NEWSLETTER ON PHILOSOPHY AND COMPUTERS

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PLATFORM

Jon Dorboło
“The Passing of a Polymath”
The investigation of computing and philosophy appears to be a self-organizing system. Publications are proliferating, CAP conferences are expanding, and an international association has formed. All of this provides evidence that the philosophical issues clustered around the computational turn are coalescing into a bonafide academic field.

At the recent Carnegie-Mellon University Computing and Philosophy conference, significant effort was focused on the shape that an International Association of Computing and Philosophy (IACAP) should take. Consensus was reached on several issues, most importantly that Tony Beavers will lead the effort and take responsibility for organizing the association.

Tony’s plan involves three key points:

1) IACAP will be a membership organization funded by member dues.
2) IACAP will promote and support CAP events (conferences, colloquia, seminars, etc.) that are locally organized by members.
3) IACAP will provide advanced technology and resources to its members.

The IACAP leadership consists of association officers and an Executive Committee.

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Your opportunity to enter into and participate in this effort at its genesis is rapidly coming. Check the CAP conference sites for links to the IACAP site.

**CAP@CMU** (Carnegie-Mellon University),
http://caae.phil.cmu.edu/CAAE/CAP/

**CAP@OSU** (Oregon State University),
http://osu.orst.edu/groups/cap

**CAP@Europe** (University of Glasgow),
http://www.gla.ac.uk/departments/philosophy/ECAP.html

If adding to the momentum of the computational turn seems worthwhile to you, there are two key moves you can make now: write and publish a related book or article, or join IACAP. These are not mutually exclusive options.
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REPORT FROM THE CHAIR

APA Committee on Philosophy and Computers

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During 2000-2001 the committee sought to investigate and advance the relation between “philosophy and computers” by working closely with the Steering Committee of the Computing and Philosophy conference in order to encourage the development and expansion of CAP. The PAC committee also sponsored special sessions at the Division Meetings of the APA.

There are now regular CAP East (CAP@CMU) and CAP West (CAP@OSU) sessions. The URLs for these conferences are http://caae.phil.cmu.edu/CAAE/CAP/ and http://osu.orst.edu/groups/cap/ (CAP at Oregon State provides streaming video archives of its presentations). Expect to see CAP conferences over the next few years in Europe, Latin America, and the Pacific Rim. In fact, our first CAP abroad conference, spearheaded by Susan Stuart, will be at the University of Glasgow March 27 - 29, 2003 (http://www.gla.ac.uk/departments/philosophy/ECAP.html). Plans are also underway to hold a World Congress on Computing and Philosophy in 2005. All this speaks well for continued growth in the convergence of information technologies and philosophical activity.

A “CAP Awards” program has been established in order to recognize individual faculty contributions to computing and philosophy. Faculty members can receive these awards by being nominated by their campuses. The nomination needs to be accompanied by a proposal and letters of support from the Department Chair as well as a Dean or Provost. The first CAP Award was given to Professor Michael Byron from Kent State during the August 2001 CAP@CMU (information about CAP Awards can be found on the CAP web-sites).

With the recent death of Herb Simon, members of the committees proposed that future CAP@CMU keynote speeches be entitled “The Herbert A. Simon Lecture.” Herb was committed to both the pedagogical and theoretical aspects of computing and philosophy. Herb was also a strong supporter of our CAP conferences, and offered two keynote speeches at CAP, the last one being in the summer of 2000. It is only appropriate that we remember him this way.

A final CAP matter: At the 2001 August CAP at Carnegie Mellon, formation of the International Association for Computing and Philosophy (IACP) was announced. This independent organization will serve as the umbrella group for current and future CAP conferences.

PAC will also seek permission from the APA to establish a John Barwise Prize for significant and sustained contributions to Computing and Philosophy. As with Herb Simon, John had a life-long commitment to both the pedagogical and theoretical aspects of computing and philosophy. A drive is now underway to acquire funds for an endowment for this Prize.

As for PAC sponsored APA Division presentations, in 2000-2001 we emphasized the “computational turn” that is occurring within the fields of Logic, Epistemology, and Ethics.

An Eastern Division special session was entitled “New Models for Approaching Reason and Argument.” Tom Burke (University of South Carolina) gave a presentation on the philosophical and pedagogical foundations for Barwise and Etchemendy’s logic software (“Language, Proof, and Logic”). Richard Scheines (Carnegie Mellon) described the development and assessment of web-based courseware for causal and statistical reasoning.

At the Pacific Division meeting Clark Glymour, in a provocative talk entitled “Automating Normal Science: Rocks to Genes,” presented work in applied philosophy of science to demonstrate the idea that causal discoveries can reliably be made by algorithmic procedures. And at the Central Division meeting Charles Ess and Susan Dwyer addressed the “Cultural and Ethical Dimensions of the World Wide Web” and the “Moral Dangers of Cyberporn” respectively.

Finally, a symposium on “The Impact of Computing on the Teaching of Philosophy” (co-sponsored by the APA Committee on Teaching and the APA Committee on Philosophy and Computers) will be held at the Eastern Division APA this December. All in all, it’s been another productive season for computing and philosophy.
**BOOK REVIEWS**


Reviewed by Anthony Beavers  
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Luciano Floridi’s *Philosophy and Computing: An Introduction* is a must read for anyone interested in the intersection between philosophy and the new computational climate that is emerging with the Internet. The book is divided into five independent chapters followed by a worthy, though impressionistic, afterthought under the title of the conclusion.

Chapter One, “Divide et Computa: Philosophy and the Digital Environment,” begins by outlining four topics to consider when examining the significance of the digital revolution: 1) computation, 2) automatic control, 3) modeling and virtual reality, and 4) information management. This preliminary outline is followed by a brief historical consideration of the transition from analogue to digital information processing and the importance of “digitization” for developing mechanical means to manage information.

According to Floridi, this digitization has occurred in three main areas. Regarding the scope of digitized content, we have moved from numerical data to sounds and images. At the same time, our interfaces to the computer have become less digital and more humane. Graphical user interfaces and WYSIWYG software have quickly replaced punch cards. In the area of connectivity, we have moved from the mainframe transmission. This analysis is followed by a catalogue of some useful as a vehicle of information arrangement and transmission. This analysis is followed by a catalogue of some useful as a vehicle of information arrangement and transmission.

These changes are of world historical significance, thus worthy of philosophical investigation, as the last part of the chapter shows. Already philosophers are responding to these important developments, particularly in the areas of Information and Management Systems Methodology, Formal Ontology, The Metaphysics of Virtual Reality, The Epistemology of Computing, The Philosophy of Artificial Intelligence, Computer Ethics, The Philosophy of Artificial Life, The Philosophy of Computer-Mediated Communication, and Artificial Morality. Together these areas are unified by Floridi under a preliminary definition: “...the philosophy of information is primarily concerned with the whole domain of phenomena represented by the world of information, and inclines towards a metatheoretical approach only in so far as it addresses the philosophical problems implicit in the world of information by starting from the vantage point represented by information science, computer science and ICT” (18).

Chapter Two, “The Digital Workshop,” presents some computer basics. It begins with a discussion of some early computational machinery, including analogue devices such as water clocks and thermostats, and the analytical engine of Charles Babbage. This brief introduction is followed by a lengthy and difficult treatment of Turing Machines that contains the important elements of Turing Machine computation. The limitations of the Turing Machine are briefly treated at the end of this section in order to make room for the important application of Boolean algebra to computation and the innovations of Von Neumann respecting the modern computer’s architecture. This leads to a helpful discussion on the basic architecture of programming languages that illustrates why they are essential and important for the recent transformations in the infosphere. The chapter ends by looking at the various types of computers, both commercial and personal. As a whole, this survey of the history of computation and its mechanization is reasonably complete. The main issues are here. But, as the informed reader will suspect, this is a lot of ground for anyone to cover in just 25 pages. Floridi tries, but the sheer scope of material summarized in such a short space and an awkward use of symbolic notation makes the story a bit unclear. This criticism is local, however, and should be restricted to some sections of chapters two and five. The middle chapters are quite clear, and since these chapters provide what is revolutionary, the book as a whole does not suffer much because of a few dense sections.

In Chapter Three, “A Revolution Called Internet,” Floridi summarizes the history of the Internet, defines its various dimensions and addresses its potential impact on the “human encyclopedia.” After a brief history, the book considers the Internet as “the totality of three different spaces: the infrastructure (the physical dimension), the memory platform (the digital dimension), [and] the semantic space (the cyberspace dimension)” (61). The division is fair and necessary to ground the difference between the physical network and the arrangement of information on this network. Indeed, it is precisely this difference that makes the Internet useful as a vehicle of information arrangement and transmission. This analysis is followed by a catalogue of some of the uses of the Internet, such as E-mail, Bulletin Board communities and the World-Wide Web, along with some analysis of their significance as communications tools. The chapter then briefly considers the potential effects of the Internet on organized knowledge.

Chapter Four, “The Digital Domain: Infosphere, Databases and Hypertexts,” was this reader’s favorite, largely because it goes a good way toward establishing a philosophy of the database. Though talk of such things might initially sound like the stuff of computer science, those who study canonical philosophy will find themselves on familiar ground. The chapter appeals to recognizable thinkers such as Plato, Aristotle, Kant and Hegel, and even includes a section called “the aesthetic and the ontological interpretation of databases.” After a philosophical and historical introduction,
the chapter considers the relationship between the database and the encyclopedia, followed by a comprehensible definition of the database and an outline of its various types. Mid-way through the chapter, the reader will find an interesting discussion of the difference between data, information and knowledge. The section is a gloss, as Floridi admits, but enough is said to differentiate between three concepts that are often conflated in ordinary speech. This differentiation sets the stage for several subsequent sections that head in the direction of what might be called information engineering.

The chapter continues with a very brief look at a few issues in computer ethics, such as “Rich and Poor in the Information Economy” and a short enumeration of issues such as the standardization of the infosphere, data security, copyright infringement, privacy and pornography. This interlude into ethics is followed by a rich and lengthy discussion of what may be the most important element of modern information arrangement, hypertext. Here, Floridi dives deeply into analysis. Hypertext is defined as an information retrieval system made up of “a discrete set of semantic units,” “a set of associations,” and “an interactive and dynamic interface” (119-120). These concepts are together clarified by considering seven provocations that Floridi labels as “fallacies” and that are worth quoting here.

1) The electronic fallacy: hypertext is a uniquely computer-based concept.
2) The literary fallacy: hypertext began primarily as a narrative technique and hence it is essentially a new form of literary style.
3) The expressionist fallacy: hypertext has arisen as and should be considered primarily a writing-pushed phenomenon.
4) The politically correct fallacy: with hypertext, the reader is in complete control of whatever contents or functions are available and hence is no longer subject to the writer’s authority.
5) The obsession with the rhetoric of syntax: hypertext is non-linear writing and challenges the bookish assumption that contents have to be presented in a linear fashion.
6) The mimetic fallacy: hypertext mimics the associative nature of the human mind and therefore is better suited to its activities.
7) The methodological fallacy: hypertext will replace printed books. (120-128)

Chapters Three and Four are insightful. Here, Floridi is doing something that I have yet to see done elsewhere: he analyzes the data structures that are emerging because of the Internet and electronic databases and considers their impact on the organized body of knowledge from a philosophical perspective. He rightfully implies that issues of information arrangement do belong in philosophy and are as intrinsic to it as metaphysics and epistemology.

Chapter Five, “Artificial Intelligence: A Light Approach,” however, is a bit of an anomaly. It is a full one-third of the book and the encyclopedia, followed by a comprehensible definition of the database and an outline of its various types. Mid-way through the chapter, the reader will find an interesting discussion of the difference between data, information and knowledge. The section is a gloss, as Floridi admits, but enough is said to differentiate between three concepts that are often conflated in ordinary speech. This differentiation sets the stage for several subsequent sections that head in the direction of what might be called information engineering.

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Chapter Five, “Artificial Intelligence: A Light Approach,” however, is a bit of an anomaly. It is a full one-third of the book, yet seems to be more of a summary addendum tacked onto the end. It includes much of the standard AI introductory material, discussions of good old-fashioned AI, the Turing Test and its limitations, the various areas of AI application, light AI, fuzzy logic (another very difficult section along with the section on the Turing Machine mentioned above), neural nets, parallel computing, quantum computing, expert systems, robotics and cybernetics. But even at eighty pages, the text moves very quickly. It is packed with information; yet, it is a summary that will perhaps best be appreciated by those already familiar with the issues.

The concluding section is a playful step back from the rigorous detail of the rest of the book. It raises some issues of interest to those who study human nature and would like a jumping off point for thought on the relationship between what is happening to us informationally and what this might mean for our destiny as a species. As a hint, the reader of this review might appreciate the following quotation:

The history of human emancipation has been, so far, not devoid of success. Nature, animals, technological devices and the labour of other human beings have all been employed to transform energy into force and to manage information. The paradox of the industrial and the information revolutions, however, is that in both cases the fundamental anthropological project seems to have failed, although nothing should have been more successful than the engine and the computer in sanitating (healing) and liberating human time, developing homo faber into homo sapiens and then bringing both closer to extinction in favour of homo ludens. (221-222)

Provocative and short, the conclusion itself asserts a thesis that could well be a theme for another book.

Now here are some remarks for a general review of the book as a whole. With this book, Floridi has attempted a very difficult task. He starts the book with an acknowledgment of the difficulty that comes with writing any philosophy textbook: “We expect the author to introduce all the basic elements in the field clearly and succinctly, while providing an interesting perspective from which to interpret them fruitfully. This doubles the chances of getting things wrong and generates a paradoxical tension between originality and lack of novelty” (ix). We can imagine that this situation is all the more complicated when one attempts an introductory textbook for a field of study that is in its infancy, as is the philosophy of information. Floridi is hard at work in his other writings to outline what a philosophy of information should entail and is still defining its initial terms. This may partly explain why the book moves along so clearly with insight and innovation in some places and why it bogs down in others, particularly where it tries to summarize a vast amount of established material in a small space.

The book is at its best where Floridi is most creative. Chapters Three and Four, on the Internet and databases, respectively, breathe easily and read well, along with offering some much needed and innovative assessment. Floridi is right to want to introduce the technical aspects of digital computation and the Internet into the manifold of philosophical problems, and these two chapters go along way in setting the stage. Even by themselves, these two chapters make the book well worth reading, though the more historical sections are worth the review.

I would recommend the book as a transitional text for professionals interested in moving from the traditional issues of computation and AI into the analysis of more recent developments in information storage, retrieval and
organization brought about by the Internet. The book is rich in detail, and the catalogue of facts enumerated along the way is well worth having at one’s disposal. It is a must read for anyone interested in the intersection between philosophy and the new computational climate that is emerging with the Internet. Additionally, the scholarly-minded will appreciate the scope of the research that lies behind this work as indicated in its extensive bibliography.


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Dyson’s book is an argument disguised as an intellectual history. The argument is that all intelligence is collective, in the way that human intelligence emerges from the collection of unintelligent neurons, and that a global collective intelligence is now emerging from the growing interconnections among human beings and their machines. The history traces the rise of computation and thinking about machine intelligence from Hobbes to the present. The history is fascinating and detailed. The thesis about collective intelligence is fascinating but lacking the detail which would make it more than merely suggestive.

Each chapter spends most of its time on figures and developments in the history of computation and AI. Some are major figures in every telling of this story, such as Leibniz, Babbage, Boole, Turing, Gödel, and von Neumann. Some are major figures in other fields whose contribution to computing or AI has not been widely recognized, such as Hobbess, Robert Hooke, Samuel Butler, Charles Peirce, and H.G. Wells. And some are nearly forgotten figures with precient or eccentric ideas, or both, whom Dyson has painstakingly resurrected to fill in the story, such as Alfred Smee, Allan Marquand, Lewis Fry Richardson, Julian Bigelow, Nils Barricelli, William Ross Ashby, Olaf Stapleton, Frederic Myers, and Paul Baran. There are other histories of computation which tell the main story well, perhaps with more technical detail than Dyson, but they omit the quirky minor figures Dyson includes here. I know of no other history of pre-20th century thinking about machine intelligence as rich, detailed, or surprising as this one.

As parts of the history, Dyson eventually discusses many examples of collectives with emergent problem-solving abilities which exceed the abilities of their separate components. Apart from the example of brains, he considers Hobbes’ Leviathan, networks of human calculators, free-market economies, and the evolution of multi-celled organisms.

At the end of each chapter, Dyson draws lessons for his growing thesis about evolution, collectives, emergence, life, and intelligence. Because these chapter-closing reflections explicate the book’s title and subtitle better than the historical story, one concludes that Dyson is telling the history for the sake of this thesis, and not the other way around.

These closing reflections are intriguing, plausible, and rich with implications, but always brief, sometimes oracular, and not closely tied to evidence in the chapter. As a colleague of mine likes to write in the margins of student papers, these propositions are “important if true.” But Dyson does not give them the elaboration and support they deserve, and which he does give to his history. One gets the sense, with some frustration, that the primary thesis gets secondary attention.

This is my only complaint about the book. The thesis is too interesting and important to leave in the impressionistic state in which he leaves it. And unlike impressionistic authors, Dyson can do better, as we know from the other 98% of the book. This is the complaint of a reader who was persuaded to take the idea seriously. I’d like to see the author do the same.

This criticism may be unfair. It’s possible that Dyson’s thesis cannot yet be given the detailed exposition and argument to which philosophers are accustomed. Dyson has done a service to marshal enough evidence to make the thesis plausible and to make us vigilant for clues relevant to its truth. But I’m afraid that philosophers will be impatient with the brevity of Dyson’s treatment of his own thesis, and be impatient roughly to the extent that they find his thesis worth exploring. Nevertheless I recommend this book to philosophers, in part to increase the chance that others will pick up this thesis where Dyson left off.

A large part of the appeal of this book, apart from the very engaging history and very suggestive thesis, is its nuanced, alternative vision of machine intelligence, which makes the sci-fi scenarios still present in the philosophical literature look superficial. Dyson gives no attention to the common view of stand-alone artificial intelligence, which might pass a Turing Test, be installed in a robotic body, and interact with human society and other intelligent robots. He finds it more plausible and fruitful to think of human beings and machines in a symbiotic relationship. Already we depend on machines and machines depend on us, and this mutual dependence will become more complex and far-reaching over time. Both poles of this symbiotic relationship evolve, and together we co-evolve. Dyson wants to break down the distinction between technology and biology, and see machines, together with the human-machine symbiosis, as subject to natural selection. The examples of other collectives which have evolved to surpass their components in survival strength and intelligence suggest that the future of machine intelligence is more collective than isolated, more natural than artificial, and more a vector or society of human intelligence than a rival of it.
To deny that educational technology is value laden and agenda advancing is to contradict the one of the most potent ideas that contemporary educational technology is predicated upon.

we are witness to changes in the ways that education relates to society, the roles that educators play, the populations of learners, and the value that formal learning has for individuals. In order to understand the character and direction of this transformation, we must make sense of the technology employed as well as the principles and assumptions guiding its employment. Educational Technology: The Development of a Concept by Alan Januszewski is a philosophically sophisticated history of the definition of educational technology. Unlike many philosophical projects of definition and concept analysis, Januszewski’s has the advantages of a very brief time frame (since the 1920’s) and a progression of official definitions produced by a professional organization. What Januszewski does with this concise range of time and topic is to produce a conceptual map that leads to the social, political, theoretical, and philosophical territories that overlap with the idea of educational technology. In tracing this map, the reader comes to discover how the idea of educational technology is driven by a particular theory of learning and how thoroughly our educational institutions are dependent on that theory. Most urgent is the need to understand the agenda that educational technology sets for teaching and learning, for that agenda is implicit in the design of the tools that are now commonplace in our educational environment.

Januszewski’s analysis covers the four official definitions produced by the Association for Educational Communication and Technology (AECT) from 1963 to 1994. The AECT was formed in 1970 when the Department of Audio Visual Instruction (DAVI), established in 1932, separated from the National Education Association (NEA), taking with it 10,000 members. In 1963 University of Southern California Education professor James D. Finn chaired a commission with the objective of defining the role of technology in education. The resulting definition was published as a monograph in 1963 and contains in it the major ideas that have directed educational technology since. The key statements in this definition are;

Audiovisual communications is that branch of educational theory and practice primarily concerned with the design and use of messages which control the learning process…Its practical goal is the efficient utilization of every method and medium of communication which can contribute to the development of the learner’s potential. (Januszewski, 2001, 18).

The term audiovisual communications was explicitly set as a transitional term pending future revision. The term eventually settled upon, to present, is educational technology.

Januszewski’s method is to methodically expand upon the key concepts within each official definition, developing the historical contexts, theoretical positions, and political agenda that influence the meanings of that concept. From the 1963 definition of audiovisual communications (qua educational technology), he treats the following concepts in detail:

Theory
Process
Communications
Message
Learning
Control

Along the way he details the intersections of the educational technology movement with behaviorism which led to the educational methods of teaching machines and programmed instruction.

Among the influential figures in the development of the educational technology concept introduced in this book is James D. Finn, chair of the 1963 definition commission. Finn’s impact on educational theory and practice is broad. I believe that he will become a familiar figure in the future study of education. He is largely responsible for refocusing the emphasis in the audiovisual technology camp from the management of equipment to a field of research with its own learning theory. Finn dedicated much of his career activity to opposing the notion that technology is a category of objects; machines, tools, instruments, and gadgets. Rather, he argued, technology is a process and a way of thinking. The uses of technological objects follows from this way of thinking, such that machines are;

symbols…and must be thought of in terms of in connection with systems, organizational patterns, utilization practices, and so forth to present the true technological picture.” (P24)

Given Finn’s success in translating his vision into organizational action, this picture of technology as a process is critical these days when faced with promoters of technology mediated or automated education who proclaim that technology is merely a tool and is ultimately value neutral. It turns out that the founding figure of educational technology stands in stark opposition to contemporary instrumentalists. The machines and programs that we use for education have all along been designed to advance an agenda. To deny that educational technology is value laden and agenda advancing is to contradict the one of the most potent ideas that contemporary educational technology is predicated upon.

The 1963 definition of educational technology was intended to provide a conceptual ground for a field of educational research. Finn was out to create a self-sustaining profession complete with a professional association, training and criteria of professional competence, a code of ethics, and “an organized body of intelligent theory constantly expanded by research” (p.21). Those goals resulted in the Association for Educational Communication and Technology (AECT) which counted 21,000 members in 1972 (see http://www.aect.org). The growth of the organization led to a variety of controversies including the descriptive title of the
organization's area of activity and different aspects of the official definition. **Audiovisual communications** was replaced by **educational technology** and a new commission produced a revised definition in 1972.

Among the ideas targeted for revision was **control**. The 1963 definition states that educational technology (provisionally termed "audiovisual communications") is "the branch of educational theory and practice primarily concerned with the design and use of messages which control the learning process." (Januszewski, 2001, 18). This is one area of Januszewski's book that I find lacks sufficient development. Norbert Weiner introduced the concept of cybernetic control in *Cybernetics* (1948), refined it in *The Extrapolation, Interpolation, and Smoothing of Stationary Time Series with Engineering Applications*, (1949), and advanced it in *Cybernetics: Communication and Control in the Animal and the Machine* (1961). Weiner's notion is formal and mathematical. There is a plethora of informal (and misdirected) appropriation of the control and feedback concepts in all manners of literature. Finn was seeking to formalize the study of education. The relation between the theory of cybernetic control and the intended applications to education would seem to be one of the crucial ideas in educational technology.

In the 1972 definition of educational technology (and the two subsequent revisions), **control** was replaced with **facilitate**. The later concept continues to have currency in contemporary education language to the degree that **facilitator** commonly replaces **teacher** or **instructor** in many forms of educational text. Still, **facilitate** does not convey the crucial ideas that **control** did in the first definition. Yet, the information technology that has become the tool-set for educational technology does contain the feedback and control components as its underlying form. How the idea of educational technology as a process relates to the logic and design of its tools is an area of importance that needs further investigation. **Control**, as used in cybernetic and systems theory is a different category of concept than any of the others in the educational technology definitions. **Control** was introduced as a formal concept with a mathematical expression. It is not clear that **theory**, **process**, **communications**, **message**, **learning**, or **facilitate** follow that same intention.

Januszewski does not take up the distinction between educational technology and distance education. It is not necessary to his project to do so. Yet, as the two are frequently conflated, I think it important to explain the difference. The history of distance education begins about 150 years ago. Industrial age transportation and public postal systems made it possible to exchange instructional materials at a distance. It is plain that distance education is a result of industrial technology (Keegan, 1996, 7-8). As technology advances, so do the prospects for distance education. The impact of the internet on distance education is still open to assessment, but consider the state of affairs in 1995: at least ten distance education systems around the world were serving up to 100,000 at a time for an annual total of about 3.5 million learners. Most of these were television and correspondence systems. All of the ten had been long-established (some for more than 50 years) and none of the ten were in the United States (Keegan, 1996, 4). Distance education is a firmly-based practice by which much of the world’s higher education learners are educated. The defining features of distance education are that it is formal education (i.e. mediated by an educational institution) in which the teacher and learner as well as the learner and the learner group are separated in time and space.

Educational technology does not presume a space/time separation of teacher and learner and learner group; face-to-face communication may well be part of the educational technology model, but not in distance education. Distance education is a type of teaching and learning. Educational technology is a process in which technology is applied to the problems of teaching and learning (but, here I depart from the AECT definitions). The key point is that distance education is a large and growing force in all levels of education. We may be on the path to seeing distance education become the primary form of educating for all post-secondary learners. Being that all distance education is mediated by technology, the study of educational technology is fundamental to distance education. Januszewski points us in the right direction for the investigation into our changing educational environment.

**Notes**


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This issue’s column discusses two computer ethics texts and two useful websites. The first text is the second edition of *Computers, Ethics, and Society* by M. David Ermann, Mary B. Williams, and Michele S. Shauf. Oxford University Press published the first edition in 1990 and the second edition, containing about 80 percent new articles, came out in 1997. While this 340-page edited volume does not include the latest articles in the field, it is a solid collection of essays that will be useful to readers. The editors remark that, “The Second Edition analyzes the promise and problems of computers, and helps students recognize the broad social, cultural, economic, and psychological effects of computers.” In an effort to accomplish this, they have chosen a broad range of interdisciplinary readings, which are divided into four parts. Part 1, “Computers in an Ethics Framework,” contains seven articles grouped under the following headings: “The Ethical Context of Computing,” “Ethical Theories We All Use,” and “Is Our Intuitive Moral Sense a Reliable Guide?” The second section, “Computers and Personal Life,” includes nine articles under these headings: “Privacy Concerns in Computerized Society,” “Effects of Computerization on Personal Fulfillment,

The second text from Jones and Bartlett Publishers is *Cyber Ethics: Morality and Law in Cyberspace* by Richard Spinello. Published in 2000, this 165-page book covers a limited number of topics related to the Internet and Cyberspace. The author mentions two main purposes for this book. The first purpose is to explore the social costs and moral problems that have been produced by the expanded use of the Internet and World Wide Web. The second purpose is to investigate the question: Is the proper model of Internet control centralized state controls or decentralized individual controls? Thus, the text has a more narrow focus than many books on computer or information ethics. While the book’s focus may not be as broad as other texts, the concentration on the Internet and cyberspace may increase its relevance and interest for students. Readers will find six chapters in the book with the following titles: “The Internet and Ethical Values,” “Governing and Regulating the Internet,” “Free Speech and Content Control in Cyberspace,” “Intellectual Property in Cyberspace,” “Regulating Internet Privacy,” and “Securing the Electronic Frontier.” Most of the chapters contain an Introduction, an extended and accessible discussion of the issue, discussion questions, and a couple of case studies. The book also includes a Glossary, Bibliography, and Index. Overall, *Cyber Ethics* contains an interesting, accessible, and recent discussion of some important and relevant issues related to the Internet and cyberspace.

Two extremely useful websites related to computer ethics are “Ethics in Computing” and “Ethics and Information Technology.” The “Ethics in Computing” website is supported by North Carolina State University and is maintained by Dr. Edward F. Gehring at http://www2.ncsu.edu/eos/info/computer_ethics/. This well-organized site has links to articles and cases. Some of the subtopics also have studyguides, discussion questions, and lecture notes included. The site can be searched with a search engine found on the home page. “Ethics in Computing” is organized into eight major sections, which are divided into subtopics. The “Basics” section contains links to ethical theories, codes of ethics, and whistleblowing. The section on commerce contains links related to issues such as anticompetitive practices, spamming, cybersquatting, and term papers. The part on social/justice has links to equity of access and workplace issues among others. The computer abuse section contains links about worms, viruses, and hacking. Another section has links related to speech issues, such as netiquette, pornography, hate speech, and email. The part on intellectual property has links to patents and copyright laws, software piracy, and an excellent section on MP3s. The privacy section contains links to encryption and various other privacy issues. Finally, an area labeled “Risks” contains links related to artificial intelligence, software safety and reliability, and network security. While there are many sites with links, this one is very well organized and has articles from a wide variety of sources. The site should be extremely useful.

The second useful website, “Ethics and Information Technology,” is supported by the Colorado School of Mines and can be found at http://www.mines.edu/Academic/computer/ethics/. This site is not as extensive as the previous one, but it has some links that make it very useful. The creators of the site state that, “The following links have been created as a starting point to help members of the CSM community learn more about CSM policies as well as the ethical issues associated with the use of information and communications technologies in our society.” It is the links to CSM policies that make the site particularly interesting and useful. These policies can be compared to those in place at the student’s institution for a valuable learning exercise. The site also contains additional links grouped under the following headings: “Netiquette,” “Ethics in Computing Links,” “Cyberspace for Non-Lawyers,” “Security,” “Identity Theft,” “Copyright,” “Copying and Music on the Internet,” “Trademarks and Patents,” “Software Licensing and Piracy,” Spamming and Chain Letters,” and “Free Speech, Privacy, and Anonymity.” This is a clearly organized site with links to a limited number of useful sites and to the computer and information technology policies of the Colorado School of Mines.

I hope you find this information useful. Please feel free to let me know about books, websites, or journals that should be brought to the attention of our colleagues (drbirs@ship.edu). I am also interested in short articles on any topic related to computer ethics and information technology.
**The Passing of a Polymath**

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**Polymath.** n. Greek, from *poly* (many) + *manthanein* (to learn). A person of encyclopedic learning.

Herbert Alexander Simon is the paradigm case of a polymath. His bibliography extends to 962 published works. This body of literature covers an unbelievably wide range of scholarly, technical, and practical fields. He is a pioneer of artificial intelligence, Nobel Laureate in economic science, radical innovator in psychology, founder of cognitive science, innovator in philosophy and history of science, major contributor to political science, statistics, design theory, public administration, organization theory, computer science, management science, social psychology, and education. Herbert Simon, admired by all and loved by many, died February 9, 2001.

CAP@CMU in August 2000 was fortunate to receive a keynote address from Herbert Simon (with Hyunchul Kim, Carnegie Mellon), *Heuristic Methods to Achieve ‘Natural Proofs’ in a Computer Tutor for Logic.* Simon’s presentation included an argument demonstrating that computers are capable of mathematical discovery.

Simon shared with Alan Newell the A.M. Turing Award (1975) from the Association for Computing Machinery, for the first artificial intelligence program. The award was accompanied by this statement: “Herbert A. Simon’s scientific output goes far beyond the disciplines in which he has held professorships: political science, administration, psychology and information sciences. He has made contributions in the fields of science theory, applied mathematics, statistics, operations research, economics and business and public administration (and), in all areas in which he has conducted research, Simon has had something of importance to say.”

In economics, Simon produced a model of human beings as beings of limited rationality who use heuristic decision procedures to circumvent limitations of time and memory. This constituted a radical departure from the traditional view of humans as wholly rational decision makers. Chief among the honors received for this work was a Nobel Prize in Economic Sciences in 1978. Among the key works in this area are *Human Problem Solving,* with A. Newell, (1972); *Models of Discovery* (1977); *The New Science of Management Decision,* revised edition (1977); and *Models of Bounded Rationality* (1981).

In the 1960's Simon successfully challenged the basic precept of behaviorism — the prohibition from consideration of internal processes. Alternately, Simon proposed that human beings use symbolic processes to solve problems, reason, speak and write, learn and invent. He went on to demonstrate the roles of these processes via computer programs that simulate human behavior. This activity gave rise to the currently vital areas of cognitive psychology and cognitive science. Among other honors, he was awarded the Gold Medal Award for Psychological Science from the American Psychological Foundation (1988).

In a brilliant article, *Putting it all Together,* Simon’s main collaborator for nearly 40 years, Alan Newell, summed up Simon’s genius as turning on a conceptual pivot point; “The central idea is bounded rationality — there are limits on man as a decision maker and these limits, especially those of cognitive processing in all its varied forms, loom large in man’s behavior. Everything that Simon has done has stemmed from the working out of this idea.” (Newell, 1989, p.400).

Simon’s insight into the bounds of human rationality lead to a vast array of applications in areas where problem solving, decision making, and information processing operate. The following table (adapted from Newell, 1989, p. 436) indicates areas where Simon’s insight took him with great effect. The right column provides representative citations that make a good starting point to Simon’s work in that area.

<table>
<thead>
<tr>
<th>Herbert A. Simon’s Major Contributions by Area</th>
<th>Starting Point Citation</th>
</tr>
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<tbody>
<tr>
<td>Artificial Intelligence</td>
<td>Simon, 1963</td>
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<tr>
<td>Cognitive Psychology</td>
<td>See Table 2 below</td>
</tr>
<tr>
<td>Computer Science</td>
<td>Newell, Perlis, Simon, 1967</td>
</tr>
<tr>
<td>Design</td>
<td>Simon, 1967</td>
</tr>
<tr>
<td>Economics</td>
<td>Simon, 1979; Simon 1982</td>
</tr>
<tr>
<td>Econometrics</td>
<td>Ijiri, Simon, 1977</td>
</tr>
<tr>
<td>History of Science</td>
<td>Langley, Simon, Bradshaw, Zytkow, 1987</td>
</tr>
<tr>
<td>Operations Research and Management Science</td>
<td>Holt, Modigliani, Muth, Simon, 1960</td>
</tr>
<tr>
<td>Organization Theory</td>
<td>Simon, 1957</td>
</tr>
<tr>
<td>Philosophy and Foundations</td>
<td>Simon, 1947; Simon, Rescher, 1966</td>
</tr>
<tr>
<td>Philosophy of Science</td>
<td>Simon, 1970</td>
</tr>
<tr>
<td>Political Science</td>
<td>Simon, 1954</td>
</tr>
<tr>
<td>Public Administration</td>
<td>Simon, Smithburg, Thomsen, 1950</td>
</tr>
<tr>
<td>Social Psychology</td>
<td>Simon, Guetzkow, 1955</td>
</tr>
<tr>
<td>Statistics</td>
<td>Simon, 1955</td>
</tr>
<tr>
<td>Education</td>
<td>Simon, 1998; Simon, 2001</td>
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</tbody>
</table>

While not exhaustive of Simon’s breadth of influence, this table leaves me astonished that one person could understand and innovate so much. While it shows Simon a supreme intellect, there is another lesson to be learned from this cluster of accomplishments. According to Newell, Simon’s genius consisted in his ability to apply a rich idea (bounded rationality) to a wealth of topics. That this idea is so broadly applicable, supports the conclusion that these topics have common ground in the theory of problem solving and decision making. When we understand that human decisions are not the result of a closed rational system, but
are functions of processes that seek to compensate for limited information and processing power, then we are led to challenge the classic philosophical conception of the agent or aggregate of agents.

In economics, Simon contended that the theory of "economic man," which pictures the individual invariably choosing a course that s/he believes will maximize self-interest, fails to account for the inherent uncertainty of human action. This rational and self-interested agent is also the familiar character who populates modern moral theories. Economic and ethical theories must be revised in light of the limits that Simon posits to human rationality, and action must be recast in terms of the decision making processes that seek to compensate for those limits. This is equally true of organizational behavior, social psychology, political action, and scientific activity. By challenging the received picture of the human thinker/agent, Simon succeeds in shaking the foundations of many areas at once. At minimum, this exposes to us the shared assumptions that these varied areas of intellectual pursuit rest upon. That, alone, is an insight worthy of reflection.

Herbert Simon went far beyond the role of shaker and challenger. He focused much of his study on the specific processes of human cognition: the components of problem solving and decision making. In this work, cognitive science is born. Table 2 shows the range of information processes that Simon took under investigation and the dates of key publications from those investigations.

<table>
<thead>
<tr>
<th>Innovative Topics in Cognitive Science</th>
<th>Publication</th>
</tr>
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<tbody>
<tr>
<td>Theory of Bounded Rationality (e.g. adaptive systems, decomposable systems)</td>
<td>Simon, 1955</td>
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<tr>
<td>Problem Solving (e.g. search, word problems, protocol analysis)</td>
<td>Newell, Shaw, Simon, 1957</td>
</tr>
<tr>
<td>Symbol Systems (e.g. list processing, semantic nets)</td>
<td>Newell, Shaw, Simon, 1957</td>
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<tr>
<td>Learning (e.g. verbal)</td>
<td>Simon, Feigenbaum, 1964</td>
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<tr>
<td>Induction and Concept Formation (e.g. pattern recognition)</td>
<td>Simon, Kotovsky, 1963</td>
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<tr>
<td>Emotion</td>
<td>Simon, 1967</td>
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<tr>
<td>Chunking (e.g. size, rates)</td>
<td>Simon, 1974</td>
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<tr>
<td>Expertise (e.g. chess, physics)</td>
<td>Simon, Gilmartin, 1973</td>
</tr>
<tr>
<td>Task Acquisition (e.g. language, games)</td>
<td>Simon, Sidlessey, 1967</td>
</tr>
<tr>
<td>Scientific Discovery</td>
<td>Langley, Simon, Bradshaw, Zytkow, 1987</td>
</tr>
<tr>
<td>Representation (e.g. spatial reasoning, external memory)</td>
<td>Larkin, Simon, 1987</td>
</tr>
<tr>
<td>Political Science</td>
<td>Simon, 1954</td>
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<td>Public Administration</td>
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</tbody>
</table>

Newell regards this cluster of cognitive topics, and the recognition that they share common problems, as pointing the way to a unified theory of cognition. It is this unity of topic, Newell asserts, that Simon has long recognized and sought to clarify; “Thus Herb, with a serenity and prescience that some of the rest of us lack, has always seen the field whole — has seen it as the unfolding of a single central idea. It has allowed him to move from topic to topic within the area, always assured that the particular bit of the cathedral he happens to work on will add to the total structure — will help put it all together” (Newell, 1989).

If anything could be more striking than the prospect of a unified theory of cognition, it would be the prospect of applying awareness of our bounded rationality to the task of increasing human ability: i.e. education. Simon spent much of his work in the 1990’s and 2000’s on matters of education. Whereas issues of economics and organization (and perhaps ethics) are impacted by changes in decision theory, so too is education impacted by changes in our understanding of problem solving.

In a 1998 address to the Carnegie-Mellon Engineering College, Simon observed; “When we study the process of design, we discover that design is problem solving. If you have a basic theory of problem solving, then you are well on your way to a theory of design. This discovery came as no deep surprise to those of us who had been doing cognitive research on human thinking in other domains. Design is a special kind of problem solving… We are beginning to learn what kind of a problem solving process design is, and what its underlying principles are. If we want to teach design effectively, then we as teachers ought to know a good deal about its theory and about the empirical evidence that supports the theory. And these matters ought to enter into the construction of our courses and ought to enter into the construction of the instructional technology that we use in those courses.”

One of the powerful insights in seeing the design process as a type of problem solving is that there are limits on that process from the start; “Design is usually the kind of problem solving we call ill-structured. Unlike the Tower of Hanoi or even chess, you don't start off with a well-defined goal. Nor do you start off with a clear set of alternatives, or perhaps any alternatives at all. Goals and alternatives have to emerge through the design process itself: One of its first tasks is to clarify and elaborate goals and to begin to generate alternatives.” (Simon, 1998).

This insight may be applied to learning generally; i.e. learning and teaching are problem solving processes. As in design, the alternatives of teaching and learning are generated as the process proceeds. A realistic (i.e. effective) educational process involves an indeterminate starting point and an uncertain path to the end point. This insight runs counter to much of traditional and contemporary educational procedures that start and end with known factors. In many curricula, all of the relevant information is already present in the readings and lectures-to-be. The learning task is one of processing that information efficiently. We test for the acquisition of that knowledge by instruments in which all of the alternatives are available (e.g. multiple choice exams). Such practices run counter to Simon’s understanding of problem solving as a process conditioned by bounded rationality. Realistic education will accord to models based on the genuine dynamics of problem solving and decision making. It is essentially a creative process —
open ended and experiential. If uses of educational technology were based on such principles, we may hope for significant advances in education. Unfortunately, most applications of educational technology do not even come close. Thus, there is ample opportunity and need to develop the dimensions of Simon’s central idea. Philosophers would do well to take up that challenge.

CAP@CMU in August 2001 opened with a Herbert Simon memorial delivered by Jim Moor (Dartmouth College), Davin Lafon (MS, Carnegie Mellon), Richard Scheines (Carnegie Mellon), and Preston Covey (Carnegie Mellon). Throughout the talks, there ran a common thread of profound respect (“awe” might be more accurate) for Simon’s extensive knowledge and powerful intellect. In several instances, strong emotion gave proof to the humanity, compassion, and patience which Herbert Simon extended to his colleagues and students. The man was loved and is missed. An excellent memorial website is provided by Carnegie-Mellon at http://www.cs.cmu.edu/simon/memorial.html.

We all owe it to ourselves to process some of Herbert Simon’s information. Below is a selected bibliography which is a mere fraction of his oeuvre. A comprehensive bibliography is available at http://www.psy.cmu.edu/psy/faculty/hsimon/hsimon.html.

In his intellectual auto-biography, Models of My Life, Herbert Simon reflected on his (then) 68 years with the following:

“In describing my life, I have situated it in a labyrinth of paths that branch, in a castle of innumerable rooms. The life is in moving through that garden or castle, experiencing surprises along the path you follow, wondering (but not too solemnly) where the other paths would have led: a heuristic search for the solution of an ill-structured problem. It needs no summing up beyond the living of it.” (Simon, 1991, p.367).

Selected Bibliography