



Notes for Tutorial Presentation at The AAI 2011 Conference

(Likely to be revised and expanded.)

<http://www.aaai.org/Conferences/AAAI/aaai11.php>

San Francisco Aug 7-11 2011

This file is <http://www.cs.bham.ac.uk/research/projects/cogaff/aaaitutorial/>.

Or <http://tiny.cc/AIphiltut>

From time to time a (slightly messy) PDF version will be generated (thanks to 'html2ps' and 'ps2pdf'), available here, suitable for printing:

<http://www.cs.bham.ac.uk/research/projects/cogaff/aaaitutorial/aaai11-tutorial.pdf>

The full list of tutorials is

<http://www.aaai.org/Conferences/AAAI/2011/aaai11tutorials.php>

The main conference web site is <http://www.aaai.org/Conferences/AAAI/2011/>

Philosophy as AI and AI as Philosophy

*Those who are ignorant of philosophy are doomed to reinvent it -- badly.
Those who are also ignorant of computation will make an even worse
mess of philosophy.*

Tutorial MP 4: Monday, August 8, 2011, 2:00pm-6:00pm

(There will be a refreshment/discussion break for about 30 minutes, probably starting around 4pm.)

Presenter Aaron Sloman

Honorary Professor of Artificial Intelligence and Cognitive Science

(But mainly a philosopher: See bio below.)

School of Computer Science, University of Birmingham.

NOTE:

The very relevant Meta-Morphogenesis project was not mentioned in this tutorial because the idea came a few months later. See

<http://www.cs.bham.ac.uk/research/projects/cogaff/misc/meta-morphogenesis.html>

Last updated: 29 Apr 2011; 2 May 2011; 8 Jul 2011; 31 Jul 2011; 3 Aug 2011; 10 Sep 2014

Installed: 5 Feb 2011

Downloadable papers and presentations related to this tutorial (All PDF)

- [PDF version of the tutorial web page](#)
- [Slides for this tutorial \(Still messy, and being expanded\)](#)
(Will almost certainly be expanded and reorganised the night before the tutorial.)
- [AI and Biology](#)
- [Do intelligent machines really need emotions](#)
- [Tutorial presentation with Matthias Scheutz at IJCAI 2001](#)
- [Talk about qualia to "inside outside" workshop London 2010](#)
- [Why symbol-grounding is both impossible and unnecessary, and why symbol-tethering based on theory-tethering is more powerful anyway.](#)
- [A challenge for theories of vision](#)
- [What's vision for, and how does it work?](#)
[From Marr \(and earlier\) to Gibson and Beyond](#)
- [Ontologies For Baby Animals and Robots.](#)
[Why baby animals and robots need to learn about kinds of stuff](#)
- [Comments on a recent interview with Rick Grush \(in Avant Journal \[here\]\(#\).\)](#)
- [Some comments on Dennett's views on virtual machinery](#)
- [What's information: how to say a lot about it without ever defining it.](#)
- [If learning maths requires a teacher where did the first teachers come from?](#)
[How mathematical competences are related to animal intelligence and \(future\) robot intelligence.](#)
- [Notes for a panel discussion on meta-cognition](#)
- [Some thoughts on Piaget's last two books, on possibility and necessity](#)
- [Transitions in biological evolution related to changes in information processing capabilities and/or mechanisms.](#)
[Genomes for self-constructing, self-modifying information-processing architectures.](#)
- [Evolution of mind as a feat of computer systems engineering Lessons from decades of development of virtual machinery, including self-monitoring virtual machinery](#)
[Talk at Philosophy of Science conference, Nancy July 2011.](#)
- [Causation in virtual machinery](#)
- [What is Science? Introduction to some non-obvious answers.](#)
- [Notes for invited talk at AGI 2001 conference: The biological bases of mathematical competences: a challenge for AGI](#)

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- Reading matter relevant to the tutorial.
(Please email me suggestions for additional items, or comments on those listed.)
 - Relatively accessible
 - More technical
 - AI and Philosophy
 - AI and Biology
 - Other Sources
 - Phenomenology
 - Speaker Bio
 - Online papers, presentations, and teaching materials.
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Prerequisites For Attendance:

There are no prerequisites, except interest in how AI and philosophy are mutually relevant, and can provide insights into the nature of mind and intelligence.

A book that provides a lot of illustrative empirical data that is relevant to philosophical and engineering nature/nurture issues (e.g. for robot designers) is

Annette Karmiloff-Smith,
Beyond Modularity: A Developmental Perspective on Cognitive Science,
MIT Press, Cambridge, MA, 1992,
(I am writing a growing set of notes on that book [here.](#))

Request to those thinking of attending

If you are planning to attend it will help me with planning if you send me the following information,

to A.Sloman@cs.bham.ac.uk, with Subject [AAAI Philosophy Tutorial]

- First name (for familiar address):
 - Status (independent, student, researcher, academic, retired, industrial employee, etc.)
 - Have you studied philosophy formally? To what level?
 - Have you studied AI formally? To what level?
 - Institution (if appropriate):
 - Town, country:
 - Email address (will not be used except for this tutorial):
 - Have you already studied philosophy, and if so what, and how (e.g. university course, private reading)?
 - Are there topics you would particularly like to have discussed in the tutorial? (I make no promises!)
 - Any other information you think relevant.
 - More helpers may be required for the philosophical section of [AITopics](#)?
If required would you be willing to help?
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OVERVIEW

Although most AI research has engineering objectives, some researchers are primarily interested in the scientific study of minds, both natural and artificial. Some of the deep connections between both scientific and applied AI are linked to old problems in philosophy about the nature of mind and knowledge, what exists, how minds are related to matter, about causation and free will, about the nature of consciousness, about how language is possible, about creativity, and about whether non-biological machines can have minds. Such questions linking AI and philosophy motivated AI

pioneers such as Ada Lovelace, Alan Turing, Marvin Minsky, John McCarthy and Herbert Simon, and are also addressed in the writings of Margaret Boden, Andy Clark, David Chalmers, Daniel Dennett, John Searle, and others. Yet many questions remain unanswered and some philosophers and scientists think AI can contribute nothing except solutions to engineering problems.

The tutorial is an attempt to explain how some largely unnoticed relationships between AI, philosophy, biological evolution and individual development, along with some advances in computer systems engineering, provide the basis for major advances in several disciplines, including AI and Philosophy.

It will also attempt to show how some philosophical confusions, e.g. about "symbol grounding", about relations between embodiment and cognition, and about how theories can be evaluated, can hold up progress.

The presentation will be highly interactive and I hope provocative!

Those who are ignorant of philosophy are doomed to reinvent it -- badly.
(Apologies to Santayana.)

PROVISIONAL SCHEDULE

- Welcome and brief survey of background and interests of participants
(To help select topics for discussion.).
- Overview of main areas of philosophy and brief comments on relations to AI, including how AI can aid conceptual analysis.
 - Epistemology
 - Metaphysics/ontology
 - Philosophy of mind (including the nature of qualia and the multifarious forms of consciousness)
The standpoint of this tutorial is that these are all to be understood as forms of biological information processing.
 - Philosophy of science
Including the question -- do standard views of philosophy of science do justice to AI as science?
(See Chapter 2 of Sloman 1978).
 - Philosophy of causation
Can standard philosophical theories of causation do justice to the causal interactions within virtual machinery in complex information processing systems?
 - Philosophy of mathematics -- links with requirements for future robots and products of biological evolution.
 - Philosophy of information.
Consequences of the view of the universe as made up of matter, energy, information, and processes involving them, in space-time.
What does information add?
- Selection of a few aspects of AI/Computing and relationships to old philosophical problems.
- Links with biology and neuroscience
- How to think about evolution of information processing: What were the major transitions?

- The roles of virtual machinery, and implications for mind/brain relations and for philosophy of causation.
 - Relations with major transitions during individual development and relationships with philosophy of mathematics.
 - Implications for nature of human languages used internally (for perceiving, having desires, planning, control of actions etc.) (Philosophy of language.)
 - Implications for nature of language learning: collaborative design rather than data-mining in a corpus.
 - Confusions about embodiment.
 - Confusions about symbol grounding (concept empiricism re-invented)
How can a machine or animal acquire, create, derive and use semantic contents?
Why do so many people (and not just John Searle) regard it as obvious that computers cannot understand the symbols they manipulate?
 - **Contrast:**
<http://www.cs.bham.ac.uk/research/projects/cogaff/81-95.html#4>
Aaron Sloman, What enables a machine to understand?, in **Proc 9th IJCAI**, Los Angeles, pp. 995--1001, 1985,
 - Varieties of functionalism
Atomic state functionalism (ASF) vs virtual machine functionalism (VMF)
 - Reward-based vs Architecture-based motivation.
 - Confusions about emotions.
 - Confusions about free will
 - Where to go next in AI and long term philosophical implications.
 - Request for help with [AITopics](#) web site.
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A KEY IDEA

- Many philosophers, especially so-called "analytical philosophers" have been taught that philosophy is a special non-empirical discipline, investigating eternal conceptual truths using methods that do are distinct from and cannot be affected by results of methods in other disciplines -- especially the sciences.

However those other disciplines can be the object of philosophical investigation, e.g. philosophy of history, philosophy of art, philosophy of physics, philosophy of biology, philosophy of mathematics etc.

- It has often been said that philosophy done in ignorance of the other disciplines, especially the sciences, ends up being arid and disconnected from the original problems that sparked philosophical investigations. That's why many philosophy books and journals include rich and detailed discussions of quantum mechanics, biology, neuroscience, linguistics, et.
- What has not been widely appreciated by philosophers is that the science and technology of information can offer something radically different providing entirely new ways of addressing some very old problems, e.g. about the nature of consciousness, free will, the mind body problem, the nature of emotions, the nature of language, and metaphysical questions about what sorts of things can exist, and what sorts of causes are possible.

Many think, mistakenly, if they have learnt about Turing machines, incompleteness results, and perhaps written a simple arithmetical program, they know all there is to know about computing. But they don't know how different the computers we all use now are from what they have learnt about.

- The situation is changing but very slowly -- in part because very few people understand what we have been learning in the last 60 years or so as a result of the science and technology of computing, even though they use computers every day.
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EXAMPLE TOPICS

Here are some examples of topics that may be discussed.

The precise choice of topics will depend on who turns up for the tutorial, their backgrounds and interests.

Up to 2nd Aug 35 persons had registered for this tutorial.

- Example topic:
What exactly is special about computers, and computation, that makes a computational approach to understanding mind not just the latest a series of fashions for thinking about minds and brains in terms of new technology?

When I was a child it was fashionable to say, and write, and think that the brain was a sort of telephone exchange. Telephones were still relatively new then, and they were all connected by wires.

- Example topic:
The philosophical significance of virtual machines composed of interacting coexisting virtual machines, some of them connected to input and/or output devices.
Could biological evolution have "discovered" the need for virtual, as opposed to physical, machinery long before engineers did?
Could self-monitoring virtual machines, including perceptual sub-systems linked to sensory devices, provide the key to the nature of perceptual qualia, including explaining all their philosophically puzzling features? (E.g. their privacy.)
See <http://www.cs.bham.ac.uk/research/projects/cogaff/08.html#803>
Title: Virtual Machines in Philosophy, Engineering & Biology
(And other items referred to there, including talks on virtual machinery.)

- Example topic:
What implications do causes and effects within complex virtual machinery have for philosophical theories of causation? Or for metaphysics more generally?
A paper on this topic, written for a philosophy of science conference held in July 2011 is online here:
<http://www.cs.bham.ac.uk/research/projects/cogaff/11.html#1103>
Evolution of mind as a feat of computer systems engineering: Lessons from decades of development of self-monitoring virtual machinery.

- Example topic:
Many animals (e.g. corvids, elephants, primates, squirrels) seem to be able to **work out** solutions to new problems, instead of having to use trial and error, or imitation, or explicit instruction, or genetically programmed solutions. What mechanisms enable them to do solve such problems, and how are they related to the abilities of humans to do mathematics?
Can designing robots with similar capabilities be a contribution to philosophy of mathematics?
E.g.: can a computational theory of development of mathematical competences in young humans, or young robots, shed light on philosophical questions about the nature of mathematical knowledge?
Is research in philosophy of mathematics relevant to the task of designing machines capable of doing or learning to do mathematics?

See: <http://www.cs.bham.ac.uk/research/projects/cogaff/talks/#toddler>

- Example topic:
Under what conditions could a young robot begin to make mathematical discoveries, e.g. about geometry, topology, sets, orderings, numbers, ...
- Example topic:
Symbol-grounding theory is often taken as axiomatic by researchers in AI and robotics. Yet it is just a new version of an old philosophical theory "concept empiricism", first refuted by Immanuel Kant (around 1781) and more thoroughly demolished by philosophers of science in the 10th Century. What alternative is there? Can "theory tethering" provide the answer?
See <http://www.cs.bham.ac.uk/research/projects/cogaff/talks/#models>
- Example topic:
Many philosophers, psychologists, neuroscientists, biologists, and AI/Robotics researchers think that causal learning processes are captured by various forms of associative/statistical learning, e.g. using Bayesian nets. This is essentially a Humean view of causation: causation is just reliable association. Our feeling that we understand something more, e.g. some kind of necessitation, is just illusory, and ruled out by concept empiricism for we cannot experience necessitation, only correlations, regularities, statistical relations, etc.

Immanuel Kant (e.g. Critique of Pure Reason, 1781) argued that Hume must be wrong and that since concept empiricism is wrong (since concepts are needed for experience and therefore cannot all come from experience) we can have a non-empirical concept of causal necessitation. Several of his examples can be shown to be similar to mathematical relationships - changing the height of a triangle causes the area to change, and adding three coins to a jar with five coins causes the number of coins in the jar to become eight.

- Example topic:
It is often assumed that all motivation must be based on (positive or negative) rewards. I'll argue that that's a false assumption and there are good reasons why evolution should have produced mechanisms for "architecture-based motivation", which have consequences that the individual concerned cannot possibly anticipate.
If this is correct, what are the implications for robotics? For philosophical theories of motivation and affect?
See: <http://www.cs.bham.ac.uk/research/projects/cogaff/09.html#907>
- Example topic:
Under what conditions could a young robot discover for itself some old philosophical problems, e.g. about the nature of qualia, about relations between mind and matter, about what knowledge is, about whether free will is possible, about what words like "good", "right" and "ought" mean, and whether there are objective moral values?
Could the same initial philosophical potential in young robots lead to different "adult" philosophical theories in different robots with the same initial design? E.g. could some end up thinking like John Searle, others like Daniel Dennett, others like David Hume, others like Immanuel Kant,etc...?
- Example topic:
In the past decade or two, there has been great enthusiasm among philosophers, cognitive scientists and roboticists for the claim that cognition must be embodied, and that acknowledging the role of embodiment revolutionizes theories about mind and intelligence.
Is that claim correct, or does the emphasis on embodiment ignore some important features of

biological evolution and important requirements for future robots?

Compare: <http://www.cs.bham.ac.uk/research/projects/cosy/papers/#tr0804>

Some Requirements for Human-like Robots: Why the recent over-emphasis on embodiment has held up progress.

(Might include discussion of claims for "mirror neurons".)

- Example topic:

What implications does AI have for debates about free will? What implications do philosophical discussions of free will have for AI?

See

- <http://www.cs.bham.ac.uk/research/projects/cogaff/misc/four-kinds-freewill.html>

Four Concepts of Freewill: Two of them incoherent

- <http://www.cs.bham.ac.uk/research/projects/cogaff/81-95.html#8>

Title: How to dispose of the free will issue (1988)

(Expanded as Chapter 2 of Stan Franklin's 1995 book: **Artificial Minds**)

- Example topic:

How do **affective** states and processes (e.g. desires, attitudes, preferences, values, ideals, emotions, moods, interests, etc.) differ from things like perception, belief, reasoning, planning, explaining?

How can thinking about **architectures** for minds help us answer this question? Do information-processing theories provide a better alternative than older philosophical answers, e.g. dualist theories, logical behaviourism, the intentional stance?

- Example topic:

Could consciousness have been produced by biological evolution? If not, why not? If so how?

If evolution can produce conscious animals does that have implications for whether human engineers can produce conscious machines?

Similar questions can be asked about having desires, preferences, ideals, moral values, etc. Can non-human animals have them, and if not why not, and if so how? Does this help us understand whether robots could?

- Example topic:

Are Asimov's "Laws of robotics" unethical towards intelligent machines?

See <http://www.cs.bham.ac.uk/research/projects/cogaff/misc/asimov-three-laws.html>

- See also the abstract for invited talk at AGI 2011 (<http://agi-conf.org/2011/>) the week before AAAI 2011:

<http://tinyurl.com/aaronagi11>

The biological bases of mathematical competences: a challenge for AGI (Artificial General Intelligence)

There's more here: <http://www.cs.bham.ac.uk/research/projects/cogaff/misc/AREADME.html>

Reading matter relevant to the tutorial. (To be extended)

(Please email me suggestions for additional items, or comments on those listed.)

- **Introductions to AI**

- **Relatively accessible**

Stan Franklin, *Artificial Minds*, Bradford Book (MIT Press) 1995.

Hans Moravec, *Mind Children: The Future of Robot and Human Intelligence*, Harvard University Press (Cambridge, Mass; London, England), 1988

An elderly but still useful introduction to key ideas in AI for non-specialists is **Artificial Intelligence and Natural Man**, Margaret A. Boden, 1978, revised 1987.

Mike Sharples, et al. *Computers and Thought*, MIT Press, 1989.
(Available online at the [Free Poplog Site here.](#))

A short history of AI, by Pamela McCorduck
Machines Who Think: 25th anniversary edition, Natick, MA: A K Peters, Ltd., 2004
http://www.pamelamc.com/html/machines_who_think.html

○ **More technical**

Stanford AI Class taught by Sebastian Thrun and Peter Norvig offered online Free
<http://www.ai-class.com/>

Online enrollment ends Sept 10th, sign up early! The class runs from Sept 26 through Dec 16, 2011.

Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.
<http://aima.cs.berkeley.edu/>

Full table of contents: <http://aima.cs.berkeley.edu/contents.html>

As a supplement to the section on vision see my introduction to and criticism of J.J. Gibson's ideas about perception:

<http://www.cs.bham.ac.uk/research/projects/cogaff/talks/#gibson>

What's vision for, and how does it work? From Marr (and earlier) to Gibson and Beyond

Artificial Intelligence (2nd edn), Elaine Rich & Kevin Knight McGraw Hill, 1991

Artificial Intelligence: A new Synthesis Nils J. Nilsson, Morgan Kaufmann, 1998,

Artificial Intelligence (3rd ed). Patrick Henry Winston, Addison Wesley, 1992.

Artificial Intelligence, Structures and Strategies for Complex Problem Solving, George F. Luger, William A, Stubblefield, Benjamin Cummings, 1993.

A no-longer-maintained but still useful list:

<http://www.cs.cofc.edu/~manaris/ai-education-repository/textbooks.html>

● **AI and Philosophy**

- Web pages of two AI pioneers who have both been very interested in links between AI and philosophy, both with important papers online:

- John McCarthy: <http://www-formal.stanford.edu/jmc/>

- See his answer to What Is AI? <http://www-formal.stanford.edu/jmc/whatisai.html>

- Marvin Minsky: <http://web.media.mit.edu/~minsky/>

- Daniel C. Dennett, *Kinds of minds: towards an understanding of consciousness*, Weidenfeld and Nicholson, London, 1996, (And other books by Dennett.)
- Daniel C. Dennett, The Practical Requirements for Making a Conscious Robot <http://users.ecs.soton.ac.uk/harnad/Papers/Py104/dennett.rob.html>
An optimistic account of the MIT "COG" project.
- Margaret A. Boden,
The Creative Mind: Myths and Mechanisms,
Weidenfeld & Nicolson, 1990,
- Margaret A. Boden (Ed) *The Philosophy of Artificial Intelligence*,
"Oxford Readings in Philosophy" Series, Oxford University Press, 1990
- The Computer Revolution in Philosophy: Philosophy, Science and Models of Mind
Aaron Sloman, Harvester Press and Humanities press, 1978.
Now online: <http://www.cs.bham.ac.uk/research/projects/cogaff/crp/>
- <http://www.cs.bham.ac.uk/research/projects/cogaff/misc/turing-test.html>
The Mythical Turing Test.
(Turing was too intelligent to propose a test for intelligence. Instead he was doing something different, and more interesting.)
- <http://www.aaai.org/AITopics/pmwiki/pmwiki.php/AITopics/Philosophy>
The "Philosophy" section of the AITopics web site. (Helpers needed to work on this.)
- Liz Stillwagon Swan's web site:
<http://sites.google.com/site/lizstillwaggonswan/Home/publications>
Includes some thoughtful papers and reviews -- with some antagonism to AI-based models of mind.
- There's lots more work on links between AI and Philosophy. If someone has a good, comprehensive online bibliography, please send me a link.

Interest in relations between philosophy and AI seems to be growing among philosophers, at long last.

E.g. see these recent announcements:

- Pierre Duhem Conference, Philosophy of Artificial Intelligence
Nancy France, Tuesday 19th July 2011
<http://www.sps-philoscience.org/activites/activite.php?id=15>
- <http://www.pt-ai.org/>
Philosophy and Theory of artificial intelligence
- 2012 is the centenary of Alan Turing's birth. There will be many events and publications related his work on AI, e.g. this conference
<http://events.cs.bham.ac.uk/turing12/>
<http://www.iacap.org/conferences/aisbiacap-world-congress-2012/>
AISB/IACAP World Congress 2012 - Alan Turing 2012 2-6 July 2012,
For the Turing year 2012, the [AISB](#) (The Society for the Study of Artificial Intelligence and Simulation of Behaviour) and the [IACAP](#) (The International Association for

Computing and Philosophy) merge their annual symposia/conferences to the AISB/IACAP World Congress.

The congress will take place 2-6 July 2012 in Birmingham, UK.

<http://www.cs.bham.ac.uk/>

- [A new free online interdisciplinary Polish/English journal AVANT](#)

(Feel free to browse my previous presentations [here](#).

Some of them are in 'flash' format on [my slideshare.net web site](#).)

- AI and Biology

- See books, journals, conferences on ALife and evolutionary computation.

- <http://www.cs.bham.ac.uk/research/cogaff/05.html#200502>,

A. Sloman and J. Chappell, The Altricial-Precocial Spectrum for Robots, in *Proceedings IJCAI'05*, Edinburgh, IJCAI, pp. 1187--1192, 2005

- <http://www.cs.bham.ac.uk/research/projects/cosy/papers/#tr0609> Jackie Chappell and Aaron Sloman, Natural and artificial meta-configured altricial information-processing systems, in *International Journal of Unconventional Computing*, 3, 3, pp. 211--239, 2007,

- <http://www.cs.bham.ac.uk/research/projects/cogaff/aiib/>

Symposium on AI-Inspired Biology (AIIB), 2010

Other Sources

- There is a lot more material on the AITopics web site: <http://www.aaai.org/AITopics/>

- http://en.wikipedia.org/wiki/Artificial_intelligence

The wikipedia entry usefully summarises some aspects of AI, but never believe any **definition** you read of AI, there or anywhere else, as it is very unlikely to cover the full range of research and teaching in the field.

- Margaret A. Boden,

Mind As Machine: A history of Cognitive Science (Vols 1--2),
Oxford University Press, 2006,
(Huge but enormously broad and deep.)

- Herbert A. Simon,

Motivational and emotional controls of cognition,
in *Models of Thought*, Yale University Press, pp. 29--38

- Herbert A. Simon, *The Sciences of the Artificial*, MIT Press, 1969.

- D.R. Hofstadter and D.C. Dennett, editors *The Mind's I: Fantasies and Reflections on Self and Soul*,
Penguin Books, London, 1981.

- Important relevant work in Philosophy of Science

Imre Lakatos, Falsification and the methodology of scientific research programmes,
in *Philosophical papers, Vol I*, Eds. J. Worrall and G. Currie,
Cambridge University Press, 1980, 0-521-28031-1, pp. 8--101,
(See if you can understand Lakatos' distinction between "progressive" and "degenerative"
research programmes.)

- **Phenomenology**

Much writing based on introspection gives information about what needs to be explained by a theory of human consciousness, and requirements for working models of human mental processes, or human like intelligent robots.

- An example is Susan Blackmore's little autobiographical introspective book **Zen and the Art of Consciousness** (previously published as **Ten Zen Questions**)
I have some comments on the book here
<http://www.cs.bham.ac.uk/research/projects/cogaff/misc/blackmore-zen-consciousness.html>
 - Some examples of the phenomenology of human visual perception are in these slides
<http://www.cs.bham.ac.uk/research/projects/cogaff/talks/#sps11>
 - More to be added.
-

Speaker Bio

First degree in mathematics and physics (CapeTown 1956),

DPhil in philosophy of mathematics (Oxford, 1962),

then worked in philosophy, cognitive science, AI and theoretical biology/psychology.

Now officially retired, but doing research full time.

Author of "[The Computer Revolution in Philosophy](#)" (1978) and many articles and book chapters, contributor to [the Poplog system for AI research and teaching](#).

Elected Fellow of [AAAI](#), of [ECCAI](#) and of [SSAISB](#).

Honorary DSc Sussex University (2006).

[More details here](#).

Online papers and presentations:

<http://www.cs.bham.ac.uk/research/projects/cogaff/>

<http://www.cs.bham.ac.uk/research/projects/cogaff/talks/>

Some also on [slideshare.net](#)

<http://www.cs.bham.ac.uk/research/projects/cogaff/misc/AREADME.html>

Teaching and research support software

<http://www.cs.bham.ac.uk/research/projects/poplog/examples>

"Thinky" Programming for young learners

More examples and OVA download [here](#)

[SimAgent toolkit](#)

[Videos of some talks](#)

Maintained by [Aaron Sloman](#)

[School of Computer Science](#)

[The University of Birmingham](#)