



The 2008 North American Conference on Computing and Philosophy

NA-CAP@IU 2008: The Limits of Computation



July 10th-12th

Indiana University, Bloomington



The 2008 North American Conference on Computing and Philosophy

Welcome Letter from the IACAP President

Dear Participants and Organisers of NACAP 2008,

As you know, Presidential welcoming messages have a robust tendency to be repetitive, and I would not wish to break with such a noble tradition, at least not entirely. So let me re-assert at least some of the things I had the opportunity to say in connection with our last Asian Pacific conference.

We know that the world is in need of good philosophers. We are the knowledge-workers who neither demonstrate nor test, but debate, evaluate and solve issues that are intrinsically open. Thus, we carefully and painstakingly build the conceptual tools and frames that enable others to make sense of the world and of life as it unfolds. The more democratic a world is, the more reasonable debates and exchanges of views become crucial, the more philosophy becomes pervasive. A bigger Athens needs more not fewer philosophers, who can collaborate with scientists and scholars to build a better future.

Now, as problem lovers and conceptual engineers, we are witnessing a very interesting time. Never before has humanity experienced so many and such radical changes and challenges, in so many contexts, in such a short time, and so often dependent on new digital technologies, which are themselves constantly evolving. It is a bubbling new reality in need of understanding. And for this very reason, it is not surprising to see our association increasingly growing and flourishing. We are at the centre of an ongoing digital revolution, and I do not need to remind you that the IACAP is at the forefront of the conceptual research in every subject involving Information and Communication Technology, Computing and Information-theoretic issues. It is hard to think of a more crucial area of philosophical investigation in our society, which we define, after all, as the information society.

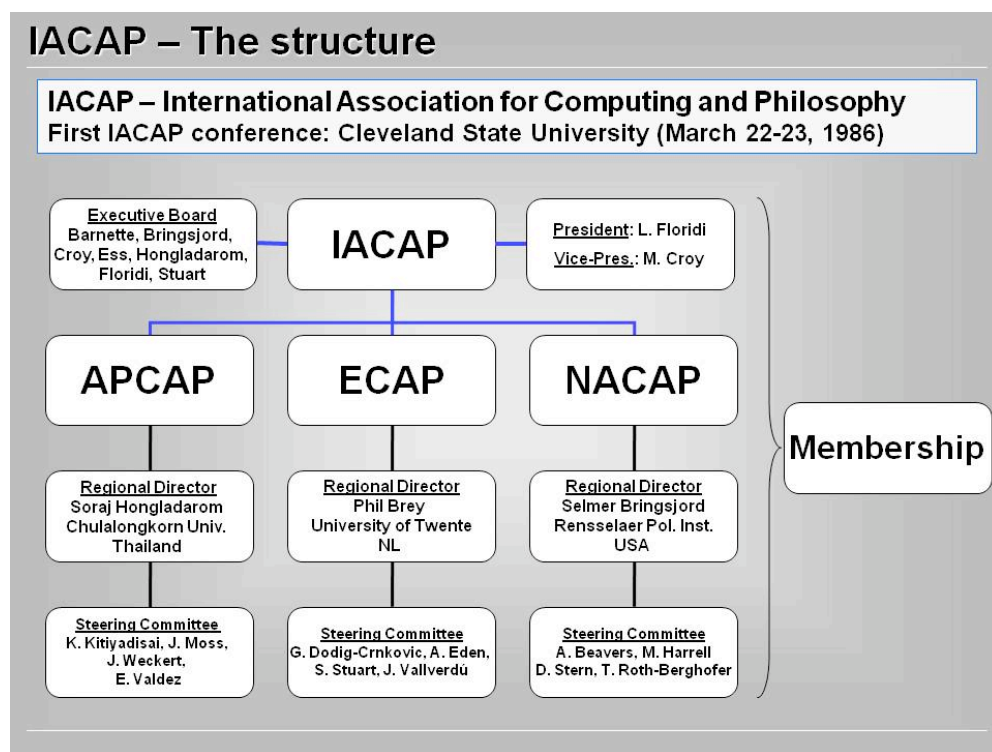
In recent years, the IACAP has moved from one successful meeting to another, expanding the scope of its topics of interest and attracting an increasing number of excellent scholars, scientists and philosophers. We now have three regions (Asian-Pacific, European and North American) and hope to create soon a fourth (Latin American). Each region has its own international meeting. Colleagues in China, India, Mexico and Japan are in the process of planning conferences under the auspices of the IACAP. ECAP 2008 has just been successfully hosted in France, and there are exciting plans for ECAP 2009 in Barcelona (2-4 July). A new agreement to transform the Society for Machines and Mentality (SFMM, <http://www.cs.hamilton.edu/~sfmm/>) into an IACAP Special Interest Group (SIG) is being discussed. If successful, the merger will bring a reinforced connection with the American

Philosophical Association (SFMM organises regular meeting at APA conferences), with Minds and Machines (the journal officially associated to SFMM), a larger membership and above all an increase in research and scholarship opportunities. There is simply so much interesting work going on. As in the case of APCAP 2007 and ECAP 2008, the remarkable program of this NACAP 2008 conference bears proof of this. The quality and scope of the papers being presented speaks for itself. And as you know, at any IACAP conference interdisciplinarity is not a buzz word but a fact taken for granted. Interaction between different areas of expertise and within a variety of disciplines is an enriching experience and one of the important ingredients of our success. I have never been to an IACAP conference where I did not meet interesting people from other fields, from whom I could learn so much.

Let me close here this message by wishing everybody a fruitful and pleasant conference. I hope you will enjoy the talks and take full advantage of the many opportunities for new contacts and interaction offered by the meeting in the following days. The organisers – and Prof. Colin Allen, Prof. Anthony Beavers and Prof. Selmer Bringsjord in particular – are to be congratulated for the successful effort to organise a splendid program. And I would like to extend to all the staff and the participants a very big thanks on behalf of the Association.

All my best wishes,

Luciano Floridi
IACAP President



Visit www.ia-cap.org to learn more about the IACAP.



The 2008 North American Conference on Computing and Philosophy

Acknowledgements

The IACAP wishes to acknowledge the help of the following people
and organizations who have worked to make this year's conference possible:

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Selmer Bringsjord
NACAP Regional Director

Tony Beavers
2008 NACAP Conference Chair

Colin Allen
2008 NACAP Conference Host

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Morality and Machines
Michael Anderson

Automatic Programming
Selmer Bringsjord & Konstantine
Arkoudas

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The 2008 North American Conference on Computing and Philosophy

The Conference at a Glance

Thursday, July 10th

- 2:00-4:00 Registration (Conference Lounge)
- 4:00-5:00 **IACAP Presidential Welcome and Address** (Oak Room)
 - "The Fourth Revolution"
 - Luciano Floridi, *University of Hertfordshire & University of Oxford*
- 5:00-7:00 **IU Showcase Session** (Oak Room)
- 9:00 **After-dinner Rendezvous** (The Crazy Horse Food and Drink Emporium)

Friday, July 11th

- 8:15-9:00 **Continental Breakfast** (Conference Lounge)
- 9:00-10:00 **Douglas C. Engelbart Keynote Address** (Oak Room)
 - "Ethics and Lethality in Autonomous Robots"
 - Ronald Arkin, *Georgia Tech*
- 10:00-10:15 **Break** (Conference Lounge)
- 10:15-12:15 **Special Panel Session on Morality and Machines** (Oak Room)
- 12:15-2:00 **Lunch**
- 2:00-4:00 **Concurrent Sessions**
 - 1a **Computer and Machine Ethics** (Oak Room)
 - 1b **Cognitive Science / Philosophy of Mind** (Walnut Room)
- 4:00-4:15 **Break** (Conference Lounge)
- 4:15-6:15 **Concurrent Sessions**
 - 2a **Artificial Intelligence / Artificial Life / Robotics** (Oak Room)
 - 2b **Reality, Virtual and Otherwise** (Walnut Room)
- 6:20-7:00 **Goldberg Award Presentation** (Oak Room)
 - "A Process Interpretation of Agent-Based Simulation and Its Epistemological Implications"
 - Chih-Chun Chen, *University College London*

7:30 **Banquet** (State Room East)

Saturday, July 12th

8:15-9:00 **Continental Breakfast** (Conference Lounge)

9:00-10:00 **Herbert A. Simon Keynote Address** (Oak Room)

"Can Computers Understand Causality?"
Paul Thagard, *University of Waterloo*

10:00-10:15 **Break** (Conference Lounge)

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3b **Artificial Intelligence / Artificial Life / Robotics** (Walnut Room)

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4:15-6:15 **Concurrent Sessions**

4a **Formal / Computational Issues** (Oak Room)

4b **Computer and Machine Ethics** (Walnut Room)

6:20-6:45 **Conference Evaluation Session and Closing Comments from the NACAP Regional Director** (Oak Room)

8:30 **Post-conference Party** (Allen Residence)



The 2008 North American Conference on Computing and Philosophy

Detailed Program

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Chair: Colin Allen, *Indiana University*
- "Process Models of Scientific Structure and Evolution"
Katy Börner, *Information Visualization Lab, School of Library and Information Sciences*
- "ETHOS: Ethical Technologies in the Homes of Seniors"
Kalpana Shankar and Oliver McGraw, *School of Informatics*
- "Modeling the Static and Dynamic Aspects of Information."
J. Michael Dunn, *Departments of Computer Science, Informatics, and Philosophy*
- "Seqsee: A Cognitive Architecture for Sequence Perception"
Abhijit Mahabal (presenter) and Douglas Hofstadter, *Center for Research on Creative Cognition*
- "Computing & Dynamics: Two Alternative Frameworks for Describing Mental Mechanisms?"
Carlos Zednik, *Cognitive Science Program*
- "The World Is Not Flat: How InPhO Manages Different Levels of Philosophical Expertise"
Cameron Buckner, Mathias Niepert, Colin Allen, *Departments. of Philosophy, Computer Science, and the Cognitive Science Program*
- 9:00 **After-dinner Rendezvous** (The Crazy Horse Food and Drink Emporium - 214 W. Kirkwood Avenue - <http://www.crazyhorseindiana.com/>)

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Ronald Arkin, *Georgia Tech*
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10:15-12:15 **Special Panel Session on Morality and Machines** (Oak Room)

Chair: Michael Anderson, *University of Hartford*

"Is Ethics Computable?"

Colin Allen, *Indiana University*

Ronald Arkin, *Georgia Tech*

Susan Anderson, *University of Connecticut*

Marcello Guarini, *University of Windsor, Canada*

James Moor, *Dartmouth College*

Tom Powers, *University of Delaware*

John Sullins, *Sonoma State University*

12:15-2:00 **Lunch**

The long lunch period today and tomorrow is to allow conferees to take advantage of the fine restaurants in close proximity of the conference venue. See the restaurant guide included in this manual.

2:00-4:00 **Concurrent Sessions**

1a **Computer and Machine Ethics** (Oak Room)

Chair: Selmer Bringsjord, *Rensselaer Polytechnic Institute*

"Robot Autonomy: Some Ensuing Ethical Questions"

Matthias Scheutz, *Indiana University*

Charles Crowell, *University of Notre Dame*

- Commentator: Jean-Gabriel Ganascia, *University Pierre and Marie Curie, Paris*

"Towards Trustworthy Intelligent Robots: A Pragmatic Approach to Moral Responsibility"

Gordana Dodig-Crnkovic, *Mälardalen University, Västerås*

Daniel Persson, *Mälardalen University, Västerås*

- Commentator: Evaristus O Ekwueme, *Boston College*

"Tele-Robotic Interfaces and the Ethics of War"

Peter Asaro, *Rutgers University*

- Commentator: Mara Harrell, *Carnegie Mellon University*

1b **Cognitive Science / Philosophy of Mind** (Walnut Room)

Chair: Vincent C. Müller, *American College of Thessaloniki*

"Computational Theories of Mind and Fodor's Analysis of Neural Network Behaviour"

Marcello Guarini, *University of Windsor, Canada*

- Commentator: Cameron Buckner, *Indiana University*

"Computing vs. Cognition: Three Dimensional Differences"

James Fetzer, *University of Minnesota, Duluth*

- Commentator: Maxim Lebedev, *Moscow State Medical University*

"Computational Functionalism, Phenomenology, and Externalism"

Darren Abramson, *Dalhousie University*

- Commentator: Jonathan Waskan, *University of Illinois at Urbana-Champaign*

4:00-4:15 **Break** (Conference Lounge - Refreshments Available)

4:15-6:15 **Concurrent Sessions**

2a **Artificial Intelligence / Artificial Life / Robotics** (Oak Room)

Chair: Ron Barnette, *Valdosta State University*

"From Homeostasis to Allostasis: A Paradigm Shift in AI"

Ioan Muntean, *University of California, San Diego*

"Knowing, Doing, and Talking: The Inherent Tension in Artificial Intelligence"

Hamid Ekbia, *Indiana University*

"Through an Event Log, Darkly"
Keith Douglas, *Statistics Canada*

"Behavior-based Hints for Propositional Proof Construction"
Marvin Croy, *University of North Carolina, Charlotte*
Tiffany Barnes, *University of North Carolina, Charlotte*
John Stamper, *University of North Carolina, Charlotte*
Dana Level, *University of North Carolina, Charlotte*

2b **Reality, Virtual and Otherwise** (Walnut Room)
Chair: Marcello Guarini, *University of Windsor, Canada*

"The Reductionist Blind Spot: Downward Reduction and Upward Conceptualization"
Russ Abbott, *California State University, Los Angeles*
- Commentator: Kari Theurer, *Indiana University*

"The Tocqueville Lens: Informing the Design of the New Township"
Christian Briggs, *Indiana University*
- Commentator: Evaristus O Ekwueme, *Boston College*

"Computational Reason, The Turing Test and the Problems of Definition of Virtual Reality Environments"
Olga Antonova, *St. Petersburg State University*
Sergei Soloviev, *Universite Paul Sabatier, France*
- Commentator: Tad Bratkowski, *Southern Illinois University, Carbondale*

6:20-7:00 **Goldberg Award Presentation** (Oak Room) - *Sponsored by the Department of Philosophy at Carnegie Mellon University*
Chair: Mara Harrell, *Carnegie Mellon University*

"A Process Interpretation of Agent-Based Simulation and Its Epistemological Implications"
Chih-Chun Chen, *University College London*

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Paul Thagard, *University of Waterloo*

10:00-10:15 **Break** (Conference Lounge - Refreshments Available)

10:15-12:15 **Special Session on Automatic Programming and Human Creativity** (Oak Room) -
Sponsored by the National Science Foundation
Chairs: Selmer Bringsjord, *Rensselaer Polytechnic Institute* & Konstantine Arkoudas, *Rensselaer Polytechnic Institute*

"The History (and Remarkable Difficulty) of Attempts to Build Computer Programs That Automatically Build Computer Programs"
Konstantine Arkoudas, *Rensselaer Polytechnic Institute*
Selmer Bringsjord, *Rensselaer Polytechnic Institute*

"Toward Complex Automatic Programming"
Richard Liston, *Ursinus College*

"Creativity vs Classical Computation"
Eric Nichols, *Center for Research on Concepts and Cognition, Indiana University*
Alexandre Linhares, *Getulio Vargas Foundation*

"An Initial Framework for Studying Human and Machine Programming"
 Selmer Bringsjord, *Rensselaer Polytechnic Institute*
 Jinrong Li, *Rensselaer Polytechnic Institute*

12:15-2:00 **Lunch**

2:00-4:00 **Concurrent Sessions**

3a **Cognitive Science / Philosophy of Mind** (Oak Room)
 Chair: Mara Harrell, *Carnegie Mellon University*

"Intrinsic Computational Models and the Experience of Physical Properties"
 Jonathan Waskan, *University of Illinois at Urbana-Champaign*
 - Commentator: Peter Asaro, *Rutgers University*

"Embodiment and Non-Turing Computation"
 Bruce MacLennan, *University of Tennessee, Knoxville*
 - Commentator: Matthias Scheutz, *Indiana University*

"The Organization of Meaning in Memory: Evaluating Computational Mechanisms"
 Brendan Johns, *Indiana University*
 Michael Jones, *Indiana University*
 - Commentator: Trent Kriete, *University of California, Merced*

3b **Artificial Intelligence / Artificial Life / Robotics** (Walnut Room)
 Chair: Ron Barnette, *Valdosta State University*

"The Problem of Original Agency"
 Don Berkich, *Texas A&M University, Corpus Christi*
 - Commentator: Tom Powers, *University of Delaware*

"Conceptual Mapping and Other Models of Artificial Creativity"
 Jean-Gabriel Ganascia, *University Pierre and Marie Curie, Paris*
 - Commentator: Martin Frické, *University of Arizona*

"Is Life Computable?"
 Anthony Chemo, *Franklin and Marshall College*
 Michael Turvey, *University of Connecticut / Haskins Lab*
 - Commentator: Darren Abramson, *Dalhousie University*

4:00-4:15 **Break** (Conference Lounge - Refreshments Available)

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 Chair: Gordana Dodig-Crnkovic, *Mälardalen University, Västerås*

"Machine Models for the Arithmetical and Analytical Hierarchies"
 Daniel Leivant, *Indiana University*

"The Limits of Abstraction: Software and Science"
 James Overton, *University of Western Ontario*

"Recurrent Misconceptions of Computation"
 Matthias Scheutz, *Indiana University*

"Non-Mechanical Computing and Non-Computational Mechanics"
 Vincent C. Müller, *American College of Thessaloniki*

4b **Computer and Machine Ethics** (Walnut Room)
 Chair: Mara Harrell, *Carnegie Mellon University*

"Why Ethics is a High Hurdle for AI"
 Drew McDermott, *Yale University*
 - Commentator: Wendell Wallach, *Yale Interdisciplinary Center for Bioethics*

"Ethical Responsibility in Software Engineering: From Codes of Conduct to Ethical Design"

Matteo Turilli, *University of Oxford*

- Commentator: Tad Bratkowski, *Southern Illinois University, Carbondale*

"From Trust to E-Trust: Old Theories and New Problems"

Mariarosaria Taddeo, *University of Padua*

- Commentator: Iryna Lytvyncuk, *Taurida National V.I. Vernadsky University*

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Selmer Bringsjord

Rensselaer Polytechnic Institute

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"The Fourth Revolution"

Luciano Floridi, *University of Hertfordshire & University of Oxford*

In this presentation, I shall argue that recent technological transformations in the life-cycle of information have brought about a fourth revolution, in the long process of reassessing humanity's fundamental nature and role in the universe. We are not immobile, at the centre of the universe (Copernicus); we are not unnaturally distinct and different from the rest of the animal world (Darwin); and we are far from being entirely transparent to ourselves (Freud). We are now slowly accepting the idea that we might be informational organisms among many agents (Turing), *inforgs* not so dramatically different from clever, engineered artefacts, but sharing with them a global environment that is ultimately made of information, the *infosphere*. This new conceptual revolution is humbling, but also exciting. For in view of this important evolution in our self understanding, and given the sort of IT-mediated interactions that humans will increasingly enjoy with other agents, whether natural or synthetic, we have the unique opportunity of developing a new ecological approach to the whole of reality.

5:00-7:00 **IU Showcase Session** (Oak Room)
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"Process Models of Scientific Structure and Evolution"

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Introduction by Wendell Wallach, *Yale Interdisciplinary Center for Bioethics*

"Ethics and Lethality in Autonomous Robots"
Ronald Arkin, *Georgia Tech*

Weaponized robotic systems are being introduced into the battlefield at an ever increasing pace. The consequences of this technological progress need to be examined carefully. In this talk, I outline the philosophical basis, motivation, theory, and design recommendations for the implementation of an ethical control and reasoning system potentially suitable for constraining lethal actions in an autonomous robotic system so that they fall within the bounds prescribed by the Laws of War and Rules of Engagement. It is a further contention that an autonomous robot capable of lethal force can ultimately be more humane in the battlefield than human soldiers.

Robot architectural design recommendations are presented for (1) post facto suppression of unethical behavior, (2) behavioral design that incorporates ethical constraints from the onset, (3) the use of affective functions as an adaptive component in the event of unethical action, and (4) a mechanism in support of identifying and advising operators regarding their ultimate responsibility for the deployment of such a system.

This research is supported under a grant from the Army Research Office.

10:00-10:15 **Break** (Conference Lounge - Refreshments Available)

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"Robot Autonomy: Some Ensuing Ethical Questions"
Matthias Scheutz, *Indiana University*
Charles Crowell, *University of Notre Dame*
- Commentator: Jean-Gabriel Ganascia, *University Pierre and Marie Curie, Paris*

Progress in robot technology has led to the production of affordable autonomous service robots that are entering people's homes. For humans, however, autonomy is an important component of agency, hence it is important to determine to what extent humans perceive robots as autonomous and accept their autonomy. In this paper, we point to important differences between industrial and service robots and review different notions of robot autonomy. We then summarize our work on studying human perceptions of robot autonomy in human-robot interaction experiments and list a set of ethical questions that result from these investigations, concluding that help from philosophy will be required to sort out the impending ethical difficulties that are already arising from the dissemination of autonomous machines into our societies.

"Towards Trustworthy Intelligent Robots: A Pragmatic Approach to Moral Responsibility"

Gordana Dodig-Crnkovic, *Mälardalen University, Västerås*

Daniel Persson, *Mälardalen University, Västerås*

- Commentator: Evaristus O Ekwueme, *Boston College*

Today's robots are used mainly as advanced tools and do not have any capability of taking moral responsibility. However, autonomous, learning intelligent systems are developing rapidly, resulting in a new division of tasks between humans and robots. The biggest worry about autonomous intelligent systems seems to be the fear of human loss of control and robots running amok. We argue that for all practical purposes, moral responsibility in autonomous intelligent systems is best handled as a regulatory mechanism, with the aim to assure a desirable behavior. "Responsibility" can thus be ascribed an intelligent artifact in much the same way as (artificial) "intelligence". We simply expect a (morally) responsible artificial intelligent agent to behave in a way that is traditionally thought to require human (moral) responsibility. Technological artifacts are always a part of a broader socio-technological system with distributed responsibilities. The development of autonomous learning morally responsible intelligent systems must consequently rely on several responsibility feedback loops; the awareness and preparedness for handling risks on the side of designers, producers, implementers, users and maintenance personnel as well as the support of the society at large which will provide a feedback on the consequences of the use of robots, back to designers and producers. This complex system of shared responsibilities should secure safe functioning of the distributed responsibility systems including autonomous (morally) responsible intelligent robots (softbots).

"Tele-Robotic Interfaces and the Ethics of War"

Peter Asaro, *Rutgers University*

- Commentator: Mara Harrell, *Carnegie Mellon University*

Robotic systems are symbolic of the socio-technical processes of automation, as well as being concrete examples of the embodied materiality of digital communication and control technologies. While not truly autonomous, robotics confront us with their agency through both their material performances and the difficulty inherent in controlling them at a distance through programs and interfaces. In this talk, I review some recent trends in the design of visual and tactile interfaces for military robotics, and their relation to military video game interfaces. This includes a consideration of the longer historical trajectories that have led to these recent developments. My research points on the one hand to a rapid convergence of technologies, and on the other hand to various material, psychological and social resistances to their development. I also consider how military robotics are reshaping traditional conceptions and social meanings of warfare and its morality. I argue that we can look to military robotics as a site of cultural transformation, in which society and technology are mutually reshaping one another. We can also see robotics more generally as a site for researching the interfaces between social practices and new technologies, cultural representations and material performances, and human bodies and machines.

1b **Cognitive Science / Philosophy of Mind** (Walnut Room)

Chair: Vincent C. Müller, *American College of Thessaloniki*

"Computational Theories of Mind and Fodor's Analysis of Neural Network Behaviour"

Marcello Guarini, *University of Windsor, Canada*

- Commentator: Cameron Buckner, *Indiana University*

The purpose of this paper is to critically examine Jerry Fodor's views of the limits of computational neural network approaches to understanding intelligence. Fodor distinguishes between two different approaches to computationally modelling intelligence, and while he raises problems with both, he is more concerned with the approach taken by those who make use of neural network models of intelligence or cognition. Fodor's claims regarding neural networks are found wanting, and the implications of these shortcomings for computational modelling of cognition are discussed.

"Computing vs. Cognition: Three Dimensional Differences"

James Fetzer, *University of Minnesota, Duluth*

- Commentator: Maxim Lebedev, *Moscow State Medical University*

The computational conception of language and mentality appears to have arisen from the virtually irresistible temptation to exploit the properties of formal systems as a framework for understanding thinking things. There appear to be at least three dimensions with respect to which classic von Neumann digital machines are incapable of instantiating the properties of thinking things, two of which I have emphasized in the past, namely: (1) the static difference, which arises because minds are sign-using (or "semiotic") systems, for which things stand for other things for those systems, which is not the case for digital machines; and (2) the dynamic difference, which arises because computers are typically governed by programs that implement algorithms, while human thought processes are not. Examples of the same kind that exemplify the dynamic difference, however, also illustrate (3) the affective difference, which arises because, while programs tend to be constructed based upon logical relations involving intensions and extensions by those who design them, human thought transitions are strongly affected by connotations and denotations. Intensions and extensions, as objective properties of language frameworks, are constant for every user of the same language. But connotations and denotations, as subjective properties of language users, vary from person to person and from time to time. While computers can simulate emotions and attitudes, that is not the same thing as actually possessing them, which is another difference between them. While it is possible to simulate thought processes using digital machines, that does not turn digital machines into thinking things.

"Computational Functionalism, Phenomenology, and Externalism"

Darren Abramson, *Dalhousie University*

- Commentator: Jonathan Waskan, *University of Illinois at Urbana-Champaign*

In this paper, I argue that three philosophical theses cannot be jointly held, despite intuitive appeal and adoption inside and outside of philosophical circles. In doing so, I introduce what I believe to be a superior argument in favour of externalism for phenomenological content than those on offer. In short, the three theses are: qualitative states supervene on computational functional states; qualitative states supervene on local physical states; and, some objects compute, and others do not. First, I give short arguments in favour of each of these statements, and show that two of them follow from computational functionalism as a theory of mind. Then I outline what I take to be the strongest theory that account for the third of these theses. After deriving a contradiction, I explore ways to resolve it, and suggest that the least undesirable involves denying the second of these theses. In doing so, I introduce a novel argument for the claim that phenomenological states involve relations to objects outside of occurrent physical states. I claim that this argument is novel in two ways: it is stronger than the conventional representational argument given for this conclusion, and it depends essentially on a computational view of mind, widely regarded as an independent issue.

4:00-4:15 **Break** (Conference Lounge - Refreshments Available)

4:15-6:15 **Concurrent Sessions**

2a **Artificial Intelligence / Artificial Life / Robotics** (Oak Room)

Chair: Ron Barnette, *Valdosta State University*

"From Homeostasis to Allostasis: A Paradigm Shift in AI"

Ioan Muntean, *University of California, San Diego*

In this paper I raise a question about the computability of allostatic models in direct relation to the computability of homeostatic models in robotics. According to the biomimetic strategies currently used in robotics, a good suggestion would be to follow the generalization of homeostasis to allostasis. I propose to discuss this second strategy because I believe that invoking models of allostatic mechanisms would contribute to the understanding of how to enhance autonomy in artificial systems. I will revise the main issues related to allostasis and I will conclude the paper by suggesting some difficulties inherent to this strategy.

"Knowing, Doing, and Talking: The Inherent Tension in Artificial Intelligence"

Hamid Ekbia, *Indiana University*

Research and practice of Artificial Intelligence has advanced many areas that are intellectually compelling and holds great promise for advances in science, engineering, and practical systems. After the 1980s, however, the field has often struggled to deliver widely on these promises. Philosophical critiques of AI tend to attribute these shortcomings to the alleged limits of computing. This paper provides an alternative explanation in terms of an inherent tension in AI due to its multiple practices of knowing, building, and talking. Characterizing these as, respectively, scientific, engineering, and discursive practices, the paper provides illustrative examples in various approaches in the field, and proposes a research approach that can ameliorate the tension.

"Through an Event Log, Darkly"

Keith Douglas, *Statistics Canada*

In this paper I discuss how computer virtualization technologies (e.g. VMWare) provoke metaphysical and epistemological problems (e.g. a version of the experimenter's regress) similar to but not identical to familiar philosophical concerns. A sketch at resolution of one is proposed; the others are suggested as interesting open research problems in the area of potential limitations of computing.

"Behavior-based Hints for Propositional Proof Construction"

Marvin Croy, *University of North Carolina, Charlotte*

Tiffany Barnes, *University of North Carolina, Charlotte*

John Stamper, *University of North Carolina, Charlotte*

Dana Levie, *University of North Carolina, Charlotte*

This demonstration will exhibit a mechanism for providing hints for solving proof problems in propositional logic with an inference/replacement rule set. Hints are supplied within a java-implemented environment that supports proof construction in a graphic mode. This proof checking program functions as one component of an instructional environment that collects data on various aspects of student performance. Data related to hint-giving will be discussed for the purpose of (1) exploring the difference between a Markov Decision Process approach and other approaches (the traditional production rule method and the example-based method) to generating hints, and (2) addressing a number of questions concerning the process of effectively supplying students with hints as a means of facilitating learning. These questions include: characteristics of the hints themselves (level of detail, working forwards versus working backwards), the delivery of hints (when and how often), and characteristics of students (determined by performance on pre-test and related logic exercises).

2b **Reality, Virtual and Otherwise** (Walnut Room)

Chair: Marcello Guarini, *University of Windsor, Canada*

"The Reductionist Blind Spot: Downward Reduction and Upward Conceptualization"

Russ Abbott, *California State University, Los Angeles*

- Commentator: Kari Theurer, *Indiana University*

Can there be higher level laws of nature even though everything is reducible to the fundamental laws of physics? The computer science notion of level of abstraction explains how there can be.

"The Tocqueville Lens: Informing the Design of the New Township"

Christian Briggs, *Indiana University*

- Commentator: Evaristus O Ekwueme, *Boston College*

Since the advent of the public internet in the 1990's, the golden promise of a digitally-enhanced democracy has loomed large for many different stakeholders in American democracy. During the first wave of the internet at the beginning of the 1990's, online media was thought to be a faster, more widely-available version of the newspaper, which, according to Tocqueville, was integral to 1830's American Democracy. Currently online media is thought to be a novel means by which practical civic and political engagement (Klein) and e-Democracy can be created through the concept of Social Capital (Putnam). In this paper, I argue that, truer to Tocqueville's ideas of the strength of the New England Town meeting, current forms of collaborative online media, more than merely enabling practical civic and political engagement, are also serving, as the 1830's Township did for its constituents, as a formative environment where local citizens gain and learn what they need to in order to then become effective national citizens. With 67 percent of the U.S. population now online, and with many of them participating in collaborative online environments (Pew, 2008), the philosophical commitments of the designers of these media must therefore be informed from not only a traditional design perspective, but also a socio-political one as well. In this paper, I offer a simplified version of Tocqueville's account of the strength of the New England Township as a lens through which designers of online communities can start to inform design theory and practice.

"Computational Reason, The Turing Test and the Problems of Definition of Virtual Reality Environments"

Olga Antonova, *St.Petersburg State University*

Sergei Soloviev, *Universite Paul Sabatier, France*

- Commentator: Tad Bratkowski, *Southern Illinois University, Carbondale*

We begin with an analysis of certain fundamental limitations to the quality of virtual reality environments due to the difficulties of real-time computation and "computational asymmetry" related to interactivity. We consider also difficulty of representation of certain physical phenomena in virtual reality, for example acceleration and weightlessness. Afterwards we consider the role of restrictions concerning the communication channels and other implicit assumptions in the famous Turing Test. This leads us to the definitions of a virtual object, a virtual situation and virtual reality that take into account the inevitable limitations of the quality of various types of sensorial input in virtual environments and are based on further development of the ideas of Alan Turing.

6:20-7:00 **Goldberg Award Presentation** (Oak Room) - *Sponsored by the Department of Philosophy at Carnegie Mellon University*

Chair: Mara Harrell, *Carnegie Mellon University*

"A Process Interpretation of Agent-Based Simulation and Its Epistemological Implications"

Chih-Chun Chen, *University College London*

This presentation introduces a formal theory for relating multi-level processes in agent-based simulations and discusses the epistemological implications that follow from this theory.

The formalism has two important properties. Firstly, processes at any representable level of abstraction and scale can be formally characterised. Secondly, processes are defined by their source (agents executing rules) as

well as their state transitions (the outcome of rule executions). Relations between processes can also be defined to model different (weak/epistemological) emergence-related phenomena. More practically, the formalism gives us a means of formulating and testing multi-level hypotheses computationally.

The theory allows us to re-characterise simulations as distinct processes with particular features (themselves processes) while an agent-based model defines a finite set of possible epistemologically unique simulations (processes). Furthermore, for a set of agent-based simulations, it is theoretically possible to define the set of possible hypotheses that can be formulated by enumerating all the processes at all representable levels of abstraction and their possible relations with each other. This would allow us to define the epistemological limit of any agent-based model.

7:30 **Banquet** (State Room East)

Saturday, July 12th

8:15-9:00 **Continental Breakfast** (Conference Lounge)

9:00-10:00 **Herbert A. Simon Keynote Address** (Oak Room)
Introduction by Colin Allen, *Indiana University*

"Can Computers Understand Causality?"
Paul Thagard, *University of Waterloo*

Causal reasoning is a crucial part of human intelligence, in areas as diverse as science, medicine, and law. Computer programs for various kinds of causal reasoning are already available, for example, Bayesian networks. But current computers lack an understanding of causality as manipulation and intervention. Using a neurocomputational account of how sensorimotor schemas underlie human causal thinking, I will consider how future computers might understand causality.

10:00-10:15 **Break** (Conference Lounge - Refreshments Available)

10:15-12:15 **Special Session on Automatic Programming and Human Creativity** (Oak Room) -
Sponsored by the National Science Foundation
Chairs: Selmer Bringsjord, *Rensselaer Polytechnic Institute* & Konstantine Arkoudas, *Rensselaer Polytechnic Institute*

"The History (and Remarkable Difficulty) of Attempts to Build Computer Programs That Automatically Build Computer Programs"
Konstantine Arkoudas, *Rensselaer Polytechnic Institute*
Selmer Bringsjord, *Rensselaer Polytechnic Institute*

Automatic programming has been a holy grail of AI since the very beginning of the field. We will survey the most prominent attempts to get computers to program themselves, starting more than forty years ago and ending with a review of the current state of the art and a forward look at future prospects. We will examine both deductive and inductive techniques, although we will focus on the latter, and particularly on techniques based on analogical reasoning. We will also discuss the contributions of cognitive science to automatic programming, reviewing the literature on the psychology of computer programming and assessing the impact that empirical results have had in steering AI research.

"Toward Complex Automatic Programming"
Richard Liston, *Ursinus College*

Where are the limits of automatic programming? If a fixed limit exists—a universal constant akin to the speed of light—how might it be approached? Will automatic programming surpass the limits of human capability? The answer to these questions have profound implications. In this paper we describe a small step towards an argument that automatic programming that exhibits a level of

creativity surpassing current human cognition may be possible to achieve, and suggest some of the essential components that such a system must possess. Our work on automatic programming leverages some of our prior investigations of learning and conjecture, two key components of human creativity.

"Creativity vs Classical Computation"

Eric Nichols, *Center for Research on Concepts and Cognition, Indiana University*
 Alexandre Linhares, *Getulio Vargas Foundation*

Humans tend to repeat behavior that is deemed pleasurable, and inhibit behavior deemed painful or unpleasurable. Computer algorithms, and specifically cognitive models, on the other hand, rarely incorporate this type of hedonic feedback to regulate behavior. For instance, programs such as Copycat and SeqSee, based on the Fluid Concepts Architecture (FCA), while stochastic in nature, may go through undesirable processes multiple times, continuously falling into "loops" of unproductive behavior. Based on this observation, we have been experimenting with an extension to FCA, where hedonic feedback systems cause the model to learn to recreate behaviors leading to positive conditions while avoiding painful situations.

Specifically, feedback influences the probabilities for individual bits of code ("codelets") to run, and encourages specific useful sequences of codelets to occur as a larger-scale unit. This aggregation of codelets into larger chunks effectively provides a way to perform automatic programming (AP) in a Fluid Concepts system: programming using FCA simply involves defining domain knowledge and some domain-specific codelets. Creative AP solutions result from the aggregation process. Preliminary results in the domain of automatically sorting a list of numbers are encouraging.

"An Initial Framework for Studying Human and Machine Programming"

Selmer Bringsjord, *Rensselaer Polytechnic Institute*
 Jinrong Li, *Rensselaer Polytechnic Institute*

We introduce a simple but surprisingly fertile framework for studying creativity in human and machine programming. Our framework requires novice programmers to negotiate simple programming challenges. The idea is to build a machine able to emulate the creativity leveraged by these human programmers, and to thereby shed light on how the study of human creativity can pay dividends for the problem of automatic programming.

12:15-2:00 **Lunch**

2:00-4:00 **Concurrent Sessions**

3a **Cognitive Science / Philosophy of Mind** (Oak Room)
 Chair: Mara Harrell, *Carnegie Mellon University*

"Intrinsic Computational Models and the Experience of Physical Properties"

Jonathan Waskan, *University of Illinois at Urbana-Champaign*
 - Commentator: Peter Asaro, *Rutgers University*

Certain computational systems harbor and manipulate intrinsic computational models (InCoMs), which are non-sentential representations of objects that are like scale models and unlike paradigmatic sentence-and-rule-based representations in several important respects (e.g., the extent to which they are immune to the frame problem). The existence of InCoMs provides proponents of the computational theory of mind (CTM) with a much-needed strategy for coping with the simple phenomenological fact that the world does not appear to us in the guise of sentences and inference rules. This fact has driven some proponents of the CTM to embrace an externalism about conscious experience according to which the character of our experiences of objects is produced *entirely* by external goings-on. Others proponents of the CTM claim that our experiences of objects somehow derive their qualitative character from the functional role played by sentential representations of those objects in a larger system of rules and representations. An appeal to InCoMs enables proponents of the CTM to maintain instead that our experiences of (at least) the spatial,

kinematic, and dynamic properties of objects derive their character *entirely* from our representations of those objects.

“Embodiment and Non-Turing Computation”

Bruce MacLennan, *University of Tennessee, Knoxville*

- Commentator: Matthias Scheutz, *Indiana University*

Post-Moore's Law computing will require an assimilation between computational processes and their physical realizations, both to achieve greater speeds and densities and to allow computational processes to assemble and control matter at the nanoscale. Therefore, we need to investigate "embodied computing," which addresses the essential interrelationships of information processing and physical processes in the system and its environment in ways that are parallel to those in the theory of embodied cognition. We address both the challenges and opportunities of embodied computation. Analysis is more difficult because physical effects must be included, but information processing may be simplified by dispensing with explicit representations and allowing massively parallel physical processes to perform computations. Nevertheless, in order to fully exploit embodied computation, we need robust and powerful theoretical tools, but we argue that the theory of Church-Turing computation is not suitable for the task.

“The Organization of Meaning in Memory: Evaluating Computational Mechanisms”

Brendan Johns, *Indiana University*

Michael Jones, *Indiana University*

- Commentator: Trent Kriete, *University of California, Merced*

What sources of statistical information do humans leverage to organize the mental lexicon? Classic accounts of learning based on repetition have recently been challenged by rational theories of “likely need” for memory organization from environmental structure. We evaluate both theories using a large corpus-based analysis, by subsequently building and testing computational cognitive models of memory organization, and by quantitatively fitting the models to data from humans in memory tasks. Our results are most consistent with rational theories, but we find clear evidence that contextual uniqueness during learning is an extremely important factor that humans capitalize on to optimally organize memory. The model with the closest correspondence to the human data relies on a mechanism that shifts attentional weight in a learning context depending on how unique the context is for a word relative to memory for previous contexts in which the word has been experienced. Hence, memory organization cannot be accurately modeled with document retrieval algorithms but, rather, requires a dynamic update mechanism that is based both on the current structure of the environment and the current structure of memory. Although this model gives the closest approximation to human data there is much residual variance; thus, we end with a discussion of the limits of co-occurrence learning mechanisms and rational accounts.

3b **Artificial Intelligence / Artificial Life / Robotics** (Walnut Room)

Chair: Ron Barnette, *Valdosta State University*

“The Problem of Original Agency”

Don Berkich, *Texas A&M University, Corpus Christi*

- Commentator: Tom Powers, *University of Delaware*

The Problem of Original Intentionality--wherein computational states have at most derived intentionality, but intelligence presupposes original intentionality--has been disputed at some length in the philosophical literature by Searle, Dennett, Dretske, Block, and many others. Largely absent from these discussions is the Problem of Original Agency: Independent of any putative solution to the problem of original intentionality, robots and the computational states upon which they depend have at most derived agency. That is, a robot's agency is wholly inherited from its designer's original agency. Yet intelligence presupposes original agency at least as much as it does original intentionality. In this talk I set out the problem of original agency, distinguish it from the problem of original intentionality, and argue that the problem of original agency places as much of a limit on computational models

of cognition and is thus at least as vexing as the problem of original intentionality. I close by arguing that in one respect at least, the problem of original agency is more difficult than the problem of original intentionality inasmuch a Dennett-like move to instrumental attributions of agency is foiled by the fact that neither unpredictable nor reasonable behavior signals original agency.

“Conceptual Mapping and Other Models of Artificial Creativity”

Jean-Gabriel Ganascia, *University Pierre and Marie Curie, Paris*

- Commentator: Martin Frické, *University of Arizona*

During the last fifty years, many attempts have been made to build creative machines. For instance, there are story telling machines, automatic music composers, painting machines etc. However, those various attempts differ considerably. This paper tries to inventory the different theories of artificial creativity that were emitted by artificial intelligence researchers. It classifies those theories in four categories that correspond to four models of creativity: exploratory, mathematical, entropy-based and compositional. Then, it investigates the role of conceptual mapping and structural matching in the last of those models of artificial creativity, i.e. in the compositional model. It mentions its psychological relevancy and the key role it plays in imagination.

“Is Life Computable?”

Anthony Chemero, *Franklin and Marshall College*

Michael Turvey, *University of Connecticut / Haskins Lab*

- Commentator: Darren Abramson, *Dalhousie University*

This paper has two primary aims. The first is to provide an introductory discussion of hyperset theory and its usefulness for modeling complex systems. The second aim is to provide a hyperset analysis of Robert Rosen's metabolism-repair systems and his claim that living things are closed to efficient cause. Consequences of the hyperset models for Rosen's claims concerning computability and life are discussed.

4:00-4:15 **Break** (Conference Lounge - Refreshments Available)

4:15-6:15 **Concurrent Sessions**

4a **Formal / Computational Issues** (Oak Room)

Chair: Gordana Dodig-Crnkovic, *Mälardalen University, Västerås*

“Machine Models for the Arithmetical and Analytical Hierarchies”

Daniel Leivant, *Indiana University*

Alternating Turing machines are traditionally defined in terms of local branching conditions, and consequently are not more powerful than deterministic machines. We revise the acceptance condition of alternating machines to more global conditions on existential and universal branching. We show that such machines accept precisely the inductive (i.e. Π_1^1) languages.

Alternating deciders, which either accept or reject each input, accept precisely the hyper-elementary (Δ_1^1) languages. Alternating machines with a uniform bound k on alternations accept precisely level k of the arithmetical hierarchy.

Using negation states, with a strong semantics, the languages accepted by alternating TMs with $< k$ negation states along every branch are precisely the level Π_1^1 - k of the analytical hierarchy.

“The Limits of Abstraction: Software and Science”

James Overton, *University of Western Ontario*

The stunning progress over the past half century in the capabilities of computer hardware has led some to see the rise of human level artificial intelligence as inevitable. But despite progress in hardware, it is commonly objected that progress in software does not keep pace. While programming tools and

methodologies have improved, Fred Brooks has famously argued that there is "no silver bullet" to reduce the complexity of the tasks software is put to. Joel Spolsky expresses a related view in terms of "leaky abstractions": since our abstractions are imperfect, the complexity of the system will always leak through. Are there limits to abstraction?

The sciences also deal with complexity by means of layers of abstraction. One often hears about a hierarchy of sciences, building from physics and chemistry through biology, psychology, and social sciences. While some philosophers have speculated that the special sciences will reduce to branches of an ideal physics, problems with such strong reductionism are sometimes similar to problems with abstraction in software.

This paper considers the similarities between layers of abstraction in software design and in scientific theories. Leaky abstractions may be caused by details of implementation at lower software or hardware levels, or in lower-level sciences. But leaks may also be caused by mismatches between the concept we apply to an abstraction and its implementation. I propose that these problems with abstraction for both software and science may have similar solutions.

"Recurrent Misconceptions of Computation"
Matthias Scheutz, *Indiana University*

Computationalism, the view that mental states are computational states, has been rejected by various subcommunities in cognitive science in the recent past, from dynamicists who view brains as intrinsically dynamical systems, to proponents of an embodied and situated view of cognition that emphasizes the interactions of brains and the bodies they control as well as the intrinsic embeddedness of cognitive systems in their environments. We argue that many of these objections to computationalism depend on a fundamental misunderstanding of what computation is in general, and on a program/process conflation in particular. In this paper we will discuss some recent charges in detail and then briefly list a view misconceptions together with counterexamples demonstrating that they indeed miss important aspects of computation in the real world.

"Non-Mechanical Computing and Non-Computational Mechanics"
Vincent C. Müller, *American College of Thessaloniki*

I motivate that several developments in the theory of computation suggest a divide between 'computation' and 'mechanical computation' (and what is computable by each of these). I will sketch a notion of the 'mechanical computational process'; and then investigate whether the pancomputationalist notion(s) of computation is different from this, in particular whether it involves the notion of a 'wide mechanism'.

4b **Computer and Machine Ethics** (Walnut Room)
Chair: Mara Harrell, *Carnegie Mellon University*

"Why Ethics is a High Hurdle for AI"
Drew McDermott, *Yale University*
- Commentator: Wendell Wallach, *Yale Interdisciplinary Center for Bioethics*

I argue that there is a gap between so-called "ethical reasoners" and "ethical-decision makers" that can't be bridged by simply giving an ethical reasoner decision-making abilities. Ethical reasoning {it qua} reasoning is distinguished from other sorts of reasoning mainly by being incredibly difficult, because it involves such thorny problems such as analogical reasoning, and deciding the applicability of imprecise precepts and resolving conflicts among them. The ability to do ethical-decision making, however, requires knowing what an ethical conflict is, i.e., a clash between self-interest and what ethics prescribes. I construct a fanciful scenario in which a program could find itself in what seems like such a conflict, but argue that in any such situation the program's "predicament" would not count as a real ethical conflict. Hence, for now it is unclear how even resolving all of the difficult problems surrounding ethical

reasoning would yield a theory of "machine ethics."

"Ethical Responsibility in Software Engineering: From Codes of Conduct to Ethical Design"

Matteo Turilli, *University of Oxford*

- Commentator: Tad Bratkowski, *Southern Illinois University, Carbondale*

The paper offers an analysis of the problem of integrating ethical principles into the practice of software design. The approach is grounded on a review of the relevant literature from Computer Ethics and Professional Ethics. The paper is divided into three sections. The first section analyses the ethical nature of computational artefacts. This section highlights the fact that this nature is impossible to comprehend without first considering designers, users, and patients alongside the artefacts that they create, use and are affected by. Some of key ethical concepts are discussed, such as freedom, agency, control, autonomy and accountability. The second section illustrates how autonomous computational artefacts are rapidly changing the way in which computation is used and perceived. The description of the ethical challenges posed to software engineers by this shift in perspective closes the section. The third and last section of the paper is dedicated to a discussion of Professional Ethics for software engineers. After establishing the limits of the professional codes of practice, it is argued that ethical considerations are best embedded directly into software design practise. In this context, the Value Sensitive Design approach is considered and insight into how this is being integrated into current research in ethical design methodologies is given.

"From Trust to E-Trust: Old Theories and New Problems"

Mariarosaria Taddeo, *University of Padua*

- Commentator: Iryna Lytvynchuk, *Taurida National V.I. Vernadsky University*

Although trust is largely recognised as an important issue in many fields of research, we still lack a satisfactory definition and foundation of the concept and its cognate phenomena. In recent years, new problems have arisen because of the occurrence of trust in digital contexts, what is known as e-trust. Given the twofold nature of the issue, with old problems concerning trust being now joined by new problems generated by e-trust, this paper is divided into two parts. In each of them the goal is to help the reader to gain some orientation in the literature and thus prepare the ground for a new approach, which, however, will be developed in a separate work.

The first part evaluates the solution to problems such as it's the definition and foundations of trust provided in the relevant literature. The second part analyses the problems of e-trust such as the emergence of e-trust, the role of trust in distributed artificial systems. In the conclusion, the paper pulls together the various strands, indicates three problems, the definition, the foundation of trust and e-trust, and the requirements for the emergence of trust in digital contexts, which remain unsolved and suggests what kind of new perspective might be able to solve them.

6:20-6:45 **Conference Evaluation Session and Closing Comments from the NACAP Regional Director** (Oak Room)

Selmer Bringsjord
Rensselaer Polytechnic Institute

8:30 **Post-conference Party** (Allen Residence - Directions and map included at the end of this manual)



The 2008 North American Conference on Computing and Philosophy

List of Participants Registered as of July 7th

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The 2008 North American Conference on Computing and Philosophy

Appendices

**General Information (Emergency,
Internet Access, etc.)**

**Conference Guide to Casual and
Fine Dining**

Map of Bloomington

Map of Indiana University

Map of Indiana Memorial Union

**Map and Directions to Allen
Residence**

GENERAL INFORMATION

Emergency Information

- For quick response 24 hrs a day, report any accident or emergency to the IMU hotel lobby front desk
- If you have access to a telephone, call **911**
- Emergency medical care is available at:
 - **Promptcare East.**
326 S. Woodcrest Dr
812.353.6888
8:00am – 8:00pm
Monday – Sunday
 - **Bloomington Hospital**
601 West 2nd Street
Emergency Room: 812.353.9515
Open 24 hours Monday – Sunday

Alcohol

All visitors are subject to Indiana University alcohol policies. Alcohol will be available for the banquet, but may not be removed from the banquet room. Walking across campus with alcoholic beverages is prohibited.

Internet/Email Access

In order to access the Internet you must log in using a temporary visitor's username and password. If you are an IMU hotel guest, the front desk staff will issue a username and password. If you are staying in Willkie Residence Center, a username and password are included in the envelope you will receive at check in. Usernames and passwords are **case sensitive**. Please log in by duplicating exactly the access information provided.

Computer terminals are available in 2 locations on the Mezzanine level of the IMU:

- Outside of Poplar & Redbud Meeting Rooms
- Outside "the Commons" eating area

There are also computer terminals available in the lobby of the Willkie Residence Center North Tower.

Configuring your computer

Before you use your Network Access account to access the Internet, you need the following:

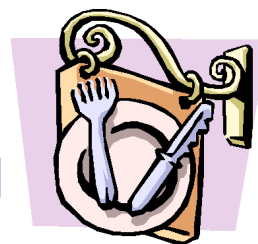
- An 802.11b or 802.11g wireless network card. Some laptops may already have a wireless card built in. Others will have PC card slots in which you can insert a wireless **PC card**. These PC cards are available for purchase online and at most electronic retail stores, including IUB's **Computer Connection**.
- You'll need to log into the network. Launch a web browser; you will see a window labeled Web Site Certified by an Unknown Authority. You may safely accept the certificate by clicking **OK** in this window. Then you will be automatically taken to a web page where you can log in to access the network. In the "IU Guest Login" box, enter your Network Access account username and password. Follow the instructions on the page that appears. After you have signed on, you will have access to the network for eight hours. If you need continued access, you will need to log in again after the eight hours are up.

Note: Usernames and passwords are case sensitive, which means you must use the correct uppercase or lowercase characters. Also, be aware that users of Network Access accounts **do not** need to use VPN or register their MAC address.



Conference Guide to Casual & Fine Dining

IU Bloomington Campus and Downtown Area



WALKING DIRECTIONS FROM THE INDIANA MEMORIAL UNION

1. WHEN LEAVING CONFERENCE LOUNGE AREA, EXIT THE IMU BUILDING THROUGH THE DOORS LEADING INTO THE GARDEN AREA.
2. WALK UP THE STAIRS TO THE SIDEWALK, TURN RIGHT AND WALK ALONG THE SIDEWALK UNTIL YOU SEE THE LARGE LIMESTONE GATES (SAMPLE GATES).
3. WALK THROUGH THE SAMPLE GATES.
- 4A. **TO GET TO KIRKWOOD AVENUE (5TH STREET):** KIRKWOOD IS STRAIGHT IN FRONT OF YOU AS YOU WALK THROUGH SAMPLE GATES
- 4B. **TO GET TO INDIANA & FOURTH STREET:** TURN LEFT ON INDIANA AVE, THEN TURN RIGHT ON TO 4TH STREET.
- 4C. **TO GET TO THE DOWNTOWN AREA:** CROSS INDIANA AVENUE AND WALK STRAIGHT DOWN KIRKWOOD UNTIL YOU COME TO THE COURTHOUSE. RESTAURANTS ARE AVAILABLE ON ALL SIDES OF THE COURTHOUSE SQUARE, AND WITHIN A BLOCK OR TWO IN EACH DIRECTION.

In the IMU

THE MARKET, BURGER KING, PIZZA HUT, KIVA
856-0379 ☀️📶💰
(FAST FOOD)

STARBUCKS 📶
(COFFEE)

SUGAR 'N SPICE
(COFFEE & BAKERY)

TUDOR ROOM 💰
855-1620
(BUFFET)

PUCCINI'S LA DOLCE VITA
420 E. 4TH ST.
333-5522 \$\$\$
(ITALIAN)

SIAM HOUSE ♥️💰
430 E. 4TH ST.
331-1233
(THAI)

SNOW LION ♥️💰
113 S. GRANT ST.
336-0835
(TIBETAN)

Indiana Avenue

BUFFA LOUIE'S ➡️💰
114 S. INDIANA
333-3032
(WINGS)

CHOW BAR 💰
216 S. INDIANA AVE.
336-3888
(ASIAN)

DAGWOOD'S SUBS ➡️📶💰
116 S. INDIANA

PENN STATION \$
212 S. INDIANA AVE.
333-7366
(SANDWICHES)

QDOBA 📶💰
116 S. INDIANA AVE.
339-1122
(MEXICAN)

STARBUCKS 📶
110 S. INDIANA
(COFFEE)

Kirkwood Area

BLOOMINGTON BAGEL ➡️📶\$
113 N. DUNN ST.

CAFÉ DJANGO ♥️💰
116 N. GRANT ST.
335-1297
(INTERNATIONAL)

CAFÉ PIZZARIA ➡️💰
405 E. KIRKWOOD
332-2111

CEREAL BARN \$
408 E. 6TH ST.
332-7325
(CEREAL, PBJ's)

CHIPOTLE GRILL ♥️💰
E. KIRKWOOD AVENUE
330-1435
(MEXICAN)

DP DOUGH ➡️\$
107 N. DUNN ST.
323-4444
(CALZONES)

ESAN THAI 💰
221 E. KIRKWOOD
333-8424
(THAI)

FALAFEL'S \$
430 E. KIRKWOOD AVE.
355-3555
(GREEK/ISRAELI)

GREEK'S PIZZARIA ➡️💰
118 E. KIRKWOOD
323-0044

JIMMY JOHN'S DELI 📶💰
430 E. KIRKWOOD

KILROY'S BAR & GRILL 📶💰
502 E. KIRKWOOD
332-3700

LAUGHING PLANET 322 E. KIRKWOOD
332-2233 ♥️\$
(BURRITOS)

NICK'S ENGLISH HUT 423 E. KIRKWOOD
332-4040 📶💰
(BAR & GRILL)

NOODLES COMPANY 💰
517 E. KIRKWOOD
323-1400

PITA PIT ♥️\$
530 E. KIRKWOOD
355-3500
(SANDWICHES)

RUNCIBLE SPOON
412 E. 6TH ST.
334-3997 \$\$\$
(BREAKFAST, COFFEE, SANDWICHES)

SHANTI ♥️💰
221 E. KIRKWOOD
333-0303
(INDIAN)

SOMA
322 E. KIRKWOOD
(COFFEE & JUICE BAR)

TRULLI FLATBREAD 💰
514 E. KIRKWOOD
333-2700
(PIZZA)

UNCLE D'S PIZZA ➡️💰
430 E. KIRKWOOD
339-2260

VILLAGE DELI 📶♥️\$
409 E. KIRKWOOD
336-2303
(BREAKFASTS, SANDICHES)

Downtown Area

BLOOMINGTON BAGEL 📶➡️\$
238 N. MORTON ST.

BLOOMINGTON SANDWICH ➡️💰
107 N. COLLEGE
330-9611

BOBBY'S PUB \$
100 COLLEGE AVE.
330-0955

COACHES LOUNGE 💰
245 N. COLLEGE AVE
339-3537
(BAR & GRILL)

CRAZY HORSE 📶💰
214 W. KIRKWOOD
336-8877
(BAR & GRILL)

GRAZIE! 💰
106 W. 6TH ST.
323-0303
(ITALIAN)

IRISH LION
212 W. KIRKWOOD AVE.
336-9076 \$\$\$
(IRISH BAR & GRILL)

JANKO'S LITTLE ZAGREB \$\$\$
223 W. 6TH ST.
332-0694
(STEAKHOUSE)

JAPONEE 💰
320 N. WALNUT ST.
333-3122
(ASIAN)

KILROY'S SPORTS BAR ➡️📶💰
319 N. WALNUT ST.
333-6006

MALIBU GRILL ♥️\$
106 N. WALNUT ST.
332-4334

MAX'S PLACE \$
109 W. 7TH ST.
336-5169
(PIZZA & PUB)

MICHAEL'S UPTOWN CAFÉ 📶♥️\$\$\$
102 E. KIRKWOOD
339-0900
(AMERICAN & CAJUN)

NEANNIE'S CAFE 💰
402 W. 6TH ST.
333-1275

OPIE TAYLOR'S ➡️💰
110 N. WALNUT ST.
333-7287
(BAR & GRILL)

LE PETITE CAFÉ \$
308 W. 6TH ST.
334-9747
(FRENCH)

LEGEND

- \$ = Inexpensive
- \$\$ = Average
- \$\$\$ = Above Average
- ➡️ = Delivery
- ♥️ = Vegetarian friendly
- ☀️ = IMU Room service
- 📶 = Wifi

RESTAURANT TALENT
620 W. KIRKWOOD
330-9801 ♥ \$\$\$

ROOTS
124 N. WALNUT ST.
336-7668 ♥ \$\$
(VEGETARIAN FOOD &
JUICE BAR)

SAMIRA
100 W. 6TH ST.
331-3761 ♥ \$\$
(AFGHAN)

**SCHOLAR'S INN
BAKEHOUSE**
125 N. COLLEGE AVE.
3002 E. THIRD ST. ☞ \$
(BAKERY & SANDWICHES)

SCOTTY'S BREWHOUSE
302 N. WALNUT ST.
333-5151 \$\$

STEFANO'S ICE CAFÉ
101 W. KIRKWOOD ☞
(ICE CREAM, COFFEE)

TROJAN HORSE
100 E. KIRKWOOD
332-1101 ♥ \$\$
(GREEK)

Other Campus
Spots

BEAR'S PLACE
1316 E. 3RD ST.
339-3460 \$\$
(BAR & GRILL)

BIG MOUTH SUBS
1420 E. 3RD ST.
323-8987 ☞ \$\$

COPPER CUP
1400 E. THIRD ST.
415 N. COLLEGE AVE ☞
(COFFEE)

DRAGON EXPRESS
1400 E. THIRD ST.
331-7030 \$\$
(ASIAN)

THE MAC GRILL
1434 E. THIRD ST.

334-9100 \$\$
(INTERNATIONAL)

MOTHER BEAR'S PIZZA
1428 E. 3RD ST.
332-4495 ☞ \$\$

TINA'S CUISINE
309 E. 3RD ST.
332-0464 ☞ ♥ \$\$
(GOURMET GROCERIES &
SANDWICHES)

TURKUAZ CAFE
301 E. THIRD ST.
333-7908 ☞ \$
(INTERNATIONAL)

YOGI'S BAR & GRILL
519 E. 10TH ST.
323-9644 \$\$

Futher Afield
(BUT WORTH THE TRIP)

CHOCOLATE MOOSE
401 S. WALNUT ST.
(ICE CREAM)

LENNIE'S
1795 E. 10TH ST. \$\$
323-2112 \$
(BAR & GRILL, PIZZA)

LIMESTONE GRILLE
2920 E. COVENANTER
335-8110 ♥ \$\$\$
(AMERICAN FINE DINING;
NOT WALK-ABLE)

RAGGAZZI ARTE CAFÉ
212 S. ROGERS ST. \$\$
323-9005 \$
(ITALIAN)

SCHOLAR'S INN
717 N. COLLEGE AVE.
332-1892 \$\$\$
(AMERICAN FINE DINING)

TRUFFLE'S 56 DEGREES
1131 S. COLLEGE MALL
330-1111 \$\$\$
(AMERICAN FINE DINING;
NOT WALK-ABLE)

TUTTO BENE WINE CAFÉ
213 S. ROGERS
330-1060 \$\$\$
(AMERICAN DINING)

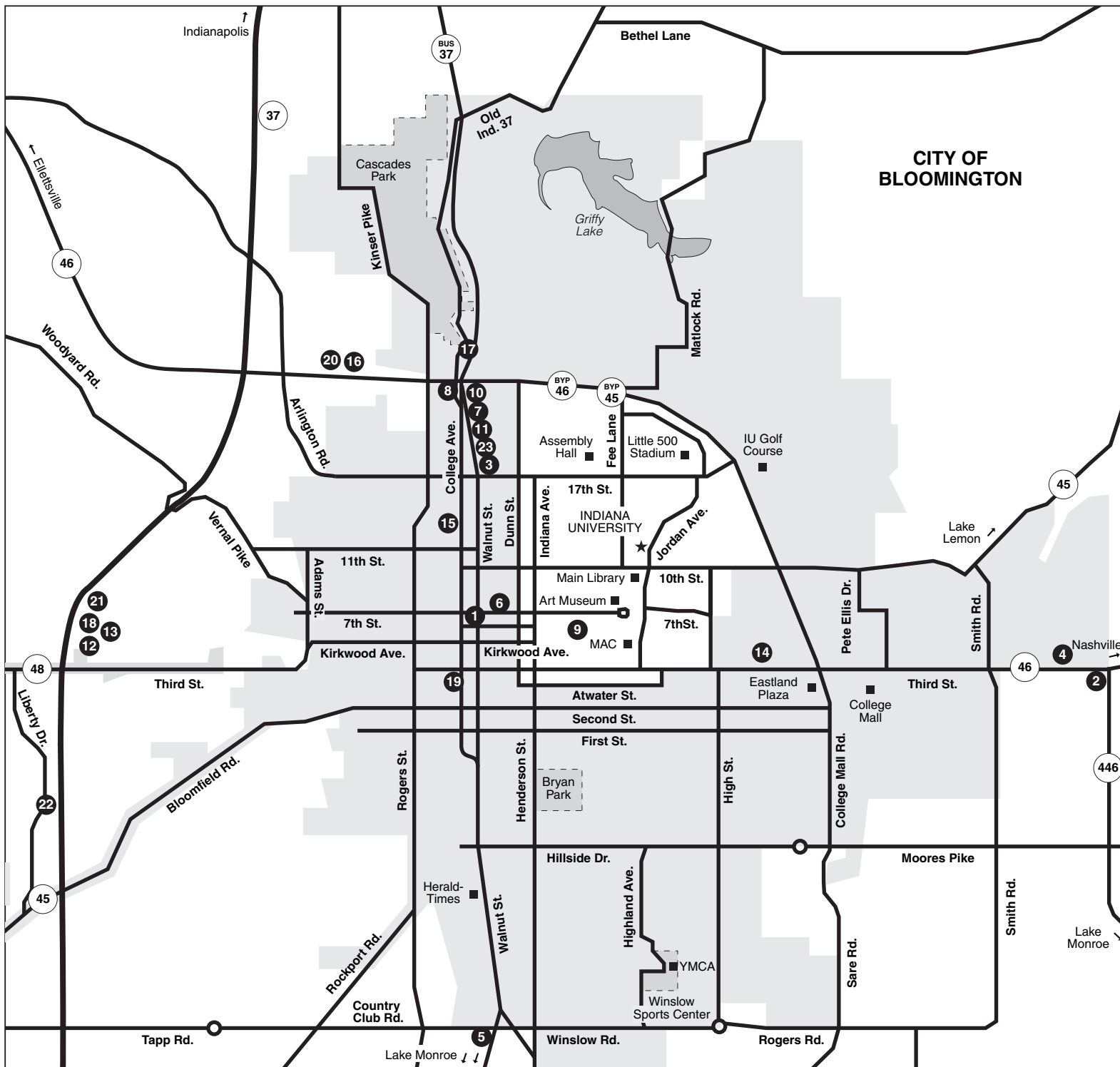
UPLAND BREWING CO.
254 N. WALNUT ST.
336-2337 \$
(BAR & GRILL)



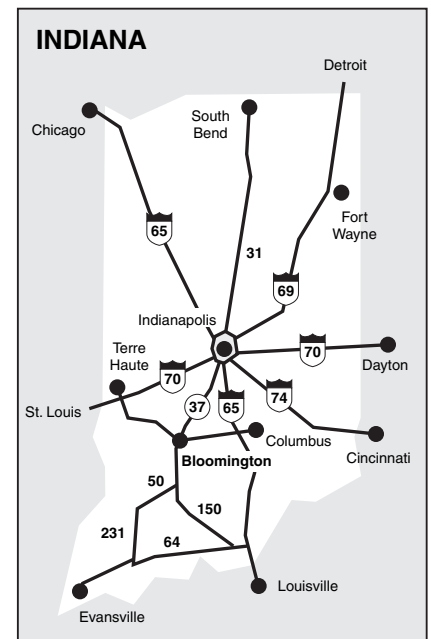
CITY ORDINANCE:
Smoking is prohibited
in all public places
and work places.



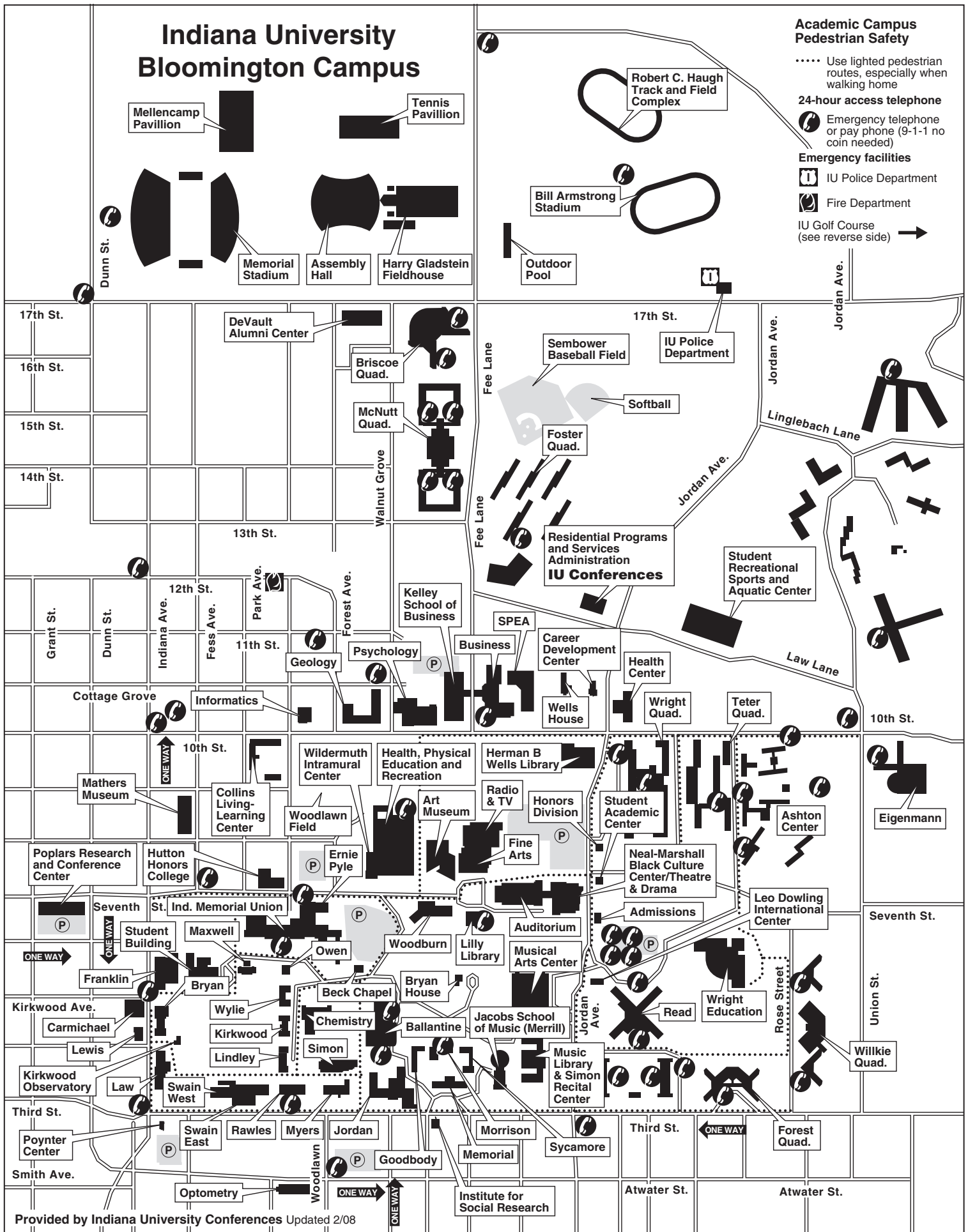
IU Conferences
July 2007



- 1 Hilton Garden Inn
- 2 Century Suites
- 3 Comfort Inn
- 4 A Summerhouse Inn
- 5 Economy Inn
- 6 Grant Street B&B
- 7 Hampton Inn
- 8 Radisson
- 9 Indiana Memorial Union
- 10 Days Inn
- 11 Motel 6 - University
- 12 Scottish Inn
- 13 Holiday Inn Express & Suites
- 14 Travelodge
- 15 Scholars Inn B&B
- 16 Super 8
- 17 Econo Lodge
- 18 Fairfield Inn
- 19 Courtyard by Marriott
- 20 Quality Inn
- 21 TownePlace Suites by Marriott
- 22 Homewood Suites by Hilton
- 23 Country Hearth Inn and Suites
- ★ IU Conferences, 801 N. Jordan



Indiana University Bloomington Campus



Academic Campus Pedestrian Safety

..... Use lighted pedestrian routes, especially when walking home

24-hour access telephone

Emergency telephone or pay phone (9-1-1 no coin needed)

Emergency facilities

IU Police Department

Fire Department

IU Golf Course (see reverse side) →

Indiana Memorial Union

Map

