

The ICSI GAZETTE

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featured alum: Wolfgang Wahlster

by John Tortorice

Wolfgang Wahlster has a sterling ICSI pedigree. He was present at ICSI almost before the beginning.

"I was here when ICSI consisted of only two people, myself and Ron Kay, who was acting director. I was a visiting professor at UC-Berkeley and ICSI's first visitor. We had a room in Evans Hall without a window." Wahlster was involved in the initial proposal to create ICSI and with the search committee for that chose the first director.

A member of the Executive Committee of the ICSI's Board of Trustees, Wahlster is Director and CEO of the German Research Center for Artificial Intelligence (DFKI) and Professor of Computer Science at Saarland University, Saarbrücken. He has published more than 150 technical papers and 6 books on language technology and intelligent user interfaces. Under Wahlster's direction, DFKI has experienced steady growth and now employs more than 250 researchers with a yearly budget of over \$30 million.

Over the years, Wahlster has witnessed the creation and growth of a unique institution that plays an important role in computer science research. "ICSI is a success story. It has grown to become an international institution."

He sees ICSI's consistent high quality of research and strong reputation within the research community as due squarely to the contributions of its stellar researchers. "The people and their knowledge are the real asset. This is a world-class team, and in some fields they dominate development."

Some of the characteristics that make ICSI as successful as it has been can be in short supply in European academic and research circles, Wahlster believes. These include an open and inquisitive academic environment, and an interdisciplinary approach that breaks down barriers within computer science and fosters collaboration with other disciplines.



Wolfgang Wahlster

During a recent visit to Berkeley, Wahlster spoke about how these characteristics are deeply woven into ICSI's culture and how important they are to European visitors like himself.

ACADEMIC OPENNESS

"The kinds of discussions you have in the U.S. and at ICSI are unique. In Europe still, especially in France and Germany, it's very hard to approach the professor directly and also it's impossible to challenge him on a scientific topic. I think what visitors learn here is a very open atmosphere. Everything can be criticized, challenged and so on."

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as i see it by Nelson Morgan, Director

In the July/August issue of Technology Review, Seth Shulman wrote a column about the rapid determination of the virus responsible for SARS. He contrasted this to the three years that it took to find HIV, and attributed part of the difference to the collaborative spirit that drove the research community in the former case while the latter had been characterized by secret work at each lab. He wrote "There are many reasons – including better technology and a less elusive viral target – but don't discount the unprecedented level of worldwide communication among SARS researchers." He concluded with the comment, "Let's hope that we can spread our ideas at least as rapidly and widely as the most opportunistic virus."

Naturally, I was interested in these comments in the original context of epidemics, which concern us all; but I was also struck by the relevance of Shulman's comments to the question of how best to conduct research on any topic, including computer science. We

"From the start, we have eschewed contract or other proprietary-style research, despite the fact that this restriction limits our potential sources of revenue."

don't all track deadly viruses; but each of us can work to advance our respective fields by a collaborative approach to science and technology. ICSI is dedicated to advancing computer science and engineering, and doing so in the open. The "International" in our name is indicative of collaborations and visitor programs that transcend national boundaries. We provide a haven for researchers whose individual efforts impact the world, but whose joint efforts with colleagues elsewhere provide even greater leverage. This perspective is fundamental to ICSI, and is the basis of our own Prime Directive: accept no funds conditioned on the restriction of information. From the start, we have eschewed contract or other proprietary-style research, despite the fact that this restriction limits our potential sources of revenue. This is a credo that we are proud of.

Part (though certainly not all) of our collaborative activities consist of our international visitors' programs. These have continued to flourish since our last Gazette. The Spanish Call for Proposals came and went, and a new year's worth of visitors were chosen; similarly, we have now selected next year's German postdoctoral visitors. Our Swiss program began with collaboration with two new visitors. Finally, our Finnish program continued to grow, with activity spread over several ICSI groups. As part of this program, I had the chance to visit Finland in early June, and to speak with many researchers who were interested in a future visit to

ICSI. One event was particularly significant to me: it was the Finland/ICSI program's first alumni meeting, in which former ICSI visitors had the chance to give their impressions to potential future visitors. It was personally quite gratifying to see how warmly they described their ICSI experiences (at least for the discussions in English!)

ICSI research activities also continued at their usual rapid pace. In one example, the speech recognition effort was marked by two significant meetings. Early this year, the DARPA Effective Affordable Reusable Speech (EARS) program held its workshop in Berkeley, with ICSI acting as the host. Currently the main avenue for government speech recognition research, this was an important meeting that established many of the trends that would later see fruition in work reported at an East Coast meeting 4 months later. With ICSI as the lead site for the Novel Approaches work, and a key participating site for the larger Rich Transcription effort, I was pleased to see the attention that we received. Our open and effective wireless network was also a big hit with the visiting researchers, who were visible at all hours in our reception area. We will report on the scientific progress in this program in the next Gazette.

Another major project at ICSI has been the eXtensible Open Router Project (XORP), which is the feature project for this issue. XORP continues in the tradition of some of ICSI's past software projects like Sather in the sense that the research is yielding a tangible artifact that will be publically available.

In local news, the ICSI building has been purchased by the City of Berkeley. We look forward to a productive partnership with Berkeley, and our initial contacts with local officials (ranging from the Mayor to the local Property Manager) have been extremely positive. We are anticipating significant improvements to the building. Speaking of improvements, ICSI added another undergraduate researcher to its family, as Howard Ming Zhu was born to ICSI researcher Qifeng Zhu and his wife Xuemei Feng.

We hope you like the changes to our Gazette. The look was designed by our consultants, envision ID, who are working with us to improve our external communications. The front page feature also is the kind of thing we hope to have much more of in the future – columns celebrating some of our extremely successful alumni. Wolfgang Wahlster is a particularly good choice, being both one of the most prominent computer scientists in Germany, and a trustee on our current Board (in addition to his earlier connections to ICSI).

news briefs



MARK HANDLEY has been appointed to a Chair as a Professor of Networked Systems at University College London. Although Mark's presence will certainly be missed at ICSI, he will continue working with the XORP project much in the spirit of our other strong European collaborations, with the status of ICSI External Fellow. Congratulations to Mark; everyone at ICSI wishes him the best at his new job and new home in London.



ICSI has appointed four new Faculty Associates, in recognition of their close collaboration with ICSI staff on one or more research activities. They are: Professor **STEVE WEBER** of the Political Science Department, UCB (working with BCIS); and Professors **JOE HELLERSTEIN**, **CHRISTOS PAPADIMITRIOU**, and **ION STOICA** of the Computer Science Department, UCB (working with ICIR). ICSI has always had close ties to UCB faculty, and the new



Faculty Associate program recognizes the benefits of this collaboration and promotes future research cooperation with UCB.



On May 16, 2003, **HOWARD MING ZHU** was born, son of proud ICSI parent Qifeng Zhu and Xuemei Feng. Howard was nine pounds eleven ounces at birth and 22



inches long. Howard's Chinese name is Zhu, Minghao and is a very happy (and big) baby. His father is sure that Howard will be bigger than Dad. Congratulations to the proud parents!



1947 CENTER STREET, the building that houses ICSI, was sold on April 1, 2003. Formerly owned by a commercial property company, it is now owned and operated

by the City of Berkeley. ICSI looks forward to a productive partnership.



ICSI's international programs continue to thrive this year. The 2003 German and Spanish calls have been completed, and the new visitors have been chosen and scheduled. The Finnish and Swiss processes are active year-round, and visitors continue to arrive. Visitors comprise an integral part of the various projects at ICSI. For a list of recent visitors, please see the "Visiting Scholars" listing on page 6.

Prof. **JOHN MOODY** of OGI in Portland Oregon has joined ICSI as senior researcher. His research interest is machine learning with particular application to computational finance. He will be working in Portland on a research project entitled Risk, Reward and Reinforcement, funded by NSF.



XORP Group Members
Back Row (Left to Right): Eddie Kohler, Orion Hodson, Javier Cardona, Fred Bauer
Front Row (Left to Right): Pavlin Radoslavov, Atanu Ghosh

eXtensible Open Router Project

How do you improve performance when testing a new routing algorithm that could destabilize the Internet? XORP researchers are developing software that combines the high performance and availability of regular routers with an open source development model, resulting in a better network for all.

services in production networks for fear of destabilizing their

Dr. Fred Bauer received his Doctorate in Computer Engineering from the University of California, Santa Cruz. He has over 20 years experience in the computer industry in the areas of Chip Design and Network Protocols at such companies as Intel, SRI and Nokia. He is the author of several conference and journal papers on Network Protocols and has participated in standards committees such as the Internet Engineering Task Force. He has most recently served as General Chair for the INFOCOM 2003 Conference in San Francisco.

Javier Cardona is a Telecom Engineer with an embedded systems background. Javier has worked for several companies in Silicon Valley developing embedded products and tools, ranging from safety critical lasers to embedded HTTP servers. Javier joined the XORP team in February 2003 on a fellowship awarded by the Spanish Ministry of Science and Technology. His role is to implement network management protocols.

Orion Hodson is a software developer on the XORP project. He is primarily working on infrastructure related code (core libraries, IPC), though is presently working on an implementation of the RIP Unicast Routing Protocol. He has a B.Sc. in Physics with Theory from the University of Birmingham (UK) and an M.Sc. in Neural Networks from the University of Stirling (UK). Prior to XORP, he was a member of the Networked Multimedia group in the Computer Science department of University College London.

Pavlin Radoslavov is a postdoc at ICSI, where he is a researcher for the XORP open-source router project. He is currently working on the implementation of the following multicast protocols: Protocol Independent Multicast-Sparse Mode (PIM-SM), Internet Group Management Protocol (IGMP), and Multicast Listener Discovery (MLD) for XORP. He recently completed the design and implementation of the Multicast Forwarding Engine Abstraction (MFEA) XORP module. Before coming to ICSI, Pavlin completed his Ph.D. at the University of Southern California.

Eddie Kohler is a postdoctoral fellow and researcher at the ICSI Center for Internet Research. His thesis work developed a modular software forwarding path, called Click, that XORP will eventually target. He is also Chief Scientist and cofounder of Mazu Networks, a network security company whose first product was based on Click. His research interests include systems, networks, programming languages, and software engineering – or, more generally, readable systems: building fast component systems that are more flexible and correct because they're more fun to program. In January 2004 he will take up an assistant professorship in UCLA's computer science department.

A yawning gap exists between research and practice in Internet routing and forwarding. The savvy researcher has the tools of theory and simulation at hand, but validating results in the real world is hard.

Why should this be so? For network applications research, there are languages, APIs, and systems that make development and deployment easy. For end-to-end protocol research, there is access to open source operating systems, such as Linux and FreeBSD; since these systems are used in research and in production, code can feasibly migrate between the two environments.

Unfortunately the same cannot be said of router software. Router vendors do not provide APIs for third party applications to run on their hardware. Thus, researchers cannot even conduct pilot studies in production networks unless router vendors implement their software. This is unlikely to happen unless the vendors perceive a reward, such as customer demand, commensurate with their efforts, but customers will not demand a feature unless they have faith in existing research results or can experiment in their own environment. This is a catch-22. Even when vendors can be convinced to implement, it is not uncommon for initial implementations of a protocol to be found wanting, and the path to improving the protocols is often difficult and slow. Finally, network operators are almost always reluctant to deploy experimental

existing (hopefully money-making) services.

Thus, the difficulty in validating Internet research is largely attributable to the absence of open Internet routers for researchers to experiment with and deploy new work on. Routing toolkits exist, but typically they implement a subset of IP routing functionality and are rarely used in production environments; routing and forwarding research requires access to real production traffic and routing information.

How can we enable a pathway that permits research and experimentation in production environments while minimally impacting existing network services?

The XORP group envisions an integrated open-source software router platform, running on commodity hardware, that is viable both as a research platform and as a production platform. The software architecture should be designed with extensibility as a primary goal and should permit experimental protocol deployment with minimal risk to existing services. Internet researchers needing access to router software could then share a common platform for experimentation, deployed in places where real traffic conditions exist. Researchers working on novel router hardware could also use the mature software from this platform to test their hardware in real networks. In these ways, the loop between research and realistic real-world experimentation can be closed, and innovation can take place much more freely.

Atanu Ghosh (XORP Principal Investigator) received his BSc (Eng) from Queen Mary College, University of London. He received his MSc (Data Communication Networks and Distributed Systems) from UCL where he also spent 2 years working in the Civil Engineering Department.

For the next 4 years, he worked at UniSoft Ltd porting UNIX to new hardware platforms. He also spent some time working on networks, became very interested in the subject and returned to UCL for another 3 years working and studying for his MSc degree.

He then moved into the commercial area working 18 months at Siemens Nixdorf Informationssysteme in Munich as a consultant in the TCP/IP group. His next 4 1/2 years were spent at the University of Technology,

Sydney, Australia working on the Alpine project - a collaboration funded by British Telecom, a number of UK universities and UTS. While at UTS, he began working on his PhD from UCL.

Dr. Mark Handley was at ICSI working on a large router project. Handley and Ghosh had worked at UCL together and when funding became available, Handley asked Ghosh to come to Berkeley and join the group working on the XORP project. Ghosh received his PhD while at ICSI.

In discussing XORP, Ghosh said, "Like Linux did, software became more competitive and more innovative due to free software. It was our feeling that we could do the same for routing. The more people would start to use the code, the more robust it would become and this would be exciting."

He also feels that software patents are a bad idea - they are being used to stifle smaller companies. Innovation is always happening; many people work on the same idea at the same time. "Maybe it's time for a change in patent laws?"

In regards to ICSI, Ghosh said that there is significantly more effort put into cooperation here than at different departments in the same University. He feels that ICSI has created an atmosphere for more synergy between people. "When people work in companies, universities, labs, etc., they know that at some point, it's time to move on. ICSI is an environment where it would be easy to stay."

featured alum: Wolfgang Wahlster

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In Europe this kind of deference is extended to colleagues as well. "If you give a public talk in Europe, there are always some questions, but the questions are not really tough. You would never hear a question that goes to a fundamental criticism. Only in the U.S., where there is not this hierarchical thinking in research, could an undergraduate student come up and ask questions of a famous speaker. This is very inspiring."



"In the U.S., they don't mix up the private relationship. It's like a game. You ask very hard questions, but this is part of the scientific culture. You can be very good friends and yet ask very nasty scientific questions. This is something Europeans have to learn because it is crucial for scientific progress."

"ICSI's success story, from my point of view, is this open, scientific approach."

INTERDISCIPLINARY SPIRIT

"The interdisciplinary spirit is especially important at Berkeley and ICSI. For example, there is wonderful cooperation with linguists. You cannot do good AI or speech research without talking to professional linguists or people in cognitive science. There's a long tradition at ICSI, introduced by Jerry Feldman, to talk to cognitive scientists, linguists, even philosophers. ICSI is a very good environment, with excellent linguists like Chuck Fillmore and George Lakoff."

Wahlster sees this ability to cross academic boundaries as offering new opportunities in the future as well, for example, in bio-informatics. "With bio-informatics, you need to talk to the biologists and I think ICSI has a good history of this. At UC-Berkeley all the relevant areas are covered at a very high international level. Not only does Berkeley have a very good CS faculty, but also topnotch psychologists, linguists, biologists and so forth. That's a unique situation."

While the future looks bright, the present looks just as promising. Wahlster reported that he recently finished a study on "Megatrends in Information Technology" for the German government. "There are 8 topics and most of them are part of ICSI's areas of excellence."

MORE THAN SLICK DEMOS

In Wahlster's estimation, ICSI offers a best-of-both worlds approach to computer science, focusing on basic and theoretical work while also fostering practical systems. "Nelson Morgan has the right spirit because in speech you have to go to the basic foundation, but you also have to have a running system which can be evaluated."

He sees this as the fruit of ICSI's UC-Berkeley heritage. "UC-Berkeley actually has a strong history of taking theory and building practical systems. I was involved in the initial proposal to create ICSI and there were several institutions interested. Stanford had a proposal, also MIT. Berkeley was picked [for ICSI] because the computer science faculty had this reputation that they build systems that can be deployed. Like the famous Berkeley Unix or with relational databases, there was Ingres, and the RISC architecture. So Berkeley has the reputation for having very good theory, but turning the theory into practical systems that can be deployed and delivered at least to the scientific community."

STAYING CONNECTED

"ICSI has many senior European visitors who keep in touch with their home base. At other institutions in the US, you lose contact with the academic system in Europe. But this is not the case at ICSI, because almost every week you have some Swiss or German professor talking here and you can hear about new positions, what is going on with the funding system. ICSI European postdocs learn a lot but they are still in touch. This is unique. ICSI is the only place in the US which offers this."

visiting scholars

Since its inception, ICSI has had a strong international program, consisting primarily of ties with specific countries.

Current formal agreements continue with Finland, Germany, Spain, and Switzerland.

From Finland

Andrei Gurtov (Networking)
Pekka Himanen (BCIS)
Petri Kiukkonen (FrameNet)
Kira Lopperi (Haas)
Maarit Makinen (BCIS)
Seppo Raudaskoski (FrameNet)

From Germany

Sven Behnke (Speech)
Katrin Erk from U of Saarland (FrameNet)
Marek Musial (AI)
Sebastian Pado from U of Saarland (FrameNet)
Manfred Pinkal from U. of Saarbruecken (FrameNet)
Petra Steiner (AI)
Klaus Wehrle (Networking)
Britta Wrede (Speech)

From Spain

Fernando de Arriaga from U Politecnica de Madrid (AI)
Javier Cardona (Algorithms)
Chema Gonzalez (Algorithms)
Javier Macias (Speech)
Alberto Medina (ICIR)
Sira Palazuelos (FrameNet)
Carlos Subirats (FrameNet)

From Switzerland

Jitendra Ajmera (Speech)
Sebastien Coquoz (Speech)
Micha Hersch (Speech)

In addition, we often have visitors associated with specific research and projects.

From India

Joyojeet Pal (BCIS)

From Israel

Eran Halperin (Algorithms)
Robi Krauthgamer (Algorithms)
Ron Shamir (Algorithms)
Roded Sharan (Algorithms)

ICSI is also involved in collaborative research with colleagues at other American institutions.

From MIT

Chris Batten (Architecture)
Jeayeon Jung (ICIR)
Ronny Krashinsky (Architecture)
Jacob Strauss (ICIR)
Michael Walfish (ICIR)

From Champaign-Urbana

Suzanne Gahl (AI)

From U of Chicago

Terry Regier (AI)

From Princeton

Junwen Lai (ICIR)

From UCB

Karthik Lakshminarayanan (ICIR)
Kannan Ranchandran (Qualcomm)

From UCSD

Sriram Rambhadran (ICIR)

From U of Texas

Arun Venkataramani (ICIR)

From U of Wisconsin

Vinod Yegneswaran (ICIR)

From UCSB

Manli Li (AI)

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THE INTERNATIONAL COMPUTER SCIENCE INSTITUTE (ICSI) is the only independent, non-profit US lab conducting open, non-proprietary, pre-competitive research in computer science. Affiliated with the University of California campus in Berkeley, ICSI's mission is to further research in computer science through international collaboration, and further international collaboration through research in computer science. ICSI provides a haven for computer science researchers to conduct concentrated efforts towards long-term goals without commercial limitations and with few faculty pressures. ICSI has significant efforts in four major research areas: Internet research, including Internet architecture, related theoretical questions, and network services and applications; theoretical computer science,

including applications to bioinformatics; artificial intelligence, particularly for applications to natural language understanding; and natural speech processing.

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