

Faculty of Computing and Information Science

The creation of CIS in 2000 is just one of several innovative moves by Cornell in computing. In 1965, it placed the newly established CS department in *both* Engineering and Arts & Sciences so that it could blossom in many directions. The Program of Computer Graphics, created in 1973, has educated many of the leading graphics researchers in the world. The Cornell Theory Center, created in 1984, brought Windows-based high-performance computing to computational science and engineering. (The Center's cluster complex now has over 2000 processors.) Now, all three units are part of CIS.

The concepts, modes of thought, and technology of computing and information science have fundamentally extended our means of creating knowledge and are thus relevant in every academic discipline. They are also transforming the arts, because they provide new means of expression and virtual experience. But how should universities respond?

Cornell hit upon a unique strategy: create a college-level Faculty of Computing and Information Science (CIS), with computer science at its core. This college-level structure can create new programs, organize and recruit faculty, and sponsor research. But CIS has no students per se; instead, it offers undergraduate degrees in the colleges of Engineering, Arts & Sciences, and Agriculture & Life Sciences.

The mission of CIS is to integrate computing and information science—its ideas, technology, and modes of thought—into every academic field. This means working with seven colleges and four professional schools, which, combined, provide an unprecedented breadth of study.

CIS brings its faculty together with faculty throughout the university—from Anthropology, Astronomy, Aerospace Engineering, Biology, Electrical and Computer Engineering, History, Mathematics, Operations Research, Philosophy, Psychology, Sociology, and the social sciences and the humanities. Already, 25 academic departments cross-list courses with CIS.

Cornell grants PhDs in Information Science and in Computational Biology. Undergraduates in Cornell's three largest colleges can major in Information Science, and students in each of Cornell's colleges can pursue a minor in Information Science. Students can minor in Computational Biology in several colleges. Various programs in the Digital Arts are being developed, as well.

Interdisciplinary research is affecting academic disciplines and stimulating a new level of student interest in computing. Just as the needs of computational science and engineering have led to dramatic advances in high-performance computing, other areas such as biology, law, and the social sciences are calling for new software methods, tools, and products that serve a broad spectrum of commercial and individual users. Cornell and CIS have driven such innovation and will continue to do so in the future.

Ultimately, CIS will reach every Cornell undergraduate in more than 50 departments, as CIS and its subfields, like human/com-

puter interaction, attract a more diverse group of students. This broad reach is critical, as the information technology sector seeks to expand its impact and attract more young people to careers in industry.

At the core of CIS is the CS Department, and, as we partner more deeply with the social sciences and humanities, we are discovering new problems and new paradigms for using computers and information resources to automate intellectual processes and to create knowledge in ways that require these new “tools for thought”, leading to more research problems for computer science.

CIS houses the following academic units and institutes:

Department of Computer Science

Department of Statistical Science A home for faculty in statistics throughout Cornell who are working at the interface of math, computing, and data analysis.

Cornell Theory Center See sidelight on page 21.

Program of Computer Graphics See sidelight on page 29.

Information Science Program Brings together people who share an interest in combining computer science with the social sciences. Fifteen CS faculty are involved, along with a dozen others.

Computational Biology Program Five CS faculty are involved in this program, along with 20 others.

Computational Science and Engineering Program Brings together faculty from several dozen departments in offering interdisciplinary work. Four CS faculty are involved.

Information Assurance Institute Directed by CS professor Fred Schneider, the institute supports activities aimed at developing a science and technology base to enhance information assurance and networked information systems' trustworthiness—system and network security, reliability, and assurance.

Intelligent Information Systems Institute Directed by CS professor Carla Gomes, its main mission is to perform and stimulate research in computing-intensive and data-intensive methods for intelligent decision-making systems. Thirteen CS faculty members are involved.

National Science Digital Library Part of the NSF's long-term program to enhance all aspects of education in science, mathematics, and engineering. Cornell is a major contributor to the program, with six separate NSF grants. At Cornell, this program is directed by CS professor Bill Arms and CS researchers Dean Krafft and Carl Lagoze.

Information Science Program

Faculty of IS come from across campus:

Earth and Atmospheric Sciences
 Communication
 Computer Science
 Design and Environmental Analysis
 Economics
 Applied Economics and Management
 Electrical and Computer Engineering
 Human Ecology
 Labor Economics
 Linguistics
 Physics
 Psychology
 Science and Technology Studies
 Sociology
 Operations Research and Industrial Engineering
 Law School
 Johnson School of Management
 School of Hotel Management
 Cornell Library

Information science is concerned with the design and use of information systems in a social context—with the creation, representation, organization, application, and analysis of information in digital form. IS examines the social, cultural, economic, historical, legal, and political contexts in which information systems are employed, to inform the design of such systems and to understand their impact on individuals, social groups, and institutions. IS is where computer science meets the social sciences.

The interdisciplinary Program of Information Science (IS) is a unit within CIS. The Charles and Barbara Weiss Director of IS is CS professor Claire Cardie, and half the CS faculty are members of IS. IS also has faculty from 15 other departments, spread over six college-level units and the Cornell Library.

The National Science Digital Library studies the problems of large-scale electronic publishing, Web information systems, scholarly communication, and the long-term preservation of digital information. For example, physics professor Paul Ginsparg founded the arXiv (see p. 37), and the Law School's Legal Information Institute is the leading public source for law. The CS part of this research investigates architecture, protocols, and services that facilitate the creation, management, accessibility, and longevity of distributed information. A Cornell team, headed by CS professor Bill

Arms and CS researchers Dean Krafft and Carl Lagoze, is building the central computing system for the NSF's National Science Digital Library program.

The HCI (Human-Computer Interaction) group, directed by professor Geri Gay, investigates social, psychological, and design issues involving computers at school, work, and home. This group worked with CS professor Thorsten Joachims on machine learning for Web search, reported on p. 24. The group is working on the evaluation of the NSF-sponsored Kinematic Models for Design Digital Library (K-MODDL), an open access, multimedia resource for learning and teaching about kinematics (the geometry of pure motion) and the history and theory of machines.

The core of K-MODDL is the wonderful Reuleaux collection of mechanisms, maintained by Frank Moon of Mechanical & Aerospace Engineering. Involved in K-MODDL is CIS professor Hod Lipson, who was the first to demonstrate physically working machines synthesized by self-organizing processes.

IS offers a PhD and three undergrad degrees: IS in the College of Arts & Sciences, IS in Agriculture & Life Sciences, and Information Science, Systems, and Technology in Engineering. Cornell University's motto, direct from Ezra Cornell, is, "I would found an institution where any person can find instruction in any study." CIS and its IS Program are taking this to an extreme, making it easy for students in all seven colleges to learn about computing and for faculty throughout the university to take part in IS.

Few universities offer such organized flexibility in interdisciplinary work related to computing. And CS itself benefits tremendously from the presence of IS.

107 Dart's Chamber Wheel Mechanism. Application: pump, steam engine, water motor. In the Reuleaux collection.

John Dennis, David Gries join.

1969

Gerry Salton becomes Editor-in-Chief of the *Journal of the ACM*—the first of many influential editorial positions held by members of CS.

John Hopcroft and Jeff Ullman publish their classic text *Formal Languages and Their Relation to Automata* (Addison-Wesley).

Ellis Horowitz, Jorge More, John H. Williams join.

1970

Dick Conway's group develops PL/C, a subset of PL/1 designed for instructional purposes. The PL/C compiler is distributed to 100 institutions and instantly becomes the standard instructional PL/1 compiler.

Jim Bunch joins. Gerry Salton becomes Chair.

1971

David Gries publishes the first text on compiler construction: *Compiler Construction for Digital Computers* (John Wiley & Sons).

Gerry Salton publishes *The SMART Retrieval System Experiments in Automatic Document Processing* (Prentice Hall).

Faculty members Jim Bunch and Jorge More win Householder Prizes for their PhD theses in numerical analysis.

Charles Moore, Tim Teitelbaum join.

1972

Bob Tarjan, Alan Demers join. CS grows to 15 faculty.

1973

Dick Conway and David Gries publish the first programming text to deal with issues of correctness, like loop invariants: *An Introduction to Programming, a Structured Approach using PL/1 and PL/C* (Winthrop).

Juris Hartmanis becomes the founding editor of Springer-Verlag's LNCS series (*Lecture Notes in Computer Science*) and David Gries becomes the founding Editor of Springer-Verlag's *Text and Monograph Series* (TMCS). Hartmanis and Gries maintain these positions for over 30 years.

John Hopcroft becomes Managing Editor of the *SIAM Journal on Computing*.

