The Philosophy of Information as a New Field of Research

Introductory lecture: National Course in Philosophy of Computer Science

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Summary

Introduction
- Simon's view
- The Philosophy of Information
- Hilbert's view
- The Nature of Philosophical Problems

Analysis
- Eighteen Problems in PI

Conclusion
- Philosophy as Conceptual Design

Simon's view

The Philosophy of Information
Technology expands our ways of thinking about things, expands our ways of doing things.

The Philosophical Laboratory
knowing a lot about the world and how it works. That's a major place where computers come in. They can help us to think.

The Philosophy of Information: A Manifesto

From time to time, major movements occur in philosophy. These movements begin with a few simple, but very fertile, ideas.

Computing provides philosophy with such a set of simple, but incredibly fertile notions — new and evolving subject matters, methods, and models for philosophical inquiry. Computing brings new opportunities and challenges to traditional philosophical activities.

Computing is changing the way philosophers understand foundational concepts in philosophy, such as mind, consciousness, experience, reasoning, knowledge, truth, ethics and creativity.

Terrell Ward Bynum and James H. Moor

The Digital Phoenix - How Computers are Changing Philosophy **(1998)**

The Philosophy of Information: A Definition

What is the Philosophy of Information?

a new philosophical discipline, concerned with

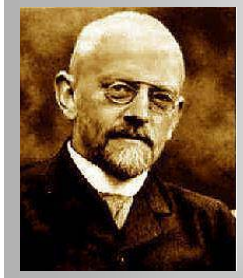
a) the critical investigation of the conceptual nature and basic principles of information, including its dynamics (especially computation and flow), utilisation and sciences; and
b) the elaboration and application of information-theoretic and computational methodologies to philosophical problems.

L. Floridi
***What is the Philosophy of Information?* (2002)**

Hilbert's view

About Problems

Philosophical problems have their initial roots in the "ever-recurring interplay between thought and experience". They are not contingent but must be timely.
Good problems are the driving force of any intellectual pursuit.
A good problem is a problem rich in consequences, clearly defined, easy to understand and difficult to solve, but not inaccessible.
In philosophy, genuine problems should also be open: they should allow for genuine and not unreasonable difference of opinion.



About Solutions

Open problems call for explicit solutions, which facilitate a critical approach and hence empower the interlocutor.
If we do not succeed in solving a problem, the reason frequently consists in our failure to recognize its complexity.
The accessibility of a problem is a function of its size.
Philosophy, like cooking, is a matter of careful and gradual preparation.
The Cartesian method of breaking problems into smaller components remains one of the safest approaches.

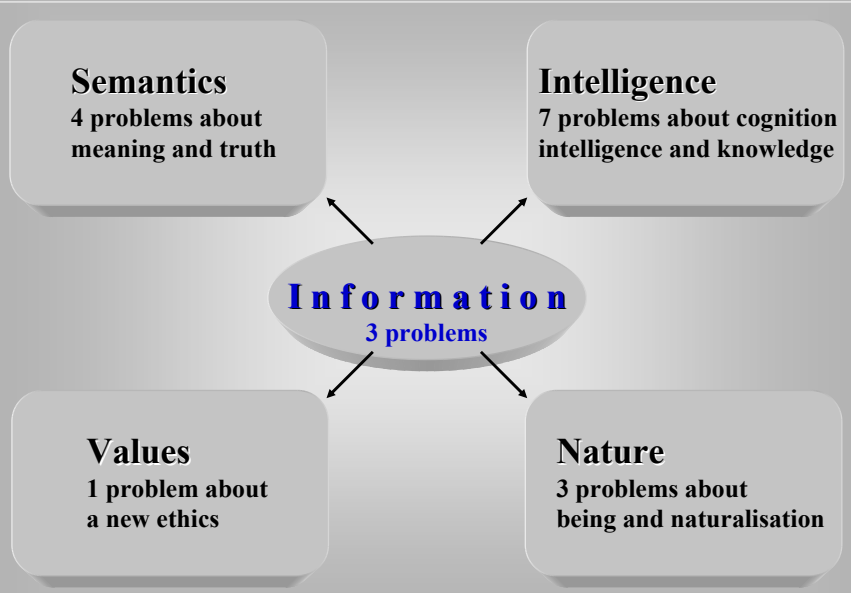
Negative solutions, "showing the impossibility of the solution under the given hypotheses, or in the sense contemplated" are as satisfactory and useful as positive solutions.

Criteria of Selection

No metatheoretical problems, e.g. "What is the foundation of PI?", "What is the methodology fostered by PI?"
No problems translated into informational language but philosophical problems with an explicit and distinctive informational nature.
Macroproblems and microproblems. Only a sample and selected problems are only sketched.

No old problems that have already gotten their due philosophical attention: some problems are new, some others are evolutions of old problems, some problems have already begun to be addressed.
No uniform level of scope: some problems are very general, some others more specific.

A Map of 18 Problems



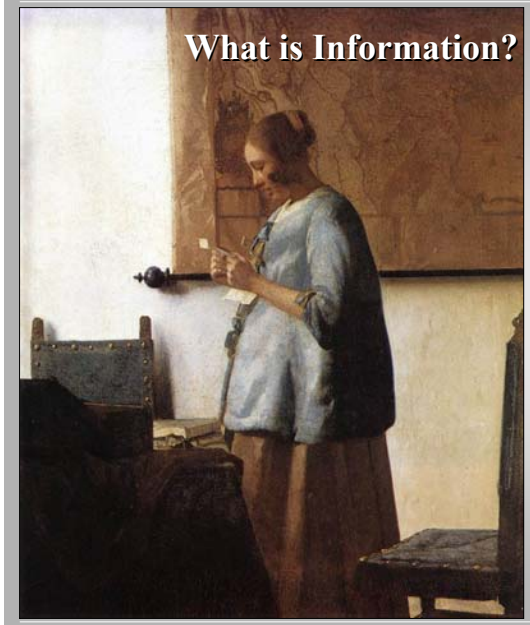
Analysis: 3 Macroproblems

P.1) the elementary problem

P.2) the I/O problem

P.3) the GUTI challenge

P.1 The Elementary Problem



Communication theory defines syntactic information in terms of data transmission. Does it provide the necessary conditions for any theory of information?

Five philosophical approaches define semantic information: are they mutually compatible? Is there a logical hierarchy?

Does any approach provide a clarification of the notion of data?

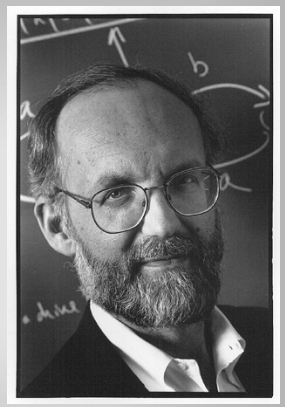
P.2 The I/O problem

What are the dynamics of information?

information processes (information states transitions, whatever goes on between the input and the output phase)

<u>Information flow</u> (Situation Logic): How is it possible for something to carry information about something else?

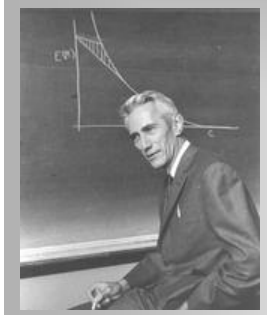
<u>Logic</u>: Is epistemic logic (as the logic of "S knows that p") a fragment of the logic of information (the logic of "S is informed that p"), and the latter a fragment of doxastic logic (the logic of "S believes that p")?



<u>Processing</u>: information processing includes effective computation, distributed processing (connectionism) and dynamical-system processing. What are the relations between the current paradigms? Do they provide a complete coverage of all possible *internalist* information processing methods?

P.3 The GUTI Challenge

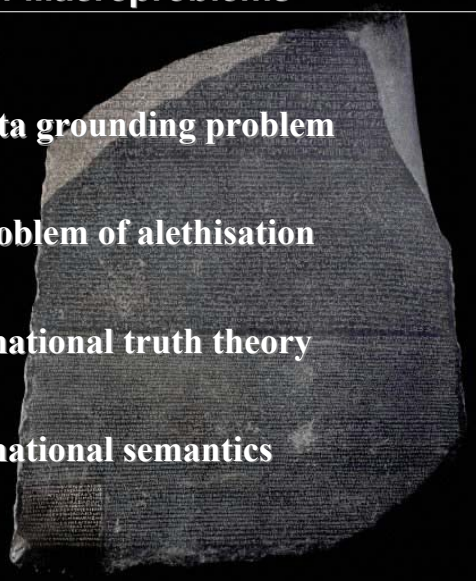
Is a grand unified theory of information possible?



The word "information" has been given different meanings by various writers in the general field of information theory. It is likely that at least a number of these will prove sufficiently useful in certain applications to deserve further study and permanent recognition. It is hardly to be expected that a single concept of information would satisfactorily account for the numerous possible applications of this general field. **(Shannon 1993, 180)**

<u>Reductionism</u>: we can extract what is essential to understanding the concept of information and its dynamics from the wide variety of models, theories and explanations proposed.
<u>Non-Reductionism</u>: we are dealing with a network of logically interdependent but mutually irreducible concepts.

Semantics: 4 Macroproblems



P.4) the data grounding problem

P.5) the problem of alethisation

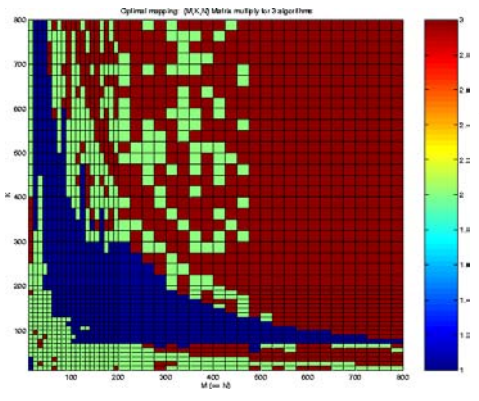
P.6) informational truth theory

P.7) informational semantics

P.4 DGP, the data grounding problem

how can data acquire their meaning?

Searle (1980), the problem of intrinsic meaning or "intentionality"
Harnad (1990), the symbols grounding problem
Harnad (1994), the frame problem is a consequence of DGP



How can the semantic interpretation of a formal symbol system be made intrinsic to the system, rather than just parasitic on the meanings in our heads?

How can the meanings of the meaningless symbol tokens, manipulated solely on the basis of their (arbitrary) shapes, be grounded in anything but other meaningless symbols?

(Harnad 1990)

P.5 The Alethisation Problem

how can meaningful data acquire their truth value?

Does truth supervene on meaningful data or does semantic information encapsulate truth?
Floridi, *Is Information Meaningful Data?*

Does information correspond to its target?

Is it isomorphic or homomorphic to it?

Does it actually contribute to constitute it?

Is the truth of information a matter of coherence?

P.6 Informational Truth Theory

Can a theory of information explain truth?

Could an informational approach explain truth more satisfactorily than other current theories?

If not, could an informational approach at least help to clarify the theoretical constraints to be satisfied by other theories of truth?

P.7 The Informational Semantics Problem

Can information theory explain meaning?

Several informational approaches to semantics have been investigated in Epistemology, Situation Semantics, Discourse Representation Theory and Dynamic Semantics.

Is it possible to analyse meaning not truth-functionally but as the potential to change the informational context?

Can semantic phenomena be explained as aspects of the empirical world?

Can meaning (at least partly) be grounded in an objective, mind- and language-independent notion of information (naturalisation of intentionality)?

Intelligence: 7 Macroproblems

P.8) Descartes' problem

P.9) the reengineering problem

P.10) Turing's problem

P.11) the MIB (mind-information-body) problem

P.12) the informational circle

P.13) the continuum hypothesis

P.14) the semantic view of science

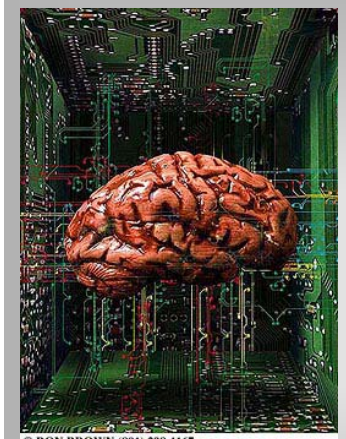
P.8 Descartes' Problem

Can (forms of) cognition C be fully and satisfactorily analysed in terms of (forms of) information processing IP at some level of abstraction LoA?

How is the triple <C, IP, LoA> to be interpreted?

Is IP sufficient for C? If it is, what is the precise relation between IP and C? What is the relation between different sorts and theories of information processing such as computationalism, connectionism and dynamicism? What are the sufficient conditions under which a physical system implements a given information processing?

P.9 The Reengineering Problem (Dennett 1994)



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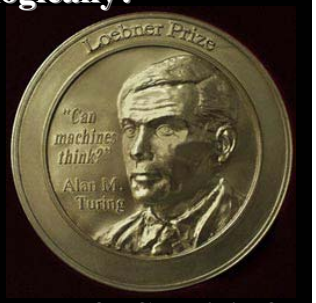
Can (forms of) natural intelligence NI be fully and satisfactorily analysed in terms of (forms of) information processing IP at some level of abstraction LoA?

How is the triple <NI, IP, LoA> to be interpreted?

What kind or form of intelligence is being analysed? What notion(s) of information is (are) at work here? Which model of information dynamics correctly describes natural intelligence? What is the level of abstraction adopted? Is it adequate?

P.10 Turing's Problem

Can (forms of) natural intelligence NI be fully and satisfactorily be implemented non-biologically?



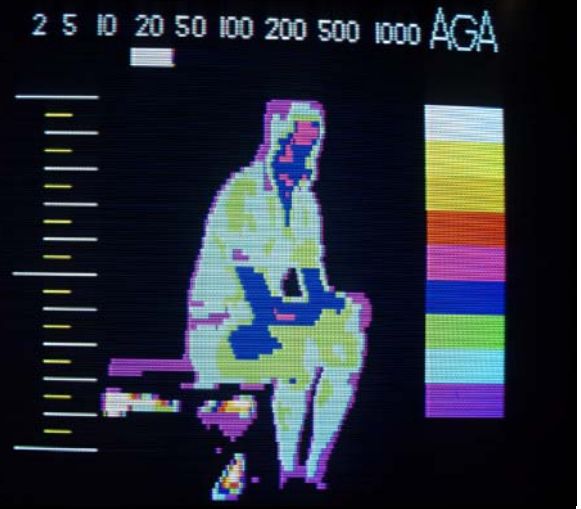
If NI = IP (information processing system), is IP *sui generis* (Searle 1980)?
Can NI = IP be so complex to elude forever any engineering attempt to duplicate it (Dreyfus 1992, Lucas 1961, 1996 Penrose 1989, 1990, 1994)?

If NI ≠ IP, what is missing? Consciousness? Creativity? Freedom? Embodiment?
Is it just a matter of size, detail and complexity of the problem?
Is NI behavioural output still (at least partly) reproducible in terms of delivered effects by some implementable forms of information processing?

P.11 The MIB (mind-information-body) Problem

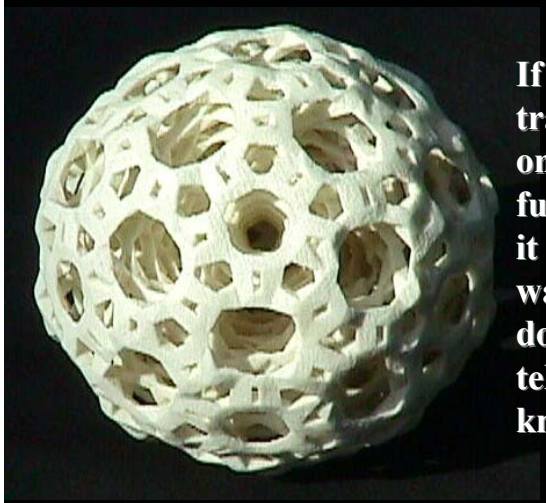
Can an informational approach solve the MB problem?

Monism vs. Dualism: is there a third way?



P.12 The Information Circle

How can information be audited?



If information cannot be transcended but can only be checked against further information - if it is information all the way up and all the way down - what does this tell us about our knowledge of the world?

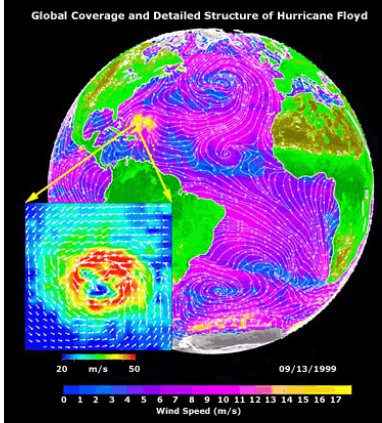
P.13 The Continuum Hypothesis

Should epistemology be based on a theory of information?

The continuum hypothesis: does knowledge encapsulate truth because it encapsulates semantic information? Or does information depend upon knowledge?
Is it possible that (1) S has the true belief that p and yet (2) S is not informed that p? (Barwise and Seligman 1997, 9).
Can there be information states without epistemic states?
Can an informational epistemology solve Gettier-type problems?

P.14 The Semantic View of Science

Is science reducible to information modelling?

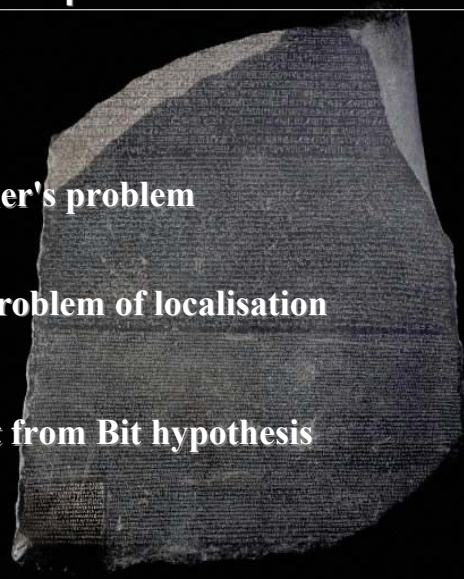


scientific reasoning is to a large extent model-based reasoning. It is models almost all the way up and models almost all the way down
(Giere 1999, 56)

Is information the non-linguistic content of these models? How are informational models semantically, cognitively and instrumentally related to the conceptualisations that constitute their empirical references? What is their semiotic status, e.g. structurally homomorphic or isomorphic representations or data-driven and data-constrained informational constructs? Is science a social, information-designing activity?

Is it possible to import in (the philosophy of) science modelling methodologies devised in information system theory? Can an informational view help to bridge the gap between science and cognition?

Nature: 3 Macroproblems



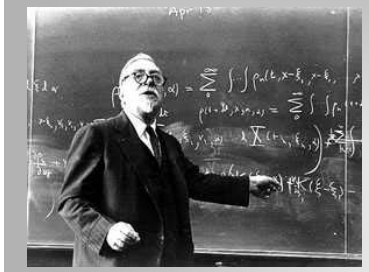
P.15) Wiener's problem

P.16) the problem of localisation

P.17) the It from Bit hypothesis

P.15 Wiener's Problem

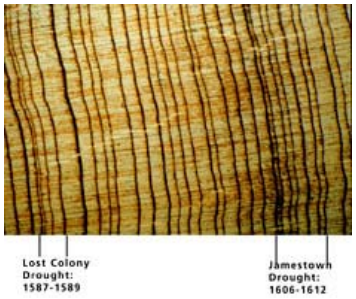
What is the ontological status of information?



Information is information, not matter or energy. No materialism which does not admit this can survive at the present day.
Wiener (1961)

Is the informational an independent ontological category, different from the physical/material and (assuming one could draw this Cartesian distinction) the mental?
If it is not an independent ontological category, to which category is it reducible?
If it is a independent ontological category, how is it related to the physical/material and the mental?

P.16 The Problem of Localisation



Can information be naturalised?

If the world were a completely chaotic, unpredictable affair, there would be no information to process. Still, the place of information in the natural world of biological and physical systems is far from clear.
(Barwise and Seligman 1997).

Does "natural information" pivots on natural signs (Peirce)? Is semantic content external (Putnam)? Are cognitive processes continuous with processes in the environment? Could information be neither here (intelligence) nor there (natural world) but on the threshold, as a special relation or interface between the world and its intelligent inhabitants (constructionism)? Could it even be elsewhere, in a third world, intellectually accessible by intelligent beings but not ontologically dependent on them (Platonism)?

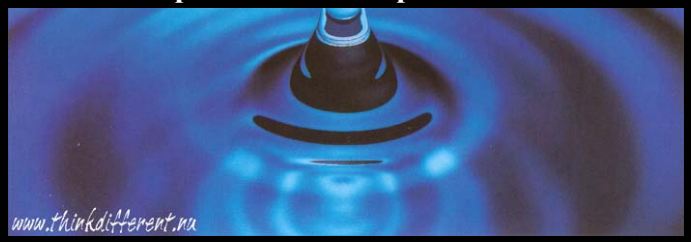
P.17 The "It from Bit" Hypothesis

can nature be informationalised?

Is the universe essentially made of informational stuff, with natural processes, including causation, as special cases of information dynamics?

If the universe is made of informational stuff, is quantum physics a theory of physical information?

And does this explain some of its paradoxes?



P.18 The Uniqueness Debate

Why does ICT raise moral issues?
Are CE issues unique (in the sense of requiring their own theoretical investigations, not entirely derivative from standard ethics)? Or are they simply moral issues that happen to involve ICT?
Can CE amount to a coherent and cohesive discipline, rather than a more or less heterogeneous and random collection of ICT-related ethical problems, applied analyses and practical solutions? If so, what is its conceptual rationale? And how does it compare with other ethical theories?
What justifies a certain methodology in CE, e.g. reasoning by analogy and case-based analysis?
What kind of ethics is CE? What is the contribution of CE to the ethical discourse?

Conclusion

The designer, is concerned with how things ought to be … in order to attain goals, and to function … With goals and "oughts" we also introduce into the picture the dichotomy between normative and descriptive. Natural science has found a way to exclude the normative and to concern itself solely with how things are.
H. Simon, *The Sciences of the Artificial*

Philosophy is the art of designing and evaluating explanatory models for problems that are genuinely open to debate and honest disagreement, even in principle. Its investigations constitute a space of inquiry broadly definable as normative. It is an open space: anyone can step into it, and disagreement is always possible. It is also a dynamic space, for when its cultural environment changes, philosophy follows suit and evolves.

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