2 principal meanings

1. The cream of the sciences, — synthetic or positive philosophy

2. Cenoscopy, the study of the experience already acquired.

§3. In commencing cenoscopy we are confronted with the fact that we already believe a great many things. These beliefs must be ~~criticised. The~~ reconsidered; and this reconsideration should be architectonically planned. Every procedure of cenoscopy should be architectonically planned. This plan should not be adopted without ~~the severest~~ criticism. Nothing in cenoscopy should be adopted without criticism. Every criticism should wait to be planned; the adoption of each plan should wait for criticism.
Imperfection inseparable. We must go ahead as little imperfectly as circumstances permit.

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I. Introduction: Cenoscopic Philosophy; its general nature and divisions. (First put the preceding page.)

Were ~~the writer, or any other~~ the life long student of philosophy to set down all his reflections ~~about this~~ in response to this question, they would fill a volume. But a few sentences will suffice to set us on the track. Aristotle took as the master-key to this multiform problem the idea of a plant growing from its seed. Thence he derived the ideas of dynamic and entelechy of ὕλη and μορφή, or as he had better have said, of the flow, the group. This has proved to be a wonderfully fertile idea. It may be said to be the only really fertile idea covering the whole ground of cenoscopy that has ever been put forward. The entire achievement of the XIXth century, especially the latter half of it, may be summed up in saying that it emphasized growth, the idea, and the act, and the ~~principle~~ living principle.

We everywhere see that growth can go but little ways, until the two elements of it which are the functions of the two sexes are well separated. The seed has to be left ~~to grow~~ at first to grow as far as it can alone, for that it must needs have a masculine element within itself. As for the mass and to speak of this masculine element as apart from the feminine, is simply ~~that~~ νοῦς ἐστι πρὸς τὴν ἐκεῖνα νοῦν. The masculine & feminine being ~~a new life begins, comes~~ ~~On the basis of such reflections we shall divide~~ ~~Applying these ideas to~~ Knowledge, ~~the capacity for know thinking is the~~ ~~seed~~ Its seed is the mind. Its growth consists in experience. The union gives science. But

(~~The female function is the primal growth,~~ ~~the male function, the seed~~ ~~has always~~ has always been recognized as the δύναμις — the potency of growth. ~~The function of the spermatozoon is the awakening of the seed to a new life~~ ~~the principle of union~~ the principle which awakens the seed to a new life.)

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§4 The business of cenoscopy is to build up as well as we can conceptions of the omne of being and of non-being and of its principal parts. ~~How shall we lay out this business?~~ ~~this business not~~

§5 It should be divided into three kinds of work,

1. The general survey of the ~~material not~~ building materials, the elements out of which concepts are to be built. Let us give this work the name of phaneroscopy.

2. The consideration of the general ~~natures of our of~~ ways in which the ~~operations~~ what ~~the warp and woof~~ of our operations ought to be. ~~This will be upon these elements of thought~~ the mind, if it is to act deliberately and under self control, must respond ~~normative science~~ to the blows of experience; and this gives Normative Science.

3. ~~The work itself under the guidance of~~ Thirdly ~~these~~ two elements being united, we proceed actually to frame our ~~the~~ theory of the omne and its principal parts; and ~~phaneroscopy and normative science~~. ~~Let this be called Metaphysics.~~ This study may appropriately be termed Metaphysics.

But cenoscopy is not to resort to special experience. It is science in the seminal condition. Still, it could have no life at all without the two seminal elements and their issue.

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The meaning is our interpretation
Or must either be Primary, Secondary, or Tertiary
A Tertiary interpretation must itself have a further interpretation.
A Primary interpretation has no bearing upon anything
A Secondary interpretation is intellectual. Or is merely feeling

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II. Phaneroscopy.

~~i. Its General Nature~~ ~~the logical composition of concepts,~~

i. The Phaneron and ~~Logical elements of~~

in general.

Here take up Kant & Leibniz & a general sketch of Existential Graphs

ii The forms of indecomposable elements of thought elementary ideas that are a priori possible

iii The forms we actually find.

iv. The principal kinds of Primanity, Secundanity, and Tertianity.

III. Normative Science.

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1905 Dec 21.

Pure logical analysis becomes, after pursuing phanerotscopy a good way, somewhat uncertain. One is glad to bolster it up with confirmations from psephical phenomena.

That secundanity implies real action, and that dyadic relation without real action is a conception possible only by conceiving an inhibition to be added to the secundanity, appears first from the evident ~~simpl~~ relative simplicity of the idea of action in comparision with that of relation. But we are glad to have psychological & historical confirmation of this.

In action there is an ~~unchanged~~ unaffected agent and another affected patient. That is the simplest form. This a complication if both are changed. Reciprocal relation is complex of two ~~rel~~ disquiparances.

The intellectual purport of a concept is its belief-value, or influence upon the interpretation of judgments.
This is a definition. But it is not easy to make it quite clear.

A sinsign symbol is a generalization of a possible feeling,
A dicisign symbol " " " " " " effort.
An argument " " " " " " movement of thought.

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1906 Jan 30

A sign is a species of medium of ~~inter~~communication.

The object, O, determines the sign, S,
and S determines the Interpreting sign, I, to being determined by O through S.

There are now 5 questions to be considered

1. What would be the effect of adding to the condition that S must correspond to O according to some system?

2. What would be that of adding that I is to be determined by the very determination of S by O?

3. How would it be to require that I should be determined in such a manner as to contract a habit?

4. How would it do to say that a sign is a consciousness of a habit; that is, that an instance of a sign is a present determination of a quasi-mind brought about by the direct action of a habit of that quasi-mind. That is that the mere truth of the proposition that under certain circumstances it would be determined in a certain way, directly determines an actual determination of that quasi-mind?

5. Is every sign a proposition as in Existential graphs? and does every proposition relate to the future as its object? Is every knowledge or even conjecture a sign? Is every sign determined by its object? Is all real determination a determination of the relatively past by the relatively future? How are these propositions to be escaped or reconciled? over

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1908 Jan 30 Continued from last page

To begin with it is necessary to distinguish between the immediate and the dynamic object of a sign.

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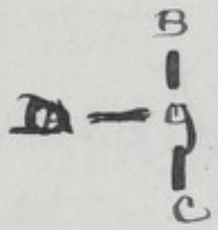
1906 March 7

273r

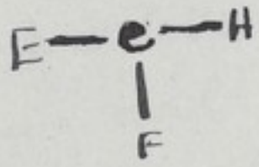
~~A—g—B is a graph instance of the graph B~~

—γ is a graph



is an instance of graph B on area C

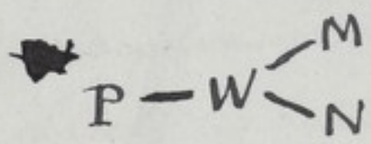
A always stands for the area of the sheet



E is an enclosure or cut on the area F of which enclosure or cut the area is H

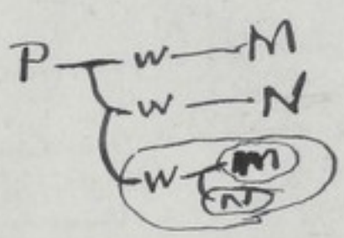
ε—K K may be erased, K being a single graph-instance.

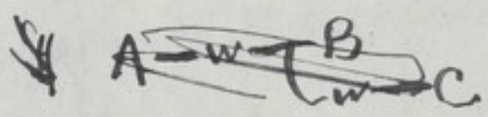
ι—I I may be scribed, I being a single graph.

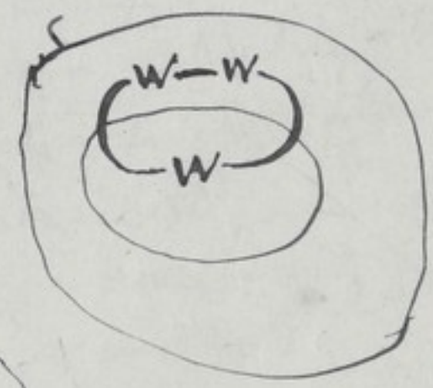


P is a graph consisting of two graphs M and N

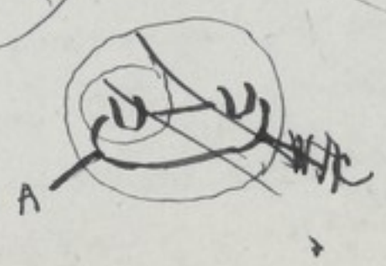
Or put R—w—S R contains as a part S

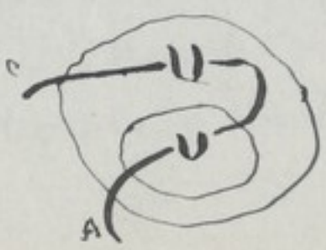






A contains everything B contained by C





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In all discourse there is but one symbol. Its parts are joined by lines of identity solely. Every object to which it refers must be immediately or mediately joined through the graph of coexistence with a known object of the same universe.

Every object ~~is either~~ (by which I mean that which determines the interpreter's ~~attention~~ through determining the sign, the "object" of a proposition being for example the fact, ~~or~~ real or not, which the proposition expresses) is of one or other of two kinds which I know not how to characterize without suggesting some idea that I do not mean. Otherwise I would say "represented as external" and "represented as internal" or better "represented as real" and "represented as imaginary". But to avoid the wrong ideas these suggest, I will take the colorless designations "active" and "passive".

~~In the abstract~~ The interpreter has no logical right to admit any active object without ~~a~~ the specific assurance of a sign. He has a logical right to admit all the passive objects he ~~has~~ can conjure up. When a sign has ~~given him the right to admit an active object~~ given him the right to admit an active object he can still refrain from thinking it if he likes. But he cannot logically refuse to admit a passive object without a specific sign authorizing him to do so. Therefore active objects may be termed actualities and passive objects possibilities.

He cannot ~~admit~~ think of an object as an actuality without a sufficient sign. But he may ~~exclude~~ refrain from thinking of any object as actuality whenever he pleases. He can think of an object as a possibility whenever he likes. But he cannot logically ~~exclude~~ exclude a possibility from his thought without a sufficient warrant of a sign.

Consequently to avoid setting down an infinity of objects we represent the actualities whose admission to thought is warranted ~~and~~ on one side (recto) of the sheet, and on the verso the possibilities whose exclusion is warranted.

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Provisional Classification of signs 1906 March 31

A Sign is

in its own nature

is ~~either~~ either A Tone what it may be in itself to be whether it is or not — A Token whose being consists in dyadic relation — or A Type whose being consists in the order of whatever may come hereafter to be, or in the order that will be shown whenever certain kinds of action shall take place.

in reference to its Immediate Object

is either Indefinite Singular or General Sign *

in reference to the nature of its Real Object

is either Abstract Concrete or Collective *

in reference to its relation to its Real Object

is either Icon Index or Symbol *

in reference to its Intended Interpretant (1906 Aug 30 Transposed from 4 thirds)

is either Positive Imperative or Interrogative

in reference to the nature of its Dynamic Interpretant

is either Poetic or excitant of feeling Sidesense — Stimulant or excitant of Action Experience — or ~~Det~~ Impressive or determinant of a Habit Experience

in reference to its relation to its Dynamic Interpretant

is either Sympathetic Compulsive or Rational

in reference to the Nature of its Normal Interpretant

is either Strange Common or Novel

in reference to the Passion of its Normal Interpretant

is either ~~Substitute~~ Suggestive ~~Suggestive~~ Suggestive or Argument

in ~~reference~~ to the Significance of its Normal Interpretant

is either Monadic Dyadic Triadic ??

6 ~~4~~

8 ~~6~~

7 ~~5~~

9 ~~7~~

5 ~~8~~

4

3

2

4

1

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The Object is always single & unique

The Immediate Object is the Mark by which the Sign represents its object to be distinguished by

A Type is a Form whose Being consists in the fact that it can be regarded as ~~virtually governing~~ creating phenomena

To understand this it is necessary to accept the narrow view that real being is limited to existence, both on right

A Token is an ~~accidentally~~ indefinitely characteristic in its nature incapable of ~~definite~~ identification

1906 April 2

Notes on my Provisional Classification of Signs.

I have thought of the Object of a Sign as that which determines the sign; and this is well thought. I have thought of the Interpretant as that which the Sign determines or might determine, or should determine, but this is not so well. For my idea of determination is dyadic while the idea of the relation of the interpretant to the sign is triadic.

Say the Interpretant is that which the Sign ~~determines~~ brings into correspondence with the Object.

The Object is plainly Twofold. The ~~Immediate~~ Dynamic Object is the Real Object according to the above definition. The Immediate Object is the Object as ~~presented~~ presented in the Sign.

The Interpretant is Threefold. The Normal Interpretant is the genuine Interpretant, ~~being~~ embracing all that the Sign could reveal concerning its Object to a sufficiently penetrating mind, being more ~~than~~ than any ~~possible~~ mind (or our mind) could conclude from it, since there is no end to the distinct conclusions that could be drawn concerning the Object from any Sign. The Dynamic Interpretant is just what is drawn from the Sign by a given Individual Interpreter. The Immediate Interpretant is the interpretant represented, explicitly, or implicitly, in the sign itself. ~~This~~ I have thus omitted the intended interpretant. So far as the intention is betrayed in the Sign, it belongs to the immediate Interpretant. So far as it is not so betrayed, it may be the ~~Interpretant~~ of another Sign, but it is in no sense the interpretant of that sign.

As to the Matter of the Sign itself, it is either a Tone or a Token or a Type. The word Tone is a blend of Tone and Tune. It means a ~~sign~~ quality of feeling which is significant whether it be simple, like a Tone or complex, like a Tune. But the latter is not pure feeling. By a Token, I mean an existing thing or an actual historical event which serves as a Sign. By a Type, I mean a general form which can be repeated indefinitely and is in all its repetitions one and the same sign. Thus the word ~~the~~ is a Type. It is likely to occur ~~two~~ over ~~twenty~~ seven hundred times on ~~an~~ English a page of an English book, but it is only one word twenty times repeated. The distinction between a Type and a Token is obvious. There may be some confusion between the Token and the Type. They may, however, be distinguished in various ways. In the first place

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goes for a continuum

is absolutely identical in all its ~~instances~~ or embodiments, while a Tone
cannot have any identity, it has only ~~the~~ similarity. Thus the sound of
any vowel will be slightly different every two times it is pronounced and in
so far as it is so, it is two Tones. But any two vowels in so far as they
are alike are the same Tone, ~~in so far as~~ without any one in which there can be any sameness
to a tone. Any thing then that could conceivably be made ~~quite~~
absolutely definite, bearing in mind that no two things can be exactly alike
in any ~~respect~~ character whatever, cannot be a ~~True~~ Tone. Another test is
that a Tone though it may be composed of many ingredients is, like
a chemical compound of many elements, perfectly homogeneous and
structureless in effect, while a Type, though it may be indecompo-
sable, may be more or less complex in its relations. ~~Still~~ Tests might
be multiplied; yet after all, it will often ~~be~~ require subtlety to decide
whether a given sign is a Tone or a Type. Take for example a
given melody, say the Last Rose of Summer. Considered as to its structure it
is a Type, but considered as ~~to the~~ a whole in its esthetic effect
which ~~does~~ is not ~~consist~~ composed of one part due to one note and
another. To another it is a Tone. As ordinarily conceived it is
a Tone (slightly different every time) but from the point of view of contrapoint, it is absolutely
the same every time it is ~~correctly~~ rendered (~~or so nearly~~ so with
substantial correctness ~~never~~ though it be a ~~little~~ little out of tune
and time) it is a Type. But any one singing it is neither
Tone nor Type but a Token. Notwithstanding ~~these~~ difficulties
in ~~so~~ many cases there is not room for an instant's hesitation, and the
distinction is not only useful but practically indispensible.

The immediate object of a sign may be of quite a different
nature from the real ~~object~~ dynamical ~~object~~. ~~It is~~ Let the
object really be ever so complex, yet if it is presented without analysis,
and in such a way as to have no definite identity, the Immediate Object
is a ~~Tone~~ simple quality, thus ~~a mass~~ ~~the~~ ~~a~~ ~~noun~~ substantive with the indefinite article
has ~~a Tone for its~~ a simple quality for an immediate Object. A proper name on the
contrary has a well-known ~~the~~ existent thing for its object, even if
like Othello, it be a fictitious object. But this cannot be the case
for an interpreter who has never heard of the thing or to whom the name is new

A sign may have for its immediate object the determining course of nature, or habit of things. Thus if I say every President of the United States has been a high minded man, I conceive that the operation of some natural law has made them so. This is a ~~possible~~ way in which the precise meaning may be expressed; and it is the first rule of logic that in pure thought in whatever way a thing can be accurately conceived in that way it is; because pure thought has no other being than that of representing its object. This is not only the way the matter may be regarded but the way it must be regarded ~~as under~~ a subject to an exception I shall mention presently. The reason it must be so regarded is that a sign cannot have two objects. You may represent a pair of things, or a triplet or other collection, but it will be a single pair, a single triplet or a single other collection. So the exception I alluded to is that the sentence (which is in so far ambiguous) may be taken to mean that the succession of Presidents of the U.S. (which succession is a ~~some~~ unique object) is a succession uninterrupted of ~~honorable~~ men of certain sentiments. Usually as when we say "All men have two legs" we plainly refer to the nature of men, since ~~we~~ some monstrosities recognized as men have different numbers of legs.

$x^2 - (\alpha+\beta)x + \alpha\beta$

$\cancel{2\alpha\beta - (\alpha}$

$(\alpha+\beta)^2 - 4\alpha\beta = (\alpha-\beta)^2$

1906 April 3

Third Triplet.

This triplet concerns the Dynamical, or Genuine Object. It is misleading to call it the real object, since it may be unreal. It is the object that truly determines the sign. But it would be a mistake to suppose that a fictitious object cannot produce a real effect. There is no reason for saying that it is impossible. Of course such action presupposes some approach to reality, but it does not suppose perfect reality, or even substantial reality in the main.

This triplet depends upon the nature of the Dynamical Object. But it is not to be forgotten that we are engaged in classifying the constitutions of signs, and therefore distinctions in the nature of the Dynamical Object are only to be regarded in so far as they affect the constitution of the sign.

The Dynamical Object may be 1st an unidentifiable character 2nd a thing or actual event, 3rd a habit affecting future determinations together with the whole course of those determinations so far as brought about by the habit.

A sign which denotes an unidentifiable character (i.e. a character incapable of strict definition in general terms) such as the word "redness" does not appear at first blush to have a constitution different from any other abstract term such as "algebraical invariance" which denotes a character susceptible of exact definition. If this primâ facie judgment is sustained by critical examination, then this kind of sign (that it may not separate signs of like constitution) must be taken to embrace all abstractions. But there would seem to be a distinction of constitution. Namely, in the case of redness, it is only necessary to take an ordinary experience of a red thing and remove all reference to shape, until it, etc. when what remains is Red in the abstract, which is the same as identical with Redness. But the notion of algebraical invariance is not so contained in experience. An ordinary presentation of an algebraic invariant, such as the quadratic discriminant $b^2 - 4ac$, does not represent it to be invariant. The invariance is the character of the necessary result of an operation upon the invariant and not of the object in itself. It is thus

not properly speaking an abstraction from "invariant," and in strictness ought not to be called "invariance" but is an abstraction from ~~"linear~~ "general linear transformation of an invariant." It might be more properly called "invariance of transformate." Indeed it is obvious that "invariant" is an abridged expression. Take a much simpler case. The character T is ~~symmetrical about a vertical axis~~ symmetrical as to its two sides. "Symmetry" is the abstract, ~~to~~ Yet ~~as~~ though we instantly recognize that character to be symmetrical, it is only because we almost instantly perform the experimerimental comparison. Therefore, though "symmetry," in this case, is an abstraction, it is not an immediate abstraction, that is does not result from merely dropping extraneous ingredients from the presentation, but is a comparative abstraction. Every comparative abstraction is evidently a complication of immediate abstraction ~~no doubt~~ of course. I have little doubt that I could readily demonstrate that every immediate abstraction is of a character in capable of definition in general terms, and therefore "unidentifiable" in the sense intended. Suppose however, that I could not. Still according to the principle that distinctions of the genuine object are only to be taken into account when ~~they affect~~ they affect the constitution of the sign, ~~the~~ ~~class~~ ~~class~~ ~~all~~ all immediate abstractions should be compelled to class together; and since the distinction of immediate and comparative abstraction is not very important, until this classification is made much more minute than I am yet prepared to make it, I make the first ~~species~~ class of the triplet to include all abstract terms, or terms denoting simple characters.

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The second class of this triplet is that of signs of actual objects. This is the familiar class of concrete signs. Here again it would be easy to draw subtile distinctions, since obviously no word in use is absolutely concrete. But until we are prepared greatly to multiply our classes, this must be taken as sufficiently ~~precise~~ exact. In regard to actuality, or existence, which two conceptions are the same for present purposes, it is to be remarked that it consists in the ~~action~~ brute action of one fact upon another. Take the existence of a chair or table. By saying that it ~~exists~~ we mean that it is in the one universe of existence ~~and this~~ Now it would not be in the same universe with anything with which it did not reach. If A never acts on B, nor B on A, they are not in the same universe. If this is so for five minutes, during those five minutes they are not in the same universe. If A acts on B but B does not act on A, they have different modes of being and therefore do not coexist.

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1906 April 4.
Father's birth-day

Let me see what kinds of signs do not appear among the first nine triads of my table (for the tenth is of no account)

Monads Dyad Polyad

A well developed description of an object

An experiment

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1906 Aug 30

We might call the three Interpretants
The Impressional Interpretant
The Factual Interpretant
The Habitual Interpretant

The first member of each Triad is distinguished by its want of definite identity, which only the Dyadic Element in it produces.

All my notions are too narrow. Instead of "Sign", ought I not to say Medium?

Concerning the Impressional Interpretant, we ask what is its Nature, Primal, Secundal, or Tertial and which division of Signs does this give rise to?

There is no other Question to be asked of it, for it is nothing but the Sign under another form of presentation. Does the meaning

Concerning the Factual Interpretant, we ask, First what is its nature, and Second how is it produced and what divisions of signs result?

Concerning the Habitual Interpretant, we ask of what Nature is it. How is it produced? and What is its Significance or Destiny.

The Sorts of Habits and Habits of Feeling, Habits of Action, Habits of habituation. How are habits produced? By simple custom, by forcible interference by the growth of one habit influencing another.

What is the Significance of Habit? Producing settled state of calm, Achieving a definite purpose, the Gradual Elevation of ideals.

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(you'll say be continued)

All very well; but what divisions of signs result therefrom?

That's the question — that there may be not Rules nor Botches in the work.

The divisions one expects seem to be entirely different. They are

Interrogative or Suggestive	Imperative	Indicative
Term	~~Prop~~ Sentence	Movement of Thought
Sign by common nature	Sign by Diagram	Sign by Experiment

But all these seem to have reference to the Object.

— The meaning of a Sign is the meaning of another Sign as "Surprise that" The meaning of a Sign is whatever one comes to in an action.

1906 Aug 31

The last Interpretant might be called the Eventual Interpretant

a Sign having for Eventual Interp a feeling	a fact (such as a start of surprise)	a habit (intellectual sign)
Sign through a quality or property	Sign through Formal fact	Sign through a Sign
Hypothetical	Categorical	Relative

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PROVISIONAL DIVISION OF SIGNS. 1908 Aug 31

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I. 1st Division according to the Matter of the Sign

Tinge — Token — Type

Vague Quality — Thing or Fact — Immediate

II.i. 2nd Division according to Form under which the Sign presents its Object.

Indefinite — Designation — General

II.ii.1. 3rd Division, according to the Nature of the Real Object

Abstract — Concrete — Collection or other Ens Rationis

II ii.2. 4th Division, according to the Connection of the Sign with its Object

Icon — Index — Symbol

III.i 5th Division, according to the Form of Signification, or Initially Interpretant.

Medad — Monad — Dyad — Polyad ?

perhaps Hypothetic — Categorical — Relative

III.ii.1 6th Division, according to the Nature of the Middle Interpretant

Sympathetic (congruentive) — Shocking (Percussive) — Usual

III.ii.2 7th Division, according to the Manner of Appeal to the Middle Interpretant

Interrogative (or Suggestive) — Imperative — Indicative

III.iii.1 8th Division, according to the Purpose of the Eventual Interpretant

Gratific — Actuous — Moral or Temperative (to produce Self Control)

III iii 2 9th Division, according to the Nature of the Influence the Sign is intended to exert.

Seme — Pheme — Delome

III iii 3 10th Division, according to the Nature of the Assurance it affords the Interpreter of taking the Sign according to its Purpose

Abducent (assurance of instinct) — Inducent (assurance of experience) — Deducent (Assurance of Form)

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1908 Sep 5.

The purpose of a Diagram is to represent certain relations in such a form that it can be transformed into another form ~~itself exp~~ representing other relations involved in those first represented and this transformed icon can be interpreted in a symbolic statement

It is necessary that the ~~Icon~~ Diagram should be an Icon in which the inferred relation should be perceived. And it is necessary that it should be in so far General that one sees that accompaniments are no part of the Object

The Diagram is ~~the~~ an Interpretant of a Symbol in which the signification of the Symbol becomes a part of the object of the Icon.

No other kind of sign can make a Truth evident. For the evident is that which is presented in an image, leaving for the work of the understanding merely the ~~trans~~ Interpretation of the Image in a Symbol.

The ~~Dynamic~~ Dynamic Interpretant is the Action of transforming the Diagram
The Eventual Interpretant is the Symbol in (or is it the transformed ~~Icon~~ Diagram) resulting the transformed Diagram
The latter is the ! Eventual Interp.

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1906 Oct 21

A sign is something which brings a determination of one thing into correspondence with another which determined

A Sign has three Interpretants (that is 3 determinations that it tends to bring about)

The Immediate Interpretant is that which is necessarily brought about if the sign is to be such

Quality signifiant

It is a vague possible determination of consciousness, a vague abstraction.

The Dynamical Interpretant is an actual event which actually does result from the influence of the sign x is an actual determination of an existent mind by force or ~~[illegible]~~ the sign to correspondence with an existent

The Final Interpretant is that habit in the production of which the function of the sign is exhausted.

These three are possessed by every sign. But now signs also differ among themselves by somewhat similar distinctions

1st Signs differ according to the natures of their immediate Interpretants, which are always indecomposable, but are Monadic, Dyadic, or Triadic,

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1908 Oct 23

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The interpretant is the determination of that which is determined by the sign to ~~rep~~ correspondence to the object.

This is threefold.

The Immediate Interpretant is the immediate pertinent possible effect in its unanalyzed primitive entirety. ~~It is~~ ~~for instance~~ in the case of a sign interpreted by a mind, that idea (in a very extended sense) ~~which~~ must be apprehended in order that the sign should actually fulfill its function, ~~this~~ idea being presented whole and unanalyzed, ~~Summary~~ be a quality of feeling, more or less vague, or an idea of an effort or experience, or it may be analyzed by the mind or previous experience, and may be the idea of a ~~habit, a general~~ form or anything of a general type.

The Dynamical Interpretant is the actual effect produced upon a given interpreter on a given occasion in a given state of his consideration of the sign. This again may be merely, or a ~~suggestion~~ feeling, or a ~~compulsion~~ an action or a habit, or a ~~force~~, or a ~~persuasion~~. ~~Moreover in this relation~~

~~The Final Interpretant~~ Moreover in respect to the relation of the sign to the dynamic interpretant, signs are divisible into the suggestive, the compulsive (or forcible), and the persuasive. Thus, if the sign is a sentence, it is interrogative, imperative or indicative.

Turn Over

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The Final Interpretant is the ultimate effect of the sign, so far as it is intended or destined, from the character of the sign, being more or less of a habitual and formal nature. In respect to the final interpretant signs are divisible, 1st, according to the nature of this interpretant; 2nd, according to the relation of it to the sign; 3rd, according to the relation of it to the object.

In the first respect the division is into different forms of good according as the object is to create or modify an Ideal,
to produce an individual event or process,
or to establish a general habit or law.

In the second respect perhaps the division is into
Monad Dyad Polyad.

In the third respect perhaps
~~Theme~~ ?
Seme Pheme Deleme

1908 Oct 25

I purposely did the above without recollecting anything about my previous 6 divisions, except that that also ended with Seme Pheme & Deleme, which is to be suspected on that account.

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Arranging Genera of Triadic Relations according to Numbers of Kinds

I.I.I — 1 kind
I.I.II — 2 kinds
I.II.II — 3 kinds
I.I.III — 3 kinds
II.II.II — 4 kinds
I.II.III — 6 kinds
I.II.III — 6 kinds
II.II.III — 9 kinds
III.III.III — 10 kinds
II.III.III 12 kinds
Total 56 kinds

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1906 Oct 25

The only way to straighten out this classification, — the 7th to 12th divisions is to put in a great deal more hard work, first, in acquiring intimate acquaintance with the different kinds of signs; and 2nd, a deeper study of the nature's of the three interpretants.

1908 Aug 18

This book having been mislaid for a good many months, I have written some things in others. As in a book 8½ × 7 inches ⅝ in thick with yellow sides shaded diagonally with brown & reddish brown back by Sir. T. Fairbanks and in several Harvard Cooperative Books with thin brown pasteboard sides 8¾ × 6 15/16 inches ¼ in thick

There is no subject into which I have inquired more particularly & persistently than the varieties of dyadic and triadic relations without obtaining a satisfactory classification of either. Triadic relations may be divided as follows:

1st those of which at least one correlate is a mere Idea,

2nd those of which no Idea but at least one Occurrence is a correlate

3rd those all of whose correlates are ~~Sig~~ Signs etc.

The 1st of these classes is divisible into

1. Those all whose correlates are Ideas
2. Those of which 2 correlates have that character
3. Those of which all three have that character

Or, denoting by I an Idea, by II an occurrence and by III a general

I, I, I — 1 kind

I, I, II — 4 kinds

I, II, II — 10 kinds

II, II, II

I, I, III — 2 kinds

I, II, III — 3 kinds

II, II, III — 9 kinds

II, III, III — 12 kinds

I, I, III — 3 kinds

I, III, III — 6 kinds

I, II, III — 6 kinds

1, 2, 3
1, 2, 13, 23
123

1 1, 1
1 1, 2
1 1, 3
12, 1
2
3
122 22, 1
222 3

111
113

This makes 10 kinds

But Occurrences are either II i Things or II ii. Events or facts

And triadic Objects are doubtless of 3 kinds

III i
III ii
III iii

On this principle Dyadic Relations should be either

I, I 1 kind

I, II 2 kinds [illegible] kinds I, II i and I, II ii

II, II 3 kinds [illegible] 3 kinds II i, II i; II i, II ii; II ii, II ii.

6 kinds

11 12 13 21 22 23

11 12 22 13 23 33

11 12 13 22 23 33

6 kinds of dyadic relations

Other examples of organic analysis are

Our distinguishing memory-elements & perceptional elements
& ~~touch~~ elements of desire from both

In a lesser degree we distinguish sensual, esthetic, moral
and intellectual gratification

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1908 Aug 21

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Different kinds of Analysis

1. All feelings are in themselves absolutely simple

organic Analysis { 1½ But we do directly distinguish in our feelings a visible part an audible part, etc, parts of the retina and we separate, the sensations of different

2. Attentional analysis; such as that by which we hear harmonies in musical notes, by simply listening for them. There is no such phenomenon in color-sensations, which is a remarkable fact, due to the organ of hearing physically making an analysis while the organ of the eye appears not to do so. As it would, by the way, if the different cones etc of the retina ~~possessed~~ were sensitive to different qualities of color,

3. Comparational analysis, by which we perceive likenesses of different feelings. As between different vowels & consonants whence the triangle of vowels. Also in colors where we recognize likenesses in hue, in chroma, and in luminosity. This kind of analysis is greatly affected by habit. (Much to be said under this head)

4. Experimental analysis. Color-box & color-wheel analysis.

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Every man begins life with a natural confidence in his own powers — or rather with an absence of any suspicion of their proving insufficient. But each step we take toward perfect self-consciousness consists in learning our own ~~[illegible]~~ weakness, ~~[illegible]~~, or error.

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1908 Aug 26

I shall best begin my book on Logic somewhat thus:

~~Writers of treatises usually~~

~~Treatises usually begin by~~

~~It is usual and natural~~

~~Treatises usually, and naturally~~ A natural custom devotes the opening ~~devote their~~ opening chapters to almost every treatise to an explanation of the nature of its subject; ~~and on the whole, that it is a good custom.~~ There is room for cavil at this custom; since the very first step toward understanding anything is to gain familiarity with it, and it is precisely such familiarity that every treatise in every case is written; while on the other hand, if no more than a rough, approximate understanding of the nature of the subject be attempted, that is what the reader must already have possessed or he would not have opened the book. But, on the whole, ~~I do not~~ the objection does not ~~seem sound~~ appear to be sound. For while the reader must ~~have~~ already have some notion of what he expects to gain from the book, the author who must be supposed to have devoted a large part of his life to the study of the subject ought to be able, even at the outset to convey a somewhat more definite conception of its nature than a reader to whom it is comparatively novel could, with the best powers of mind in the world, have been able otherwise to form. Yet when all has been said that the limits of the work shall have permitted, the writer, who cannot in his book have imparted all that he ought to know of the matter to qualify him to write it, should still be able to open to the most diligent student of his book a still more distinct view of the living nature of the subject than this student can possibly have derived from what he has read. Accordingly, I intend to make the nature of Logic the subject of my first chapter and also of my last.

~~Although every step one takes toward that self-consciousness which~~ ~~We all have~~ Every man begins life with a natural confidence in his own powers, which to some extent is assuredly well founded, and

This sentence is written on the wrong page. It belongs 1909 Nov

by the way the Notation of 1905 Oct 13 for the tri-chotomies is excellent. It is A and Ba to which I have formerly applied this method, and I am now employing it in comparing Bbβ and Cbβ, though

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1908 Aug 28

I have been for some months working out a Hypothetical Cosmology of both worlds, the here and the hereafter.

§1. I must begin by saying peccavi. How I opposed psychical research. ~~But~~ Yet after all, it has made the greatest of conceivable discoveries.

In §2 I show that this discovery puts upon reasoners the task of reconstructing the fundamental concepts both of physics and of psychics.

In §3, I show that logic requires us to postulate of any given phenomenon, that it is capable of rational explanation.

Now, I say that the co-reality of the three universes 1st of Ideas, 2nd of Occurrences (existent things and actual events), 3rd of powers ~~bringing~~ to bring two ~~objects~~ substances into relation to each other, (and I will call powers of this sort Reasons) must, accordingly, be supposed capable of rational explanation.

But in §4, I must first ~~show~~ absolutely prove that each of these three universes is Real; viz: that there are Real Possibles (not that ~~they are~~ there are ~~any~~ a mode of being ~~higher~~ different than possibility, but that there are possibilities that do not

Description cannot characterize any science
since poets also describe phenomena. The so-called
descriptive sciences do not describe phenomena
of all kinds. Which kinds do they describe? I answer
that they describe the kinds mentioned, that is, those that call
for explanation. Explanation is their aim or in view to remind
both ~~students~~ the men of science and those whom they
teach that this is their aim it would be well they were
called Explanatory Sciences.
and 2d those that will confirm true explanations
or correct false ones,

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merely consists in some mind or minds not knowing that they are not actualized) and secondly, that there are Real generals (Reasons) (which do not merely consist in any mind or minds knowing that ~~their~~ the denials of them are ~~false~~) in no actual occurrence true.) As for the universe of actuality it needs no proof since each man is constrained actually to believe that certain occurrences actually are.

I further show that the mode of being of an Idea is that of Real Possibility, that that of an Occurrence is Actuality; and that that of a ~~General~~ Reason is Real Necessity (which last concept will require considerable elucidation, though Hegel's Begriff approximates to it.) In this elucidation I will show that ~~true~~ genuine Continuity is merely Generality of Relations of Parts.

I shall ~~also~~ show that no Idea as such is Actual, that no Occurrence is as such ~~Really General~~ Really Necessary, and that no ~~General~~ Reason is merely Really Possible.

In §5, then, I consider first what it is to explain the Phenomenon of the Three Universes, and secondly in what sense I can, as a sane man, undertake such a task.

In the first place, I show that an Explanation of a Phenomenon, as the term is used in the so-called "descriptive" sciences, which ~~are not pro~~ would more properly be termed the "Explanatory" sciences,* consists in showing that the observed phenomenon follows logically, either necessarily or probably, from an Explanatory Hypothesis regarded by sound logic. (~~For scien~~ *since science begins in observation followed by explanation, which in time leads to classification of phenomena, and ~~their~~ classification ultimately results in the discovery of laws applicable to further explanations),

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The explanation shows how the phenomenon would ~~was~~ come about or result in case the hypothesis were true, But ~~so the~~ this hypothesis is recommended by logic, as it ought to be, it is plausible that so the phenomenon was produced, came about, or resulted.

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Cosmology or the ~~is~~ explanatory science of the Three Universes shows then ~~how a plausible way~~ ~~in which the~~ at least plausibly, how the Three Universes ~~came abo~~ were produced, from an antecedent state, But their Phenomena are all the phenomena there are. ~~A~~ The task of Cosmology ~~is~~ is therefore to show how all phenomena were produced from a state of absolute absence of any; and logic requires that this problem be solved. But it must suppose something to be in that antecedent state, and this must be that which would ~~exis~~ really be in any possible state of things whatsoever, that is, an Ens Necessarium. This Ens necessarium being then, the Principle of all Phenomena must be the author and creator of all that ~~can~~ could be observed of Ideas, Occurrences, or Logoi,

But it is a presumption of logic that that method and sequence of creation acts which after sufficient observation and reflection any ~~than~~ mind would find itself forced to ~~believe~~ hold reasonable would be sequence ~~actually~~ of actual creation. For what one is forced to believe he ~~yes~~ facto holds to be true. ~~So long~~ Meantime, as long as we have not attained the state of mind that would so ultimately results, we must judge of it as well as we can from such indications as we have.

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Continuation of the preceding 1908 Aug 29

Hypothetical Cosmology of the Here and the Hereafter.

§ Continued

Of course, no sane man could expect to explain the entire phenomenon of the three Universes in all its minutiae, (the rest must remain vague) he would see he must restrict himself to few main points. Nor even on these could he hope to attain the ultimate result of reason. He can only hope to suggest ideas which may aid in setting this another generation further on by one stage toward that ultimate reason.

§6. The events of creation are to be supposed to have followed the course of the explanation. This is confirmed by the fact that Time has the same form as logical sequence. Now the explanation evolves itself by reasoning from antecedent to consequent; and consequently the creation must be supposed to have come about by evolution.

This is confirmed by all that we observe of nature.

§7 Although the Ens necessarium is, I will not say mysterious, for He is the furthest possible from mystery, yet perfectly incomprehensible to us because He supremely infinite while we are finite, nevertheless Logic inexorably requires us to think that there is an analogy, — necessarily vague to us, — between the elements of our reason and Him. Formless there were we could discover nothing.

Now in the course of our reasoning it is indispensible that premisses should be continually supplied; and accordingly it is presumable that in evolution creative acts are continually supplied. If they were

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there would properly speaking be no evolution no true growth. The ~~universe~~ whole world would be a comparatively poor machine-made affair; which it is impossible to believe that it is.

Besides if we are to admit the principle of evolution at all, sound logic requires us to admit it without restriction until positive reasons for such restriction oblige us to make it. It must therefore be supposed that all the Principia including the true laws of Nature result from evolution. But that which results from evolution does not at any time reach its ~~per~~ perfect entelechy; and therefore we must suppose that the laws of nature are not absolutely obeyed but that they are in process of being more and more precisely obeyed. This means that there are at all times ~~excessively~~ minute departures from the requirements of the laws; and these departures can only be regarded as fresh creative acts. In this way more and more variety is introduced, that is more and more independent quantities.

(The action of any mechanical or other exact law

would leave the number of independent quantities, in other words the variety, unaltered, as every mathematician knows) and this increased number of independent quantities would increase the number of independent actions of the laws; the result of which would be that while the increasing precision with which the laws were obeyed would leave less room for creative action in each application of a law, yet this would be, we may believe, more than counterbalanced by the increment in the number of occasions for the application of the laws; so that creative activity would be rather on the increase than falling away. (I here speak of increment in the sense in which the time elapsed since the birth of Christ is constantly on the increase although the multitudes of infinitesimal moments be at all times since that epoch infinite in any ~~case~~ sense is incapable of being increased by mere addition or multiplication.)

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1908 Aug 29

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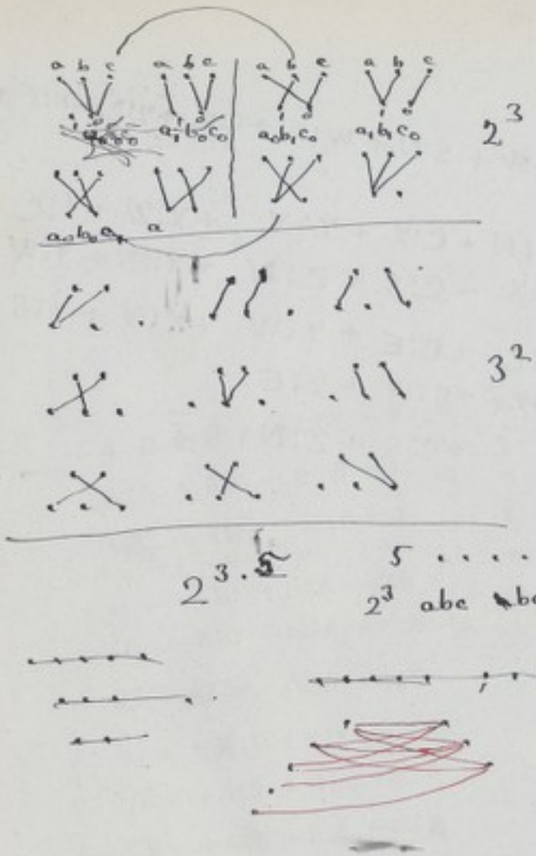

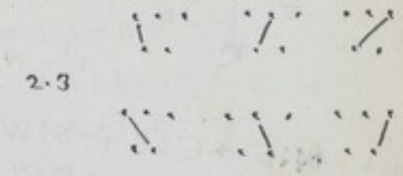

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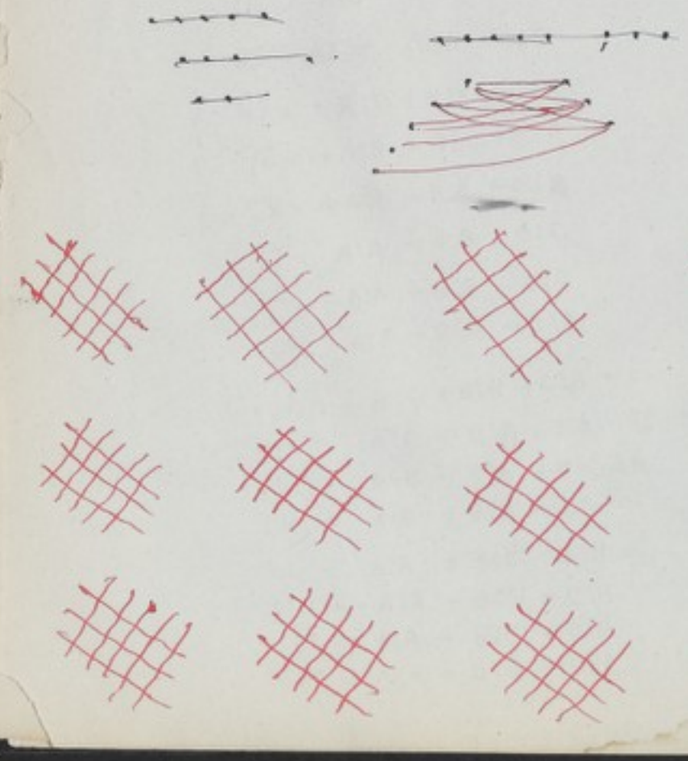

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$i^2 = N:S + E:W + S:N + W:E + C:Z + Z:C + X:Y + Y:X$

$i = N:E + E:S + S:W + W:N + C:X + Z:Y + X:Z + Y:C$

$j = N:C + E:Y + S:Z + W:X + C:S + Z:N + X:E + Y:W$

$ij = k \quad N:Y + E:Z + S:X + W:C + C:E + Z:W + X:N + Y:S$

$+ E:C \quad + W:Z \quad + C:W + Z:E$

$ji = \quad + C:S + Z:N$

$ji = j \quad N:C + \quad + S:Z$

~~$ji = N:Z$~~

1908 Aug 31

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$A:B - B:A$

$A:C - C:A$

$A:D - D:A$

$A:E - E:A$

$A:B - B:A = i$

$A:A - B:B = -1$

$A:A + B:B = 1$

$A:B + B:A = -i$

$+A:B - B:A + C:C = k$

$A:A + B:C - C:B = i$

$-A:C + B:B + C:A = j$

$ij = -A:C + B:A - C:B$

$jk = -A:C - B:A + C:B$

$ki = +A:C - B:A - C:B$

$jk = i = A:B - B:A + C:D - D:C + E:F - F:E + G:H - H:G$

$ki = j = A:C - B:D - C:A + D:B + E:H + F:G - G:F - H:E$

$ij = k = -A:D - B:C + C:B + D:A + E:G - F:H - G:E + H:F$

$ni = l = A:E - B:F - C:H - D:G - E:A + F:B + G:D + H:C$

$il = m = -A:F - B:E - C:G + D:H + E:B + F:A + G:C - H:D$

$jl = n = -A:H + B:G - C:E - D:F + E:C + F:D - G:B + H:A$

$o = +A:G + B:H - C:F + D:E + E:D - F:C + G:B - H:A$

$kj = +A:B + B:C + C:A$

$ji = +A:B + B:C + C:A$

$ik = +A:B + B:C + C:A$

$i^2 = A:A - B:B - C:C$

$j^2 = -A:A + B:B - C:C$

$k^2 = -A:A - B:B + C:C$

$ijk = -A:C + B:B + C:A = j$

$kji = A:C - B:B + C:A = j$

$jki = A:B - B:A + C:C = k$

$ikj = A:B + B:A - C:C$

$kij = A:A + B:C - C:B = i$

$jik = -A:A + B:C + C:B$

$i^3 = A:A - B:C + C:B$

$i^4 = A:A + B:B + C:C.$

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(Here is the title of my book:

Help in Reasoning:

~~being~~ Being A New System of Logic

regarded as Semeotic.

By ~~Charles~~ C. S. S. Peirce.

1908 Sep 1

Scheme of a Series of Papers.

On the Cosmology of the Here and the Hereafter

§1. Sharing the prepossessions of physicists, —

(though I never took the least stock in agnosticism,)

~~I refused~~ at the time when the American branch of the Psychical Research Society was started, I refused by joining in the movement to ~~I have any to join it on the ground that~~ ~~I would not~~ take the responsibility of encouraging young men ~~men of science would get drawn into so completely~~ to engage ~~into the business, in which it seemed to be~~ what ~~seemed~~ seemed to me most likely ultimately to prove either ~~for a probe~~ for a will-o'-th'-wisp, ~~and~~ or, ~~if not~~ it were ~~better~~ ~~it was~~ at any ~~arm~~ rate, a matter into which no living wight was ~~that in the present~~ in the present state of science qualified ~~to in some~~ to undertake. For I thought I forsaw that after ~~they~~ such young men had embarked their whole scientific and social ~~fortun~~ reputations, and after the best of their lives were spent in it without any really adequate returns in the way of positive discovery, they would find themselves so compromised that they would be in the greatest danger of exaggerating the value of their results, both to themselves and others

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and so losing their scientific integrity. The argument was specious, and I hope to be forgiven for yielding to it; but now I cry peccavi. I ought to have reflected that there is no ~~career~~ career in which a man is not liable to bankruptcy; and ~~above~~ more all others those who take part in any thoroughly original scientific research constitute a forlorn hope. So, at least, it was in America a generation ago. What they had to expect ~~to~~ was failure; and that of which they had been quite assured from the first ~~what they were sure of~~ was that they were placing all worldly well-being on the altar of science. Therefore ~~my~~ the position I took was unsound and involved the crime of virtually trying to bar ~~a~~ possible avenue to truth; and for that I must now confess peccavi. After all, ~~bad~~ poor as had been the qualities of the various evidences the psychical researchers have produced, ~~and miserably ungifted~~ awkward withal and incompetent ~~for~~ in their work as they have shown themselves to be, yet they have made up for ~~that~~ indifferent quality, by such an overwhelming quantity of evidence that I am

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accustomed in logic, against all my prepossessions, ~~and~~ not to say prejudices, to admit that they have given a fair provisional proof that we can sometimes communicate with the dead.

§2. Not for physical science itself (I think,) but for that philosophy that the men of science ~~most~~ prevalently entertain, and ~~that often~~ these counsel they ~~com~~ often take in forming their hypotheses, the new truth must be a cataclasm.

~~Now~~ This emergency is just one of those when resort should be had to the science of logic, provided there be any science of logic which is at all on the plane the ~~though~~ scientific thought of our day. Taking science in its widest sense, as including not merely the physical ~~but al~~ sciences, (physics, chemistry, biology, and the explanatory sciences of geology, astronomy etc), but also the psychical sciences (psychology in all its branches, sociology or economics anthropology and ethnology ~~etc~~) linguistics of all kinds, and the explanatory sciences of history & comparative

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biography, etc); and along with them ~~the~~ cenoscopy ~~or what~~ (Bentham's excellent ~~term~~ designation of these philosophical sciences which reason from such experience as is common to us all;) and with all these ~~that which is at once their~~ the foundation of all exact thinking, ~~foundation and their~~ pure mathematics.

But logic is a science ~~utterly hateful~~ that to the vulgar (~~among~~ a word I ~~use~~ apply, quite without mysterizing, to all who have not passed through a certain severe and long novitiate, including people of the utmost refinement, and who may be ~~supposed~~ expected indeed to catch the meaning of that last hard word, ~~though it is not often met with~~ not likely to be known to ~~the~~ readers of any other than classical Greek, ~~is classical Greek alone~~) ~~passionately~~ the Vulgar, then, I say, passionately hate, ~~this they would~~ The fact that the science calls for finer and exacter thinking than mathematics itself would suffice to make it distasteful to them. The passion of their dislike is due to the circumstance that every mother's son of the whole herd or galaxy, of them is in his ~~only~~ own conceit, such as ~~Abelard~~ the sole one among them all of whom what Abelard ~~said~~ of Aristotle really holds good "doubtless Aristotle ~~never~~ might have erred, but doubtless in his logic he never did." Now this gives M. Logic the ~~on his~~ very first

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introduction to him, ~~has~~ two, has ~~insulted and~~ blasphemed this divine gift and exaltation by questioning its reality. The logician feels this hatred of logic in ~~the~~ a resulting antipathy to himself that stands very much in the way of anything he may undertake; since every undertaking demands a certain good will from somebody or other.

For that reason after twenty years study of the subject, rewarded by some undeniable discoveries, of which nobody took the least notice, I determined to retire into seclusion and devote the remainder of my life to finding out all the logical truth I could, inasmuch as I was persuaded that no less ~~sacrifice~~ would answer the purpose and that no other competent student would be willing so to live in neglect and universal aversion; and for ~~twenty~~ considerably more years than twenty this life I have led, working ~~day~~ daily with all my might and main (and I am a great worker) to advance my knowledge of the subject.

The result is that I can now assure the Reader, ~~the rare~~ Reader, who is willing to read what I write, ~~that I~~ really have that to communicate that ~~it~~ would be

1908 Sept 2

§3. I now state the purpose of these papers. It is to show what logic ~~show~~ demands that our hypotheses should be ~~to explain~~ in order to explain the most general phenomena of the three Universes, in view of what science has hitherto brought to light and assuming that we are sometimes able to communicate with the dead, and in view of the general nature of such apparent communications. I mean, especially, that ggg out of

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well worth the pondering both of the scientific men and of those who concern themselves with the present state of religious belief. I have nothing in the world to gain whether substantial or illusory, from getting listened to except the satisfaction of thinking that shall have been of service to any Reader who shall think the matter over for himself, and who may be able to correct some of my errors and to carry the work further than I have had the strength to carry it. Except for that consideration, I should ~~for~~ rather devote the precious time ~~that~~ these papers will assume (my remaining days being few,) to further researches in pure logic.

All this section is to be greatly compressed and its smothering its egotism is to be almost annulled.

§3. I now state the purpose of these papers. It is to take the first steps toward the formation of a general hypothesis about matter and the quasi-matter by which spirits seem to communicate with us in this world, and a hypothesis about the nature of mind and thought. These hypotheses will have their most general features deduced from the principles of logic. But they must be carried beyond those general features, and in so far as they are so carried they are vague. In order to overcome this vagueness I arbitrarily ~~carry them~~ give them an unwarranted determinacy; and although they are not without some positive i.e. ex.

every thousand of them are ~~[illegible]~~ ~~[illegible]~~ mere nonsense and that even in the best of them there seems to be ~~a mixture~~ a large admixture of irrational stuff.

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It is only in the first steps that it can be said that logic demands that a definite hypothesis should be made. ~~Beyond that pu~~ That stage passed, as it very soon will be, it can only be said that a given sort of hypothesis is required by logic. But rather than attempt precisely ~~to~~ define the character of the hypothesis required, which would be very difficult for me, and which would be of little use in forming the hypothesis, I shall prefer to illustrate the sort of hypothesis required by making one that conforms to the requirements. I shall call such an hypothesis "hypothesis tantum vicaria", a phrase of ~~Kepler~~ Keppler's, though I slightly modify ~~the~~ meaning. As I shall use the expression, it will mean a hypothesis which answers the requirements, ~~as well~~ as to its general nature, but which probably needs to be replaced by another of much the same general nature in order to account for ~~the~~ observed facts which this hypothesis fails to explain. Even so, I am decidedly of the opinion that such an hypothesis may be of material service in order to indicate rather vaguely, the general neighborhood of ideas in which a better one should be sought

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(1) direct religious interest proper, or contradistinguished from theological interest, there will be little or none; and I regret to say that theology, the only science that does not further religion in the longrun, and has always been the direct and subtlest foe of religion, will unavoidably receive some hints from the papers. Religious people, however, are naturally curious about the future life; and include I have in this series nothing novel to say on that topic, yet the reasons for a ~~certain~~ definite expectation in regard to it will be better defined, ~~than~~ perhaps, than they have hitherto been.

The philosophic interest of the papers, will in my opinion be sufficient of itself to make the papers worth printing. ~~warrant their publication.~~

§4. After ~~explo~~ a preliminary explanation of my purpose, I propose to begin by establishing ~~certain points~~ the main logical principles ~~belonging in regard to the~~ ~~logical~~ explanatory hypotheses.

The first question, which has been strangely left untouched by the great majority of logicians is what are the features of a phenomenon that call for explanation.

I begin by explaining what I mean by "explaining a fact"; and for doing so, I cannot have a better guide than the second and third articles of the "definition" of the verb "explain" in the Century Dictionary; ~~which~~ for I wrote those articles myself. It dictionary definition will, or at any rate contain, ~~be, be properly speaking a~~ proper definition in the case of a scientific or other exact conception; but an ordinary word needs an explanatory, not a definition which always ~~requires an explanation~~ itself needs to be expounded. Now article 2 ~~expounds~~ sets forth

This class of meaning is then illustrated ~~therefrom~~ upon
by these two quotations (of which the second is very good one
suggested by me:

'Tis revelation satisfies all doubts,
Explains all mysteries except her own
And so illuminates the path of life
That fools discover it, and stray no more.

Bowker, Book ii. 528.

Commentators explain the difficult passages

Gary

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~~the application of the verb "explain" in these cases~~ that class of meanings of the verb "explain" in which it is nearly the Obverse of the verb to "define", since a definition proper ~~[illegible]~~ offers as a substitute for a word whose difficulty consists in its ~~precisi~~ prescissive abstractness, a composite of words more abstract still, while an "explanation" familiarizes the mind with the use of the word by bringing together in the briefest terms possible the sub-classes of occasions in which it is used and giving an interpretation of it in each of them. This is the general plan of the explanations in the Century Dictionary, due I suppose to Professor Whitney. It has the effect of reducing the number of ~~[illegible]~~ articles or members under each word to a minimum. No 2. ~~[illegible]~~ that work reads "To make plain or clear to the mind; render intelligible; unfold, analyze, state, or describe in such a manner as to make evident to the minds of others; exhibit the nature, meaning, or significance of; interpret; elucidate; expound." The Oxford Dictionary attains the same end by the ~~[illegible]~~ much superior method of giving many ~~examples~~ quotations in which the word is used in each class of ways given. (were its quotations only not successively abridged, or were the references always so given that the passages could be found without the need of having the same edition of the work ~~from~~ quoted that the reader himself had I have, many days for example, extra pages

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in the aggregate in vain searches through Tucker's 'Light of Nature' for the context of different ~~the~~ quotations ~~made~~ ~~from the~~ referred to sometimes by the ~~pagination~~ volume and page of one reprint and sometimes by those of another.) The Oxford Dict^y sets forth the classes of meaning gathered in number 2 of the Century's treatment as follows (where I give only one example under each head) [most satisfactory] [There is no occasion for my dilating on the merits of the ~~greatest~~ dictionary ever made of any language. It will take a man ten minutes on the average to find a word which it omits.]

"3. a. To unfold (a matter); to give details of, enter into details respecting. Occas. with indirect question as obj.

"1756. C. Lucas Ess. Waters I, Prefs, I thought it just to explain the Medicinal Qualities

[This explanation seems to me faulty in that we do not use the verb to mean the setting forth of details, unless it be for the purpose of affording a handle, so to speak, for an idea too much in the air. Thus we do not say that Robertson explained the life of Charles V. But if I only know of Quinine that it is used as a tonic and for malaria, I am glad to have its qualities explained as consisting in its lowering the temperature of the blood, killing certain parasites, and stimulating the stomach like any other bitter substance.]

"6. To make plain or intelligible; to clear of obscurity or difficulty.

"1651. Hobbes Leviath. iv. xlvi. 378 The power of explaining them [Laws] when there is need." [The context is, "In the power of making laws is comprehended also the power of explaining them" etc.]

"4. To assign a meaning to, state the meaning or import of;

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to interpret.

"1726 Chetwood Adv. Capt. R. Boyle 48 'This he told Mirza in the Moorish Tongue, but explain'd it to me in English.'"

In the above vernacular uses of the verb the thing which is "explained" is always a Sign, in the wide sense in which I invariably attach to this word, as including concepts. But I now come to the logical application of the verb, in which facts are said to be "explained." Here the following interpretation in the Oxford Dictionary is good:

"5. To make clear the cause, origin, or reason of; to account for."

The earliest example found by their regiment of readers is from Butler's Analogy, of 1736, Part I, Chapter V, Section III (from an American edition of 1852) give a part of the context only, since the whole is very long. It is well worth reading in connection with another subject of which I shall have much to say. I italicize a phrase or two significant

"Nor do we know how far it is possible, in the nature of things, that effects should be wrought in us at once equivalent to habits, i.e. what is wrought by use and exercise. However, the thing insisted on is, not what may be possible, but what is in fact the appointment of nature, which is that active habits are to be formed by exercise. Their progress may be so gradual as to be imperceptible in its steps; it may be hard to explain the faculty by which we are capable of habits, throughout its several parts, and to trace it up to its

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original, so as to distinguish it from all others in our mind; and it seems as if contrary effects were to be ascribed to it. But the thing in general, that our nature is formed to yield, in some such manner as this, to use and exercise, is matter of certain experience.

The Century Dictionary is ~~explanation~~ definition is as follows:

3. To exhibit, disclose, or state the grounds or causes of the existence or occurrence of; reveal or state the causal or logical antecedents or conditions of; account for.

Thereupon, I give a quotation from Bradley's Logic Bk. III. Pt. II. chap ii, §9; for which I now substitute the following ~~text I will here quote~~ brief sentence from §8 "To explain a fact you must exhibit it as the instance of a general principle or meeting of principles" A year before Mr. Bradley's Logic appeared I had in the volume entitled "Studies in Logic by Members of the Johns Hopkins University" p.147 defined an explanation of a fact as a syllogism whose major premise states or asserts a Real General Principle and whose minor premise supposes a state of things subsumptive to that Principle from which follows as ~~the~~ syllogistic conclusion the fact to be explained. Except that I might better have said that the explanation is the substance of the course of thought which that syllogism represents, I am still satisfied with that definition as the clearest account of the matter that has ever been given. ~~To illustrate~~ As an example of ~~exp~~ illustrating the definition, I will quote an argument from ~~the~~ a work ~~book~~ book, which although ~~it leaves a great deal~~ its author neither knew nor practised several ~~mo~~ highly important principles of Inductive Reasoning, is nevertheless ~~dist~~ quite

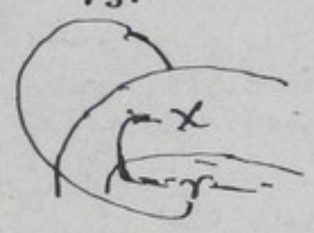
442
170
27200
13600
13600
6800
156400

50 lines
10½ cond
per line

If $2^n > x$
then $x \leqq n$
i.e
If $x > n$ then $2^n \leqq x$
i.e
Either $x \leqq n$
or else $2^n \leqq n$
i.e.
It is impossible that
$x > n$
while $2^n > x$

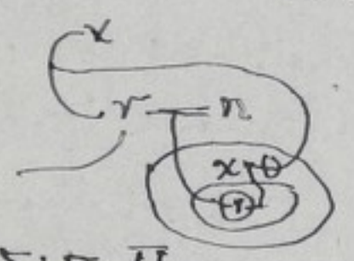
To express
~~the~~ A collection of x's
κ_{ji} i contains j
$\bar{\kappa}_{ji} + \bar{x}_j$ means i is a collection of j's

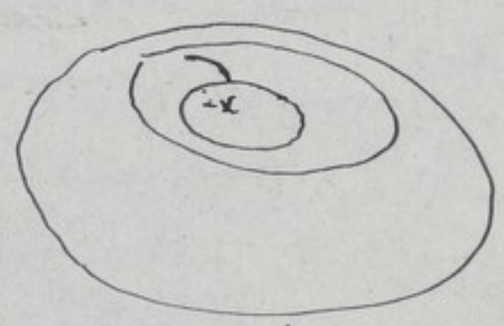
$l_{ij} = \Pi_\xi \bar{q}_{\xi i} + q_{\xi i}$



$\Pi_\lambda \Sigma_{\bar{\lambda}} \Pi_i (q_{\lambda i} + q_{\bar{\lambda} i}) \cdot (\bar{q}_{\lambda i} + \bar{q}_{\bar{\lambda} i})$

$= \Pi_\lambda \Sigma_{\bar{\lambda}} \Pi_i$





$\Pi_i \Sigma_j \Sigma_k \Pi_\ell$
$\bar{x}_i + r_{jki} \cdot n_k \cdot (\bar{x}_\ell + l_{i\ell} + \bar{r}_{jk\ell})$

$\Pi_\nu \Pi_i \Pi_\xi \Sigma_\alpha \Sigma_k \Pi_\ell \Pi_\lambda$
$q_{\xi i} + r_{\alpha k i} \cdot q_{\nu k} \cdot (\bar{q}_{\xi \ell} + \bar{q}_{\lambda i} + q_{\lambda \ell} + \bar{r}_{\alpha k \ell})$

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distances all others that have ever been published in its instructiveness in regard to this kind of reasoning, inasmuch as its ~~substen~~ contents consist in an account of the very ~~greatest pie~~ most stupendous ~~pie~~ course of such reasoning ever achieved by one man and describes ~~the~~ whole course of thought in such veracious detail as never was even distantly approached in regard to any other great discovery. I mean Keppler's Commentaria De Motibus Stellae Martis. Its pages fill the space of about 150,000 Latin words, and though it is crystal clear, yet hard reading from the nature of the subject, that is to mighty for Peare not whom you may name. But fortunately there is an admirably executed English book entitled "An Account of the Astronomical Discoveries of Kepler. By Robert Small, D.D., F.R.S.E. London: 1804," 8vo pp. viii + 367 with 11 copper-plates giving 80 geometrical figures. Nobody who cares at all to reason well on any subject should go without this volume, if he has to go barefoot to pay for it. (My copy cost 6/6) which will be a help even if he goes through the original, which is as entertaining as such a book can be, especially if one has Keppler's correspondence as given in Frisch's edition of "Joannis Keplerí astronomi Opera Omnia. 8 vols 8vo. ~~There~~ (I spell Kepler with two pp's because all the German letters in Frisch's edition that are signed at all are so signed, so far as I have noted. He was only ~~[illegible] in Latin~~ single-p'd in Latin.)

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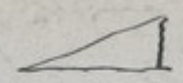
Heliocentric



Greatest lat. ♂ 1°50′ log sin 8.5050

Greatest radius vector log 0.2227

Log dist from ecliptic 8.7267

Least dist from ☉

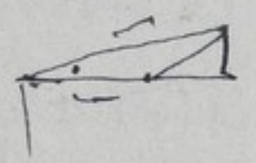
Inclination orbit ♂ 1°51′

~~Greatest dist from sun 153×10^6 miles~~

Least dist from sun 127.0×10^6 miles

Earths greatest dist 935.10^5 "

Earth dist from Mars 335.10^5



sin i 9.3125

Min Rad vect ♂ 3.1038

cos i 9.9907

2.4163

3.0945

Max Rad V ♂

2.4886

261.10^5 miles

1243.10^5 "

935.10^5

308.10^5

Greatest Geocentric lat 40°15′ tan 9.9277

~~sin i~~

ρ sin i

ρ cos i − r

2.4163

~~2.1038~~

2.9708

3.1038

−2

6.0744

3.1

6.3754

935²

1270²

874225

1612900

2487125

~~186775~~

~~237350~~

1136.00

337×10^5

−1°51′

8.5090

3.1038

−2

3.1036

1269.3

935

3343

1,6128

2.5441

9.0887

5.0554

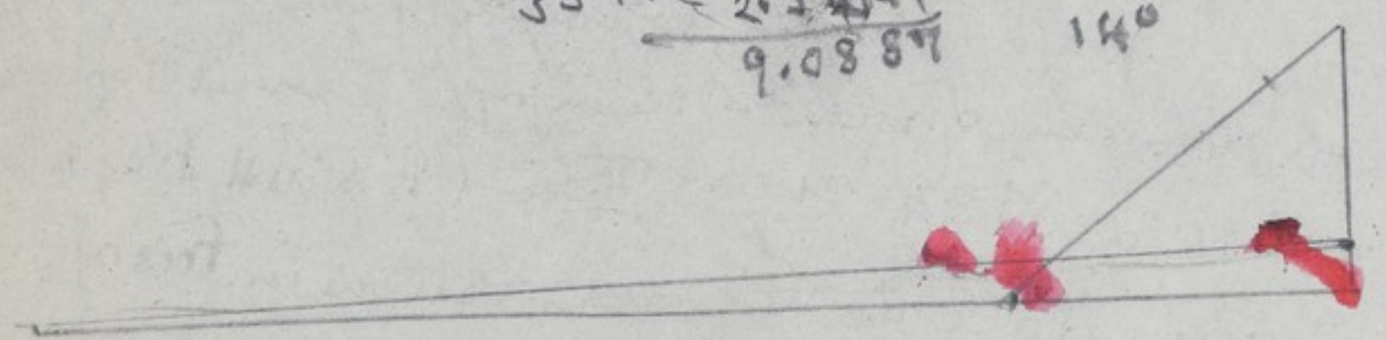
2.5277

2.4163

9.8886

50°42′

140°



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We learn from this ~~first~~ ~~great~~ masterpiece of all scientific reasoning that before Kepplar had discovered his third law, ~~that~~ ~~and also~~ ~~before~~ it might have been even ~~before~~ he had ascertained the distance of Mars by a sort of triangulation, ~~he~~ not by a determination ~~already explained~~ which, after all, ~~was not~~ rested upon ~~his~~ an assumption, ~~he was~~ and reasoning ~~substantially~~ without ~~a~~ necessarily depending upon a sort of triangulation by which (on a certain assumption) he had ascertained the distances of Mars from the earth he reasoned that since the hypothesis that both Mars and the Earth described ellipses ~~that the ellipses~~ round themselves, which ellipses, each planet describes, and ~~with the sun at the foco~~ a focus of each, ~~the~~ about the sun in equal times well satisfied both the equal areas, longitudes of the sun and the longitudes and latitudes of Mars (whose latitudes are quite large and apparently irregular, while its inequalities of longitudes are also remarkably large,) therefore such must be their real motions, even if this inference had not been supported by ~~three~~ three determinations of the distance of Mars at certain places in its orbit (though these three triangulations supposed that Mars at a given heliocentric longitude was ~~always~~ at different revolutions at the same distance from the sun, and also supposed that ~~his~~ the distances of the Earth from the Sun ~~at~~ on the six ~~times~~ nights of observation) For this would ~~Tim~~ were such as his theory made it to be) That is that from the explain all the observations. general theory together with the assumed place of ~~each planet~~ each planet at one given epoch ~~exact~~ for it and the mean motion of each, and the ~~ecliptic~~ position of the plane of the orbit

Observations of Brahe used by Keppler

1580

p211. Nov 17. $9^h 40^m$
217 Nov 12 $10^h 50^m$

1581

1582

219 Nov 23-24 several.
217 Dec 28 $11\frac{1}{2}$
211 Dec 30 $12^h 16^m$
219 Dec 26 $9^h 28^m$
220 Dec 27 $7^h 15^m$

220 Jan 16 $7^h 30^m$ vesp.
" " $10\frac{1}{2}$ "
" " 17 $10^h 18^m$
" " 17 5 20 vesp

1584

371 Nov 25 10:20
" " 11 13:26
" " 20 18:30 astronomice

211 Jan 31. $9^h 38^m$
217 " " 12^h
288 March 9 $9^h 10^m$ vesp
" " 11 5
" " 12 5
379 " " 10:39 Id p381

1585

372 Dec 16 6:30 mane
329 Dec 27 4:00 mane

1587

211 Mar 7. $17^h 22^m$
217 " " $19^h 10^m$
288 Jan 26 5h mane Id p381
" " 28 " "
289 " 26 7:10 "

1588

288 Dec 5 $6^h 30^m$ mane
" " 15 6 10 "
289 " 13 6 40 "

1589

211 Apr 15. $13^h 34^m$
217 " " 12 5 Id p381
331 Nov 1 6:10 vesp

1590

329 Oct 6 4:45 mane
329 Oct 10 8:35 vesp
288 Oct 31 6:15 mane

1591

217 Jun 6 $12^h 20^m$ Id p381
211 Jun 8. $16^h 25^m$
331 Sep 26 7:10 vesp?
391 " 19 5:42 vesp
" " " 7:10
373 nocte post May 13 1:40

374 Oct 16 6:28
381 May 13 14:00
" June 10 11:50
" June 28 10:20

1592

219 Dec 29 $7^h 47^m$ mane Id. p381
379 Nov 24 4h mane " " "
" Dec 26 8:30 " " "
" " 30 8:10

221 Jan 18 8h 52 vesp
" " 19 7 3
288 Apr 22 $9^h 40^m$ vesp
289 " 23 8: 6 mane
379 Jan 26 6:15 Id p381

1593

379 Dec 21 14h Id. p381

374 Sep 8 10:38
375 nocte post Jan 29 1:30
381 July 21 14:00
" Aug 22 12:20
" Aug 29 10:20
" Oct 3 8:00

1594

331 July 31 1:45 mane
211 Aug 24. $2^h 13^m$
218 " " 10 30
331 " 6 5 14 vesp

289 March 10 7:40 mane
329 Feb 17 10:00 mane
372 Jan 24 9h also p379. 381
379 Feb 4 6:40 Id p381

1595

374 July 22 2:40 mane
211 Oct 29. $2^h 22^m$
218 " 30 8 20

381 Sep 17 16:45
" Oct 27 12:20
" Nov 3 12:00
" Dec 18 8:00

1596

376 March 9 7:40 vesp

329 Nov 10 6:30 mane
329 Nov 22 9:02½ vesp
373 Nov 6 6:50 mane

1597 Brahe in itinere fuit

210 Dec 10 $8^h 30^m$
211 Dec 13. $13^h 35^m$ mane
370 Oct 30 5h

1598

1599.

370 Apr 5 11:30
374 Dec 3 5:39
381 March 8 16:24
" Apr 13 11:15
" May 6 11:20

1600

211 Jan 19. $9^h 40^m$
288 " 13/23. $7^h 50^m$
329 March 6 $6:17\frac{1}{3}$ vesp
329 " 15 8:30 vesp

102 observations

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1908 Sep 4

Keppler's argument is excessively complicated; and it would be a considerable task to make out exactly ~~how~~ by which and how it conclusion is rendered valid. ~~the logic of it~~ is, in details. Keppler, himself, did not attempt to do this, but merely ~~states~~ describes ~~his~~ each step of his long course of thought and how he was led to take it. His reader is fully convinced of the ~~justice and~~ ~~impecca~~ soundness of each step and fully approves of the conclusion; and having gone through the whole, rises from the perusal with the impression that the two first "laws of Keppler" have been absolutely demonstrated. ~~The~~ (Keplar's third law is not touched upon in his ~~great work~~ chief work.) Yet ~~this~~ this cannot be true is evident when we reflect that the only source of information was the visual observations of Brahe. Now of course Brahe could only ~~observe~~ see two dimensions of space; ~~and~~ ~~to~~ the sun and the planet Mars could each of them conceivably have any ~~x~~ component motions whatever along the line of vision quite undetected. And therefore it ~~can~~ is always possible that neither a straight filament connecting the sun and the earth nor another connecting the sun and Mars always sweeps over equal areas in equal times, which is as much as to say ~~that~~ Keppler's law (ill) called ~~the~~ this first should not be true. And it is equally possible that neither the path of ~~relative~~ motion ~~relative~~ to the sun of the Earth nor that of Mars should be an ellipse ~~or that~~ regardless whether the sun were in a focus ~~of~~ or not; which would falsify Kepler's so-called first law. The truth is that all that Keppler really demonstrates is that the observations cannot be satisfied by any circular orbit with or without an equant can satisfy the observations, nor ~~can any~~ by any one of a number of other hypotheses that occurred to him, while his true laws do completely satisfy them. He does not, for example, make it explicitly evident

$$D_u F' = D_u r \, D_r F'$$
$$\equiv -\log r \, D_r F'$$

$$\frac{du}{d\theta} = D_u \frac{1}{u} = \log u$$
$$\underline{\log r} \, dr$$

$$d\frac{1}{r} = dr \, \log r$$

$$\frac{du}{dr} \quad \frac{dr}{d\theta}$$

$$\frac{1}{2}\left[u^2 + \left(\frac{du}{d\theta}\right)^2\right]$$

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that the orbits might not be Cassinian ovals with the sun in one focus while the other principal focus was the centre of an equant.

The act of explaining the observed facts consists ~~in showing that if one admits the explanatory hypothesis would~~ ~~to admit~~ ~~would either the principles that are admitted anyway compel one~~ ~~allegiance~~ ~~true in consistency to admit those facts~~ ~~that the truth of the~~ any conceivable state of things of which the hypothesis should be true, along with the truth of certain ~~odd~~ principles ~~admitted to be true~~ that are beyond question, would be in all every conceivable state of things in which the observed facts said to be explained, or the main features would be so. ~~or always~~

That being the sense in which I ~~propose to use the~~ exclusively I shall speak of "explaining a fact", I ~~desire~~ would like to direct the reader's ~~location "explain~~ attention to two ~~significant~~ general psychical ~~facts~~ phenomena which seem to me highly significant for the science of logic. The first is that we frequently ~~find~~ ourselves and others expressing a sense that this or that fact "needs" an explanation, although ~~the~~ a fact is not the sort of thing that has appetites and needs. We are evidently in such a case mistaking ~~confounding~~ a sense of need that our own minds with an imaginary "need" on the part of the fragment of experience that we call a "fact" I myself have a curiosity to know more of this intellectual appetite. What is its general nature? What is the sort of ~~these~~ experience that excites it and what is the sort of experience which allays the "need"?

The other ~~psychical~~ phenomenon is that we often say that we admit the truth of a hypothesis "for the sake" of the explanation it affords of the given fact. This seems to me very curious. To see

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sure, it is only natural that an appetite for having certain kinds of facts shown to be necessary consequents from certain possible states of things should be appeased by the production of a hypothesis that ~~furnishes~~ affords such an explanation. But it seems quite extraordinary that we should ~~believe~~ come to believe that a hypothesis is true merely because it appeases an appetite. For ~~Belief~~ ~~can~~ becoming convinced of anything is not a voluntary act by any means, it is an experience forced upon us.

1908 Sep 5

This puzzle is, however, susceptible of elucidation. I define Real as follows: That and that alone is Real which is distinguished from everything else by characters which belong to it independently of their being ~~ab~~ in any way attributed to it by any ~~particular~~ ~~indiv~~ single man or single group of men. ~~To~~ I not only propose herein to confine the word 'Real' to this sense, but I am of opinion that this is the sense the word bears in the minds of most men, excepting that in most men's minds the ~~meaning~~ idea it is confused and is not seen to have this composition; or in other words, the majority of those men to whom the ~~most~~ ~~men~~ ~~who do not~~ word carries another idea, ~~would~~, if they were to ~~make~~ ~~an~~ devote sufficient mental labor to the analysis of the idea it does carry to them, would come to see that this definition expressed their confused idea as well as any equally distinct idea could. For, on the one hand, just as a ~~man~~ ~~person~~ child who had been told the story of Hamlet, but had understood

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that Hamlet was a real Prince of Denmark, learns that any character which is essential to his individuality (so that without it, he would not be the same person) such as his extreme refinement of intellect, only has true of him in the sense that Shakespeare so presented him, he will no longer call him a real man, and just as anybody who becomes convinced that the story of the Tower of Babel and the confusion of tongues is nothing but a legend which has grown up in certain great numbers of minds out of a hypothesis started by some Babylonian speculator to account for the multiplicity of languages will cease to call that a real event; so anything else, be it thing or event, which is not distinguished from other things except by the fact that a certain person or number of persons have imagined it, or wished it were so, or have been led to believe it to be so, would not be called real by any ordinary person; while on the other hand, just as the Phœnix, for example, which certainly no sane person would call real, and which is certainly amply distinguished from all other living creatures by its rising from its ashes, must be the creature either of some individual mind or of some individual group of minds; and

$\cancel{h_{02} \cdot h_{23} \cdot \bar{c}_{a0} \cdot \bar{c}_{a3} \cdot \bar{c}_{b0} \cdot \bar{c}_{b3}}$

$\cancel{+ h_{01} \cdot h_{23} \cdot \bar{c}_{a0} \cdot e}$

$h_{01} \cdot \bar{c}_{a0} \cdot \bar{c}_{b0}$

$+ h_{01} \cdot \bar{c}_{a0} \cdot e_{b1}$

$+ h_{01} \cdot e_{a1} \cdot \bar{c}_{b0}$

$+ h_{01} \cdot e_{a1} \cdot e_{b1}$

$+ h_{0.3} \bar{c}_{a0} \cdot \bar{c}_{b0} = \sum_u \sum_v \prod_t$

etc $\quad h_{uv} \cdot (\bar{c}_{tu} + e_{tv})$

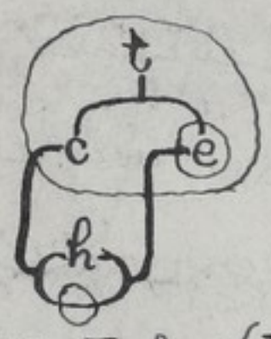
$h_{01} \cdot \bar{c}$

1909 Jan 7.

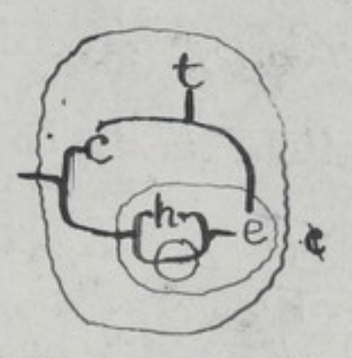
Write $\sum_u \sum_{(\bar{u}) \cdot v} h_{uv}$

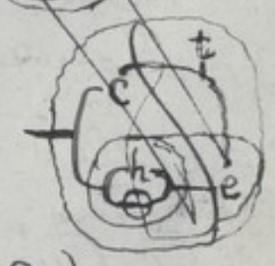
to mean there are two different people living in the same house or better

$\sum_u \sum_{\bar{u} \cdot v} h_{uv}$

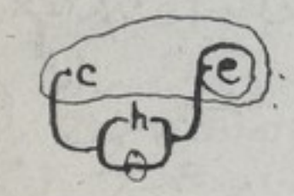


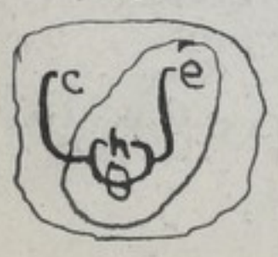
$\sum_u \sum_{v,\bar{u}} \prod_t h_{uv} \cdot (\bar{c}_{tu} + e_{tv})$

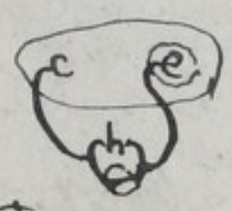


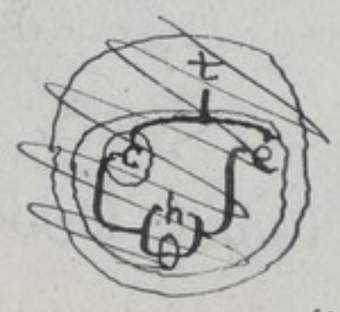


$\sum_u \prod_t \sum_{\bar{u} \cdot v} h_{uv} \cdot (\bar{c}_{tu} + e_{tv})$









$\prod_t \sum_u \sum_{\bar{u} \cdot v} h_{uv} \cdot (\bar{c}_{tu} + e_{tv})$

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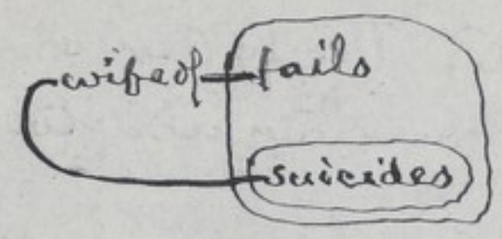
1908 Sep 6

If consider the graph



$$\# \quad \Sigma_i \Sigma_j \, w_{ji} \cdot (\bar{f}_j + s_i)$$

A = There is a married pair and if the husband fails the wife suicides

B = ~~There is a married pair and~~ If every married man fails some married woman suicides

$$\Sigma_m \Sigma_n \Sigma_p \Sigma_q \; w_{nm} \cdot \bar{f}_n + w_{qp} \cdot s_p$$

Let ω be a state of things and $f_{\omega u}$ means u fails in state of things ω

$A' = \Sigma_i \Sigma_j \Pi_\omega \; \bar{f}_{\omega j} + \bar{w}_{ji} + s_{\omega i}$ — There is a man and a woman and under all circumstances if the man is married to the woman and has a wife he fails she will suicide.

$A = \Sigma_i \Sigma_j \Pi_\omega \; w_{ji} \cdot (f_{\omega j} + s_{\omega i})$ — There is a ~~married~~ married couple and under all circumstances if the husband fails the wife will suicide

$B = \Pi_\omega \Sigma_i \Sigma_j \; w_{ji} \cdot (\bar{f}_{\omega j} + s_{\omega i})$ — ~~Other~~ Under all circumstances, there is a married couple and if all husbands fail some ~~and other~~ married woman will suicide

$C \quad \Sigma_j \Pi_\omega \Sigma_i \; w_{ji} \cdot (\bar{f}_{\omega j} + s_{\omega i})$ — There is a ~~married man and~~ married man and under all circumstances if he fails some wife of his will suicide.

Let h_{uv} mean u and v live in the same house

c_{tu} means that u comes home on day t

e_{tu} " " v eats dinner on day t

$$\Sigma_u \Sigma_v \Pi_t \; h_{uv} \cdot (\bar{c}_{tu} + e_{tv})$$

There are some two persons who live together ~~and on every day when one comes~~ and there is one of them who on every day when the other comes eats dinner

Corrected 1909 Jan 7

There is somebody living in a house who has one or other of two things or ~~that~~ either he eats dinner every day he comes home or is on such terms with another person in the house that every day on which he comes home that other eats dinner.

$$\Pi_t \Sigma_u \Sigma_v \; h_{uv} \cdot (\bar{c}_{tu} + e_{tv})$$

~~on every day everybody who comes home lives in the same house with somebody who eats dinner~~

or what is the same thing

on every day ~~every~~ on which everybody that lives in a house at all comes home some body in the same house eats dinner

On every day ~~there~~ are some two persons living together ~~& one~~ of whom eats dinner unless ~~the other fails~~ to come home.

On every day somebody or other ~~not living alone~~ eats dinner unless there be somebody living in the same house who does not come home

$$\Sigma_u \Pi_t \Sigma_v \; h_{uv} \cdot (\bar{c}_{tu} + e_{tv})$$

There is some person ~~living in a house~~ of whom it is true that on every day on which he comes home somebody living in the house with him eats dinner.

Every day there is somebody that does not come home unless there be somebody living in the same house who eats dinner

Some person is on such terms with some person (himself or another) that if the former comes home the latter eats dinner

See 1909 Jan 7.

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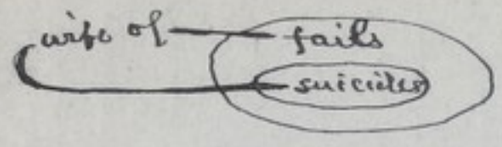
1908 Sep 7

If A definite single event ~~that~~ happens, there is no sense in saying that it must have happened just as it did, nor in saying that it might not have happened. The latter is a distinction without a difference, the former an additional phrase quite devoid of any meaning.

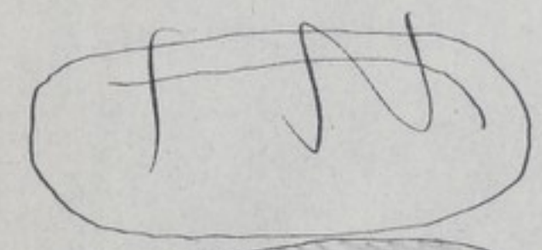
But ~~that~~ under somewhat indefinite conditions a fact (which happens) (~~which~~ is not an event but is of the nature of an abstract element of an event, if it ~~happens~~ comes to pass) ~~as~~ may be possible, not merely in the sense that we do not know ~~any reason~~ that it will not happen but in the sense that in the indefinitely stated conditions there is really nothing to prevent its happening, may nevertheless not happen. If for example in a definite locality a person were to pick up a reddish stone and giving it such a blow with a geologist's hammer as would break most such stones it might not break and yet it might have broken there being great numbers of such stones in that locality that would have broken; and that very stone perhaps would have broken under such a blow if such of every ten times on the average.

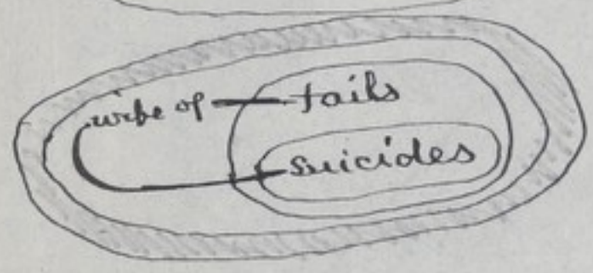
1908 Sep 8

That a coin will eventually turn up heads, if pitched often enough is inductively certain, or limitatively certain, in that its probability is $\frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} + \frac{1}{2^4}$ + etc endlessly. Yet it is not necessarily true since what is possible on one ~~d~~ pitch is possible on all; and it is therefore possible that it should turn up tails endlessly though the probability of it is an infinitesimal of infinite order, ~~of~~ or the first abnumerable into one.

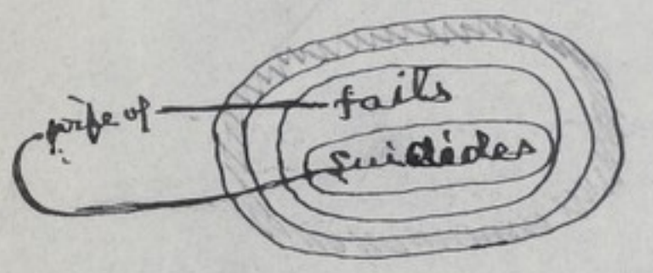


There is a married woman and ~~whenever~~ should her husband ~~may~~ fail she will commit suicide.
(under ~~the~~ actual circumstances).
But it is not said that ~~she~~ his failure will have any connexion with her ~~committing~~ suicide.



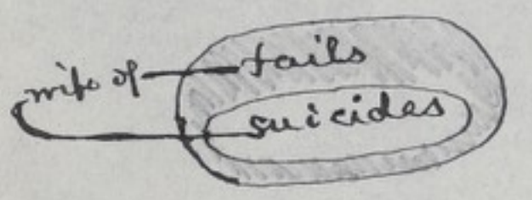


Under all circumstances there would be a married woman who, should her husband fail, would commit suicide.



There is a married woman and under all circumstances, the fact would be,* that if her husband fails she will commit suicide

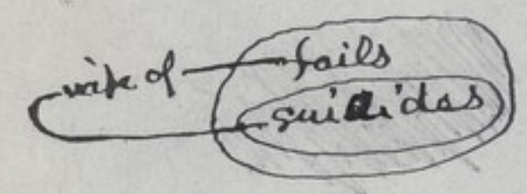
* Qu: What precisely does this mean?



~~There is a married woman and if her husband fail~~ ~~under any circumstances~~ should

~~There is a~~ *There is a married woman; and if her ~~fail then~~ husband might fail she ~~would in fact~~ will* suicide.

~~* Qu: The meaning of this?~~



There is a married woman and should her husband fail she ~~would~~ might commit suicide

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generally expressed by saying that 190 of Sep 8

By the way, the fact that the multitude of $\infty^2 = \infty'$ is strictly analogous to the fact that the sum of a semi-convergent series depends on the order in which the terms are taken. So that we should express both in the same way, and either say that the multitude of ∞^2 may change to ∞ by counting in a different order, or else say that the two values of the convergent series are equal. But the latter would be manifestly inconvenient, and therefore we should say the other. We might say that ∞^2 and ∞ are semi-equal.

$$
\begin{array}{r}
1 \\
-\ 0.5 \\
\hline
0.5 \\
+\ .333333 \\
\hline
0.833333 \\
-\ .25 \\
\hline
0.583333 \\
+\ 2 \\
\hline
0.983333 \\
-\ \tfrac{1}{6}\ -\ 166667 \\
\hline
0.316666 \\
+\ \tfrac{1}{7}\ +\ .142857 \\
\hline
0.459523 \\
-\ 125 \\
\hline
0.334523 \\
+\ 111111 \\
\hline
0.445634 \\
-\ 1 \\
\hline
0.345634 \\
+\ 0.090909 \\
\hline
0.436543 \\
-\ 0.083333 \\
\hline
0.353210 \\
+\ 0.076923 \\
\hline
0.430133 \\
-\ 071429 \\
\hline
0.358704 \\
\tfrac{1}{90}\ +\ 11111 \\
\hline
0.369815
\end{array}
$$

$$
\begin{array}{r}
139 \\
27 \\
81 \\
243 \\
\hline
1427\ 3 \\
729 \\
\hline
1428259 \\
2187 \\
\hline
14284777 \\
6561 \\
\hline
1428543311 \\
19683 \\
\hline
1428562993 \\
59049 \\
\hline
688979
\end{array}
$$

$$
\begin{array}{r}
49 \\
3\ 5\ 7 \\
25 \\
\hline
2\ 8 \\
40 \\
\hline
4\ 2 \\
20 \\
\hline
1\ 4 \\
20 \\
\hline
2\ 1 \\
5 \\
\hline
7
\end{array}
$$

$$
\begin{array}{r}
39 \\
1\ 2\ 3 \\
12 \\
\hline
1\ 2 \\
8 \\
\hline
9 \\
36 \\
\hline
3\ 6 \\
24 \\
\hline
2\ 4 \\
2 \\
\hline
2\ 7 \\
28 \\
\hline
3\ 0
\end{array}
$$

$\frac{1}{3} - \frac{1}{5}$

$\frac{1}{5} - \frac{1}{6}$

$\frac{1}{7} - \frac{1}{8}$

$\frac{1}{3} - \frac{1}{6} - \frac{1}{12}$ $\quad \frac{1}{24}$

$1 - \frac{1}{2} - \frac{1}{5} - \frac{1}{6}$ $\quad = 10\ \frac{1}{11} - \frac{1}{12}$

$\frac{1}{3} - \frac{1}{6} - \frac{1}{12} -$ $\quad = 0\ \frac{1}{13} - \frac{1}{14}$

$\frac{1}{15}\ \frac{1}{16}$

$\frac{1}{2x+1} - \frac{1}{2x+2} = \frac{1}{17}$

$\frac{1}{7} - \frac{1}{8} = \frac{1}{56}$

$\frac{1}{17} - \frac{1}{18}$

$$
\begin{array}{r}
13 \\
14 \\
\hline
182
\end{array}
\qquad
\begin{array}{r}
306
\end{array}
$$

$$
\begin{array}{r}
0.5 \\
0.833333 \\
0.033333 \\
0.017857 \\
011111 \\
007576 \\
005494 \\
004167 \\
3268 \\
2631 \\
2164 \\
1819 \\
1538 \\
1322 \\
1149 \\
1008 \\
891 \\
793 \\
\hline
679451 \\
47887
\end{array}
$$

650
756

$\frac{1}{90}$

$\frac{1}{132}$

$\frac{1}{17(17+1)}$

$\frac{1}{17^2+17}$

$(17+\frac{1}{2})^2$

$17^2 + 17 + \frac{1}{4}$

$\frac{1}{(2x-1)2x} + \frac{1}{(2x+1)(2x+2)}$

1	2
3	12
5	30
7	56
9	90
11	132
13	182
15	240
17	306
19	380
21	462
23	552
25	650
27	756
29	870

10	8
18	8
26	8
34	8
42	
50	
58	
66	
74	
82	
90	
98	
106	
114	

$$
\begin{array}{r}
29\ 870 \\
122 \\
\hline
31\ 992 \\
130 \\
\hline
33\ 1122 \\
138 \\
\hline
35\ 1260
\end{array}
$$

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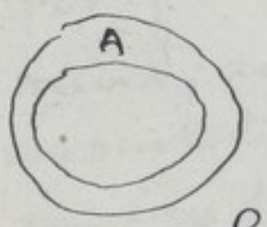
1908 Sep 9

As to the Real, I have decided within the last few days that my definition in the Hibbert Journal was not advisable, since it gives rise to a multitude of perplexing problems of little or no meaning. It is better to say that that which truly possesses ~~such a character~~ an attribute independently of the latter being attributed to the former by any single human finite mind or group of such minds is, in so far, Real, thus avoiding these insoluble & nonsentical problems.

In the case of Occurrences & Powers, that which possesses one Real Attribute possesses any sufficient to distinguish it from all others. But ~~no~~ any Idea is ~~[illegible]~~ more or less vague and ~~[illegible]~~ doesn't possess ~~never have~~ attributes sufficient to distinguish it from all others.

A power necessitates some Occurrence with the aid of some other Occurrence. A Power cannot produce an Occurrence without such co-operation. The ~~necessitates~~ necessitation of an occurrence ~~to~~ necessitates ~~consists~~ may be said to be involved in the non-possibility of ~~the~~ non-occurrence. But ~~this~~ it does not follow that there are but two Modes. For Negation consists in Necessitation, not Necessitation in Negation.

To explain a fact is to show that it is logically necessitated. But Logic is merely the ~~doctrine~~ science of ideas considered as signs.



When I speak of the World, I mean the ~~three~~ Universes ~~in their~~ as one Total. Whole and World are pretty much the same Idea unlimited. An unlimited Whole is the World. Such a postulate

of Logic that everything is Explicable. A Postulate may be defined as a Demand ~~is an Unfounded Claim~~ avowedly without any foundation ~~than the need of what is demanded~~. It is simply begging the question. If I go into a bank and ~~state~~ being asked to state my business, say that I come to borrow a billion dollars, and on being asked what my security is reply that I simply postulate (postulo) the loan, I am using the term in strict propriety. Logic makes its Postulates simply because Thought demands them. I need to understand things and cannot understand them unless a certain groundless proposition be true. I therefore beg that it be ~~true~~ admitted.

That is the definition of a Postulate given by Aristotle, Proclus and all intelligent logicians and the ~~my~~ original word αἴτημα manifestly means just that. ~~A man absolutely committed to~~ A man whose ALL absolute were staked upon an enterprise would be a miserable good for nothing to be abandoned. He should arm himself with confidence that all difficulties can be overcome. For if not, that will be no worse than any other state of mind; and if it be true it is best he should be thoroughly assured of it. Now it is agreed a man must live; but really that is not strictly necessary, since there may be a Hereafter. But he must absolutely must reason. That is his very essence. To reason is to be embarked in the enterprise of understanding things. He ought to assume that things are intelligible, then, since if they

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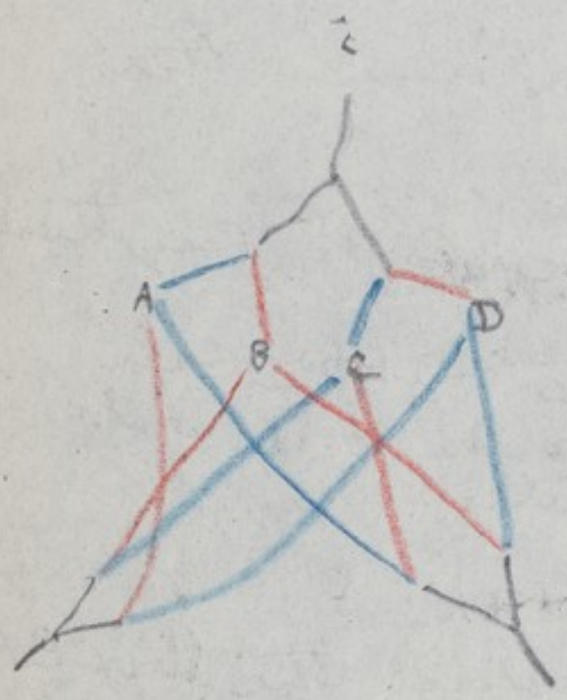
are not so the assumption is no worse than any other & if they are so, to say that it will be a great aid to be assured of it so this more than an aid: it is an an indispensible condition of success, would be an inadequate statement

But to say the World is explicable is to say that it is a product of Evolution and all we know of it multiplies the evidence of that so it is.

To say that the World is evolved is to say that it gradually grows determinate out of an original state of utter indefinitude.

Now determination is negation.

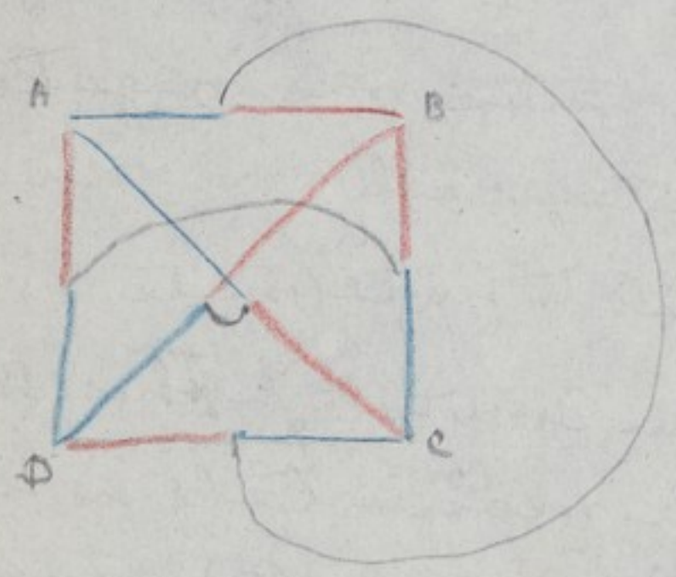
Therefore the Nothing out of which the World was created, — the chaos, the tohu-bohu, — was simply a ~~state in~~ when nothing was negated, for ~~the~~ indefinite being to be logically comprehended, must be supposed to correspond to indefinite assertion, such as "Some man is white," "this some-man is tall. ~~Some~~ for some man is tall is true. He is also short, for some man is short is equally true. In short, indefinitude consists in uniting equally all attributes.



$i = A:B - B:A + C:D - D:C$

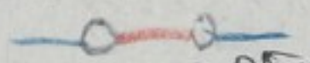
$j = A:C - B:D - C:A + D:B$

$k = -A:D - B:C + C:B + D:A$



A symmetrical connection is a mere connection between like things and no complication of connections between like things can make a connection between unlikes while two connections between unlikes can make a connection between likes.

An unsymmetric dyadic relation cannot be formed out of symmetric dyadic relations exclusively



But two unsymmetric dyadic relations will make a symmetric one

1908 Sep 10

Let u be a quantity which for each positive integer, i, takes a single value u_i. If then there is ~~but one value~~ for every value v finite, V, with a single exception, there is some positive integer i_v such that ~~if~~ for ~~any~~ every positive integer j, ~~be any positive~~ greater than i_v, ~~such that~~ $j > i_v$, v is not the value of u_i, or $u_i \neq v$. Then clearly V is the only value remaining that u_∞ can possibly have; and this is its value in the long run.

1908 Sep 11

~~Now~~ It is not possible for any compound of triads to form a ~~tetrad~~ symmetrical triad; (i.e., a tetrad in which the relation of ~~any~~ any one to correlate to another is formally the same as that of any third to any fourth). The question arises whether if we assumed the elementary relation to be a tetrad it would be any better. It would form a symmetrical triad Fig 1.

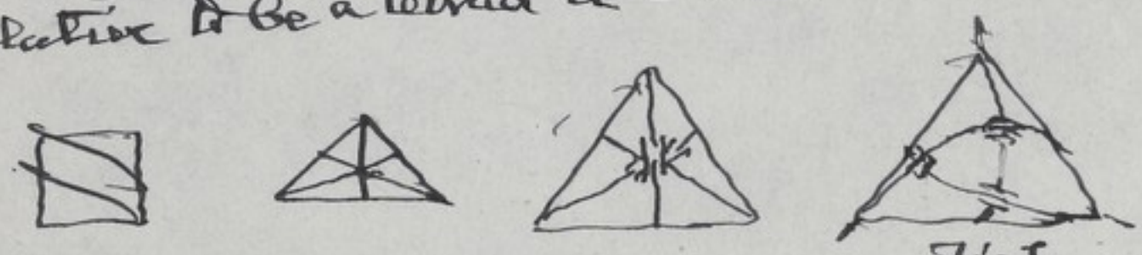


Fig I

No ~~It~~, for there are 3 triads here. Fig 2 is nearly symmetrical

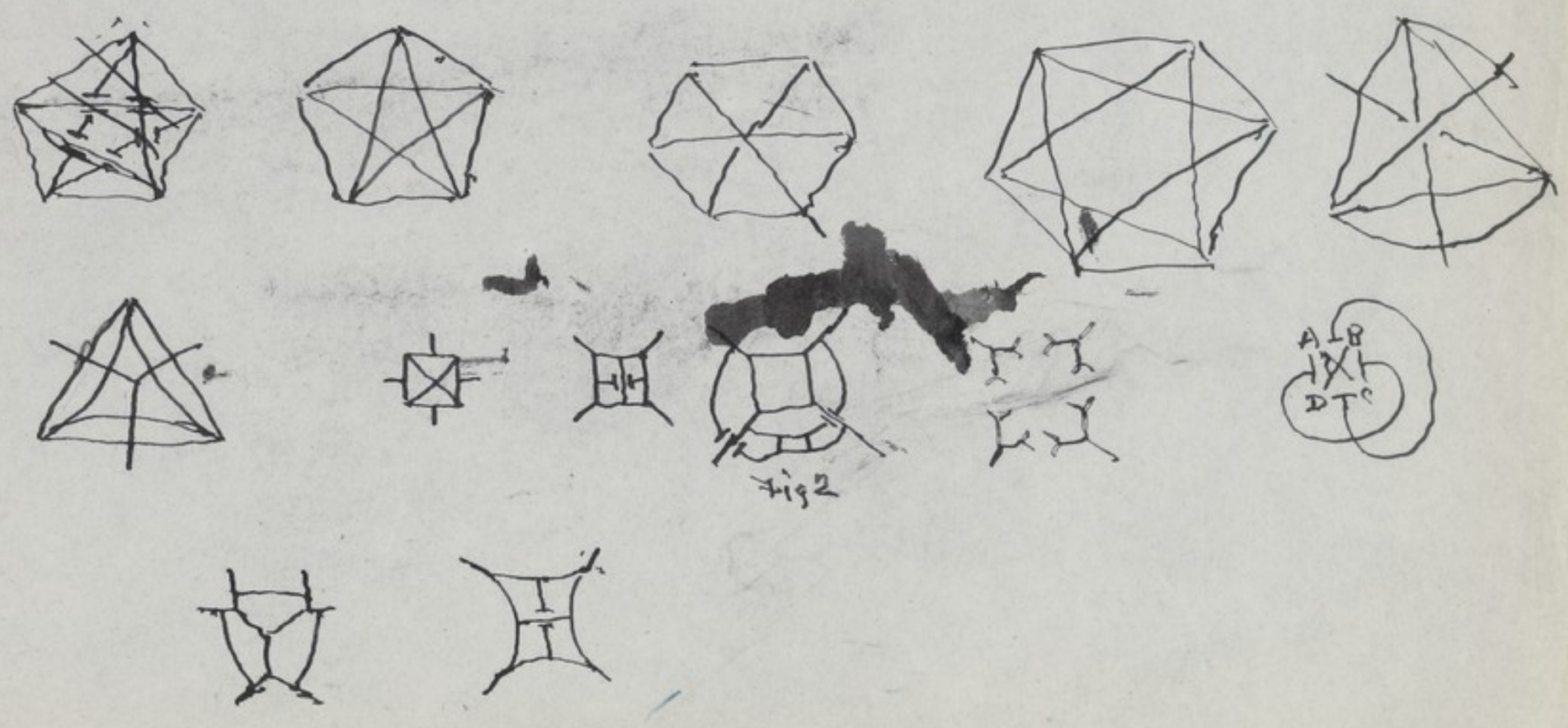


Fig 2

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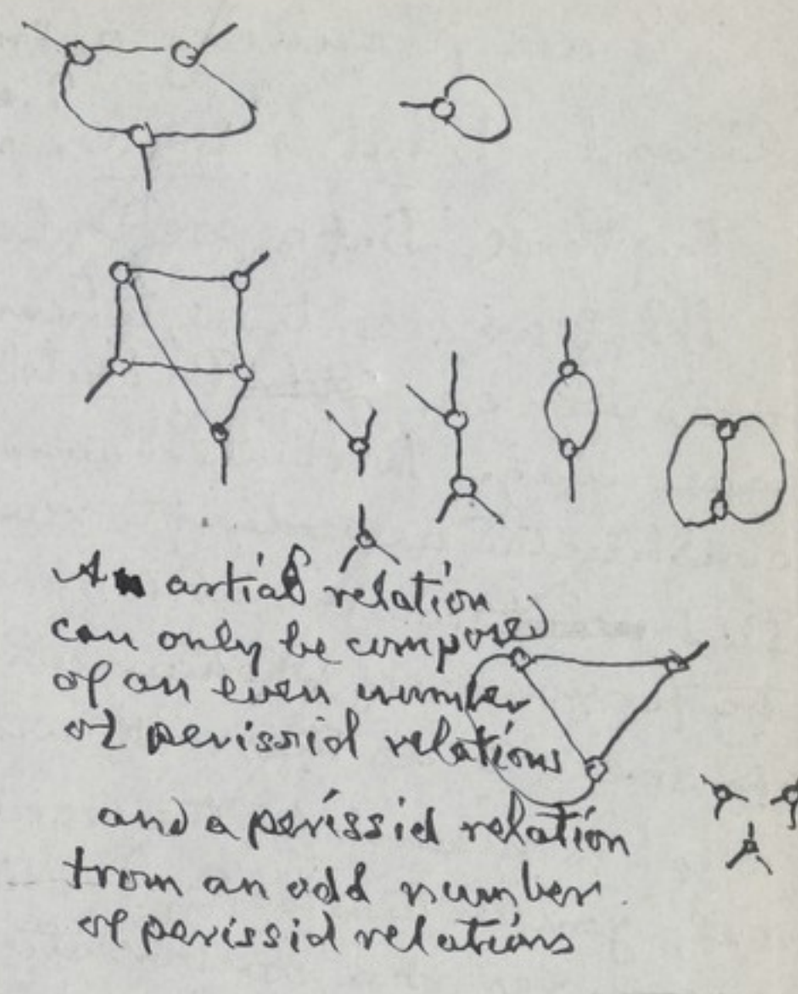
Any number of ~~two~~ O relations will form a relation of valency less by any even number than the sum of their valencies and none other



An artial relation can only be composed of an even number of perissid relations and a perissid relation from an odd number of perissid relations

1908 Oct 15

I am planning a smallish & popularish book on logic.

Chap I. What is logic? To understand the answer to that question you must first study this book. But a preliminary notion of it may be given in a chapter.

What we seem to see, to hear, to feel, to taste and smell is knowledge brutally forced upon us. By brutally I mean without appealing to our voluntary reasoning. Involuntarily and without knowing what we do, we have constructed according to reason whatever image we seem to perceive. But you ought to read this book, like every other, critically. To try for yourself whether what is said be reasonable or no; and in order to do this with what has just been read, you are to consider what is meant by the words 'reason' and 'reasonably'. In order to help you in this task, I will report a conversation, a part of which I actually had with a man of strong intellect, a part of which I supplement imaginatively.

I was remarking that nobody knew precisely what the sum of the three angles of a triangle amounts to. The idea was entirely novel to my interlocutor, — my converse; — for it was many years ago. "Why," he said, "it is two right angles." I replied that it was supposed to be so and no doubt is very nearly so, but that there is not the smallest reason to suppose it is exactly so; — quite the contrary. It was time to go to bed. My host, for I was visiting at his house, resumed the subject in the morning and said he was now prepared to prove that the sum of the angles of a triangle are exactly two right angles. "Let us suppose, said he, that I wished to prepare a perfectly level ground, and marking a point upon it, were to measure off any length, say 20 kilometres and mark its extremity. Then setting up an instrument over the second point, I bring the first point over the cross wires, and turn my telescope in that direction measure off another 20 kilometres and mark a third point.

Let us suppose that I prepare a perfectly level ground, and mark a point upon it, which we will call A. I have a sledge, which carries a telescope, which I point at the pole-star and clamp the telescope firmly to the sledge. The sledge also carries a pendulum which at first points at A. I move forward this sledge for a measured distance, keeping the pole-star without turning it at all. I now mark on the ground the point B at which my pointer now points." Seeing what his argument was to be, I here suggested that I would gladly suppose that there were. I then turn my sledge round

toward the right through exactly a right angle, ~~the~~ its pointer still pointing at B, and ready ~~adjusting~~ my telescope on the pole-star, I advance in the new direction through the same distance as before. Here I mark on the ground the point C at which the pointer of the sledge now points, and turn my sledge to the right through just one right angle. Since it has made no turn except the two turns ~~to the~~ each through a right angle, it is now turned through 2 right angles and points exactly in the opposite direction to that it had at first. I advance the same distance as before, and mark a fourth point D. Suppose, then, I had at first advancing to the north, say 1 kilometre; then to the east 1 kilometre, then to the south 1 kilometre, it will now be just one east of its first position. I turn it to the right through just one right angle and advancing just one kilometre, my point will now be pointing exactly at the point A; and when I turn it for the fourth time ~~the~~ through one right angle toward the east it will be placed exactly as at first." I here interrupted and said, "I fully admit that ~~if all that has you say~~ what you say seems very reasonable; and ~~if it be so~~, I need not trouble you to go further with your proof. ~~For if there be~~ It be possible ~~for any~~ For if space is capable of being ~~cut up~~ divided off into equal cubes, all the sides being equal and all the angles being equal, I grant that it necessarily follows that the sum of the angles of every triangle must be exactly two right angles. But I must point out to you that if you could carry out your experiments, we know positively that it would not turn out as you say. For suppose you start on the equator, in longitude, 0; and your ~~go north~~ sledge goes north ten thousand kilometres, you will now be at the pole, where your point B will be; while C will be in longitude 90° East on the equator, and D will be your first point." "But that was because the curvature of the surface prevented the sledge from moving without being turned. I was supposing the surface to be plane." "As to that,

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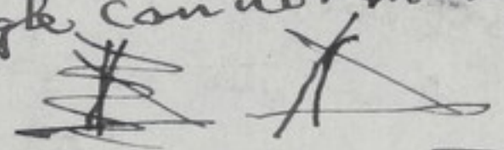
I will admit that there is some surface upon which the sum of the angles of ~~a triangle~~ every ~~all~~ triangles equals that of every other; and if ~~that is what~~ you mean by a plane nothing ~~but~~ a surface on which that is true, then of course it is true of a plane. But how do you know that what are ordinarily called planes are such surfaces?* "You have no means of knowing; and it is infinitely improbable." ~~But~~ "I know it because on a plane my sledge can slide along without turning." "Now what do you mean by ~~that~~ space from its nature can have no properties which do not express themselves in terms of the relations ~~of the things in space~~ of different positions of the same thing in space. Your notion of your sledge not turning is vague. If you will analyze your idea, you will see plainly that you have no evidence that the angles of plane triangles add up to 180°. What do you mean ~~then~~ by your sledge not turning?" "It is an elementary idea, perfectly clear & incapable of analysis" "You deceive yourself. An idea incapable of analysis is *ipso facto* a vague idea. But let me show you that you cannot possibly know what you think you know. An infinitesimal alteration in a triangle cannot make a finite change in the sum of its angles  for if so one straight line could be tangent to another & therefore ~~two~~ different straight lines could have two points in common. But granted that triangles which differ but infinitesimally have ~~that surface~~ the sum of the angles alike it follows that ~~an~~ infinitely small triangles all

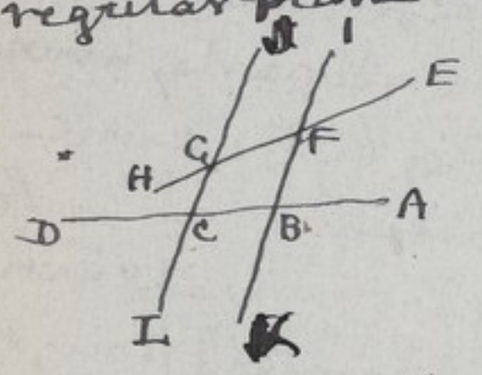
have the sum of the angles equal ~~to two~~ right angles

1908 Oct 16,

Corrections to the above. I should have stated that (calling my host E) E's argument had considerable value, although so far as he stated it, or probably himself at all understood it, it did not appear nearly so strong as it really was. Namely, as he stated it, it amounted to this, that everybody knows that the result would be as he said. Now it cannot be said with truth that everybody has much acquaintance with very large squares. Probably about as large a one as has been measured with great accuracy is the base of the Great Pyramid, whose angles are 90° within about a minute of arc, which is about the minimum visible. So that the argument as stated leaves it not unlikely that a "square" of ten times those dimensions may have angles very appreciably different from right angles. But it is easy to see that E's mind was really affected by a further argument. His talk about the sledge "not turning" during the motion shows that he was seized with the idea that if a plane turns without distortion all parts, however distant from the axis, turn in the surface upon their own centres by the same amount, (which of course is not the case with a spherical surface and this is the reason that a regular spherical tetragon has external angles less and internal angles greater than right angles.) Now, of course, those beliefs from which we absolutely cannot free ourselves, we must regard as certainly true, — and experience bears us out in so regarding them; and this being the case we cannot perhaps escape the conviction that these beliefs which we can doubt with extreme difficulty are somehow very near being absolutely certain. On this ground E's evident incapability of separating the turning in the surface of one place from a turning in another place is a sound argument that the angles of a triangle are much closer to being right angles than his expressed argument ought by itself to convince us that they are. It is a sound

(I by no means say conclusive) argument that the constitution of a plane is somehow determined by that simple and plausible idea. Yet even if we grant that it is so, it does not necessarily follow that the idea is realized in the plane to absolute perfection.

But to pursue the inquiry further, we reflect that by a quantity we mean the ideal goal of more and more accurate measurements; and ~~spa~~ all space-measurements whether of lengths or of angles are effected by displacing rigid bodies. No body is absolutely rigid, but in thinking of the true size of an angle or length we think of an ideal absolutely rigid body. By comparing measures made with bodies which approach rigidity in different degrees, we may probably infer what the result of measuring with an absolutely rigid body would be. Yet in no way whatever can we attain absolute exact measurement, and the question arises whether, such being the case, we can ever have reason to think that the angles of a regular plane tetragon are exact right angles. The question



is this: Suppose that the corner of an absolutely rigid body exactly occupies the angle ABI and that on sliding this body along the line AD until the ~~it exactly~~ the same corner of it exactly occupies the angle ACJ;

Oct 17

then supposing a corner of another rigid body placed against the line JC to occupy the angle JGE, the question is whether when this solid is slid along GE it will come to fit exactly the angle IFE, or a greater angle, or a lesser one. The first ~~assumes~~ supposition makes the sum of the angles of a plane triangle equal to 2 right angles, the second makes all geometry spherical and space finite, the third makes plane geometry the same as spherical geometry with the ordinary ~~sign~~ ~~sines and cosines~~ trigonometric functions changed to hyperbolic

functions ~~and~~ and a certain kind of surface to have a trigonometry the same as the ordinarily assumed plane trigonometry while ~~the~~ finite space is infinite ~~and finite space~~ and limited. That is to say there is a real spherical surface neither up to which any ~~part of~~ line or point of a rigid body can move. This ~~nor~~ nor away from which ~~no~~ any ~~part of~~ rigid body can move. This last one may well account a more beautifully constituted space than that of the usual assumption. The question, be it observed, is simply the question of what ~~is~~ are the properties of a rigid body. It would ~~be~~ seem contrary to all we know of the nature of the human mind to suppose that we have an absolutely exact intuitive knowledge of the properties of ~~a particular~~ bodies. We certainly have no right to be confident, therefore, that the sum of the three angles of a triangle is ~~absolutely~~ exactly equal to two right angles, although star parallaxes appear to show that the difference is excessively small. But supposing the properties of rigid bodies to be due to an evolution, this is exactly what would be the necessary result.

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1908 Oct 17.

~~By an "Idea" I mean~~ so

By an Ens, or something that has Being, I mean anything that can properly be regarded as anything denoted by a Proper Name or by a noun of any kind is regarded.

An Ens is either Real or Fictive. A Fictive Ens is an Ens of which whatever is true is so by virtue of ~~a~~ some Socius ~~Person~~ is or Persons' group of Persons' so. ~~of it as true of that Ens.~~ By a Socius ~~Person~~ I mean either a Human Being or some creature with whom you and I directly or indirectly hold converse, or semi-converse, as we ~~do with all Human Beings~~ might with an equal member of human society. By semi-converse I mean one mind's ~~offe~~ determining thoughts in another mind, without the latter ~~be~~ so acting on the former. I do not regard the Creator of Men as a Socius, since, if we can be said to have any sort of converse with Him, it is altogether different in kind from ~~that~~ any we could have with ~~our~~ any equals.

I will begin my Logic like this:

If nobody ever reads what I have set down, it goes virtually unuttered. In other words, if it be uttered it is ~~all~~ interpreted by a Reader; and to this Hypothetical Reader I say, You necessarily know the English language, (which implies a certain likeness between your mind and mine) Not only that, but you and I inhabit the same world and are acquainted with many of the same things in it (whether directly or indirectly does not much matter) ~~and~~ Each of us well knows that the other has this common ground of experience with himself, ~~and that that other knows it, and knows that he knows it and so on ad infinitum.~~ Each ~~knows~~ ~~[illegible]~~ missing ~~he knows that the other knows~~ Each knows the other knows it; each knows the other knows that he knows it; each knows the other knows he knows the other knows it; and so on ad ~~infinitum~~. I will term this ~~infinite~~ endless series of knowings a

mutual understanding. Do not lose sight of the fact that ~~this~~ our mutual understanding implies much common experience, mostly indirect. Thus, we have a common experience of the city of H'Lassa, though I was never there, and should be surprised if you were. By one's "experience" I mean the substance of the knowledge and meaning knowledge that the course of his life has forced him to acknowledge to himself, to recognize. — (1)

These two facts, then, (1) our mutual understanding and (2) your understanding of the dialect I employ, — render it certain that when I assert something, that is, endeavour by my utterances to ~~make~~ induce you to recognize it as true, you will (if not invariably, at least sometimes) know what it is ~~that~~ to which I intend to ~~cause~~ bring you ~~you to assent~~ to assent; for otherwise you would not be my Reader; and were you to deny it you would ipso facto demonstrate its truth. In the first place, by virtue of our former common experience and our mutual understanding of it, you will recognize one or more of things ~~which~~ I mention for ~~otherwise~~ allude to. These I term the dynamical subjects of my assertion. In the second place, by virtue of your knowledge of the language I employ, you will understand what it is that I mean to predicate about ~~those~~ the subject or subjects. A. Here missed

What is the essence of assent and belief? What is their real nature and value? To answer that question I must judge for myself, as we all do and must, with true caution, judge of what passes in one another's souls. Your voluntary actions, so far as they are really yours, and are not phenomena of possession or obsession, are governed entirely ~~are governed mainly, I presume,~~ by habits and natural dispositions. But you exercise a certain control over the formation and disruption of habits, and assume an even subsidiary importance, perhaps, to know just how this is done. But the process seems to me to be this. You review your acts, and you critically recollect the subject from to appraisal. You reflect upon what you have done. Your acts can be better criticized after they have been performed, and in the light of their results, than they could be when you were making up your mind to ~~do~~ ~~they~~

perform them. You ~~criticize~~ pass judgment upon your behaviour in comparison with your general intentions and purposes. You also, from time to time, ~~criticize~~ even call in question your general purposes by comparison with a beautiful ideal. You are thus led to wish that your habits should in future be modified in certain ways. I term this careful self-criticism with the resulting wish, Deliberation. It may be very special, relating only to a single occasion or it may be of a very fundamental nature. You have next to carry out the wish you have formed. In order to effect the desired modification of your habits, you avail yourself of the general fact that a habit of actual behaviour can be formed by repeated performances in imagination of acts according with the habit to be produced. You imagine occasions of ~~the proper~~ the pertinent kind, and imagine with as much vividness as you possibly can, that you act on those occasions according to the habit you desire to produce. You accompany each such imagined act with a most strenuous effort of attention, ~~a peculiar~~ attention of a peculiar kind, referring to future conduct. This, in effect, giving an imperative command to your future self, — a sort of self-hypnotization. This I denominate an act of resolve. It produces an effect upon your habits of action which I call a determination of the will. You can in this way ~~not only~~ produce on further ~~to~~ not only direct habits of behaviour, but also habits of deliberation and of resolution. You can doubtless do this and improve your methods of doing this. You exercise control over yours control. You govern your government, and the government of your government, and for aught I know can carry your control further & further indefinitely. I need not say that the attempt to act under unforeseen sudden temptation as your

wiser and better self would wish by any sudden call upon free-will, without such systematic preparation, is utter folly; and so is any conception of free-will that ~~say~~ contemplates overcoming temptation so. It is like going into a campaign with raw recruits. Discipline is indispensible. The course of one's life, so far as it consists in ~~voluntary~~ habits of voluntary action ~~formed~~ controlled by deliberation

A. I need not tell you that any assertion is composed of a subject and predicate; for ~~you must~~ have learned grammar has taught you that. Grammar, however, looks upon these matters in a superficial way; and the traditional logic is scarcely better. ~~Permit me to point out to you~~ ~~Permit me to submit to your judgment~~ Permit me to suggest to you ~~Permit me to~~ regarding the matter from a different point of view, from which I ~~think~~ am ~~sure~~ confident that, as soon as you become familiar with it, you will agree with me that the true composition of an assertion ~~appears~~ is revealed much more distinctly than from that of grammar. In the first place, then, ~~the subject of the assertion, or that is, that to which the assertion refers~~ ~~relates~~, when I speak of the subject I do not mean the grammatical subject nominative, nor do I necessarily mean that ~~real~~ thing which the subject nominative denotes. I cannot in a single brief sentence ~~make you~~ give you a perfectly ~~definite~~ distinct idea of what I mean. I shall have to be a little vague at first. By the subject I mean that ~~to~~ ~~con~~ about which the assertion is made, whether the ~~opt~~ name of it be in the nominative or not. You must consider the meaning, not the linguistic expression merely. For instance, in the assertion "Rienzi was on the border line between a great man and a fool," the dynamical subject ~~was~~ is Rienzi. In the assertion, "The greatest mind of the tenth century was Gerbert," there are two subjects, the man Gerbert, and the ~~tenth~~ century. ~~There~~ In the assertion ~~also~~ ~~minds in the~~ European men of the tenth century, "Julius Caesar died at the foot of a statue of Cnaeus Pompeius," the subjects are the two men Caesar and Pompey. ~~For the statue, which is not specified only some statue is parts merely a part of what it is~~ For though some statue is mentioned, it only serves to describe the event, which concerns Caesar chiefly ~~and~~ but Pompey, too. Two remarks will

serve to give you a clearer notion of what I mean by a dynamical subject of an assertion. ~~The firs~~ The first is this. I have said that the subjects and predicate are the two parts of an assertion. [Abelard reckoned the copula as a third part; and in a certain sense, it is a part of an assertion, but ~~by~~ not in the sense in which the subject and predicate are parts. It is nothing but a mark that the predicate is to be understood predicatively, that is, as ~~increasing the interpreter's~~ ~~inform~~ conveying information; and not as limiting the denotation of the grammatical subject.] Now while the predicate ~~may call up~~ ~~in the mind an entirely n~~ may express ~~assert~~ a novel combination of ~~circumsta~~ peculiarities, characters, such as the interpreter never dreamed ~~of a~~ facts about ~~the subject~~, the ~~sub~~ assertion can never before of any subject possessing, ~~it~~ no assertion can make us acquainted with its dynamical subject, but can only ~~indo~~ point it out among the things ~~which~~ with which some collateral experience must make the interpreter acquainted before the assertion can convey its meaning to him. Thus, if while you or I are ~~in~~ upon a ~~walking expe~~ ~~ditio~~ pedestrian tour through a country where we had never been before, an aeronaut flying with prodigious speed were to descend ~~upon~~ from an immense ~~a great~~ height ~~to~~ to a level where the aeronaut could make himself heard, and he were to shout out "there is a house on fire, ~~and its flames are~~ ~~bright green~~ burned to death" and on our asking "where ~~have~~ do you come from?" he were to ~~say~~ call out "from China" and ~~he~~ Thus if anybody were to tell me his away, ~~without~~ ~~that Prince Petropolowski had long been dead, it~~ ~~would convey no slightest information if~~ ~~never heard of Prince Petropolowski~~ Bartolomé y Herrera was ~~living in 1639~~ not alive in 1650, ~~it would~~ ~~convey no in~~ and if I never heard of any person of that name, it would convey no information whatever. But if I ~~at~~ were subsequently become in to possession of a portrait so signed, it might ~~be~~ ~~once~~ ~~become~~ convey an important fact to me.

1908 Oct 18

The second remark about the Subject of an assertion is that ~~mere~~ more or fewer objects may be regarded as subjects which the remainder of the assertion is the predicate, ~~But~~ Moreover instead of regarding the subjects are plural one may regard the whole set as forming the Collective Dynamical Subject. The Complete Collective Dynamical Subject includes all that it is necessary to be acquainted with in order to understand the assertion, excepting the forms of ~~rela~~ connection between the different Single Subjects. Thus in the assertion "Every catholic adores some woman;" the Complete Subject embraces 1. the character of being catholic, 2. the ~~the~~ character of the relation of adoring, 3. the character of being a woman; and the proposition is that, The character of being catholic determines anything to be in the relation of adoring to something having the character of a woman

1908 Oct 20.

To analyze an assertion into Subjects & Predicate, comes to making the Subjects to be all the simple monads that can be ~~found~~ imagined that ~~by functions~~ with Predicates will make up the Assertion

The Great Pyramid ~~was~~ white

Its subjects are "The Great Pyramid" and "whiteness"

The Great Pyramid possesses the character of whiteness

or The Great Pyramid stands in the relation of to a character possessed that is a possessor of something is whiteness

Pyr ~~is~~ white

Pyr — possesses — whiteness

Pyr. — is in relation of to whiteness / possessing

Brutus — kills — Caesar

Brutus — is in the relation to Caesar / of killing

Brutus — has — the relation to — Caesar / of — killing

Brutus — has — the relation to killed Ceasar / of a killer of

the relation to killer of / of killer of

I try again

1908 Oct 21

[I am going to write in first person singular, as being the sincerest & freest from everything like affectation & formality.]

The aim to which I shall endeavour in these pages to confine my pen is that of helping you who read them to reason better than you now do [i.e. more to the purpose, more accurately, more swiftly, more ingeniously, and more solidly]; yet it will not be by all the means that a writer might employ for this purpose, but only by those means which I think myself best qualified to handle, namely, by demonstrating the essential nature of each kind of reasoning, and pointing out the bearing of this truth upon the practice of reasoning, and also by suggesting the different general kinds of exercize that help this growth tend to elements of skill in the discovery of truth of different kinds of excellence in the manipulation of arguments.

At this point you ought to feel two doubts. Grammatically, this is a simple question. But I hope your thought penetrates to its substance; and that you want three elucidations: that in the first place, you want to know who is the "you" and who the "I"; that in the second place, you want to know what are the two "doubts" and why you need feel them; and that in the third place, in what sense I think that you ought to feel, or how there can be any obligation to feel. As to the first point, by "you" I mean you, the very person who are reading this, and I, one Charles Peirce, now about seventy years old, who for about fifty-eight years have been trying to understand the nature of the different kinds of reasoning, and for the last twenty years more and more has led the life of a recluse in order to escape all distractions from that study. For in order that I should be of the service to you that I hold it as the first duty of my remaining years that I should try with all the might to be, this writing on my part and reading on yours, supplemented by any further aid by correspondence which you are entitled, so long as I can possibly render it, should amount to a certain heart to heart confabulation, without any reserve that could possibly obstruct it. I, for my part, shall force myself to a degree of candour to which I have all the reluctance of such half-baked souls as mine.

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1908 Oct 22

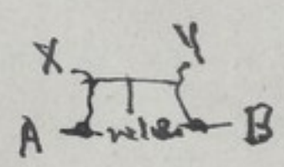
The two doubts you ought to feel, are 1st whether an acquaintance with the minute structure, – say, the histology, – of reasoning ~~is an actually~~ practically would be practically of any considerable advantage to you; and 2nd, whether I am competent to give a correct advantage of that anatomy. I speak of feeling these doubts because a doubt is a state of feeling, and the access of it is a sensation which like most sensations is, in itself, painful. For perhaps every sensation is slightly painful even in cases when the feeling once established is pleasurable. ~~At any rate~~ At any rate in the case of doubt we instinctively shun its access very strongly, and the feeling when established is uncomfortable and eminently irritating: ~~the instinctively~~ by a natural impulse we exert ourselves to be rid of it. To write down on paper or ~~express~~ otherwise express a doubt that is not really felt is a common insincerity, not to say a lie.

But can a person control a feeling? If ~~you or~~ I open my eyes in the daylight I cannot help seeing what I do see; and in the dark I cannot see. How can there be any ought in ~~the~~ regard to a feeling? This is the third point that calls for elucidation. Of course, so long as the sufficient stimulus is before the mind, no direct effort of the will can stifle the feeling. Yet we speak of entertaining various qualities of feeling

1908 Oct 26

A has the quality – X A – has – X

A has the relation to B of an X to a Y ~~A has the~~ X ~~A has the relation of X to~~



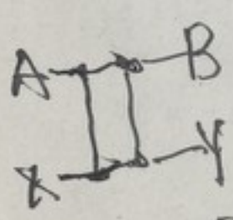
X – relation – Y
corresponds

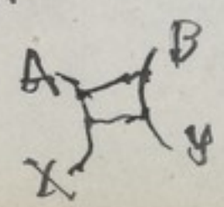
A corresponds to X in

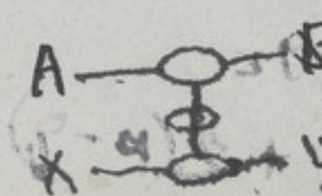
A has a relation { to B / corresponding

~~A in its relation to B~~
corresponds

X has a relation { to Y







A corresponds

1908 Nov 2

Suppose Two elastic oscillations

A force of restitution upon each oscillating body, equal to $D_t^2 s_1 = -g_1 s_1$ $\quad D_t^2 s_2 = -g_2 s_2$

A force of one upon the other $\cancel{D_t^2 s_1 = a_1(s_2 - s_1)}$

$\cancel{D_t^2 s_2 = a_2(s_1 - s_2)}$

$$D_t^2(s_1 - s_2) = a(s_2 - s_1)$$

So that
$$D_t^2 s_1 = -(a+g_1)s_1 + a s_2$$
$$D_t^2 s_2 = a s_1 - (a+g_2)s_2$$

Then suppose x and y to be such that

$$D_t^2[x s_1 + (1-x)s_2] = -y[x s_1 + (1-x)s_2]$$
$$= -x(a+g_1)s_1 + x a s_2$$
$$+ (1-x)a s_1 - (1-x)(a+g_2)s_2$$
$$= [a - (2a+g_1)x]s_1 - [a - (2a+g_2)x]s_2$$

$\frac{p}{p+q} + \frac{q}{p+q}$

$$\cancel{-yx = a}$$

$$D_t^2[p s_1 + q s_2] = -y[p s_1 + q s_2]$$
$$= -p(a+g_1)s_1 + p a s_2$$
$$+ q a s_1 - q(a+g_2)s_2$$
$$= [(p-q)a + p g_1]s_1 + [(p-q)a - q g_2]s_2$$
$$= -y p s_1 - y q s_2$$

$$y p = p g_1 + (p-q)a$$
$$y q = q g_2 - (p-q)a$$
$$y(p+q) = p g_1 + q g_2$$
$$y = \frac{p}{p+q} g_1 + \frac{q}{p+q} g_2$$
$$y(p-q) = p g_1 - q g_2 + 2(p-q)a$$
$$y = \frac{p}{p-q} g_1 - \frac{q}{p-q} g_2 + 2a$$

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$$\frac{p}{p+q} g_1 + \frac{q}{p+q} g_2 = \frac{p}{p-q} g_1 - \frac{q}{p-q} g_2 + 2a$$

$$(p^2+pq) g_1 + (pq-q^2) g_2 = (p^2+pq) g_1 - (pq+q^2) g_2 + 2(p^2-q^2)a$$

$$2pq g_2 = 2pq g_1 + 2(p^2-q^2)a$$

$$p^2 + \frac{g_1-g_2}{a} pq = q^2$$

$$\left[p + \left(\frac{g_1-g_2}{2a}\right) q\right]^2 = \left[\left(\frac{g_1-g_2}{2a}\right)^2 + 1\right] q^2 \qquad \left[q + \frac{g_2-g_1}{2a} p\right]^2 = \left[1 + \left(\frac{g_2-g_1}{2a}\right)^2\right] p^2$$

$$\frac{p}{q} = \left[\frac{g_2-g_1}{2a} \pm \sqrt{1 + \left(\frac{g_1-g_2}{2a}\right)^2}\right]$$

$$= \frac{g_2-g_1}{2a} + 1 + \frac{(g_1-g_2)^2}{8a^2} - \frac{(g_1-g_2)^4}{128\, a^4}$$

$$\frac{q}{p} = \frac{g_1-g_2}{2a} \pm \sqrt{1 + \left(\frac{g_1-g_2}{2a}\right)^2}$$

$$(1+x)^{\frac{1}{2}}$$

$$\tfrac{1}{2}(1+x)^{-\frac{1}{2}}$$

$$-\tfrac{1}{8}(1+x)^{-\frac{3}{2}}$$

$$(1+x)^{\frac{1}{2}} = 1 + \tfrac{1}{2}x - \tfrac{1}{8}x^2$$

$$(1.001)^{\frac{1}{2}} = 1.0001$$

$$-.000000001$$

$$1.0001 - 0.000000001$$

$$1.00001111 1$$

$$1.0000 \quad 10000 \quad 10000 \quad 10000 \quad 10000 \quad 10000$$

$$1.00011111 \; 111 \; 100001$$

$$ps_1 + qs_2 = \sigma^{\sqrt{-y}\,(\cancel{pg_1 - qg_2})t}$$

$$D_t(ps_1 + qs_2) = \sigma^{\sqrt{-y}}$$

$$ps_1 + qs_2 = A\sigma^{\sqrt{y}.t} + B\sigma^{-\sqrt{y}.t}$$

$$(x + \sqrt{1+x^2})(-x + \sqrt{1+x^2}) = 1 + x^2 - x^2 = 1$$

$$\frac{p}{p+q} = \frac{1}{1+\frac{q}{p}}$$

Put $\frac{g_2-g_1}{2a} = G$

$$\frac{p}{p+q} = \frac{1}{1 - G \pm \sqrt{1+G^2}}$$

1908 Dec 3

Definition of Next After

If ~~A~~ F is next after E in the collection S in respect to ~~the~~ Φ a quality of some relations, then and then only the following propositions are all true:

1st, there is a genus (or predicate) T, of qualities or non-relative characters, such that every member of S has ~~one or more of the qualities~~ some quality, say x, of which T can be predicated, ~~which~~ and there is another quality, y, of the genus T, such that m does not possess y, but any member of ~~E not~~ S not m, but possessing x, also possesses y; and there is no ~~other~~ quality of the genus T, not y, which is not possessed

2nd there is a predicate T of qualities, such that taking any member, m, ~~whatever~~ of S, ~~this member of S possesses a quality, y, of which T can be predicated, and there is a quality~~ ~~any~~ there is a quality, say x, of which T can be predicated, and which is possessed by m and there is a quality, y, of which T can be predicated, ~~and whatever member of S possesses~~ ~~y is not x, and~~ and which is possessed by a member, n, of S, and n is not m, and whatever member of S possesses y possesses x, and there is a member, n, of S which possesses x but does not possess y and if any member v of S possesses x but does not possess y, then v is n. ~~And~~ if any ~~quality~~ quality of which T can be predicated is possessed

There is a genus ~~of~~ Γ of qualities

1st such that ~~taking~~ ~~any~~ every member of S possesses some quality of the genus Γ

2nd ~~A~~ ~~any~~ every quality of the genus Γ which is possessed by a member of S,

3rd, If there are two ~~mem~~ ~~different~~ ~~non-identic~~ diverse members of S, there are two different qualities of Γ one of which is possessed ~~every~~ by every qu. member of S which possesses the other, ~~while this other is possessed~~ ~~as well as by a member of S that~~

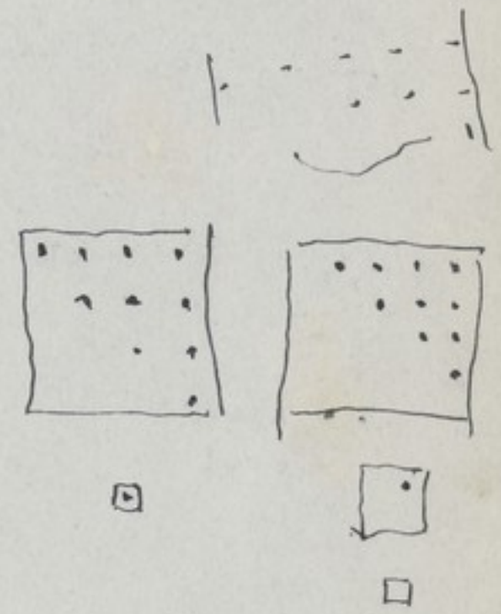
~~4th If there are two different~~ ~~by a member of S that~~

does not possess that other.

4th If there are two different qualities belonging to Γ, then there are two different members of S one of which possesses every quality belonging to Γ that is possessed by the other and possesses some quality ~~belonging~~ to Γ that is not possessed by that other.

5th ~~Some member~~ One member of S and only one whatever is ~~not~~ possessed by any ~~other~~ member of S. ~~and one member of~~ possesses ~~a~~ quality belonging to Γ that is not possessed by some other.]

6th One member of S and only one ~~possesses a quality~~ lacks a quality ~~not possessed~~ lacked by ~~every~~ any other member of S [~~or no quality~~



1908 Dec 4

Definition of Next After

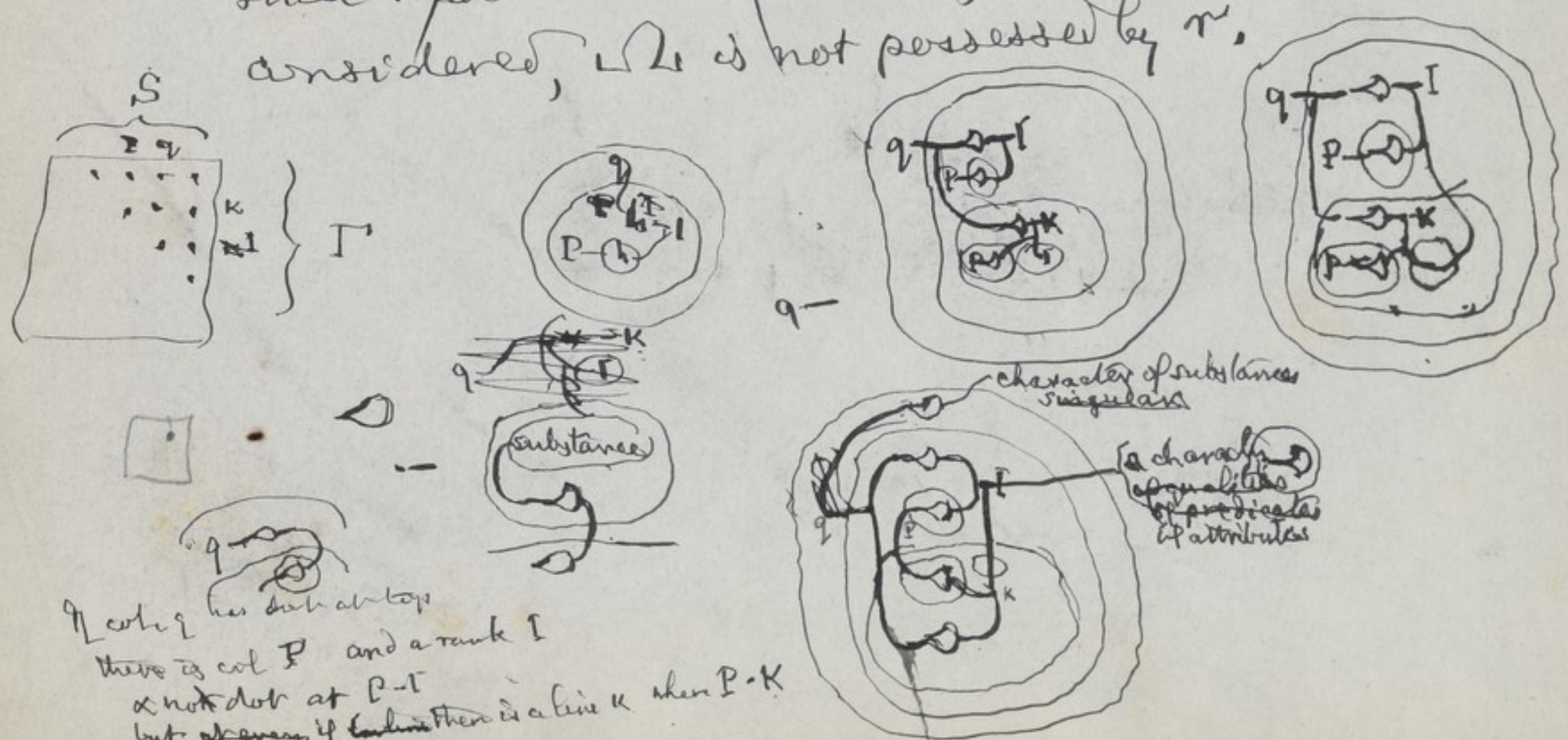
If F is next after E in the Series, S, in respect to Π,

1st there is a genus, Γ, of qualities such that there is an ~~object~~ member, I, of the collection, S, such that whatever quality, q, of the genus, Γ, be considered, I possesses q

2nd and there is a member, A, of the collection, S, such that whatever quality, q, of the genus, Γ, be considered, A does not possess q.

3rd and there is a quality, ①, of the genus, Γ, such that whatever member, t, of the collection S be considered, ① is possessed by t

4th and there is a ~~member~~ Ω of the genus, Γ, such that whatever ~~member~~ ~~quality~~ member, r, of the ~~genus~~ collection S be considered, Ω is not possessed by r.



q color q has dot at top
there is col P and a rank I
K not dot at P-I
but ~~always~~ if ~~[illegible]~~ there is a line K when P-K

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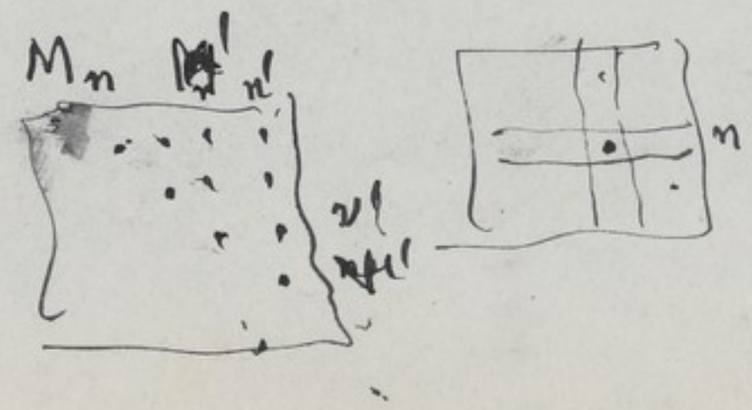
1st, there is a genus, Γ, of qualities
such that taking any ~~quality~~ member, q, of the ~~genus Γ~~ collection, S,
there is a ~~member~~ ~~quality~~ member, P, of the ~~genus Γ~~ collection, S,
and there is a quality, $\mathbf{I}$, of the genus Γ
~~such that taking any quality, κ of the genus Γ~~
such that $\mathbf{I}$ is possessed by q but not by P
and taking any quality, κ, of the genus Γ
either κ is not possessed by q, ~~or~~ it is $\mathbf{I}$, or it is possessed by P

2nd taking any quality, κ', of the genus Γ
there is a quality $\mathbf{I}'$, of the genus Γ
and a member P', of the collection S
such that P' possesses κ' but not $\mathbf{I}'$
and taking any member q' of the collection S
either q' does not possess κ', or is P', or possesses $\mathbf{I}$.

~~There~~ ~~[illegible]~~
Taking any ~~[illegible]~~ file, q



If there is a {rank / file} that has a dot in some {file / rank}
There is a {rank / file} that in
in every {file / rank} where n
has a blank has a blank
and has a blank in a file ~~[illegible]~~
wherever

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~~If Any column c_1 that has in any row r_1 a dot~~
~~There is a column C_2 having in row r_1~~

If any column c_1 has in any row r_1 a dot
There is a column C_2 having in r_1 a blank and
if c_1 has in any row r_2 not r_1, a dot C_2 has in r_2 a dot
and if in c_1 there be in r_3 a blank in C_2 there will be in r_3 a blank

---

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1908 Dec 19

Notes for a Paper for the American Mathematical Society,
"Logical Remarks on Some Mathematical Definitions"

~~It is very agreeable~~
A ~~huge~~ student of logic experiences a particular delight ~~in~~ at ~~finding~~ addressing himself to mathematicians, since they are better reasoners than the members of any other social group, while logicians, I am obliged to confess, are about the worst. I can therefore take some things for granted, which I should have to explain to my ordinary readers, and that with the unpleasant conviction that but few of them would understand what the explanation was driving at. Nevertheless, even mathematicians are subject to ~~contain~~ their besetting logical sins, by which I mean violations of this most fundamental principle of ~~logic~~ ~~which~~ ~~upon~~ ~~logic rests~~ ~~that~~ of logic ~~rests upon~~; and since logic is the theory of such a control of thought as shall adapt it to ~~a purpose~~ its purpose as acknowledged by universal common sense; while the theory of self-control in general so as to adapt conduct to proper ends is ethics, or the theory of morals, it follows that a violation of the most fundamental principle of logic is, strictly speaking, sin.

Experience has fully borne out the natural anticipation that the ~~success~~ ~~fed~~ a healthy condition of any science, using this word to denote the business of a social group that is held together by the common and peculiar ardour of its members in the ~~that~~ determining a special class of truths, ~~day~~ requires the universal recognition and employment by its members of an accurate terminology; and the experience of the naturalists, in the nature of ~~whose~~ their objects of study has forced them to a more serious study of the conditions of the ~~univers~~ establishment of a universally accepted terminology than any other scientific group has undertaken, and whom we may therefore well take as our exemplars in this matter, has thoroughly convinced them that the only practicable way of attaining the requisite unanimity in the use of terms, is to insist that upon him ~~he~~ who introduces any conceptions or the group generally

1908 Dec 20

A collection is an Ens rationis created by ~~the~~ a certain brute act of ~~[illegible]~~ ~~and whatever object is recognized in that act has such Being~~ recognition ~~of Objects which have such~~ Being as they ~~have~~ independently of the act ~~as all has; and the Collection but by virtue of the act it independently of such act.~~ ~~and any~~ whatever ~~object is so recognized~~ which act of Recognition

See next page but one

1908 Dec 20

A collection is an ~~Object~~ Ens rationis whose Being implies the Being of ~~each~~ whatever Object ~~standing~~ that stands in a certain ~~elementary and immediately recognized~~ mental recognition relation to it, ~~called~~ being a member of it, which ~~Relation implies an act of immediate recognition~~ relatedness of the Member to the Collection implies that it can be immediately recognized and further implies that the ~~Object~~ Member might have ~~been~~ Being ~~without being~~ by itself regardless of any such Relatedness. implies that it is regarded as not whose Being such ~~cons~~

A collection is an object ~~whose Being~~ ~~consists~~ having a Being ~~such logically depends~~ ~~upon the b which would not be~~ regarded as such unless each object that is termed a Member of it ~~has a Being~~ regarded as having a Being, while ~~each Mem~~ ~~no~~ each Member ~~of~~ is such, ~~that~~ is ~~has a~~ regarded as having a Being (real or fictive,) ~~which~~ ~~regardless of its body~~ whether it be ~~regarded as a Member of~~ in any ~~such way~~; regarded as a Member of a Collection or not or whether it be itself a collection or not?

the science shall rest the duty of ~~inventing~~ inventing, and giving, suitable terms wherewith to express it, and once this duty has been even passably well done, to insist that all other members of the group shall regard it as an injustice to that originator of the concept and an offence against science itself to use his terms in any other senses than those he has placed upon them, and to look askance even upon the use of any synonyms for these terms unless ~~these~~ the ~~progress of~~ science ~~will~~ can be positively furthered by such other form of expression. Now in the middle ages, although the general state of intellectual culture ~~forbade~~ ~~prevented~~ did not allow ~~much deep~~ any very scientific high development of logic, ~~yet~~ it was studied with all the accuracy that industry could in the ~~a~~ state of thought ~~at the~~ during those ages could attain, and a very convenient terminology was established, which has ~~an~~ largely ~~passed~~ passed into the vernacular of English speech more fully than into any other modern tongue. This terminology, therefore, ought to be preferred to any other wherever it is applicable. ~~But~~ It is a sin to depart from it without any weighty reason. The word collection is one of its terms, meaning an object whose Being is recognized as merely ~~consisting~~ made up of separate ~~to consist merely~~ ~~in the common~~ Being of ~~their~~ ~~which are not recognized and in no other relation~~ of each of certain other objects, ~~which are not~~ ~~they~~ ~~there objects~~ ~~each~~ being, for the purpose of their relation to the collection, regarded as single, that is, as ~~not consisting in~~ having ~~their~~ Being not so consisting in ~~any~~ mere Being of something else. In this respect a collection differs from other wholes; ~~since the Being of every other depends not merely upon the Being of each part and another~~ (Part-but also ~~upon certain relations between~~ ~~upon nothing whatever~~ ~~except upon~~ logically ~~depending~~ upon the Being of each object that is termed a member of the collection, ~~the~~ which the Being of no member ~~of~~ depends ~~upon~~ either immediately or mediately upon the Being of any other. ~~and further more the Being of the collection~~ ~~The Being of~~ ~~every~~ other whole depends not merely ~~depends on nothing else than the~~ ~~upon the Being~~ on the Being of ~~the~~ each Part, but also upon some relation between the parts,

A Collection is an Object that consists in the Real Possibility of a Fictitious Object created by mental act of ratification of whatever Brute act on ~~an~~ some one occasion there may have been, this second act (which on account of what follows may be called an act of ~~selection~~ election) being such that no Object of it is created or Really modified by it, but only thereby comes to be in the relation Member of the Collection; and no Collection, merely as such, has any other character than, first, the two relative characters of including as a Member of it what is a Member of it and of excluding from Membership in it what is not a Member of it, and secondly, such characters as consist in the characters of what it includes and of what it excludes.

This definition, I am sorry to confess, demands an elucidation. Suppose then that a person some afternoon happens to think of those three things, the first, Lemuel Gulliver's capture of the Blefuscudian navy, the second, Benedict de Spinoza, and the third, the declinational component of the precession of the equinoxes.

" A collection is an ens rationis whose Being consists in the Real Possibility of ~~erecting into~~ creating an Object of thought ~~all whose~~ the Being of which ~~should imply there the Being of in any one way of~~ ~~should have been an~~ ~~Object of thought on any one occasion~~ whatever Object should imply, and should ~~nearly~~ only imply, the Being of whatever Object of thought should ~~present itself~~ have come to recognition on ~~some~~ any one occasion, in any one way. The first step in the production of that Object of thought whose possibility constitutes the Being of the Collection is the coming into recognition on one occasion in one way of certain Objects of Thought. ~~I begin~~ Regarding this ~~proc~~ step as an act of the mind, I will term it a Lection (from λέγειν, to gather) and will term the Objects of Thought which are ~~as~~ the objects of this act, the Lecta. I use these terms as less definite than selection, election, collection, etc.

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(an Object whose Being consists in the Real Possibility of)

1908 Dec 20

(which on the following account may be called an actual selection)

339r

A collection is a fictitious object ~~which~~ created by a mental act of ratification of whatever brute act there may have been, on a certain occasion, such that no object of it ~~actually~~ is created or modified by it, but only thereby comes to be in the relation of Member of the collection; and no collection, as such, has any other character than, ~~the~~ first, the two relative characters of ~~having~~ ~~containing~~ including as a Member of it, what ~~it has~~ is a Member of it and of ~~not contain~~ excluding from Membership in it what is not a Member of it, and ~~2nd~~ secondly such characters as consist in the characters of what it includes and excludes.

And by a fictitious object I mean one created by the act of some existent mind or ~~gr~~ existent group of minds; and by a ~~brute~~ brute act I mean one which, though it may ~~have~~ be governed by a reason, yet so far as the effect spoken of is concerned, is just as if it had no reason.

A collection thus differs from a class (which by the way in this sense only came into the language about the middle of the ~~XVIII~~ XVIII th century and was only taken in to the terminology of logic by Whatelay in 1824; but previously the terms genus and species fulfilled its functions) in that a ~~cl~~ class contains such members as it does contain because they alone have certain characters. The members of a collection may be called parts of the collection as their whole. But this involves a certain violence to the terms whole and part; since in general a whole is that whose Being consists in the Being of the Parts combined with those relations between the parts which constitute the ratio essendi of the whole. The Being of an essential whole consists in the essential parts with their essential relation; the Being of an accidental whole consists in the Being of all its parts together with all their relations. But the Being of a collection is entirely independent of the relations between its parts.

1908 Dec 27

Let the first of a triad of numbers be

1 for a Tone 2 for a Token 3 for a Type

Let the second of the triad show the Object of the Sign to be

1 an Idea 2 an Occurrence 3 a Habit

Let the third number have the same signification for the Interpretant

Then there will be ten classes only

since an Idea can determined an Idea only

a Habit can be determined by a Habit only

111 131 331 333

121 231 332

221 232

222

Or Putting second Number above the third

1^1_1 1^3_1 3^3_1 3^3_3

1^2_1 2^3_1 3^3_2

2^2_1 2^3_2

2^2_2

$\begin{matrix}3\\3\end{matrix}$ $\begin{matrix}3\\3\end{matrix}$ $\begin{matrix}3\\3\end{matrix}$ $\begin{matrix}1\\1\end{matrix}$

$\begin{matrix}3\\3\end{matrix}$ $\begin{matrix}3\\2\end{matrix}$ $\begin{matrix}2\\1\end{matrix}$

$\begin{matrix}3\\2\end{matrix}$ $\begin{matrix}2\\1\end{matrix}$

$\begin{matrix}3\\2\end{matrix}$ $\begin{matrix}2\\2\end{matrix}$

$\begin{matrix}2\\2\end{matrix}$

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~~1908 Dec 27~~
1909 Jan 7

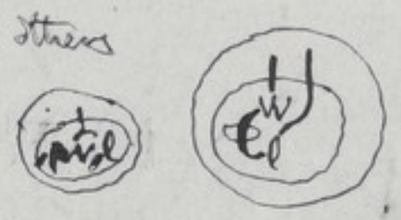
$\overset{|}{p}$ p is true under some circumstances

p is true under all circumstances

$\overset{|}{p}\ \overset{|}{q}$ p is true some times & q true some times

$\overset{\frown}{p\ q}$ p and q are sometimes true

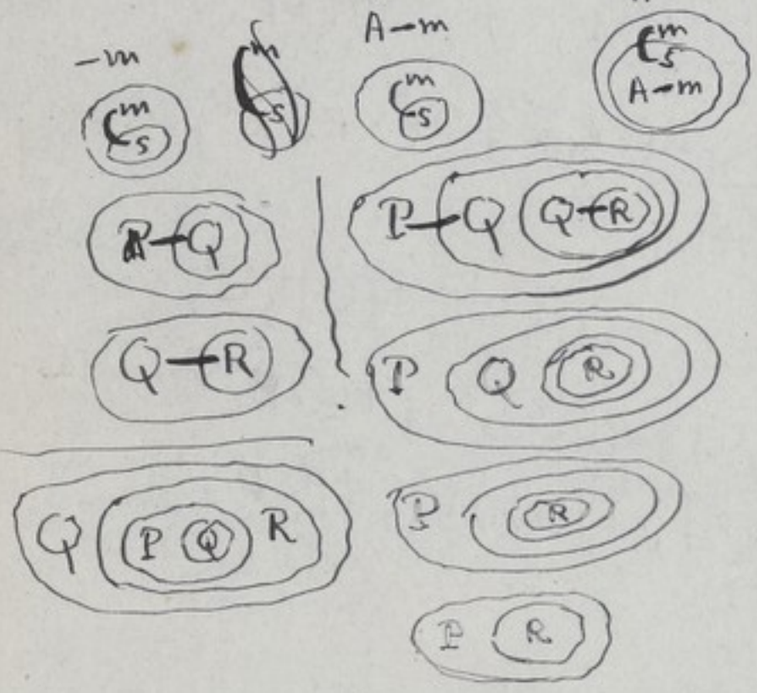
$\overset{\frown}{p\ q}$ p is true under some circumstances and q under others



$\Pi_t \Sigma_i \Sigma_j$ $w_{ti} \rightarrow l_{tj}$ Under all circumstances somebody wins & somebody loses

$\Sigma_i \Pi_t \Sigma_j$ $w_{ti} \cdot f_{tj}$ There's somebody who wins under all circumstances and under all circumstances somebody fails

Under all circumstances somebody wins and somebody loses



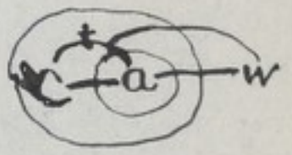
$\cancel{\Sigma_i \Pi_t \Pi_j}$

$\cancel{\Pi_t \Sigma_i \Pi_j}$

$\Sigma_i \Pi_j \Pi_t$ $w_{ti} \rightarrow (\bar{c}_{tj} \vee a_{tji})$

$\Sigma_i \Pi_t \Pi_j$ $w_{ti} \cdot (\bar{c}_{tj} \vee a_{tji})$

$\Pi_t \Sigma_i \Pi_j$ $w_{ti} \cdot (\bar{c}_{tj} \vee a_{tji})$



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Let the system of values be V, L, F.

~~Also $\Phi(V,x) = V$ $\Phi(L,x) = L$ $\Phi(F,x) = x$~~

$\Phi(V,x) = V$ $\Phi(L,x) = L$ $\Phi(F,x) = x$

$\Psi(V,x) = x$ $\Phi(L,x) = L$ $\Phi(F,x) = F$

$\Omega(V,x)$ $\Omega(L,x) =$ $\Phi(F,x)$

~~$XV = V$ $XL = L$ $XF = F$~~

~~$XV = F$ $XL = L$ $XF = V$~~

$XV = V$ $XL = V$ $XF = V$

~~$XL = V$~~ $XF = L$

$XF = F$

$XL = L$ $XF = V$

$XF = L$

$XF = F$

$XL = F$ $XF = V$

$XF = L$

$XF = F$

x	V	L	F
$\bar{x}$	F	L	V
$\dot{x}$	L	L	L

x	V	L	F
$\bar{x}$	F	V	L
$\dot{x}$	L	F	V

$\Phi(XV, x)$ $\Phi(XL, \dot{x})$ $\Phi(XF, \bar{x})$

$\Psi\{\Phi(XV, x), \Phi(XL, \dot{x}, \Phi(XF, \bar{x})\}$

~~$x = V$ $XL = XV$~~

~~$XV = V$~~ $\Psi\{V,$

must be XV

If $x = V$ $\Psi\{\Phi[(XV), V], \Phi[(XL), L], \Phi[(XF), F]\}$ XL

If $x = L$ $\Psi\{\Phi[(XV), L], \Phi[(XL), F], \Phi[(XF), V]\}$ XF

If $x = F$ $\Psi\{\Phi[(XV), F], \Phi[(XL) V], \Phi[(XF), L]\}$

All this is mighty close to nonsense.

$X\dot{x} = \Psi\{\Phi[XV, V], \Phi[XL. L], \Phi[XF. F]\}$

$XV = V$ $\Psi\{\Phi[V, V], \Phi[\begin{smallmatrix} L \\ F \end{smallmatrix}, L], \Phi[\begin{smallmatrix} F \\ L \end{smallmatrix}, F]\} = V$

$XV = L$ $\Psi\{\Phi[L, V], \Phi[\begin{smallmatrix} F \\ V \end{smallmatrix}, L], \Phi[\begin{smallmatrix} V \\ F \end{smallmatrix} F]\} = L$

$XV = F$ $\Psi\{\Phi[F, V], \Phi[\begin{smallmatrix} V \\ L \end{smallmatrix}, L], \Phi[\begin{smallmatrix} L \\ V \end{smallmatrix} F]\} = F$

$\Phi[P, V] = P$ $\Psi[L, \begin{smallmatrix} FL \\ L \end{smallmatrix}, \begin{smallmatrix} F \\ FF \end{smallmatrix}] = L$

$\Psi[F, \begin{smallmatrix} L \\ L \end{smallmatrix}, \begin{smallmatrix} LF \\ F \end{smallmatrix}] = F$

	V	L	F
x	V	F	L
L	L	V	F
F	F	★	V

Suppose $\Phi[V, P] = V$, $\Phi[L, F] = V$, $\Phi[F, L] = V$

Ψ	V	V L	V F	= V
Ψ	L	L F	L V	= L
Ψ	F	F V	F L	

$\Psi VVV = V$
$\Psi VVL = ?$
$\Psi VVF = V$
$\Psi VLV = V$
ΨVLL ?
$\Psi VLF = V$
ΨVFF ???

LV ???	
LLV	L
LLL	L ?
LLF	
LFV	L
LFL	L
LFF	?

FVV?
FVL = F
FVF = F
FLF ???
FFV?
? = F
F = F

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1909 Feb 16

Studies of Modal, Temporal, and Other Logical Forms which relate to Special Universes.

The basis of logic must regard the Universe of Discourse as an Individual. The Boolian algebra of Logic so regards it. Hence Boole thought it sufficient to adopt the fundamental quadratic $x(x-1)=0$ which is a special form of $(x-V)(x-F)=0$ where V is ~~that~~ the value of any true proposition, and F that of any false proposition, and this again is $x^2-(V+F)x+VF=0$ or $\frac{x}{V}+\frac{x}{F}=1$ ~~which is a specialization of~~ for $(x-V)(x-F)=0$ divided by FV gives $\left(\frac{x}{V}-1\right)\left(\frac{x}{F}-1\right)=\frac{0}{VF}$ or $\frac{x}{V}\cdot\frac{x}{F}-\frac{x}{V}-\frac{x}{F}+1=0$ Now $\frac{x}{V}\cdot\frac{x}{F}=0$

Now if we put $\bar{x}$ for the negation of x and let $\phi(x,y)$ be such a function of x and y that $\phi(V,V)=V$ $\phi(V,F)=\phi(F,V)=F$ $\phi(F,F)=F$ ~~so that $\phi(V,x)=(XV)$~~ $\phi(V,x)=x$ and $\phi(x,F)=F$

Then the system of values being V and F only and ~~ψ~~ ψ being such a function that ~~ψ~~ $\psi(V,V)=V$ $\psi(V,F)=\psi(F,V)=V$ $\psi(F,F)=F$ so that $\psi(V,x)=V$ and $\psi(x,F)=x$

Then any other function as $X_x=\psi\{\phi[(XV),x],\phi[(XF),\bar{x}]\}$

so that

~~$X_x=\psi\{\phi[(XV),x],\phi[(XF),\bar{x}]\}$~~

For either $X_x=V$ or $X_x=F$

and either $x=V$ or $x=F$

~~If $X_x=V$ ψ $\phi[(XF)F]=F$~~

~~and $\psi[\phi(XV,x)]$, ϕ~~

If $x=V$ $\phi[(XV),x]=(XV)$ and $\phi[(XF),\bar{x}]=F$

and $\psi\{\phi[(XV),x],\phi[(XF,\bar{x})]\}=\psi[(XV),F]=(XV)=X_x$

while if $x=F$ $\phi[(XV)x]=F$ and $\phi[(XF),\bar{x}]=(XF)$

and $\psi\{\phi[(XV),x],\phi[(XF),\bar{x}]\}=\psi\{F,(XF)\}=(XF)=X_x$

Thus the development holds in any case.

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Try the triadic ~~[illegible]~~ System of Values again

$\Phi(x,y) = \Phi(y,x) \qquad \Phi(x, \Phi(y,z)) = \Phi(\Phi(x,y), z)$

$\Phi(L,L) = L \qquad \Phi(L,F) = F \qquad \Phi = (L,V) = V$

$\Phi(L, \Phi(L,F)) = \Phi(L,F) = \Phi(\Phi(L,L),F) =$

$\Phi(F, \Phi(L,F)) = \Phi(F,F) = \Phi(F, \Phi(F,L)) = ($

$= \Phi(\Phi(F,L)F)) = \Phi(F,F) = F$

Φ

$\Phi(V,V) = \Phi(L,V) = V$

Φ	V	L	F
V	V	V	V
L	V	L	F
F	V	F	F

	V	L	F
V	V	L	V
L	V	L	L
F	V	L	F

$\Phi(\Phi(L,F),V) = \Phi(F,V) = \Phi(\Phi(F,L), \Phi(V,L))$

We naturally make $\Phi(F,V) = V$

$\cancel{\Phi(L, \Phi(L,F)) = \Phi(\Phi(F,F)L) = \Phi(F,F)}$

Ψ

Ψ	V	L	F
V	V	L	F
L	V	L	F
F	F	F	F

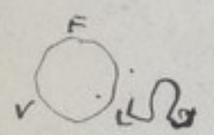
	V	L	F
V	V	L	F
L	L	L	F
F	F	F	F

$\Phi(L, \Phi(L,F)) = \cancel{\Phi(\Phi(L,L),F)} = \Phi(L,F) = F$

$= \Phi(\Phi(L,L),F) = \Phi(L,F) =$

$\Phi(F, \Phi(L,F)) = \Phi(F,F)$

$= \Phi(\Phi(F,F),L) = ?$



Ω

Ω	V	L	F
V	V	L	F
L	L	L	L
F	F	L	F

Υ

	V	L	V
	L	L	L
	V	L	F

$\Phi(\Phi(F,F), \Phi(L,L)) = \Phi(\Phi(F,F), L) = \Phi(F,F)$

$= \Phi(\Phi(F,L), \Phi(F,L)) = \Phi(F,F)$

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$$X x = \psi\{\Phi[(XV), x], \Phi[(X\bar{V}), \bar{x}]\}$$

$\Phi(V, F) = F \quad \Phi(F, V) = V$

~~$X x = \psi X A$~~

$\bar{x}$ is such a function of x that $\Phi(x, \bar{x}) = F \quad \psi(x, \bar{x}) = V$

$$\Phi\{a, \Phi(b, c)\} = \cancel{\Phi\{\psi\{}\ \Phi\{\psi(a,b), \psi(a,c)\}$$

$$\Phi\{a, \psi(b, c)\} = \psi\{\Phi(a,b), \Phi(a,c)\}$$

$a \psi a.b$ ~~$(a+a)$~~
$= a(a+b)(a \psi b).a$

$$\psi\{a, \Phi(b, a)\} = \Phi\{\psi(a,a), \psi(a,b)\} = \Phi\{a, \psi(a, b)\}$$

$\Phi(a,a) = a$
$\psi(a,a) = a$

$a \psi a.b$
$= a.a \psi a.b$
$= a \psi a.b$
$a.(a+b)$

$a+b.c$
$(a+b).c$

$a.(a+b) = a$
$a + a.b = a$

$\Phi(F, x) = x \quad \Phi(V, x) = V$
$\psi(V, x) = x \quad \psi(F, x) = F$

$\psi\{a, \Phi(a,b)\} = a$
$\Phi\{a, \psi(a,b)\} = a$

$$X x = \psi\{\Phi(x, i), \Phi(\bar{x}, j)\}$$
$$X V = \psi\{\Phi(V, i), \Phi(F, j)\} = \psi\{V, j) = j$$
$$X F = \psi\{\Phi(F, i), \Phi(V, j)\} = \psi\{i, V) = i$$

$$\cancel{X x = \psi\{\Phi(XV, x), \Phi(X\bar{V}, \bar{x})\}}$$

$\cancel{N x} = NV = F \quad NF = V$

$$\cancel{N x = \psi\{\Phi(NV, x), \Phi(NF, Nx)\} = \psi\{\Phi(F, x), \Phi(V, Nx)\} = \psi}$$
$$\cancel{= \psi\{x, V\} = x}$$
$$\cancel{N x = \psi\{\Phi(F, x),}$$
$$X x = \psi\{\Phi(NF, x), \Phi(NV, \bar{x})\} = \psi\{\Phi(V, x), \Phi(F, \bar{x}) = \psi(V, \bar{x}) = \bar{x}$$

Thus as soon as ~~FV and F~~ fF and fV are known fx generally is known.

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Geometrical Topics

1909 Feb 17

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Let $x-l$ mean x is a place

Every place is in itself

Let $x-i-y$ mean some part of x is in y

$l-i-l-i-$
$-i-$

If i^{x}_{iy} $i^{l}_{il'}$ l is a ~~part part~~ part-at-least of l'

If $i^{il}_{il'}$ some part-at-least of l is a part-at-least of l'

If $i^{il}_{il'}$ some part-at-least of l is ~~not~~ out of l'

Let $x-s$ mean x is a part-at-least of space i^{il}_{s}

If $i^{il}_{il'}$ If $il-il'$ $il'-il$, $l=l'$

$l'il$

$A-l-w$

If $i-i$ then $l-p$ $-p$ is a point

If $i-i$ then

p

p

p

$i-i$

To be in a place is to be

$x-i-$ $x-p$ $y-p$

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1909 Feb 23

Triadic Logic

Triadic Logic is that logic which, though not rejecting entirely the Principle of Excluded Middle, nevertheless recognizes that every proposition, S is P, is either true, or false, or else S has a lower mode of being such that it can neither be determinately P, nor determinately not-P, but is at the limit between P and not P. Of course it remains true, as far as the principle of contradiction is concerned that the state of things represented by the proposition can be V and F, verum atque falsum and must be V+F if by F is meant L+F (L signifying the limit, i.e. that S is not capable of the determination P or of the determination F). Thus, a blot is made on a sheet. Then every point of the sheet is unblackened or is blackened. But there are points on the bounding line; and these points are insusceptible of being unblackened or being blackened, since these predicates refer to the area about S and a line has no area about any point of it.

Everything is $V \psi L \psi F$ i.e. $V \psi (L \psi F) = (V \psi L \psi F)$ and putting $\mathcal{V} = V + L$ and $\mathcal{F} = F \psi L$. $V \cdot \mathcal{F} = F$ $V \psi \mathcal{F} = V$

$\mathcal{V} \psi F = V$. Thus the Triadic Logic does not conflict with Dyadic Logic; only, it recognizes, what the latter does not that

though $V \cdot F = F$ and while $\mathcal{V} \psi \mathcal{F} = \mathcal{V}$

Yet $V \psi F \neq V$ Yet $\mathcal{V} \cdot \mathcal{F} \neq \mathcal{F}$

but $V \psi L \psi F = V$ $\mathcal{V} \cdot \mathcal{F} = \mathcal{F} \psi \mathcal{L}$

{or better $\mathcal{V} \cdot \mathcal{F} \cdot \mathcal{L} = \mathcal{F}$

$V \cdot F = F$ (for $V \cdot F \overset{?}{=} V(L \cdot F) = (V \cdot L) F \overset{?}{=} L \cdot F = F$)

$V \cdot L = L$ $F \cdot L = F$ (?)

$V \psi L = V$ $L \psi F \overset{?}{=} L$

$V \psi F = (V \psi L) \psi F = V \psi (L \psi F) \overset{?}{=} V \psi L = V$

Triadic Logic is universally true. But Dyadic Logic is not ~~universally~~ absolutely false — it is only L.

Note on the Tinctures

1909 Feb 26

To illustrate the need of the Tinctures, take the fact that no matter what ~~points~~ particles there may be on a Line, there will be a point place on that line (if nothing but Particles are on it) where there is no Particle but where a particle can be placed.

Let $x = 5$ mean X is a ~~point~~ particle (or existent without proper parts) στιγμή (lit. a tattoo-prick) Euclid (and Aristotle, too, for that matter) uses σημεῖον; but that is too indeterminate. The definition is

~~But~~

I say that a imagined performance has ~~the~~ 1909 May 29

~~Grade~~ ~~First Grade~~ or its Grade of Endlessness equal to 1
~~Grade No. 1~~ if it consists of an endless sequence of ended steps

its Grade of Endlessness is 2 if it consists of an endless sequence of ~~operations~~ performances of which the Grade of endlessness of each is 1

its Grade of Endlessness is N (any positive integer) if it consists of a sequence of ~~op~~ performances each having its Grade of Endlessness equal to N−1

In General the Grade of Endlessness of a performance consisting of an endless series of steps each ~~of~~ having its Grade of Endlessness equal to N is N+1. And a performance that does not consist of ~~some~~ any endless series of performance has 0 for its Grade of Endlessness.

Now if the Performance last ended be always followed by a repetition of the same on a scale ~~of~~ equal to ~~the~~ a fixed scale divided by ~~2 to~~ one more than its Grade of Endlessness power what will be its total measure?

1

1909 July 6

The distinctive features of my System of Logic are as follows:

1st, Using "cognimen" (not cognomen) to mean that which is before the mind when one actively makes an approximation toward knowing, and using the word infer to ~~mean~~ signify the act making a cognimen because of another cognimen, I say that to draw an inference is virtually to assume that there is a real cause that tends to make the universe conform to something similar to human reason; so that, just as the fish ~~and~~ or the bird know by nature how to coordinate the efforts for swimming ~~and~~ or flying, and just as many insects know where and how to dispose of their eggs so as best to insure their producing new individuals, although they can have had no experience pertinent to such a task, so man by nature has a power of guessing at the truths which he has not experienced. And, therefore, although we know that we ~~cannot always~~ guess right, yet it would be the height of folly to hesitate to accept, provisionally, any cognimen which we feel an inward impulse to accept; while ~~always bear~~ never losing sight of the possibility of its being false.

Secondly, because we see that the instincts of animals have no other value than that of guiding their actions, as well as for several other reasons, I maintain that the whole intellectual signification proper to any sign ~~can~~ is summed up in the effects which it could rationally have upon our conduct. William James seems inclined to say that the word "pleasure" signifies that sort of immediate consciousness that we call "pleasure"; and no doubt this is true in a certain sense. But what is the intellectual signi

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1909 July 11

The meaning of any sign is its rightful effect. And its rational meaning is its rightful effect upon that which ought to be governed by my reason; that is to say, upon my conduct.

This follows from the definition of a sign.

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The clear superiority of the genuine, undegenerate Greeks, the Mycenean, classical, and the ancient Greeks generally, to all other breeds of the species *homo albidus* is ~~shown~~ exhibited in various ways; in their sculpture, and the accuracy of their taste generally; in their exploits; in their language ~~which none but~~ ~~which experiences none~~ ~~but they has ever been able to bear the brunt of~~ which none of the modern scholars who have discovered in it a thousand excellences ~~unknown~~ ~~which they alone~~ ~~unnoticed by~~ ~~which the~~ the Greeks themselves ~~without were unaware~~ has ever been able to ~~manage~~ cope with and to domesticate; in their science; in their assimilation of christianity. But in order justly to gauge the intellectual capacity of any people, ~~we must inquire of~~ since the work of intellect consists in making and in establishing theories, we must inquire what it has ~~done~~ accomplished or endeavoured towards ascertaining the relation between data and conclusions; in other words toward an understanding of logic. Now we find that, excluding from consideration the present scientific era of which we cannot well judge because we breathe its ~~atmosphere~~, there has been no other people than

the Greeks that ever really originated ~~an~~ or broke the ground for the construction of any system of logic whatsoever; while we may say that they ~~did that no less~~ ~~origin~~ did that not once alone nor twice, but something like five times over. For without ~~speculating upon~~ attempting to disinter works that may have been forgotten, and without reckoning such apparently unsystematic observations as those of the sophists and of Parmenides, we may reckon in the first place the inductive system of inquiry of Socrates, and secondly the Analytics of Aristotle. Thirdly, ~~the Chrysippus and the early stoics had a logical system of their own, well adapted to serve the purposes of their Ethical~~ Thirdly, we find in the Elements of Euclid, and in what we know of his other works, a ~~well~~ fully self-conscious method for reaching necessary conclusions, a method ~~strikingly different~~ sharply distinguished from that of Aristotle ~~in recog~~ ~~its~~ in several respects, ~~But more~~ especially by its recognition of the necessity of having

before the mind's eye a diagrammatic image of the relations between the parts of the subject of the ratiocination. ~~The mathematic~~ It was further recognized that individuals exactly alike must ~~be~~ in reasoning be distinguished by arbitrary ~~design~~ lettering or other designations; and ~~there were~~ the system had other peculiarities. In the fourth place ~~the~~ Chrysippus and the early stoics had a logical system of their own well fitted to their uncompromising ethics. It was distinguished particularly by its nominalism, its necessitarianism, ~~its~~ ~~utter rejection of induction~~, and its endeavour to make the reductio ad absurdum (really a mere device of exposition) supply the place of induction, which was utterly rejected as illogical. ~~In the fifth place~~ Last comes the Epicurean logic, which, as set forth by Philodemus in papyrus ~~found~~ recovered in a fragmentary condition from Herculaneum, prefigures ~~with~~ in astonishing detail, all the merits and all the errors of the system of J. S. Mill. Like that it breathes an individualistic nominalism; yet ~~this~~ represents Induction as the sole form of reasoning, and bases it upon uniformity, without observing that a uniformity ~~that~~ can hold any

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support to induction, a uniformity which is more than a chance coincidence, is a real law the ~~occ~~ actuality of which its nominalism denies.

Taking these five systems together, they ~~are~~ ~~have~~ more than tolerably well represent the methods of scientific thought among the Greeks.

~~Thirdly~~ Throughout the Middle Ages, ~~there were no~~ all their science nor philosophy, ~~which~~ either intentionally carried ~~[illegible]~~ ~~[illegible]~~ ~~[illegible]~~

denotes a wife

understand ~~interpret~~ b+c as c increased b

other people say

of interpretation

but where some rule has to be followed, I prefer to make that rule as uniform and broad as possible, and accordingly to write the active factor before the passive one in all cases where the order is to depend upon a rule; since this is acknowledged to be the natural way, and is our usual way; that seems to me the natural way, and our usual way; 'Isabella horse', not 'cheval alezan'; 'the laughing man', not 'l'homme qui rit'; 'four and twenty' not 'twenty-four'; etc.

The other order seems to me the more logical, because we learn that an object is a man or a horse, before we ascertain that it is always laughing or is by nature of the color of a ~~[illegible]~~ bay; answer shift.

depends upon the use of parentheses, square brackets, braces, and the vinculum to show that all that is described within such an enclosure is to be conceived as describing a single object. Thus, $a^2(b+c)$ means the product of a and the quantity resulting from ~~the addition of~~ increasing c by b (or of a and increasing b by c; but I prefer invariably to write the active factor before the passive one, since such is our usual and the natural way; as when we say 'Isabella horse' not 'cheval alezan', and the laughing man", not 'l'homme qui rit', 'four and twenty' not twenty-four.)

Yet disuse has so weakened our power of logical analysis that I have never seen brackets and other 'Klammern' referred to as the most indispensible of all algebraic signs; they are usually treated as ~~relational~~ unimportant ~~almost~~ because ~~is quite~~ insignificant. Even Schröder relegates his rules for their use to an "Excurs."

~~Rectangular com~~ Cartesian perspective, rectangular coordinates, the differential calculus, and so-called "symbolical" algebra are powerful instruments of reasoning but the by far chief contribution to logic that the scientific era has witnessed has been the opening up of the doctrine of chances, otherwise called the "calculus of probabilities."

This high rating of it would not be justified by the improvements this method has introduced into physical and biological sciences and into business; but is justified by its placing at a point of view whence we are enabled to ~~[illegible]~~ solve the riddle of the relative reasoning about realities in general.

Although ~~it has~~ mathematicians and physicists have always — I do not say have done full justice to its importance, but have always recognized its importance as great, it is lamentable, ~~lamentable~~ it is humiliating to ~~see~~ note the puerile

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weakness of all their treatments of it that crosses the threshold of pure mathematics.

354r

1909 Aug 11

For the above reasons I have determined to write a brief account of the Doctrine of Chances, not going unnecessarily into mathematics, but paying attention particularly to those points whose logical difficulties have baffled the mathematicians.

I begin by defining probability in the strict sense that it bears in this doctrine. Namely, let G stand for any genus of occurrence that might recur in endless series, and let S stand for any species of that genus readily recognized. For instance, G might denote the pitching up of a perfect coin, and S might denote its turning up heads. Then suppose that ~~and~~ a first person were to keep tally of all the occurrences of G that were S, ~~and~~ that ~~another~~ a second person were to keep tally of all the occurrences of G that were not S, and that a third person were to keep a record of the successive values, after each occurrence of G, of the quotient of the first person's tally divided by the sum of the tallies of the first and second persons. This third person's record would necessarily begin ~~with~~ either with 1 or with 0. But since each occurrence of G would ~~either~~ always ~~or~~ increase the divisor ~~alone~~ (or denominator, if we think of the third person's result as a fraction, the value of ~~just~~ ~~one~~ by one, and might ~~always~~ also

Turn over two leaves

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increase the dividend, or numerator, by 1, it follows that as soon as his last result ceases to retain its initial value, it would change its value with every new occurrence of G.

For if $\frac{N}{D} = \frac{N}{D+1}$ either $N = 0$ Since $ND + N = ND$.

or $\frac{N}{D} = \frac{N+1}{D+1}$ or $N = D$. Since $ND + N = ND + D$.

For if $N/D = \frac{N}{1+D}$, clearing from fractions, $N + ND = ND$, and $N = 0$;

while and if $N/D = \frac{(1+N)}{(1+D)}$, " " " , $N + ND = D + ND$, and $N = D$.

~~or if~~ $\cancel{\frac{S}{S+G} = \frac{S}{S+1+G}}$

$\frac{S}{G+S} = \frac{S}{1+G+S}$, clearing from fractions, $S + SG + S^2 = SG + S^2$ and transposing $S = 0$

and if $\frac{S}{G+S} = \frac{1+S}{1+G+S}$, clearing from fractions, $2S + SG + S^2 = G + S + SG + S^2$, and transposing $S = G$

or, writing Z for the number of occurrences of G that have just been occurrences of S,

if $\frac{S}{Z+S} = \frac{S}{1+Z+S}$, clearing from fractions, $S + SZ + S^2 = SZ + S^2$, and transposing $S = 0$

while and if $\frac{S}{Z+S} = \frac{1+S}{Z+1+S}$, clearing from fraction, $= Z + SZ + S + S^2$, $SZ + S + S^2$ and transposing, $Z = 0$

or writing S for the sum of the first tally at any time and Z for that of the second tally at any time, the third persons result will be $\frac{S}{Z+S}$ which the next occurrence of G will change either to $\frac{S}{1+Z+S}$ or to $\frac{1+S}{Z+1+S}$ Now

if $\frac{S}{Z+S} = \frac{1+S}{Z+1+S}$ clearing from fractions $ZS + S + S^2 = Z + ZS + S + S^2$ and transposing $Z = 0$

while if $\frac{S}{Z+S} = \frac{S}{1+Z+S}$ " $S + ZS + S^2 = ZS + S^2$ " " $S = 0$

32222
70757
61465 411765+ +01176+

34242
71600
62642 42308 +01654 $\frac{1}{2}$ −

−00799

34242
72428
61814 41509

−00768

34242
73239
61403 40741

−00741

34242
74036
60206 40000

−00715

34242
4819
59423 39285

−00688

4242
5587
58655 38597

−00666

4242
6343
57899 37931

−00643

34242
72085
57157 37288 +01046

36173
17815
58358 38834

−333
6667 −167
5000 −100
4000 −067
33333 −04762
28571 0357
25 0278
2222 +0778
3333

4 + .00120

200/500

201/501 30320 69984 60336 .40120 + 00119

202/502 30535 70070 60465 40239 −00080

202/503 30535 70157 60378 40159 080

202/504 30535 70243 60292 40079 79

202/505 30535 70329 60206 40000 79

202/506 30535 70415 60120 39921 78

202/507 30535 70501 60034 843 79

202/508 30535 70586 59949 764 79

202/509 30535 70672 59863 685 + 00119

203/510 30750 70757 59993 804

543/79 = 843

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As time goes on, the changes of the ~~first~~ third persons luck result will become usually smaller and smaller. Suppose for instance the series of occurrences begins ~~that~~ thus

S S Z Z Z Z Z Z Z S

Then the third persons results will be

$\frac{1}{1}$ $\frac{2}{2}$ $\frac{2}{3}$ $\frac{2}{4}$ $\frac{2}{5}$ $\frac{2}{6}$ $\frac{2}{7}$ $\frac{2}{8}$ $\frac{2}{9}$ $\frac{3}{10}$ or 1.00 1.00 0.67 0.50 0.40 0.33 0.28 0.25 0.22 0.30

But if after ~~the~~ 50 occurrences his result should be $\frac{20}{50}$ and then the same series, S S Z Z Z Z Z Z Z Z S should recurr, the results would be

$\frac{20}{50}$ $\frac{21}{51}$ $\frac{22}{52}$ $\frac{22}{53}$ $\frac{22}{54}$ $\frac{22}{55}$ $\frac{22}{56}$ $\frac{22}{57}$ $\frac{22}{58}$ $\frac{22}{59}$ $\frac{23}{60}$

or 0.400 0.412 0.423 0.415 0.407 0.400 0.393 0.386 0.379 0.373 0.383

The successive changes being

+0.012 +0.011 −0.008 −0.008 −0.007 −0.007 −0.007 −0.007 −0.006 +0.010

instead of as they had at first been

0.000 −0.333 +0.167 −0.100 −0.067 −0.048 −0.036 −0.028 +0.078

Text resumed

To define a concept is to analyze it and bring to light its essential elements. If the reader pays close attention to my procedure in finding this definition, he will have received a lesson in the art of analyzing concepts, whether he entirely approves my method or not. My method may be at fault, but it is the fruit of much more study than the reader is likely to have given to the subject. My first step must be to ~~form~~ imagine a concrete image of a probability. I will take $\frac{2}{5}$ for the value of the probability, because it is a compara-

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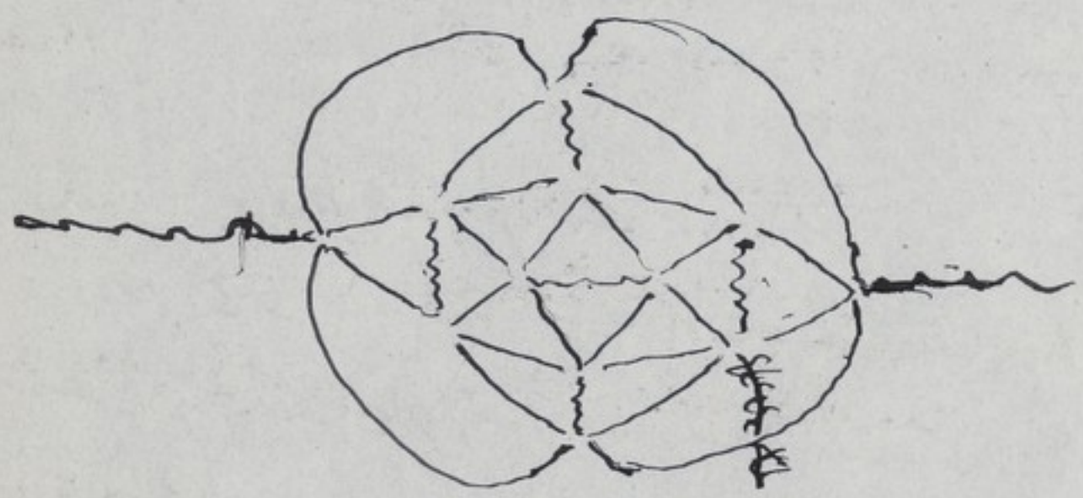
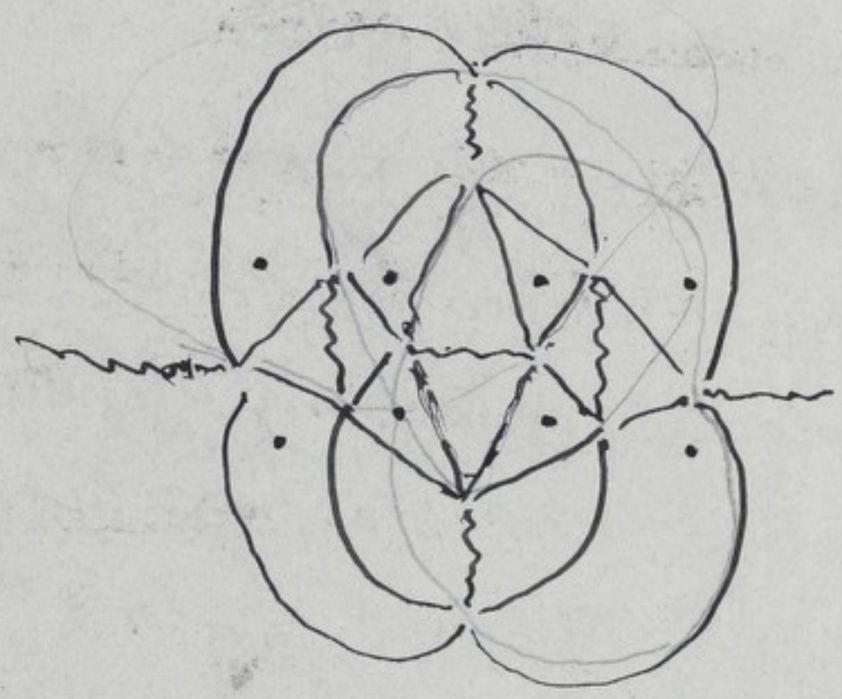
truly simple fraction, yet avoids the possible peculiarities of $1/2$, $1/3$, and $1/4$. The simplest proper vulgar fractions are in order $\frac{1}{2}$ $\frac{1}{3}$ $\frac{2}{3}$ $\frac{1}{4}$ $\frac{2}{5}$ and I state the simplest that does not appear to be open to probable objections. I now want to form the image of a probability of $2/5$, that is of an event that will happen in the long run, without any further regularity in its occurrences, ~~but~~ ~~twice~~ in two fifths of the possible occasions. What I mean by its so happening, I am not yet prepared to say; but it is plain that by "the long run" I mean any endless succession of occasions.

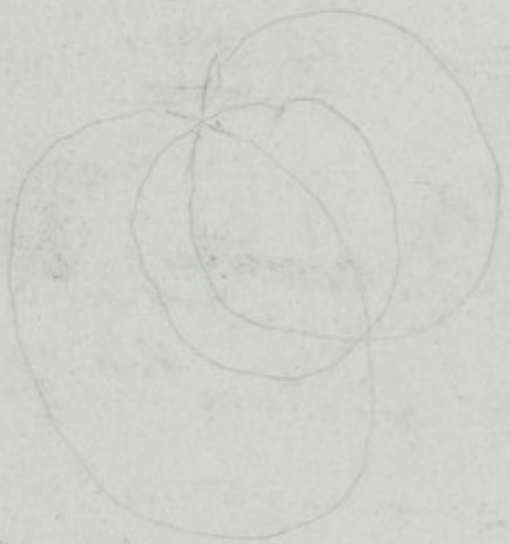
I now proceed to form my image of probability $2/5$, as follows. I imagine that I take a piece of homogeneous ~~non magnetic~~, isotropic, and non-magnetic metal, and use the highest attainable art in cutting out of it a perfectly regular and perfectly balanced icosohedron. That done I mark 8 of its 20 faces ~~sides~~ in the most regular distribution possible by the following rules:

1st, no two marked faces are to be adjacent,

2nd, one only of the 5 edges that radiate ~~proceed~~ from any summit is to be a boundary between two marked faces. Six of the 30 edges will be such boundaries.







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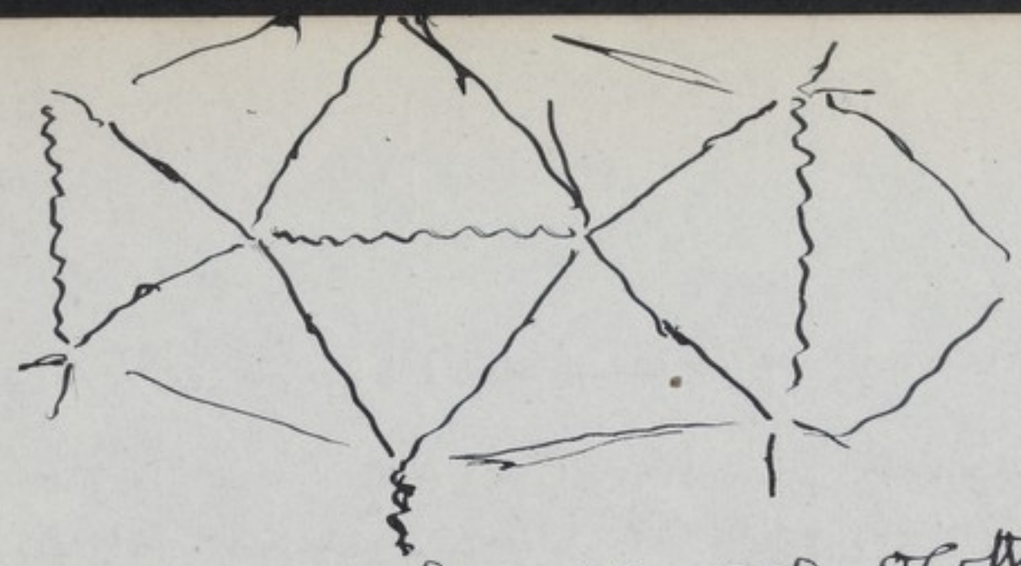

Selecting an edge as one of these, it will point directly at two others of these, and will be pointed by other two as shown in the figure where the such edges are denoted by wavy lines. The sixth such edge will be opposite to the one first selected. The figure disregards proportion altogether, and shows one edge in two pieces; but it shows the 8 marked and the 12 unmarked faces.

I now imagine that I throw this icosahedron down upon a level floor time after time in endless succession taking the utmost pains to avoid doing anything that can tend to make it fall upon any one side oftener than upon any other; and I imagine myself to be provided with three aids, of whom the first keeps tally of the times on which it rests on a marked face (which will be opposite to another marked face), the second keeps tally of the times on which it rests on an unmarked face, while the third, the secretary, after each throw, writes down the quotient of the number of the former tally divided by the sum of the numbers of the two tallies.

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0010 0 0***
1234 5 6789

In doing this, we must entirely disregard whatever is merely likely to happen, no matter by how little it may fall short of certitude. This we ought to do, were there no other reason for doing it, because otherwise we should fail ~~completely~~ ultimately ~~to analyze~~ ~~make an assume~~ completely to analyze the concept of each probability, since unanalyzed probability would remain an ingredient of one of the constituents into which we should have separated it ~~and we should~~ That would be the fallacy termed a "vicious circle", or "circulus in definiendo". But there is another and more fundamental reason. For an endless series of imagined events cannot have an general character that it will not certainly have, but will only be likely to have. For an endless series of endless series, each followed continuously be the next following such series, makes up no more than a simple endless series; and therefore a simple endless series can, without ~~falsity~~ misrepresentation, be regarded as composed of an endless series of endless series. Now since an endless series of events cannot actually have happened in such a way as to admit of every one of ~~these~~ its components being separately observed, but can only be what would happen under some presupposition, it is contrary to its nature that any thing should be known to be true

Let us now inquire what general characters the series of quotients obtained by the secretary are quite sure to show. ~~We must not consider what~~ In doing this, we must entirely disregard whatever is merely likely; because were we to allow ourselves to do that, we should fail ~~comp~~ to separate completely the essential elements of probability, since unanalyzed probability would be an ingredient of one or more of the constituents into which we ~~have~~ should have separated it. Let us write a 1 for a case of ~~a marked~~ ~~face~~ our icosahedron's falling on a marked face, and a 0 for a case its falling on an unmarked face. Consider then this possible sequence of falls:

0010001111

Since this is possible, it is sure to occur somewhere in an endless sequence of throws. For if it never would fall, this would constitute an impossibility, whereas we have supposed that there is nothing to prevent any sequence from occurring. You may object to this reasoning that, according to it and endless sequence must occur. But I fully accept this conclusion. Only you must remember that no particular endless sequence ~~does not~~ exhausts an endless sequence. After an endless sequence there may follow an endless sequence of endless sequences; and since we suppose that the long run is long enough for everything possible to occur in it, an endless sequence may occur in it and yet its total

of any one of its constituent units in any other way than as a necessary consequence of the underlying supposition.

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[Follows 359] 9.74

3594

effect may be completely smothered in the endless sequence of subsequent endless sequences. But this will probably only confuse you at present. Later, it will be made plain enough. At present let us content ourselves with saying that in the ~~Ba~~ infinitely long run any finite sequence that is possible is sure sooner or later to occur.

There is nothing peculiar about the special sequence of nine throws which I have supposed. I wish to show what its effect will be, first, if it occurs at the outset; secondly, if it occurs, ~~begin~~ ~~ing~~ immediately after the hundredth throw, and thirdly if it occurs immediately after the thousandth throw. ~~If it~~ o

If it occurs at the outset, the secretary's series of records will be as follows:

0	0	1	0	0	0	1	1	1
$\frac{0}{1}$	$\frac{0}{2}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{6}$	$\frac{2}{7}$	$\frac{3}{8}$	$\frac{4}{9}$
					0.167	0.286	0.375	0.444
	0.000	0.000	0.333	0.250	0.200			
		0.000	+.333	−0.083	−0.050	−0.333	+0.119	+0.089 +0.069

Effects

If the same sequence occurs after the hundredth throw the effect will somewhat depend upon what the value of the secretary's quotient after that throw be. It may be 0 it may be 1 and it may have any intermediate value, as 0.4. Let us display the effects in these three cases.

1008
2016
3024
4032
5040
6048
7056
8064
9072
80

.3998016

903
3024
1006
9072
988
9072
908
8064
1600
1008
592

Hmm
Hmm
Such were the words
Such were the
Sha

4000000 .0003986
3996004 3988
3992016 +0005990
3998006 .0003982
3994024 .0003974
3990050 .0003966
3986084 +0005972
3992056 +0005960
3998016 +0005948
4003964

$\frac{1}{1008} = .0009920635$

4) 1008
252

3) 1008
336

$\frac{400}{1008} = \frac{100}{253} = .3952569$
$.0029762$
$.3982331$

$\frac{3}{1008} = \frac{1}{336}$

$\frac{1}{1009} = .0009910803$
$.0039643212$
$\frac{4}{1009}$ $\frac{3964}{3212}$
$\frac{400}{1009}$ 4003964

1009
2018
3027
4036
5045
6054
7063
8072
9081
10090

.4041
.8082
1212 3
1616 4
2020 5
2424 6
2828 7
3232 8
3636 9
4040

.4003964321

404
4036
4000
3027
9730
9081
649
6054
436
4036
324
3027
213
2018
1120
1009
111
1009
1010
1009

501
505

First case

0/100	0/101	0/102	1/103	1/104	1/105	1/106	2/107	3/108	4/109
0	0	0	.0097	.0096	.0095	.0094	0.0186	.02777	.03667
			+.0097	−.000094	−.000091	−.000090	+.009258	+.009086	+.008919

Effects 0 0

Second Case

100/100	100/101	100/102	101/103	101/104	101/105	101/106	102/107	103/108	104/109
1.0000000	.990099	.990099	.9803920	.9805825	.9711539	.9528302	.9532710	.9537057	.9541284
					−.0092491	+.0004408	+.0004347	+.0004227	

Effect −.009901 −.0097070 +.0001905 −.0094286 −.0090746

Third case

40/100	40/101	40/102	41/103	41/104	41/105	41/106	42/107	43/108	44/109
0.4000000	.3960396	.3921569	3980593	3942308	3904762	3867924	3925234	3981481	4036697
	−.0039604	−.0038827	+.0059024	−.0038285	−.0037546	−.0036838	+.0057309	+.0056247	+.0055216

0/1000	0/1001	0/1002	1/1003	1/1004	1/1005	1/1006	2/1007	3/1008	4/1009
0	0	0	.000997	.000996	.000995	.000994	.001986	.002976	.003964
			+.000997	−.000001	−.000001	−.000001	+.000992	+.000990	+.000988

1000/1000	1000/1001	1000/1002	1001/1003	1001/1004	1001/1005	1001/1006	1002/1007	1003/1008	1004/1009
1.000000	.999001	.998004	.9970090	.9960159	.9950249	.9940358	.9930487	.9920635	.9910803
			9970	9960	9950	9940	19861	29762	39643
			.9980060	.9970119	.9960199	.9950298	.9950348	.9850397	.9950446
	−.000999	−.000997	+.0000054	−.0009841	−.0009920	−.0009901	+.0000050		+.0000044

400/1000	400/1001	400/1002	401/1003	401/1004	398009.95	401/1006	402/1007	403/1008	404/1009
.400000	.3996004	.3992016	.3988036	.3984063	399502	.3990498	.9940358	.9930487	.9982531	.4003943
			9970	99602			3976432	198609.74		
			.3998006	.3994038			.3986836	.3972194.8		
								39920558		

We may neglect for the moment the third cases. What I wish to bring your attention to is that any sequence of throws, since it is possible, will certainly recur endlessly, and that every time it recurs it will ~~have less and less effect~~, ~~and that consequently in~~ causing the ~~results to other~~ secretaries results to oscillate less than it did before; and this will be true even of such short series of throws where ~~rec~~ irregular recurrence will make up the whole ~~se~~ endless sequence after a certain point

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000

1000

$\frac{1}{1}$ $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$

$\frac{1}{1}$	1.000	+.5000
$\frac{1}{2}$	0.500	−.1667
$\frac{1}{3}$	0.333	−.0833
$\frac{1}{4}$	0.250	−.0500
$\frac{1}{5}$	0.200	

$\frac{1}{11}$	.0909	−.0076
$\frac{1}{12}$	0833	−.0064
$\frac{1}{13}$	0769	−.0055
$\frac{1}{14}$	0714	

$\frac{1}{101}$	009901	000097
$\frac{1}{102}$	009804	000095
$\frac{1}{103}$	009709	000094
$\frac{1}{104}$	009615	

$\frac{1}{1001}$	000999001	−000000997
$\frac{1}{1002}$	000998004	−000000995
$\frac{1}{1003}$	000997009	000000993
$\frac{1}{1004}$	000996016	

$\frac{11}{11}$	1.0000	−.0833
$\frac{11}{12}$	.9167	−.0705
$\frac{11}{13}$	.8462	−.0604
$\frac{11}{14}$	.7857	

$\frac{101}{101}$	1.000000	−.009804
$\frac{101}{102}$	.990196	−.009614
$\frac{101}{103}$	.980582	−.009429
$\frac{101}{104}$	.971154	

$\frac{1001}{1001}$	1.000 000 000	−.000998004
$\frac{1001}{1002}$	.999 001996	−.000996013
$\frac{1001}{1003}$	998 005982	−.000994036
$\frac{1001}{1004}$	997 011952	

$\frac{11}{12} - \frac{11}{13}$ $\frac{11}{}$

7692308
769231
846154
916667
070513

07143
71429
78572
84615
06043

0097087
9708738
9805825
980582.52

103)101 9805825
927 9711538
83 0694287
824
971 6
104)101
936
74
728
12
104
16
104
56
520
400
312
88
832
48
416
4

.999,001,996,008

1002
9
9018

1001
9018
992
9018
902
9018
2000
1002
998
9018
962
9018
602
6018
800

998,005,982

1001
9027
983
9027
803
8024
6000
5015
985
9027
823
8024
2006
2006
54
5015
385
3009
720
7028
252

99010 6078
9805825
0096136

997,011,9521

1001
9036
974
9036
704
7028
1200
1004
196
1004
956
9036
524
5020
220
2008
192

1,000 000 000 0
999 001 996 008
998 005 982 538
997 011 9521
000 998 004
000 996 013
994 036

1003)1001
9027
983
9027
803
8024
600
5015
985

9980059

$\frac{57}{52}$

0097087 38
019230769
076923
142857 0095220 31
065934

1992031872

2
1004
996
9036
924
9036
204
2008
32
3012
188
1004
876
8032
728

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[Follows a9r] a8r 359C

1001

$\frac{11}{1}$ 1.0 −.50

$\frac{1}{2}$ 0.50 −.17

$\frac{1}{3}$ 0.33 +.17

$\frac{2}{4}$ 0.5

$\frac{1}{11}$ .0909 −.0076

$\frac{1}{12}$ 0833 −.0064

$\frac{1}{13}$ 0769 +.0659

$\frac{2}{14}$ 1429

$\frac{1}{101}$ .009901 −.000097

$\frac{1}{102}$ 009804 −.000095

$\frac{1}{103}$ 009709 +.009522

$\frac{2}{104}$ 019231

$\frac{1}{1001}$ = .000999 0010 −.000 000 9970

$\frac{1}{1002}$ 000998 0040 −.000 000 995

$\frac{1}{1003}$ 000997 0090 +.000995 0029

$\frac{2}{1004}$ 001992 0319

$\frac{11}{11}$ 1.0000 −.0833

$\frac{11}{12}$ .9167 −.0705

$\frac{11}{13}$ .8462 +.0109

$\frac{12}{14}$ 8571

$\frac{101}{101}$ = 1.000000 −.009804

$\frac{101}{102}$ 990196 −.009613

$\frac{101}{103}$ 980583 +.00186

$\frac{102}{104}$ 980769

$\frac{1001}{1001}$ = 1.000 000 000

$\frac{1001}{1002}$ 0.999 001 996

$\frac{1001}{1003}$

$\frac{1002}{1004}$

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1909 Nov 1.

During the last 3 years I have been resting from my work on the Division of Signs and have only lately — in the last week or two — been turning back to it; and I find my work of 1905 (letter than any since that time, though the latter doubtless has value and must not be passed by without consideration.

Looking over the book labelled in red "The Prescott Book," and also this one, I find the ~~entry in this one of 1905~~ entries in this book of "Provisional Classification of 1906 March 31" and of 1905 Oct 13 particularly important from my present (accidentally limited, no doubt) point of view; particularly in regard to the point made in the Prescott Book 1909 Oct 28 and what immediately precedes that in that book but is not dated.

Namely, a good deal of my early attempts to define the difference between Icon, Index, & Symbol, were adulterated with confusion with the distinction as to the Reference of the Dynamic Interpretant to the Sign.

The amount of labour still required upon the ten trichotomies of signs (and more than these ten I dont inquire into, not because I dont thinks they are in truth there, but simply because it will be all I possibly can do to define and to prove these ten) is enough of itself to occupy the 10± years of efficient thinking that may remain to me if no accident cuts them short.

The light which the 2 trichotomies referred to in the ~~pres~~ last [1 but one above throw upon each other suggests a ~~mode~~ method of study that I have hitherto employed only in getting as clear ideas as I have (and they ought to be more definite) of the 1st and 2nd trichotomies of [using the excellent notation of 1905 Oct 12] A and Ba. I am now ~~employing~~ applying the same method to Bbβ and Cbβ. It ought to be ~~employed~~ applied not merely to A and Ba but further to A, Ba, and Ca taken together. Also to

A Ba Bbα to A Ba Cbα to Bbα Cbα

Then to ~~A Ba Cb~~ A Bβ Ccγ etc. to Ba Bbα Ccα

to A Bbα Ccα etc.

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~~contains some par~~
~~enables the Interpreter~~

A "Sign" is an Ens (i.e. something, ~~of~~ ~~some~~ category of being) which, ~~in addition to~~ not only has a capacity of being either imagined, perceived, or conceived, as anything of the same category of Being ~~of which~~ ~~we~~ ~~has sufficient~~ happens to have enough of the right kind of dealings may be. but also has ~~a capacity to~~ the property ~~power under~~ of producing ~~in a mind~~ through ~~which perceives it and which has skill, or practical con~~ upon a person ~~who fulfills~~ in whom certain conditions are fulfilled ~~to~~ effects that another thing or a collection of other things would ~~fulfill~~ produce, those conditions being the possession by that person of a practical understanding of the system of correspondence.

But this definition ought to be prefaced with the remark that no ~~know~~ ~~some~~ ~~cognition~~ event of learning anything brings ~~per se~~ any ~~know~~ other knowledge than ~~its content~~ that which it brings in learning, and in particular does not include any knowledge about that event of learning itself. Thus seeing does include a sight of the eye or any knowledge about the learning itself. True, Hamilton and others insist that to know includes the knower's knowing that the knows; and in the limited sense in which he ~~under~~ ~~accep~~ here used the word know, one must admit that something is true which those words seem to express. ~~But it~~ Nevertheless, merely knowing a fact does not include ~~that~~ the knowledge that that very act, per se includes any knowledge about itself, any more than seeing includes any vision of ~~sig~~ the event of sight itself. When one first comes to ~~recognize~~ ~~acknowledge~~ ~~perceive~~ ~~that the number~~ assent to the truth its ~~of edges of~~ in any solid that has no hole through it nor any hole enclosed in it, is less by 2 than the sum of the numbers of distinct surfaces and of summits (supposing every one of the former has ~~a~~ ~~hole of~~ edges ~~has an edge all round it~~ by three or more edges and that every one of the latter simply extends from one ~~summit to another~~), ~~he is thinking~~ its parts, and he is ~~not thinking~~ exclusively occupied with ~~the solid and the points, lines surfaces~~ all of himself or his knowledge. And if Hamilton does not ~~call~~ call an assent, however unqualified and confident, by the name of "knowledge" unless it be accompanied by a recognition of its acceptance by the knower, then it is undoubtedly true that to know is to know that one knows that which one knows, but it still remains false that to know is to know that one knows ~~that~~ one's knowledge ~~is~~ ~~the~~ sense of actually ~~of the former~~ the knowing that one knows it, has what the scholastics call an habitual knowledge of it, that is to say a disposition ~~to recognize~~ thinking it, though one undoubtedly ~~as~~ to the question occurs to the person supposed.

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1909 ~~Oct~~ Nov 1

A "Sign" is an ens (of ~~almost~~ any kind), or something, which ~~has~~ in addition to possessing characters such as an other ens of the same kind might possess without being a "Sign", ~~is in some way is in a~~ is capable of ~~determining~~ ~~causing an effect, called here an Interpretant, upon a conscious Being, which is as if it were in some way due or in some mode corresponded to such as might be regarded as affecting mentally affecting some conscious~~ ~~mentally affecting some be the Being~~ affecting some consciousness so as to tend to produce in him a disposition, action, or imagination as if some state of things called the substance, signification, predicate, or (here particularly) the Interpretant of the Sign were ~~realized~~ ~~embodied~~ more definitely realized in reference to an object (other than the sign itself) or in

Well, on the whole, — or rather not on the whole by any means, but as another phase of reflection, — I think this work ~~It is necessary~~ This is made plain to me by the impossibility of doing along this line to do justice to the Object in all its generality. I think I must say

A "Sign" is an Ens (i.e. is something) which in addition to being either imagined, perceived, or conceived, as anything of which we are to have any experience or dealings must be, must also be taken as a revelation of something else, — i.e. it ~~gives us~~ conveys its interpreter not experience of that other thing, ~~but a substitute for it.~~ It in some measure and with some modification the same effect, with such modification as the interpreter, if sufficiently qualified (though it is not always possible that he should be so, in many cases, among ~~as for example~~ ~~at any rate~~ least suspect, ~~and~~ may expect or at ~~any rate~~ designed to deceive) ~~and~~ ~~the for it is a skill fully~~ example that it is being

The man who understands the particular system of substitution, it is its Interpreter as we call him.

It not only produces this effect, which is variously called its Substance, Signification, and in particular here through its Interpretant, but it also

On the Opposite Page Better put

Let it be admitted then that no school thinking ~~does not~~ can involve thinking about that very act of thinking.

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