

Paris, 29 Octobre 2013

LOGIC
REVISITED
THROUGH
INFORMATICS

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1 — A CENTURY-LONG SCHIZOPHRENIA

- Logic = *philosophy* implemented within *mathematics*.
Mathematics: enables technical treatment of questions.
Philosophy: discusses relevance of answers.
- Analytic philosophy: realism *sense/denotation*.
Syntax/semantics: *Materialism and Empiriocriticism 1908*.
Language about reality; the same with art!
- Analytic *newspeak*: trade concepts for (mock) technics.
Beyond discussion: consistency, truth values.
Cabalistic syntax: modal, epistemic, paraconsistent, ...
Ad hoc semantics: A refers to \mathbb{A} , Kripke models.
Cognition handled as objective issue.
- Logic schizophrenia between:
XIXth century, pre-Gödelian philosophy.
XXth century, post-Gödelian mathematics.

2 — THE AGE OF COMPUTERS

- Computer science recreated logic from scratch.
The best and the worst: all XIXth century mistakes redone.
- More active, more visible than philosophers.
Atrocities: abduction, closed world assumption, etc.
Violations of incompleteness/undecidability.
- Infantile, hence *spankable*.



La Vierge corrigeant l'Enfant Jésus devant trois témoins : André Breton, Paul Éluard et le peintre, 1926.

Max Ernst, 1926, Museum Ludwig, Köln.

2 — THE AGE OF COMPUTERS

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- Worse than philosophers: more active, more visible.
Atrocities: non-monotonic, abduction, CWA, etc.
Violations of incompleteness/undecidability.
- Infantile, hence *spankable*.
Curable: domain in expansion; deserves *pedagogy*.
Step out of technique to communicate with informatics.
Reinstallation of dialogue between halves of logical brain.
- The computer as anti-realistic artifact.
Subject *par excellence*, even if devoid of psychology.
Informatics refers to its own procedures, nothing else.
Kant rehabilitated as major reference for logic.
Mainly the Kantian *toolbox*.

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I — FIRST LIGHT: ANSWERS

Analyticity: the space of no sense.

3 — DID YOU SAY « ANALYTIC »?

- Kant: the predicate is part of the subject.
Judgments: the *blue* moon is blue.
Obsolete: quid of philosophical *logic*, popular *democracy*?
- Analytic: beyond discussion, since *self-contained*.
Not contextual: i.e., not put to use.
Meaning = use: hence analytic = meaningless.
- Police report analytic, although cops need not be trusted!
Existence of report: beyond discussion.
- Computers analytic in same sense:
Self-evidence: of their own procedure.
- Semantics is not analytic!
 $A \Rightarrow A$ true since « A true » implies « A true. »
 $A \Rightarrow A$ since $B \Rightarrow B$.

4 — EXPLICIT VS. IMPLICIT

- Sense/denotation \rightsquigarrow implicit/explicit. Witness *keyboards*:
Constative (explicit): *typewriter* key \downarrow opens new line.
Performative (implicit): *computer* key \downarrow launches program.
- *Explicit* answers: inefficient, but reliable.
Mathematics: numerical equations $2 + 2 = 4$.
Economy: barter.
- *Implicit* answers: efficient, but unreliable.
Mathematics: theorems yield *corollaries*.
Economy: cheques can be *cash*ed. Beware of Madoff!
- \Rightarrow ambiguous too. *Sequents* (Gentzen 1934) distinguish:
Implication: \Rightarrow explicit and incremental: *subformulas*.
Entailment: \vdash implicit and destructive through *cut*.
Relative: explicit = no meaning, no further use, *analytic*.

5 — RELATIVITY OF THE EXPLICIT

- **Explicit** = satisfied with the answer. Subjective, contextual.
Program: executed or opened by developer.
Cheque: can also be pinned on the wall.
- **Sequent calculus** distinguishes finished from unfinished.
 $A \Rightarrow B$: pure, decorative, implication.
 $A \vdash B$: give me A and you will get B .
- Glimpse in Lewis Carroll (1895): explicitation can be **stalled**.
No cashing: put the cheque in an envelope.
Sending envelope entails eventual cashing.
Carrollian nonsense: put envelope in second envelope, etc.
- Computer analyticity: explicit/implicit a matter of colours.
Stars: cells with coloured filaments, forming **constellations**.
Explicitation: trough **matching** of complementary colours.
Explicit: no colour, all filaments black: the **normal form**.

6 — TRANSPARENCY

- **Reasoning** about what we don't have, don't fully control.
- **Transparency**: XIXth century reduction implicit \rightsquigarrow explicit.
Politics: Big Brother, Jeremy Bentham, NSA.
Economics: replace money with barter.
Semantics: replace consequence with **subsequence**.
Mrs. X broke the chain; **subsequently** her daughter died.
- **Failsafe** ideology at war with intelligence. Stumbles on:
Too many data: no way of processing them.
Explicit bank should milk cows!
Incompleteness: consequence \neq subsequence.
- **Gödel** 1931, **Turing** 1936:
Normal form: hazardous, no way to ensure its existence.
Unanswerable question, even by cheating.
Complexity: refutation of concrete transparency.

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II — SECOND LIGHT: QUESTIONS

The format: condition of possibility of sense.

7 — FORMATTED VS. INFORMAL

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- The *format* at work in all activities.
 - Art:** musical forms (symphony, sonata, ...).
 - Politics:** systems (democracy, tyranny, etc.), laws, family.
 - Computation:** languages, extensions (.jpg, .pdf).
 - Logic:** formal languages select « *relevant* » questions.
 - Semantics:** within the very format preserved by *morphisms*.
- Turtle shell: useful *and* a burden!
 - Linguistic schizophrenia:** education as format*ion/ing*.
 - Computer formats:** extensions .jpg, .pdf protective.
 - Jailbreak** Apple **OS** format too repressive.
- *Richard* 1905: smallest integer not definable in ≤ 20 words.
 - Unformatted** definability yields antinomy.
 - Gödel 1931:** formatted **DEFINABILITY** too restrictive.
 - Richard** with **DEFINABLE:** definition, but not **DEFINITION**.

8 — QUALUNQUISM

- ***Direct access:*** ask question and wait for answer from ***reality:***
Populists, libertarians: no politicians, just ask the People.
Logic programming: no program, just ask the Machine .
Analytical philosophy: no concept, just use Logic.
- ***Hidden* formats:** « **some were more equal than others.** »
Duce interprets free will of ***l'uomo qualunque.***
PROLOG: messy « **control** » primitives hide program.
God: translate logically as ∞ ? Is He denumerable?
- The ***treasure hunt*** format: Sherlock Holmes selects clues.
Abduction: qualunquist ideology of unformatted « **reality.** »
Lynch's law: informal ***whodunit***, shady-looking = evil.
- Totalitarianism = XIXth century ***immediacy.*** Also present in:
Transparency: implicit = explicit.
Autoritarianism: no doubts as to the format.

9 — THE DEONTIC DIALOGUE

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- **Prussian formalism:** no discussion! Essentialist (Hilbert).
Logic: main format external, axiomatic, military.
- **Constructivism:** format conscious, Kantian (Brouwer).
Informatics: dialogue actions/permissions.
Hegel: contradictory foundations, *negation-as-format!*
Cinema: movies *against* Hays code.
- **Herbrand 1930:** first *deontic* dialogue in logic.
 $\forall \vec{x} \exists \vec{y} A[\vec{x}, \vec{y}]$: outputs $\exists \vec{y}$ as functions of inputs $\forall \vec{x}$.
Essentialism: in $\exists y \forall x A[x, y]$, output y independent from x .
Existentialism: $x \rightsquigarrow f(y)$ impedes dependency y/x .
- **Proof-nets (1986):** law avoids miscarriages of normalisation:
Vicious circle: self-plugging $y = x = f(y)$, a.k.a. *deadlock*.
Disconnectedness: material implication.
Infinite normalisation: typical of Russell's antinomy $\Omega\Omega$.

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III — THIRD LIGHT: CERTAINTY

Prediction: logic on the verge of irrationality.

10 — DOUBTS

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- Logic on the verge of irrationality.
Prediction: cheque on the possible.
Confidence: cannot be totally rational.
Black cat: good/ill omen depending on what happens *after*.
- XIXth century antinomies: *Burali-Forti* 1897, *Russell* 1902.
Formalism misses nothing; can only *overprove*.
Hilbert 1925: fix doubts by reducing certainty to:
Consistency: $A, \neg A$ not both provable.
Justification of unique format by consistency.
- Incompleteness destroys *unicity* of format.
First theorem: $\neg G$ consistent: several formats.
Status of limitations: consistency $\not\Rightarrow$ *confidence*.
Paraconsistency: logic à la Berlusconi, meaningless.
Second theorem: honest consistency out of reach.

11 — APODICTIC VS. EPIDICTIC

- **Transcendentalism**: conditions of possibility of *prediction*.
Doubts: failure of *apodictic*, irrefragable certainty.
Sufficient conditions: not necessary (\neq Kantian a priori).
Epidictic: reasonable, limited, certainty.
- Deontic dialogue badly infinite.
Infinitely many tests.
Dissension: tests should be tested.
Explains logical law, but cannot *enforce* it.
- Restriction to selected *virtual* tests: remains finite.
Analyticity of symbolic testing: gives *rights*.
Syntheticity of logical consequence: *duties*.
Cheque: *write* vs. *cash*.
- **Epidicticity** conjectures *balance* rights/duties.

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DEREALISM

God created numbers, everything else the deed of man.

12 — ALTERNATIVE INTEGERS

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- Failure of *realism* (= fetichism of reality).
Subsequence cannot explain consequence.
Incompleteness \neq non-euclidian geometries.
Non standard: no room in usual format.
- Want of models due to schizophrenia *object/format*.
Cro-Magnon number ||||| uses distinct writing instructions.
Write: begin/ $|_i \rightsquigarrow_i |_{i+1}$ /end.
Analyticity: \rightsquigarrow_i interferes with evaluation; hence formatting.
Categorical format « identifies » all \rightsquigarrow_i by essentialisation.
- *Format conscious logic:* not restricted to external comment.
Logspace integers derealist, compute in **NL** complexity.
- *Derealism* make the format part of the object.
Épure : object + views of the object.
File + extension .jpg, .pdf the object and how to access it.

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THE END