European computer science takes its fate in its own hands

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Europe's contribution to computer science, going back seventy years with Turing and Zuse, is extensive and prestigious; but the European computer science community is far from having achieved the same strength and unity as its American counterpart. On 20 and 21 October 2005, at ETH Zurich, the "**European Computer Science Summit**" brought together, for the first time, heads of computer science departments throughout Europe and its periphery. This landmark event was a joint undertaking of the CS departments of the two branches of the Swiss Federal Institute of Technology: EPFL (Lausanne) and ETH (Zurich).

The initiative attracted interest far beyond its original scope. Close to 100 people attended, representing most countries of the European Union, plus Switzerland, Turkey, Ukraine, Russia, Israel, a delegate from South Africa, and a representative of the ACM, Russ Shackelford, from the US. Eastern Europe was well represented. The program consisted of two keynotes and a number of panels and workshops on such themes as research policy, curriculum harmonization, attracting students, teaching CS to non-CS students, existing national initiatives, and plans for a Europe-wide organization.

The reason our original call for participation attracted such immediate and widespread interest is that computer science in Europe faces a unique set of challenges as well as opportunities. There were dozens of emails in the style "It's high time someone took such an initiative"; at the conference itself, the collective feeling of a major crystallizing event was palpable.

The challenges include some old and some new. Among the old, the fragmentation of Europe and its much treasured cultural diversity have their counterparts in the organization of the educational and research systems. To take just three examples from the education side, the UK has a system that in many ways resembles the US standard, although with significant differences (3- rather than 4-year bachelor's degree, different hierarchy of academic personnel with fewer professors and more lecturers); German universities have for a long time relied on a long (9-semester) first degree, the "Diplom"; and France has a dual system of "Grandes Écoles", engineering schools, some very prestigious and highly competitive, but stopping at a Master's-level engineering degree, and universities with yet another sequence of degrees including a doctorate. To harmonize these systems, the ministers of education of European countries adopted in 1999 the "Bologna declaration" defining standard study cycles — bachelor's, master's, PhD — with the goal of facilitating mutual recognition of degrees, enforcing a common way of counting credits, and promoting such goals as student mobility (which was already on the rise thanks to such programs as Erasmus) and quality control. How to

implement the “Bologna process” remains a major worry for many departments in continental Europe; one of the benefits of the Summit has been to show that this is not necessarily a life-threatening issue, rather an opportunity to improve and strengthen the curriculum while attaching internationally recognized labels (bachelor, master) to specific steps. This was confirmed by talks about the experience at ETH Zurich (and Utrecht, as well as confirmation from French Grandes Écoles (Polytechnique, ENS Lyon, Ensimag Grenoble) that their programs are or would soon be Bologna-compliant. Jan Van Leeuwen from Utrecht, whose department completed the process in 2001, insisted that such a significant educational change should be carried out quickly rather than dragged out over several years.

Independently of the Bologna process, and like in most other places in the world,, European CS departments have recently faced declining student numbers. The field’s negative image, especially among women, the burst of the Internet bubble, the fear of outsourcing have all contributed to this broad decline. A few well-publicized layouts have somehow led many people to believe that there is high unemployment in the field — while in fact recent statistics at ETH show that computer science graduates have the second-highest hiring rates of all disciplines. To a certain extent we are just experiencing the downside of the hype phenomenon after being on the upside just a few years ago, but in some cases this borders on the absurd, as in this recent string of articles in the popluar press in Switzerland which, drawing from a handful of unrelated police cases, gravely ask whether the proportion of murderers is higher among computer programmers! Such cases are laughable but characteristic of a general problem with popular perceptions. Participants expressed the strong desire to work collectively to develop a more upbeat image of the field. Unlike public perception, most computer scientists do not spend all their time sitting in front of a computer, and have excellent job prospects in most European countries..

European research policy also presents challenges. The “Esprit” initiative and the various “frameworks” that have followed it have changed the European landscape for technology research, forcing in particular a transnational shakeup of teams and ideas and introducing many opportunities for university-industry cooperation. But there is also a general feeling of bureaucratic heaviness, with the emphasis on consortium-style endeavors involving many partners from many nations at the detriment of smaller, more focused projects. Another characteristic of the European research scene is, in several countries, the important role of state research organizations not affiliated with universities; a similar situation exists in the US for the health sciences, but not for our field.

The financial context raises interesting problems. Europeans, by and large (the UK is an exception), want teaching to be free, save for modest administrative fees. In addition, there are neither major endowments nor a tradition of alumni contributions. That has resulted in universities that are generally far less rich than their US counterparts — although the situation varies widely, Switzerland for example being very generous to its two technical universities. While some attempts are underway to increase student fees, in Germany and Switzerland for example, the costs are unlikely to reach soon the levels common in the US or Australia. Private universities are not common. All this means that

any ambitious research effort requires funding from the state, either at the national level or increasingly from the European Union.

Certainly the picture doesn't all consist of problems and challenges; a constant theme at the Summit, and the reason for the high spirit of many of the sessions, was a realization of the opportunities open to European computer science. The near-gratuity of universities, along with its negative effect on funding, yields a more democratic access to education, and means that European universities have not turned into the fundraising-obsessed business machines that their US counterparts sometimes seem to be. The long cultural and scientific tradition of Europe is also a plus; studying on the same benches as Newton, Cauchy, Gauss or Einstein is not a bad way to motivate oneself. In the global competition for good PhD students, a major advantage for the universities of some countries — in particular the German-speaking world, Northern Europe and Switzerland — is the system of "assistants", paid employees of the university who participate in teaching and the general life of their chairs while pursuing a PhD. This system is not without its drawbacks; for example there is always a danger for assistants of settling down into a comfortable job, not the best incentive to do a great PhD. But by and large the assistant scheme is a great tool for attracting talent, especially in universities where those salaries are comfortable. For some of the candidates, the alternative is to go to a US or Australian university where they have to *pay* hefty fees.

Several Summit participants viewed the current US political climate as offering a great opportunity for ambitious and competitive European universities and research centers. The tightening of visa procedures is turning away numerous potential excellent candidates at the graduate student level. The freezing of research funding outside of health care and "homeland security" (where the focus is on short-term applied work rather than research topics such as cybersecurity) has made the US less attractive to senior researchers. News stories about teaching "Intelligent Design" in schools further create an impression of an anti-science mentality in the US. European schools and others are benefiting from this situation by attracting top talent, both Europeans having spent time in the US and genuine Americans, in both cases bringing a much needed North American academic research culture to be blended with European traditions.

It is clear, though, that this opportunity will not come to fruition without fundamental changes in the way European universities function. Better career opportunities for junior professors and more broadly-based graduate education are among the key priorities. The current US situation will in any case not last forever, leading to a strong sense of opportunities to be seized now.

The avowed model for our meeting was the US "Snowbird" conferences, which for decades have been a forum for North American CS department chairs, and resulted in the creation of the Computing Research Association; the CRA has had a profound effect on shaping the North American CS community and influencing public policy. The first keynote, by Ed Lazowska from the University of Washington, chairman of the CRA for many years, showed how much Europe has to learn from this experience. Ed's talk was a goldmine of information on the CRA story and on the computer science community in

North America, filled with facts, trends, curves and relevant statistics. This was an opportunity to appreciate how much we have to accomplish, starting with the first steps of gathering the basic data. Already during the preparation of the Summit we had realized the importance of such groundwork: the major task turned out to be reaching the relevant computer science departments and their heads. There was no mailing list available, so we resorted to all possible means, from Web searches to posting on widely read mailing lists such as ecoop.org. It is no accident that the biggest contingents at the Summit came from countries where either a national organization or at least a mailing list already existed, through which we could reach interested people: UK, Germany, France, Spain. Lazowska confirmed that one of the first and most important tasks of the CRA has been to establish and maintain a proper list of departments and contacts.

Although not universities have experienced it yet, another concern is getting more pressing for a number of the participants: evaluation of publications and more generally of research. Increasingly, professors and researchers are asked to have their publications, their citations or both counted; at the same time, there's growing noise about "performance-based" resources and even pay — with "performance" being measured for a large part by these counts Regardless of one's basic opinion on the wisdom of such counting exercises, it is clear that computer scientists in Europe have failed to make the specificity of computer science with respect to publications — the importance of conferences for example — generally understood and accepted; the risk exists of being evaluated according to criteria poorly adapted to most of our discipline, such as the number of publications in *Science* or *Nature*. A first step towards assessing publication activity is to know exactly what to count and the methodological limit of what we can count.

Our second keynoter, Michael Ley, who maintains the DBLP server in Trier (Germany), has a unique perspective on the topic. The DBLP lists computer science publications, not citations, and results from an exacting effort to get the data right, through a combination of automatic and manual work. In his keynote, Michael described for example the difficulties raised by authors whose names appear in different way (Michael Smith, Mike Smith, M Smith), by several authors sharing the same name (he applies coauthor analysis algorithms to help sort them out), Asian names and many other issues. He amusingly illustrated the perils of automatic analysis of documents by showing how a well-known citation database attributes articles on computer-aided design to a prolific researcher called "Johann Wolfgang Goethe". (The explanation: articles where the cover page lists "John Author1 Jill Author2 Johan Wolfgang Goethe Universität", where the last part is simply the authors' affiliation, the Frankfurt university named after the great German poet.) His work is a model of rigor care, and openness, which one may only wish were followed by all those in charge of counting who publishes what and who cites whom.

A number of other topics led to extensive discussions at the Summit. One is the role of women in computer science, and how to attract and retain more of them; it was interested to note here that participants, in particular women, were not afraid to state claims that would not necessarily be acceptable in a US conference, for example (Violaine Prince from Montpellier) that women are generalists rather than specialists and that curriculums

should be adapted accordingly. On the topic of how to attract more students (workshop led by Oscar Nierstrasz from Berne), an interesting example is provided by a few universities whose enrollment has actually been growing, thanks to new programs on such topics as “media informatics”. Contrary to possible fears these are not “soft” programs, but strong computer science curricula which simply include a few popular themes, attracting an audience that might otherwise be put off by the (unintended) “nerdy” look and feel of the more traditional programs. Other workshops addressed European research policy (discussion led by Giorgio de Michelis from Milan); CS for non-CS students (Hans Hinterberger from ETH); curriculum initiatives (Manfred Nagl from Aachen).

A number of national efforts have led to the formation of organizations in specific countries. These were presented and compared, to draw the lessons for a Europe-wide body. SPECIF in France (Christine Choppy), the Fakultentäg in Germany (Gregor Engels), the Committee of Professors and Heads of Computing (CPHC) in the UK (Andrew McGettrick and Roger Boyle), Hungarian organization (Attila Pethoe).

Besides the keynotes, talks, panels and workshops the most important result of the Summit was the unanimous view that European computer scientists urgently need an organization with aims and scope similar to those of the CRA, extended — in light of the peculiar situation in Europe — to cover education as well as research. An initiative to start this organization is on its way, and should culminate in an official start at the next ECSS, tentatively scheduled for early September 2006 in Lyon. Some of the immediate tasks are:

- Starting the ground work: list of institutions, mailing list, Web site,.
- Defining criteria for publication and research evaluation.
- Defining guidelines for CS curricula.
- Proposing strategic directions for CS research in Europe.
- Attracting students to the discipline

The aim of the association will be to become the recognized voice of the European computer science community — not limited to universities, but including for example research centers and industrial research labs. The momentum created by the Summit should enable us quickly to take the first steps towards this goal by building on the enormous amounts of good will and community spirit that were so apparent during the two days shared by a hundred CS department chairs at the foundational event in Zurich.

See http://se.ethz.ch/events/cs_summit_2005 for more information.