

# The ICSI GAZETTE

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## featured fellow: norbert szyperski

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former ICSI director

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Norbert Szyperski has never been an ICSI employee, but in many ways, he is our most important alumnus. It was through his conversations with Ron Kay, a former IBM Research manager, that the idea for an international computer science institute crystalized; it was his lobbying that convinced the German government and German companies to fund the institute; and it was his vision that was realized more than twenty-five years ago when ICSI was inaugurated in October of 1988. But ICSI is certainly not Szyperski's first achievement, nor his last.

#### EISENHOWER FELLOWSHIP

Szyperski has had a career-long interest in business administration, applications of information and communications technology, and the question of how to implement new ICT technologies into businesses and public organizations. His interest was sparked in the 1950s, a time when, he says, "the first really interesting machines came into the market in the fields of science, engineering, and business." He was a student at the Freie Universität Berlin, where he fell in love and began working for his future father-in-law's business, selling office machines.

He received his undergraduate and doctoral degrees and, in 1962, was elected as an Eisenhower Fellow. The fellowship program, established in the United States in 1953 to encourage cooperation with other countries, brings mid-career professionals in business, science, and the arts from around the world and provides them with funds and connections to travel the U.S., meet leaders in their fields, and build their leadership skills. Szyperski's fellowship topic was the social and economic challenge of automation. In his travels around the U.S., which he called a "tremendous" experience, he met the governors of North Carolina and California and the presidents of universities and major companies, including IBM. Ron Kay said the program "was very successful because many participants became leaders, much like ICSI postdocs."

Indeed, Szyperski is proof of the success of the Eisenhower Fellowship, which has been awarded to more than 2,000 people over the course of its 60 years. His son Clemens, who was born in the U.S. during the fellowship, is now a principal development manager at the Data Platform Group of Microsoft Research in Redmond, Washington; another son, Thomas, is a distinguished professor at State University of New York, Buffalo, where he is the director of the High-Field Magnetic Resonance Facility. Last year, Szyperski was one of 60 alumni whose stories the fellowship program highlighted to mark its 60th anniversary. "You see, we gave something back," Szyperski says.

#### UNIVERSITY OF COLOGNE

After his fellowship, Szyperski spent a year as a visiting professor at the University of Florida Gainesville, then returned to Germany. He received his Privatdozent degree, in preparation for candidacy for a full professorship, from the Freie Universität Berlin and in 1968 began teaching at the University of Cologne. There, he and Professor Erwin Grochla founded an institute that supported research on information technology in business, the Betriebswirtschaftliches Institut für Organisation und Automation (BIFOA). "We created research by development," said Szyperski. "We went into companies to create new things to study. If you're just doing empirical research, you're in the past, not going



# letter from ron kay

*Ron Kay, ICSI's first acting director, worked with Norbert Szyperski to found the institute*

The most appropriate retrospective of ICSI's 25 years would be to identify the major scientific ideas that have been pursued and show their impact upon computer science. Not qualified to do this, I will leave that to some future historian. What I will attempt is to call attention to some of the contributions to ICSI not subject to the best paper award.

The accompanying profile of Norbert Szyperski speaks of the seminal role he played in the conception and establishment of ICSI. This was something that had never been done before; it required imagination and commitment to an idea, once formulated. But it also required the support of people who could make a difference.

Among the earliest supporters who made a difference was Michael Rabin, Turing Award Laureate, of Harvard and the University of Jerusalem. Rabin served on the initial Board of Trustees of ICSI and he was instrumental in recruiting Jerry Feldman to the ICSI directorship. It takes someone of Rabin's stature to convince a well-established professor of computer science to commit his future to something never tried before.

Early on, there were four people on the Berkeley campus who made a difference in the establishment of a novel organizational entity, associated with the university:

**CALVIN MOORE**, Professor of Mathematics, co-founder of Mathematical Sciences Research Institute (MSRI) at UC Berkeley

**JOSEPH CERNY**, Professor of Chemistry, Provost for Research, UC Berkeley

**ERNEST KUH**, Professor of Electrical Engineering, Chair of the EECS Department, UC Berkeley

**DOMENICO FERRARI**, Professor of Computer Science, Chair of the CS Division, UC Berkeley

Moore was most generous in sharing his experience in founding MSRI, an independent institute housed at UC Berkeley, in 1982. He had faced many of the problems encountered by ICSI and had shown organizational genius not usually associated with professors of mathematics.

Cerny, in his role as provost, was instrumental in bringing together the interests of the university, the EECS faculty, and ICSI; a brilliant scientist and an exceptional administrator, he exemplified what made UC Berkeley great.

Kuh and Ferrari, as heads of the department, had the job of rallying the faculty in support of ICSI. Anyone familiar with the task of getting a large faculty to agree on a course of action will appreciate the accomplishment of a joint faculty proposal. In the course of site selection it had become evident that even institutions of great renown could not marshal such concerted action.

I can honestly say that, without these four individuals, ICSI would not have materialized.

On the other side of the Atlantic, there were others who made a difference. Foremost was Dr. Uwe Thomas, a director in the German Ministry for Research and Development, then known as the BMFT. At the time, German officialdom was ill prepared to consider the idea of a German-funded institute in the United States. Thomas immediately appreciated the potential of Szyperski's proposal. He asked the right questions and defined the appropriate conditions to be met to realize such an undertaking. One of these rare individuals able to think outside of the box and a mindset to get things done, he understood how to make the system work.

Another such individual who played a significant role in the establishment of ICSI was Friedrich Winkelhage who became the acting director of the Gesellschaft für Mathematik und Datenverarbeitung when Szyperski left to take over as CEO of Mannesmann-Kienzle. Winkelhage took over in the midst of negotiations between the German Government and the Förderverein, newly established to assume formal responsibility for the funding of ICSI.

Winkelhage was another exceptionally competent individual who put his dedication to the idea of ICSI above the many other demands made upon him.

In the world of science, we rarely speak of management as a praiseworthy activity. On the other hand, there is no hesitation in our reaction to poor management. This is unfortunate in my view. Jerry Feldman and Nelson Morgan, who have carried the burden of running ICSI for the better part of 25 years, deserve our admiration and gratitude for their willingness to perform an essential service which has benefited everyone associated with ICSI.

And what is more – to have done it, and continue to do it, well.

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# featured research:

## california connects

A 63-year-old woman interviewed by artificial intelligence researcher Blanca Gordo described her confusion about and frustration with the technology at a new job as digital dissonance: “Things are changing so much in the digital world, using the computer and the Internet... it’s assumed that you know about this, that you know about all of these new applications that are out there, and you don’t know.... I did my best to keep up but I couldn’t keep up.”

Gordo calls that digital destitution – a state of disconnection from economic, social, cultural, and institutional processes that depend on broadband technology. She’s leading an evaluation of California Connects, a federally funded project that attempted to spread broadband adoption among California residents, especially those who are under-served and disconnected.

In the 1990s, which saw the dotcom boom and the increasing use of computers in everyday and business life, the Clinton administration initiated projects to study the digital divide and to expand connection. In addition to commissioning studies and surveys of technology adoption, the administration founded the Technology Opportunities Program as part of the National Telecommunications and Information Administration, or NTIA, of the U.S. Department of Commerce. The program, which operated from 1994 to 2004, provided funds to governments, businesses, schools, libraries, community based organizations, nonprofits, and medical centers to improve their technological

capability – one grant, for example, funded broadband video conferencing between tribal hospitals and clinics to provide better services in remote areas.

In the new millennium, the Bush administration focused less on both studying digital connection and solving the problem of disconnectedness. “There’s only a problem if you have data to prove it,” says Gordo.

With the Obama administration, the federal government began again to address inequality of access to technology. Several national studies showed that those unconnected to the Internet tend to be poor, ethnic, non-citizens, and in their old age – in other words, “the demarcations follow the same trajectory as other inequalities,” Gordo says.

In addition, digital destitution has what Gordo calls a “multiplier effect”: if you don’t have the money or know how to be connected, you miss out on a vast range of ways that the Internet saves money and helps you make money. “You take longer to do things with less quality,” she said. Getting a job, communicating with a child’s teacher, finding medical services – all are more difficult the more you are disconnected. “We can’t look at technology as a separate institution,” she said. “It’s embedded.”

In 2009, Congress passed, and President Obama signed, the American Recovery and Reinvestment Act, which, among other things, allocated funds to the NTIA. One of the programs established was the Broadband Technology Opportunities Program (BTOP), which has three components, all of which aim to expand access to broadband services around the country. Two components, making up the lion’s share of the allocated funds, are devoted to building infrastructure for broadband Internet connection. Another, Sustainable Broadband Adoption (SBA), funded 44 projects around the country to increase usage and adoption.

California Connects is one of those SBA projects, administered by the Foundation for California Community Colleges (FCCC). The evaluation is one of a handful of SBA grant evaluations nationwide. The California Connects evaluation team comprises members with backgrounds in linguistics, political philosophy, anthropology, psychology, ethnic studies, and sociology; Gordo herself holds a PhD in city and regional planning from UC Berkeley.



AI Researcher Blanca Gordo

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The project comprises three main components. In one, the FCCC distributed laptops and provided technology support to California community college students within Mathematics, Engineering, Science Achievement (MESA), a national program that helps disadvantaged students succeed in math and science. In exchange, the students were expected to train their families and communities in how to interact with the Web.

In another component, the FCCC collaborated with the Great Valley Center to conduct digital literacy training to residents of 18 counties in the Central Valley of California, which extends from Redding in the north to Bakersfield in the south and includes some of the highest rates of disconnectedness in the state (Gordo's team estimates that 16 of the 18 counties have a higher rate of households without broadband subscriptions than the state as a whole).

The project also funded the building of an online technology teaching tool, Living with Technology, built by American River College.

The evaluation gave Gordo the opportunity to ground and expand theoretical claims about expanding broadband adoption – in particular, how it can be done effectively and why it should be.

It also highlighted the tensions in efforts to address digital destitution. For one thing, according to Gordo, much of the data on destitution is unhelpful. She points to recent results from the American Community Survey, which asked respondents without Internet why they didn't have

it. The number one answer was that they simply 'don't need it and not interested.' But, Gordo says, this is misleading: "I don't need or want it" can be a proxy for "I don't understand it," an option that was not provided for the survey. "One thing that inhibits adoption is the embodied myth that I can't," Gordo

said. "People have developed shame over the recognition that they don't understand the Internet."

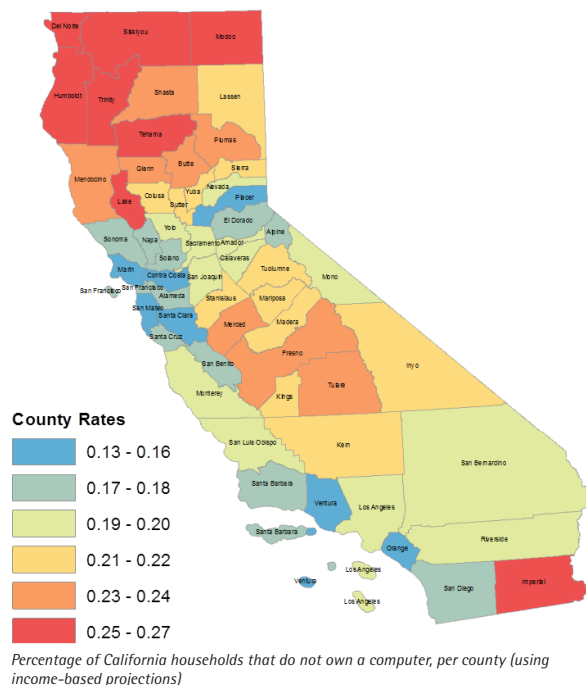
The lack of understanding requires a new user to enter a learning curve – one that becomes more and more difficult as time goes on, technical skills build on previous skills, and norms evolve through online social activity. As Gordo writes in the evaluation, "In terms of both technical skills and online social norms, new learners today simply have much more to learn than did new learners who began learning when Internet technology first started to be used broadly."


Seen purely in the light of its quantitative outcomes, California Connects was not successful. The project's goal was to train 61,120 people in digital literacy; a little more than 21,000 are

recorded as having participated. This includes 5,786 MESA students who received laptops, 11,877 family and community members trained by the students, 2,649 participants in the Great Valley Center trainings, and 961 users in the U.S. who created accounts for the Living With Technology Web site. But these numbers, low relative to the project's ambitious goals, obscure the qualitative success of the ambitious project.

Evaluating California Connects required the team to consider the context, national development plans, systems change and individual circumstances: what role does the Internet play in the everyday life of a new user? Does she connect to the Internet for work? What family, social, and economic structures support or impede use of technology?

In addition, traditional measures of success – such as whether the program prepared participants for skilled jobs or whether it increased the number of broadband subscriptions – ignore the magnitude of the knowledge gap as well as individual





users' circumstances. With those criteria, "if you don't get jobs, the project's a failure," says Gordo. "It may be that it was successful – just not in that way."

California Connects' stated goal is to promote digital literacy, an unhelpful term, according to Gordo. "Digital literacy invokes debates that are unhelpful," she said. "There's no standard definition, and it confuses the conversation."

This is part of a debate about the meaning of the "digital divide" – does it mean the division between those who own computers and those who don't, or between those who are able to function online and those who aren't?

She said an important goal is "teaching people to function in civil society." She calls this digital functioning: a continuous learning process that relies on understanding an old technology in order to develop an understanding of new technology. In other words, she said, "You have to learn to learn."

Despite the inadequacy of its numerical outcomes, California Connects helped new users become comfortable with the

Internet, use it for specific benefits, and, more importantly, begin to understand it dynamically. Of the participants in the Great Valley Center trainings, Gordo said, "People left thinking they could continuously learn."

Gordo says the project was helpful in reaching the population that the policy prescribed. "They truly were underserved. The question was, if you build it, will they come?" she said. "It was built for them. They came."

But the program needs more time, she said, as well as a recognition that learning is a social and continuous process. "The problem is more profound than anyone thought," she said. "It was a tall order." The outcome of the program also points out a need for collaboration among people with different backgrounds. "The reason we haven't been able to predict some of these issues is that we didn't collaborate," she said.

More about the California Connects evaluation and digital destitution is available at [www.digitalequality.net](http://www.digitalequality.net).

## how do you teach technology?

One challenge that California Connects faced, Gordo says, is that "there is no pedagogy for digital functioning. This is why I'm interested in building a language to teach technology."

In addition to California Connects, Gordo works with the Teaching Privacy team, a cross-disciplinary group of computer scientists, educators, and social scientists at ICSI and UC Berkeley that is building teaching materials and hands-on exercises to help Internet users, especially younger students, understand what happens to personal information online.

The team's work is funded by the National Science Foundation through the Geo-Tube project, which seeks to show how it is possible to aggregate public and seemingly innocuous information from different media and Web sites to attack users' privacy.

This fall, Teaching Privacy released the Ready or Not? app, which extracts publicly available GPS data from Twitter and Instagram posts to create a map of where the users are posting from and when they are posting there. Strangers could take advantage of this information to find users in the physical world.

The app accompanies a Web site designed by the team that seeks to spread awareness among users, particularly younger ones, about what communicating over the Web really means – who has access to what personal information and how providing that information could be harmful. The site explores ten principles for social media privacy by explaining what happens to personal information when it goes online, how it might be used to negatively affect users, and how they can defend their privacy by limiting what they share. The site also provides real-life examples of online privacy attacks. The site is at [www.teachingprivacy.com](http://www.teachingprivacy.com).

# featured fellow: continued

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into the future.” Szyperski has continued to be affiliated with the university throughout his life, becoming an adjunct professor in the mid-1980s and returning to teach for seven semesters in the mid-1990s. Now an emeritus, he remains an honorary professor of the university.

Ron Kay, who met Szyperski while he was the director of BIFOA, said, “Many students of his became leading figures in business and academia. He introduced the role of computing to business schools.”

## RON KAY

As the head of BIFOA, Szyperski was often invited to travel throughout Europe to moderate conferences and give talks. He was sometimes invited to IBM’s offices in Europe, the largest of which was in Germany. At one of these meetings, he met Ron Kay, a senior manager of research planning at IBM based in the Bay Area. Kay’s talk at the meeting was about the future direction of research, and Szyperski’s talk was about the need to adapt organizations before adopting technologies. They struck up a friendship that has lasted to this day. “We’ve become very close friends,” Kay said.

The friendship led to several professional collaborations: Szyperski invited Kay to spend time at BIFOA and was asked to nominate people to participate in a newly established fellowship program at IBM’s Research Division. It was also out of this friendship that the plan for ICSI came.

## GMD

In 1979, the German research minister asked Szyperski to be on the supervisory board of the Gesellschaft für Mathematik und Datenverarbeitung (Society for Mathematics and Information Technology, or GMD), and in 1981 asked him to take over the institute. The GMD, a German research organization, had been founded by applied mathematicians in 1968 and, by the time Szyperski took over, comprised about 1,500 scientists of different disciplines and from different locations. However, when Szyperski took it over, Kay said, “It needed major redirection.”

Szyperski says the institute’s emphasis on theory detracted from applied sciences: “The scientists liked to talk and think about it, but not to do it. Because of the heavy influence of mathematics, computer science was overlooked and engineering was not part of it.” Szyperski decided to change the institute’s focus, putting a heavier emphasis on applied algorithms and software. “I was changing it as a non-specialist,” he said. “It was easy to talk about subjects when you know where they are coming from and what they are trying to do.”

He succeeded in bringing together computer science and engineering in order to build faster computers – for example, a supercomputer, SUPRENUM, that was for a time the fastest computer in the world.


The GMD also gave Szyperski the chance to see how far Germany’s computer science community lagged behind those of other countries. “He came up with the idea that Germany was completely isolated from international computer science,” said Kay, “and he wanted to change that.”

## ICSI

In the 1980s, computer science was an emerging field, with little precedent at major universities. Kay says a surplus of scientists in the U.S. was available to forge the new discipline; Germany, which had lost many of its brightest scientists during World War II and the years leading to it, could not count on such a surplus. Kay said that in Germany, “Computer science was uniquely behind in every respect in the early 1980s.”

In 1984, Szyperski, who was still leading the GMD, and Kay, who had retired from IBM, started talking about how to correct this in ways that would benefit not only Germany but the field of computer science itself. From these talks came the idea of an international computer science institute, based in the United States, affiliated with but independent from a major university. “It had to be possible to create an institutional frame that would bridge Germany and the U.S.,” Szyperski said. “You’d have a bridge with two pillars.”

In the U.S., there was a complementary desire for such an institute. U.S. faculty were concerned about academic science’s major dependence upon DARPA funding. DARPA, the research



arm of the Department of Defense, provided a huge proportion of computer science funding at the time. Faculty were attracted to the idea of an independent institute that would provide a broader funding base as well as the same intellectual freedom granted by university departments.

Many obstacles stood in the way. Getting German entities to fund such an institute, from which they would be separated by an ocean and a continent, was the next problem. “There was a good understanding that computer science and engineering in the U.S. were developed. It was easy to transfer this idea,” says Szyperski. “It was more difficult to get an understanding that it could not be financed only by public money.” In addition, the German government could not give money to a U.S. institution directly; rather, a public-private partnership had to be established through which German funds could be sent to the U.S.

“The Germans had to trust my story,” Szyperski said. “Like in business, you have a good story and good partners, and it’s up to management.”

Szyperski’s vision and dedication paid off. “He sold the idea of ICSI to them,” Kay said.

To get private German financing, Szyperski said, “I asked the leader of Mannesmann [a German industry group] what Mannesmann could spend. He said 300,000 D-Mark a year.” He took that offer to the CEO of Siemens, then to Daimler. “I asked five industries, and I got a letter of intent for five years,” he said. “Then I went to the minister and asked for the other 50 percent.” Some of the companies said yes immediately, while others said they wanted to talk about it internally. Finally, in 1988, a sponsoring group, the Foerderverein, was formed.

In the meantime, there was work to do stateside. Between December 1984 and February 1985, Kay visited 18 computer science research organizations in the U.S. He distributed a two-page proposal for an international computer science institute that he and Szyperski had written together. From the conversations he had with about 40 people in academia, industry, and government came a set of parameters for the structure of the institute: it should be independent but affiliated with a university or major research organization;

it should perform fundamental rather than applied research; and, as Kay puts it, “It would never fly as a German institute of computer science; it would only fly as an international institute.

The political atmosphere of the 1980s played a role in how the institute would operate. Kay says that when he pitched the idea of the institute to officials at the Office of Science and Technology Policy, which advises the White House, they responded positively but “made it clear that this could not affect U.S. interests.” UC Berkeley, which was eventually chosen as the site, also wanted reassurance that such an institute would not jeopardize either its reputation for world-class research or its ability to receive grants from U.S. agencies like DARPA.

To assuage these fears, Kay and Szyperski emphasized that the institute would focus on non-proprietary, basic research. This aligned with the interests of professors who wanted to do unrestricted research. During his travels to the U.S., Szyperski also had to assure universities and government officials that “this was not a way of pirating information from the U.S.,” Kay says, but rather a way to get young people to benefit from the country’s intellectual environment. Kay says that “the guiding word was unrestricted research” that would be published just as university research was published. In addition, UC Berkeley was to be represented on the board of trustees to guide research decisions.

In March 1985, Kay and Szyperski submitted to the GMD a full proposal that, in addition to laying out the vision for the institute, also evaluated seven U.S. institutions with which it could be affiliated. Of these, five had faculty with sufficient interest and had, by the end of 1985, submitted proposals for ICSI.

In early 1986, the GMD board of directors visited the candidate universities and, in March, announced that Berkeley had been selected. UC Berkeley was chosen partly because other universities already had computer science research centers. “Berkeley was unique in not having that,” Kay said. Also important: the computer science faculty and administration strongly supported the institute, and Professor Michael Rabin of Harvard and Jerusalem Universities – one of the earliest

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winners of the Turing Award – expressed interest in sitting on the board, especially if UC Berkeley was chosen.

In addition to Rabin, Professor Gerhard Goos sat on the first board. Goos had recently helped established a computer science research institute at the University of Karlsruhe and was essential to solidifying German support of ICSI. He was joined by Professor Domenico Ferrari, the chairman of UC Berkeley's Computer Science Division; UC Berkeley Provost Joseph Cerny; Professor Richard Karp, who would lead ICSI's Theory Group (later renamed Algorithms); several other members of the UC Berkeley faculty; and Norbert Szyperski.

#### MANNESMANN AND INTERSCIENCE

In 1986, Szyperski left the GMD – in far better shape than when he took it over – to lead the board of directors at Mannesmann Kienzle GmbH. Mannesmann, its parent corporation, is an industry group with companies in several fields; Mannesmann Kienzle, which with 14,000 employees is one of its largest, focuses on data processing with special applications to automobiles. At Kienzle, Ron Kay says, “he got them into the communications business.” Szyperski worked with Peter Mihatsch to develop the first private competitor to the public telecommunications system, Mannesmann Mobilfunk, which was, he said, “a tremendous business success. We had the chance to create a new business.”

Mannesmann Mobilfunk was succeeding and ICSI was welcoming its first international visitors. Ron Kay says, “Being the restless individual he is, he went back to what he liked to do, which is startups.” Throughout the 1980s, Szyperski had often been asked to provide consulting services by companies, cities, and communities. “Some prefer to get a bill from an organization,” he said – so he founded a small consulting firm, InterScience, in 1992. InterScience is now a network that spans three generations, comprises senior and junior partners, and brings together projects in science and business.

Under InterScience's auspices, Szyperski established the Sylter Runde a decade ago. Five times a year, experts in different fields and different age groups gather on the island of Sylt, in northern Germany, to discuss specific topics and devise solutions; out of each meeting comes a white paper. “We

create out of these discussions institutions, foundations, growing companies,” he said. “The idea is not be like these talk shows, where we talk but now the time is up and we have to go.” He said one important aspect of the meetings is that participants are spread out across three generations: early adulthood, middle age, and over 60. “The main problems around the world are primarily discussed by old men and old women,” he said, “and the people who have to live with their decisions are the young people.”

“Szyperski was never paid for what he did for ICSI, but what the man did was phenomenal.”

- Ron Kay

In late 2013, for example, the Sylter Runde topic was cultural entrepreneurship: how to employ entrepreneurship not only in business, but also in art. “We [Germans] have a tradition that these activities are publicly funded,” he said. “But the funds get scarcer.” For example, he points out, in Germany operas receive 90 to

95 percent of their funding from public sources; by contrast, the Metropolitan Opera House in New York receives nearly all its funding from ticket sales and other private sources.

#### CHANGING ANTIQUATED ATTITUDES

The Sylter Runde is just the latest example of a lifetime spent influencing the direction of entrepreneurship in Germany. “He has had enormous influence changing antiquated attitudes,” Kay said. In the U.S., for example, a failed start-up can sometimes be a point of pride on a résumé because the experience provides an opportunity to examine what went wrong. In the business climate of Germany in the 1980s, failures were badges of shame. “This required the re-education of an entire society,” Kay said. “There's nobody more effective in doing that than Norbert Szyperski.”

ICSI was part of Szyperski's intellectual influence. Its earliest visitors include Wolfgang Wahlster, now the CEO of DFKI, the German Research Center for Artificial Intelligence, the leading German research institute for software technology; Oliver Günther, now the president of the University of Potsdam, Germany; and Hervé Bourlard, now the director of the Idiap Research Institute in Switzerland. All three continue to play a vital role in European support of ICSI.

Kay says that one reason German computer science lagged in the 1980s was a top-down approach to academic activity

# ron kay

– a “the professor’s way or the highway” attitude. In the U.S., arguing with a professor is looked upon much more favorably and is even expected. This different way of doing academic research is “one of the most transformative ideas the Germans took back from ICSI,” Kay said.

Since ICSI’s founding, “German computer science has come up to par. They have come up to par in every way. The flow [of information exchange between Germany and ICSI] is as much one way as the other,” Kay said, “and that was the intent.”

Szyperski also championed the idea of government support of research centers and active support, public and private, of business ventures. In a profile of Szyperski for its 60th Anniversary, the Eisenhower Foundation wrote, “That today every mayor in Germany can spell ‘incubator’ is thanks in large part to Szyperski.”

Szyperski has coached between 65 and 70 companies and invested in at least ten. He continues to sit on the boards of several of these.

“Szyperski is an exceptional person in that he is receptive to other ideas,” Kay said. “He had the opportunity to see a vast variety of ways of doing things and the intuitive ability to seize upon ideas.”

Szyperski said simply, “You don’t always have to do the same thing – you can change.”

Szyperski’s tireless efforts on behalf of entrepreneurship have garnered for him numerous accolades. In 1991, then-Governor Pete Wilson of California wrote a letter recognizing his “unselfish contributions” to ICSI and his efforts to “strengthen the research relationship between our countries.” In 1984, he was awarded the Bundesverdienstkreuz Erster Klasse, the Officer’s Cross of the Order of Merit of Germany, and twenty years later, he received the Grosse Bundesverdienstkreuz, the Commander’s Cross of the Order of Merit. In the same year, 2004, ICSI presented him and Ron Kay with Distinguished Service Awards for their “seminal role in the creation of ICSI.”

“Szyperski was never paid for what he did for ICSI,” Kay said. “But what the man did was phenomenal.”

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The extra travel, the time away from the family and the voluntary deferment of doing science is only partially compensated by the satisfaction which comes from doing something for the community at large. This community includes everyone who has ever come to the director with a personal problem, the dedicated staff who look to the director for recognition of their work, and the visitors who benefit from the services that have been put in place to make their stay productive and enjoyable.

Speaking of dedicated staff! The extended tenure of much of the staff speaks of their loyalty and sense of pride in being part of ICSI. I have come to know them as an exceptionally competent group who, through their initiative, have made ICSI a world-renowned place and, for computer science faculty, a favored place to do research.

For many of the postdocs who have participated, ICSI has been an important part of their professional career and, for all of us, the basis for lasting friendships.

Within the context of this laudation there is a need for recognition of the Board of Trustees. These fine people, recognized leaders of their fields, have given much of their valuable time – and not only at board meetings – to help the director and the institute as a whole.

Let me single out Wolfgang Wahlster, mainly because I know him well. Director of the German Research Center for AI, he was one of the first visitors to ICSI. With UC Berkeley Professors Peter Norvig (now director of research at Google) and Robert Wilensky, he helped organize an ICSI-supported conference on planning in the UNIX domain in 1988.\* Since 2002, Wahlster has been one of the most active members of the ICSI Board; for all these years, he has been instrumental in securing German government support for ICSI. As member of numerous commissions and the Royal Swedish Academy of Science, he is today one of the most influential computer scientists.

ICSI is fortunate indeed to have the support of such distinguished individuals.

ICSI’s future success will continue to depend upon its contribution to computer science. Such success will largely be due to the responsible group leaders. Here, I can only add my sincere admiration for their past accomplishments and untiring effort to stay on top.

## news briefs

Audio and Multimedia researchers **LUKE GOTTLIEB** and **BENJAMIN MARTINEZ ELIZALDE** are winners of the Ideas Competition sponsored by the Workshop on Crowdsourcing for Multimedia, held in conjunction with the ACM International Conference on Multimedia in October. The competition asked for short crowdsourcing proposals related to multimedia problems. Gottlieb and Martinez's proposal is one of ten selected for funding. The researchers will ask crowdsourced workers to classify videos by simple binary conditions - for example, whether a video was shot indoors or outdoors or whether it has music. The results will help other multimedia projects by providing audio profiles for the videos.

**NETALYZR**, ICSI's popular online tool that analyzes how open and transparent a user's connection to the Internet is, can now test network connections on Android smartphones through an app released October 22 on the Google Play store. Netalyzr is developed and maintained by Networking and Security scientists **CHRISTIAN KREIBICH**, **NICHOLAS WEAVER**, and Professor **VERN PAXSON**, who leads networking and security research. Narseo Vallina Rodriguez, a postdoc in the group, and Matt Zavislak also helped develop the app. Since Netalyzr went live in 2009, it has been used more than 1 million times to analyze connectivity from 600,000 IP addresses. The smartphone app will broaden its reach to both cellular and WiFi networks that users connect to as they travel throughout the day.

Professors **KATE SAENKO**, a researcher affiliated with the Vision Group, and **BRIAN KULIS**, an alum, were among the co-chairs of the First International Workshop on Visual Domain Adaptation

and Dataset Bias in December. The workshop focused on the challenges that arise when the data used to train a computer vision machine have different properties from the data that the model is used on. The workshop was held in conjunction with the International Conference on Computer Vision in Sydney, Australia. Saenko is an assistant professor in the Computer Science Department at the University of Massachusetts Lowell; Kulis is an assistant professor in the Computer Science and Engineering Department at Ohio State University.



Gerald Friedland

**GERALD FRIEDLAND**, who directs Audio and Multimedia Research, has been appointed to the editorial board of *IEEE MultiMedia Magazine*. Friedland joins Professor Dan Ellis of Columbia University and ICSI's Speech Group on the board. The appointment was announced in the October - December issue of the magazine, which

publishes research articles and reviews related to multiple media types.

## visiting scholars

Since its inception, ICSI has had a strong international program consisting primarily of ties with specific countries. Formal agreements exist with Finland and Germany. In addition, we have visitors associated with specific research and projects.



Claudia Nieuwenhuis

### NETWORKING

Istemi Ekin Akkus  
Bernhard Amann (Germany)  
Marco Chiesa  
Hitesh Dharmdasani  
Haixin Duan  
Andrei Gurtov (Finland)  
Shuang Hao  
Jian Jiang  
Volodymyr Kuznetsov (Switzerland)  
Jussi Kangasharju (Finland)  
Alexandros Kapravelos  
Sheharbano Khattak

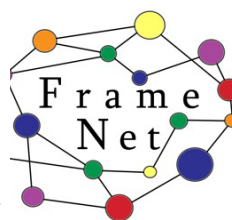
Dmitriy Kuptsov (Finland)  
Christof Leng (Germany)  
Jinjin Liang  
Andrey Lukyanenko (Finland)  
Giang Nguyen  
Ilya Nikolaevsky (Finland)  
Philipp Richter  
Luigi Rizzo  
André Schumacher (Finland)  
Amin Tootoonchian  
Daniel Warneke (Germany)  
Andreas Wundsam  
Jiao Zhang



Professor Jerome Feldman

Professor **JEROME FELDMAN**, the director of artificial intelligence research and former director of ICSI, has been appointed to the Scientific Commission of the Open University of Catalonia (UOC) in Barcelona, Spain. The UOC, a leading virtual university, has about 60,000 students as well as a research institute, the Internet Interdisciplinary Institute, of about 100 researchers. The Scientific Commission, an independent oversight body that comprises approximately 12 scholars from leading universities and research institutes around the world, is responsible for guiding and evaluating university research and doctoral programs. Members of the commission are appointed to seven-year terms.

**FRAMENET**, one of the Institute's longest running projects, has been in operation since 1997. Based on the theory of frame semantics developed by Professor Charles J. Fillmore and his colleagues, the project is building a lexicon, readable by machines and humans, by grouping words according to the semantic frames—schematic representations of situation types, such as eating and removing—that they evoke.



#### FRAMENET HOLDS 5-DAY WORKSHOP

ICSI hosted a five-day workshop on FrameNet September 9-13, 2013. The workshop, which was endorsed by the Association for Computational Linguistics and sponsored by the National Science Foundation and Google, attracted developers of natural language processing applications, researchers in linguistic semantics, and lexicographers from both industry and academia.

#### RESEARCHERS GATHER TO DISCUSS NON-ENGLISH FRAMENETS

More than 30 people from around the world traveled to Berkeley on April 19, 2013 to attend the International FrameNet Workshop, sponsored by Swedish FrameNet++. Attendees from Brazil, Germany, Japan, and Sweden discussed their experiences developing non-English framenets. Representatives from Carnegie Mellon University, Columbia University, and Google also attended.

#### FRAMENET BRAZIL BUILDING TRILINGUAL TOURISM AND SOCCER DICTIONARY FOR 2014 WORLD CUP

Researchers working on FrameNet Brazil (FN-Br), a lexicon in Portuguese based on the original English FrameNet, are helping build a trilingual dictionary – in English, Spanish, and Portuguese – in preparation for the FIFA World Cup soccer championships, to be held in Brazil in 2014. The dictionary will emphasize words and phrases related to tourism and soccer. FN-Br was established in 2007 and now comprises seven researchers and more than two dozen students, from undergraduates to postdocs.

#### VISION

Jiashi Feng  
Alexander Freytag  
Stefanie Jegelka  
Matthias Kirchner (Germany)  
Claudia Nieuwenhuis (Germany)  
Erik Rodner (Germany)

#### AI

Björn Fritsche  
Ely Matos (Brazil)  
Gerard de Melo (Germany)  
Aida Nematzadeh  
Hiroaki Sato  
Tiago Torrent  
Alexander Ziem (Germany)

#### SPEECH

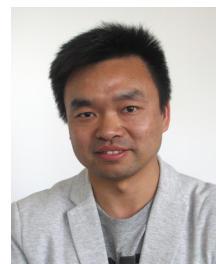
Arlo Faria (Brazil)  
Daniel Göhring (Germany)  
Kalle Palomaeki (Finland)  
Mirco Ravanelli  
Korbinian Riedhammer (Germany)  
Haihua Xu (Singapore)  
Weibin Zhang

#### RESEARCH INITIATIVES

Michael Elberfeld (Germany)  
Hayit Greenspan  
Elior Rahmani

#### AUDIO AND MULTIMEDIA

Xiao-Yong Wei



Xiao-Yong Wei

# identifying spam accounts on twitter

ICSI researchers and their collaborators at UC Berkeley, Twitter, and George Mason University have developed a technique to identify fraudulent Twitter accounts that are mass-created and then sold through an underground marketplace. Such accounts are used primarily to send spam but have also been employed to silence political protests.

The approach could seriously undermine spam sent by social media; in the researchers' study, it correctly identified millions of fraudulent accounts and helped Twitter disable 95 percent of those registered by 27 merchants tracked for the study. The researchers estimate these merchants are responsible for between 10 and 20 percent of all accounts flagged as spamming by Twitter. They are now working with Twitter to integrate the findings and other recommendations into the account creation process and Twitter's spam detection techniques.

The paper about the work, "Trafficking Fraudulent Accounts: The Role of the Underground Market in Twitter Spam and Abuse," was presented August 14 at the USENIX Security Symposium.

To build the classifier, the researchers purchased more than 100,000 fraudulent accounts over the course of 10 months. The merchants used a variety of online retail strategies, from operating storefronts with automated purchase forms to advertising on black hat forums and freelance labor Web sites. The median price of a fraudulent account purchased by the researchers was just 4 cents. Most of these accounts were confirmed through unique email addresses and had at least minimally completed profiles.

The researchers worked closely with Twitter to analyze the process used to register the accounts, determine patterns reflected in the account names, and identify particular behaviors that occur at the point of registration. From this analysis, the researchers developed a classifier that was able to retroactively identify millions of accounts that had been flagged as spam and also to flag other accounts that were eventually disabled. Based on the number of legitimate requests for account reactivation that Twitter subsequently received, the researchers estimate that the precision of the

classifier - the percentage of flagged accounts that are actually fraudulent - is 99.9942 percent.

In addition to the classifier, the researchers' study of the market for social media accounts pointed to other techniques that might limit spam. For example, accounts confirmed by email cost significantly more than those that are unconfirmed, and because merchants often resell the email addresses used to confirm Twitter accounts, only 47 percent of the accounts the researchers purchased came with the email address and password used to confirm them. Email confirmation may increase the price of - and therefore limit the demand for - spam accounts, and re-confirmation may limit the ability of those who purchase accounts to use them.

The researchers also found that merchants registered accounts from thousands of unique IP addresses, suggesting they have access to large numbers of compromised machines. This makes traditional IP blacklisting difficult. However, a fraction of IP addresses are used to register thousands of accounts, an aspect that social media sites could exploit by generating IP blacklists in real time.

The work is part of the group's ongoing study of the online underground economy, a vast marketplace that supports a complicated network of vendors specializing in a wide range of products and services, including custom malware, stolen accounts, toolkits, spam mailing lists, freelance hacking, and money laundering. In 2012, Networking and Security researchers began working on the National Science Foundation project "Beyond Technical Security: Developing an Empirical Basis for Socio-Economic Perspectives," a collaboration among ICSI, UC San Diego, and George Mason University to broaden the scope of the team's work to include attacks on social media.

In addition to the NSF grant, funding for this work is also provided by the Office of Naval Research under MURI grant N000140911081 and by a gift from Microsoft Research. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors or originators and do not necessarily reflect the views of the sponsors.

# spotlight on: bro



Bro is an open-source network monitoring platform maintained by ICSI and the National Center for Supercomputing Applications at the University of Illinois at Urbana-Champaign, with support from the National Science Foundation. Originally developed by UC Berkeley Professor Vern Paxson, who now directs networking and security research at ICSI, Bro is used to monitor and secure the network infrastructure at major universities, research labs, supercomputing centers, and Fortune 50 companies. Larger deployments include Indiana University, and NCSA's Blue Waters sustained-petaflop supercomputer, and Lawrence Berkeley National Laboratory, where Paxson began development of Bro in 1995 as a staff scientist and PhD graduate student.

## **NSF-FUNDED BRO CENTER OF EXPERTISE SUPPORTS CYBERSECURITY OPERATIONS IN RESEARCH AND EDUCATION**

The NSF has awarded a three-year, \$3.4 million grant to fund the Bro Center of Expertise, a group of researchers at ICSI and NCSA that provides training and technology for deploying Bro at NSF-funded sites of all sizes. The project also helps members of the research community use Bro as a deployment platform for their networking research.

"For many NSF-supported sites, Bro has become key to protecting their cyberinfrastructure," said Robin Sommer of ICSI's networking and security group, who, with NCSA's Adam Slagell, leads the project. "The Center gives these organizations a central point of contact for guidance and best practices, and it enables us to tailor Bro further to the unique needs of the open-science community."

The new center offers support to NSF-funded sites, from small colleges to large research facilities. A team with backgrounds in research, operations, and engineering helps such institutions install and operate Bro. The team also develops guidelines that aid the NSF community in creating custom Bro installations.

At the same time, the team will continue to maintain Bro's open-source code base, and it will extend the system with novel capabilities that cater to the specific needs of open-science networks. Universities and research institutes tend to have more liberal networking policies than commercial organizations do, putting them at greater risk and making it more difficult to find malicious behavior as users perform a wider variety of tasks on the network. Scientific networks also often face challenges when supporting high-performance

applications. The team at ICSI and NCSA will be working to improve the effectiveness of Bro in such environments.

The team also supports researchers using Bro installations in their networking research. Bro's wide deployment provides researchers with a platform to test prototype technology with little risk of disrupting ongoing operations.

"Traditionally, it has been hard for small organizations to get started with Bro," said Slagell. "We will provide the assistance to get over that inertia of the first deployment."

The Bro Center is funded by the NSF through grant number ACI-1348077.

## **NEW COMPANY BROALA PROVIDES SERVICES FOR BRO**

On June 26, 2013, ICSI announced that it was spinning out a services company for Bro. The new company, Broala, provides commercial-grade services including strategic consulting on network security and large-scale Bro implementations, as well as custom Bro programming. These enhanced services will better support mission-critical deployments by corporations and government entities. The Bro software will remain open source and will continue to be maintained by ICSI and NCSA.

Broala, the first ICSI-invested spinoff company, was founded by Seth Hall, Vern Paxson, Liam Randall, and Robin Sommer, all key members of the Bro project. Hall and Randall serve as Broala's co-managers.

"Bro will provide a next generation deep packet inspection platform as the centerpiece of our solution set necessary for improved visibility to better understand and manage the multi-threat environmental challenges of maintaining a complex network of 13,000 retail and corporate network endpoints across North America," said John C. Knuckles, Jr., Chief Information Security Officer at Luxottica North America, which has used Bro to monitor its network.

"It's an exciting time for Bro," said Paxson. "The inception of Broala will allow us to much better support the larger organizations using our system, where we're finding amazing levels of demand for Bro-oriented services. At the same time, Bro will continue as a non-commercial, open-source offering for the community, and our goal is to sustain its development in part by revenue from Broala."

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# in memoriam: charles j. fillmore

## HE FIGURED OUT HOW FRAMING WORKS

Charles J. Fillmore, one of the world's greatest linguists – ever – died Thursday, February 13, at the age of 84 in San Francisco. He was the discoverer of frame semantics and did the essential research on the nature of framing in thought and language. He discovered that we think, largely unconsciously, in terms of conceptual frames – mental structures that organize our thought. Further, he found that every word is mentally defined in terms of frame structures. Our current understanding of “framing” in social and political discourse derives ultimately from his research, whose importance stretches well beyond linguistics to social and political thought – and all of intellectual life. The world has lost a scholar of the greatest significance.

Charles J. Fillmore was the man who first figured out how framing works. He is world-renowned in linguistics, but deserves a much wider appreciation as a major intellectual. I have cited his work over and over, in my writing and in my talks. But over more than 50 years, he worked modestly as an OWL, an ordinary working linguist. He was brought up in St. Paul, Minnesota, and was known for his Minnesotan modesty, gentlemanliness, and a sly wit befitting Lake Wobegone.

When he first came to Berkeley in 1971, he encountered a culture defined by the then-commonplace expression, “Let it all hang out.” His response was to wear a button saying, “Tuck it all back in.”

I will always miss him.



*Excerpted from an article by George Lakoff, Distinguished Professor of Cognitive Science and Linguistics at UC Berkeley as well as an ICSI-affiliated researcher. He works with members of the AI Group on the MetaNet Project. His Web site is [www.georgelakoff.com](http://www.georgelakoff.com).*

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