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The degree reform – a great challenge, an excellent opportunity

With the complete revision of its degree structure, Helsinki University of Technology is witnessing the greatest reform in its teaching to date. The project is part of a European process to clarify and harmonise the degree structures in European universities, and aims at enhancing the mobility of both students and labour across Europe. HUT has been working on the structural reform of the degree programme for some years, in relation to its own strategy process. The Bologna Declaration has, however, provided extra momentum for this development.

Helsinki University of Technology will implement a genuine degree reform in accordance with the best practices of the Bologna Declaration. The aim is a high-quality 3+2 year degree structure corresponding to 180 + 120 ECTS points, which are recognised in other high-standard European universities of technology and science. The theoretical content of the degrees will be reviewed in connection with the structural reform. The reform involves the entire academic community: in one way or another, the process affects all personnel, with the students at the centre of the reform.

The structural harmonisation of European university education is being carried out in a way characteristic of and familiar to Finns: seriously and comprehensively.There are currently a total of 18 decrees governing the degree structure and contents in Finland.Thanks to the reform, these will be replaced by one national decree on university degrees. National collaboration has been close; the Ministry of Education has close contacts with both universities and the contact persons of different disciplinary fields of study. The aim is to achieve adequate harmonisation in different fields, thus improving opportunities for national mobility.

The reform is nationally significant, and the simultaneous implementation is both a great challenge and a unique opportunity. In the field of technology, the reform is perhaps more challenging than in other disciplines, because apart from Medicine and Dentistry, only technology has not awarded lower university degrees. So far, students have pursued a Master's degree in technology or architecture as their first degree. The goals – a clear degree structure and the promotion of studies in every way while retaining flexible structures as well as diverse studies and options – provide challenges for the process. Despite the greatly different educational goals in different programmes, the structure must be clear. The higher university degree will provide flexibility, while the lower degree will form the basis for pursuing higher studies in more than one way. The lower university degree in technology will provide a sound mathematical and scientific foundation, and in architecture, a basis for artistic work. The need for flexibility required by the changing labour market and the completion of new subject combinations must be possible in advanced-level studies. HUT will establish a two-tier degree system to facilitate mobility between universities and within HUT.

The goal of increasing domestic and international mobility will be taken into account in connection with the reform of the degree content. Finland and Helsinki University of Technology are at the cutting edge of competence and education in many fields, and have a lot to offer to the global community. HUT will support the structural reform through English-language Master's prowgrammes, thereby increasing international mobility. HUT already offers two Master's programmes taught in English: the Master's Programme in Electrical Engineering and the Master's Programme in Telecommunications. This year will see the launch of the Master's Programme in Micro- and Nanotechnology and the Master's Programme in Forest Products Technology, while the Master's Programme in Process Systems Engineering is scheduled to begin in 2005. Once the most laborious stage of the degree structure reform has been successfully implemented, HUT is most likely to increase its provision of international teaching. ■

Eeva Pitkälä

Anneli Lappalainen
Director for Academic Affairs

Not all use is illegal

Peer-to-peer networks can in the future be used for distributing television programmes

"Peer-to-peer networks are an interesting topic in telecommunications due to their controversial nature. There is a lot of promise but also difficult issues, such as using the networks for illegal file sharing. The question of illegality is also controversial: is it illegal to download a digital version of music which you have previously bought on vinyl?" says **Raimo Kantola**, Professor of Telecommunications Technology.

By Riikka Hopiavaara
photo: Jan Lönnberg

A peer-to-peer (P2P) network is an application-level network of computers connected to the Internet. As a phenomenon, it has been known and studied since the 1970s and thanks to the spread of broadband connections, P2P networks are once again a hot topic. There are approximately 800,000 broadband connections in Finland.

"The computers at the end of these broadband connections are quite powerful and when they share the same application, they form a P2P network. These computers form a distributed supercomputer with a potential calculation power of a couple of hundred teraflops in the case of Finland, many times more than the world's largest single computer. This distributed supercomputer has approximately forty gigabits per second of bandwidth at its disposal and over ten petabytes of disk memory. From the users' perspective, they are using a distributed supercomputer."

Users pay a fixed monthly charge for their broadband connection regardless of the amount of traffic. The only expense in addition to the monthly charge is the price of the computer, the applications are free or very cheap.

"An application that is attractive to users will enable them to do things you could not even imagine a few years ago. The Web can be used to do similar things, but it has its restrictions. If you try to serve a million users, for instance, by offering movies, you need a very expensive media server arsenal to take care of the distribution. In a P2P network, the users' own computers are harnessed to do the job."

Legal and illegal uses

There are dozens of P2P network applications, most of them for sharing files, such as audio and video. While sharing files may be legal, most of the content is, however, protected by copyright. Under Finnish law, reading and downloading for personal use are legal, but redistribution is illegal. This is not necessarily the case in all countries.

"Skype, which came out last autumn, is an application attracting much attention at the moment. It can be used to replace telephone networks by creating a P2P network that enables its users to talk via the Internet. This P2P application is completely legal."

The computer simultaneously acts as a phone and telephone exchange. "It remains to be seen what Skype's impact will be. It is an example of an application that is very attractive to the users," says Professor Kantola.

Catching the thieves or more supply?

Important copyright holders are slow to adopt new technology. "They are afraid of piratism. I think they have themselves to blame if they do not offer people what people want to buy. Besides, existing distribution methods, such as CDs and DVDs, are also pirated. The Internet is not the biggest culprit. If, instead, copyright holders joined in with selling content over the net, they could benefit more than anyone else from broadband networks."

Copyright holders have two alternatives: they can try to catch the thieves or offer legal material on the net. "Chasing thieves will not lead to the outcome copyright holders hope for. Those who want to copy material will do so anyway. They can encrypt the traffic. Copyright holders are not offering enough legal material, despite having the ability to do so. Instead, they are holding on to their old operating models and protecting themselves with monopolies," criticises Kantola.

Television programmes over the Internet

Kantola believes that in the future all consumer electronics will be directly connected to the Internet over a broadband connection. A P2P network could, for instance, be used for distributing television programmes. They would be bought and recorded on users' own DVD devices or computers, which in turn would distribute the programmes to other users with the same application.

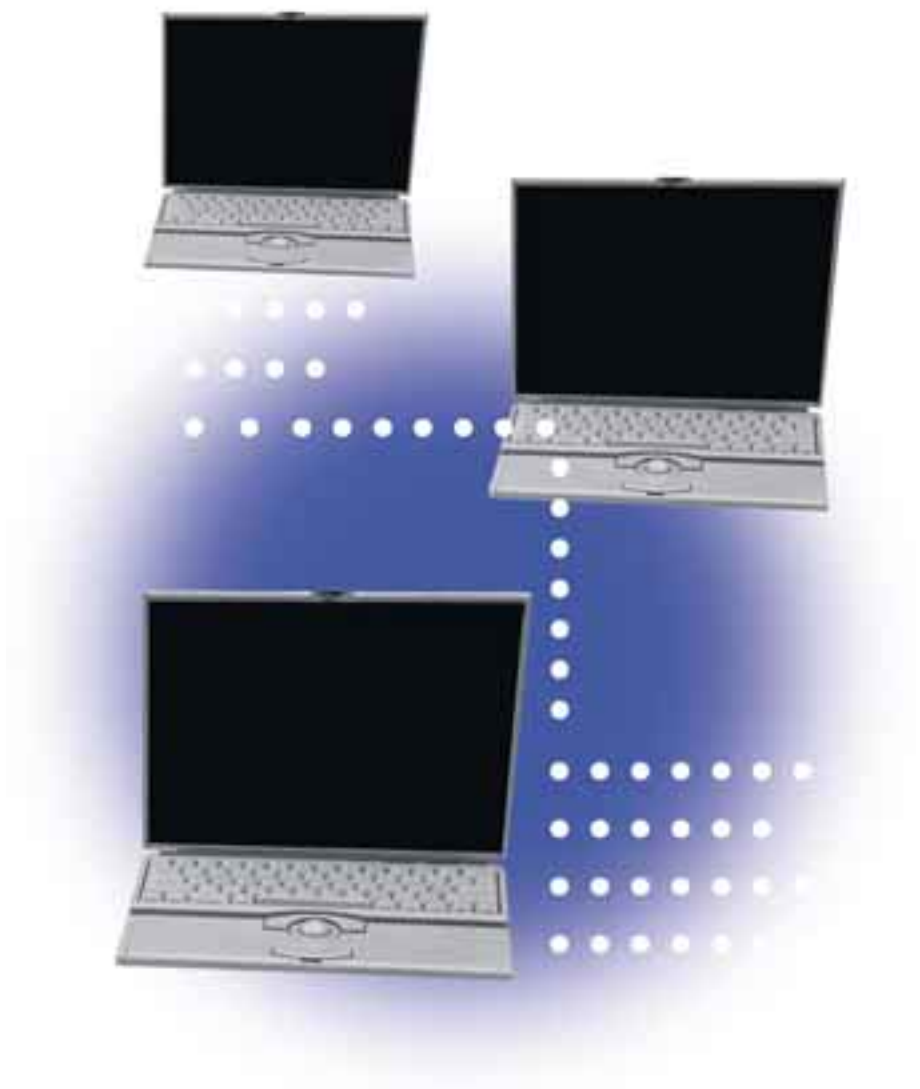
"Content would be bought legally. In order to do this, supply should be on an entirely different level than now. The aim is to use the equipment as it is. There will be savings in costs because distribution costs will be shouldered on the user. This allows the price of the contents to be affordable."

Television offers some contents that are very tightly bound to the moment in time, such as news and sports. The majority of fiction programmes, however, are not bound to time and they could have individual channels on the Internet. People could watch them when they have the time and inclination. The difference between a continuous television channel stream and a programme on the Internet could be made invisible to the user.

Digital television and Internet-based television are often seen as opposites. "I think it is pointless to see them as opposites. Time-bound

content could be distributed through digital television and Internet-based distribution could smoothly complement the supply on digital television. Digital television would only have a very limited number of channels, while Internet-based distribution would have a hundred thousand channels when each programme has its own channel," says Kantola.

Broadband connections are still not fast enough for downloading films for immediate viewing. Kantola suggests fibre cable is the solution. "Distributing programmes over the Internet would be possible if homes were equipped with fibre cables. This was not realistic only a few years ago, but now the technology for it exists. The question is whether we want to take the step. Government officials say it is not necessary, but it is already happening elsewhere in the world and we are missing the boat. For instance, there are over a million fibre cable homes in Japan. I am convinced that fibre cables will also come to Finnish homes in the next ten years." ■



What is broadband?

When a network has enough capacity to distribute moving images, for example, it is called a broadband connection. A broadband connection can be implemented in a conventional telephone network with optic or copper cable, in a G3 mobile network, with radio technology or via satellite. Cable television networks, digital television networks and even the electric power network are also suitable for two-way data transfer. According to the established definition, a broadband connection has a capacity of at least 256 kilobits per second in both directions. "I do not think that is a broadband connection. Such a network enables users to run errands, such as banking, it is an 'errand infrastructure'. When the capacity is 10 megabits or more, we are talking about a real broadband connection, which enables the users to watch videos real time, for instance," says Professor Kantola. ■

Dutch students Geert-Jan de Haan and Marina Goense participated in the European Mineral Engineering programme (EMEC).

Master's programme in a suitcase

The language barrier no longer stops foreign students from studying in Finnish universities. In addition to traditional exchange programmes, many universities now offer whole modules, even degree programmes and postgraduate studies, in English. This is one way of making Finnish universities, and through that also the working life, more international. A few students of Helsinki University of Technology have agreed to give us an insight into their route towards this northern school of technology.

By Tiina Korkiakoski
photos: Kimmo Brandt

Travelling band of recycling students

Every spring for three months on the HUT campus, you can bump into two dozen students of recycling and mineral processing, mainly from Europe. The European Mineral Engineering programme (EMEC) is a joint effort of four

European universities teaching mineral processing and recycling. The universities include the Delft University of Technology from the Netherlands, London Imperial College from the UK, Rheinisch-Westfälische Technische Hochschule Aachen from Germany, and Helsinki University of Technology from Finland. The joint studies bring savings to universities, as all modules do not have to be tailored in each university for the small number of students of each special field.

The nine-month programme has been put together from the courses of the participating universities, emphasising the strengths of each school. For the students, this means living out of their suitcases, visiting each of the four universities in turn. Dutch students **Marina Goense**, 23, and **Geert-Jan de Haan**, 20, will receive their Masters' degree from the Department of Applied Earth Sciences at Delft University of Technology after finishing their theses and completing one more course at HUT.

"I chose Applied Earth Sciences at Delft, because it seemed to be the most up-to-date degree programme, since recycling is a big future business," says Marina of her choice of career.

"I was interested in technology and recycling already in school. After two years of basic degree studies we had to choose our major subject, I chose Raw Materials. The EMEC programme is an integral part of the Master's degree," says Geert-Jan.

Everything has a price – especially the fun part

The EMEC programme offers great experiences, but is not easy on the wallet, even though cheaper airfares have now brought the price down and the home universities give their students a small grant.

"Normally I work as a waitress alongside my studies, but when I'm travelling, I can't do it. Money flows out, but there's no income," says Marina.

Geert-Jan has also put his work on hold for the duration of the programme. The students do not have to pay for their accommodation, as it is the responsibility of the host universities. But many students who have studied abroad are familiar with the increased spending; eating out, leisure time and travel all cost more when in a foreign country. This is also true for the EMEC programmeme students, but Geert-Jan does not want to scrimp too much, he wants to get everything out of this experience.

The three-month stint at Helsinki University of Technology has meant travels to neighbouring countries and to Lapland, and of course studying. "The trip to Lapland with the company visits, snowy scenery and Saami culture was one of the highlights of this whole programmeme," declares Marina.

Changing of seasons a thrill, early dinner strange

The EMEC students spend the whole nine months together, and Marina says she was pleasantly surprised at how well the team has stayed together during the winter. Some of the students have promised to keep in touch and visit each other after the programme ends. Each city has left a different impression on the students, and winter on the road has lowered the threshold of working abroad after graduation.

"Each city has its own rhythm," says Geert-Jan. Marina says, "The first two months in Delft in the EMEC programme concentrated on hard studying."

"In Aachen, we did a lot of practical work on recycling," Geert-Jan continues. "In London, we had a lot of theory, but we were also busy seeing the entire city," Marina chuckles.

"Espoo seemed very quiet, and the rhythm has been slower. Here, we have studied plant design with roads and everything," Geert-Jan says. "It was quite a shock to move from London to Espoo, but the Nordic spring weather has been beautiful," Marina says. "It was great to see the change from winter to spring," says Geert-Jan nodding.

Finnish culture has a small, but important detail, which is strange to a person, accustomed to the Dutch way of life: dinner is too early in Finland. "Here, you eat your main warm meal in the afternoon, whereas at home in Holland, I eat it in the evening," Marina says. Geert-Jan laughs and says that it is not a problem for him.

As the Espoo period nears its end, the students on the road are willing to pack up and go home again. Both Marina and Geert-Jan see the EMEC programme as an important investment in their studies and their future career. Next year, there will be Finns again among the EMEC students travelling between the four European universities.

Aiming for a degree and a future in ICT

By Tiina Korkiakoski
photo: Tiina Korkiakoski

According to the statistics, HUT has more foreign degree students, both Master´s degree and postgraduate degree students than exchange students who only come for a few months or a term. Majority of the foreign students, are from Asia. There are not too many technical textbooks in Finnish, so it is easier for foreigners to take courses where all the material is in English. Foreign degree students are a welcome addition to a country with a small population. They ensure the progress of science and fulfil the demands of industry. Living in Finland for a longer period shows the country, culture and HUT in a more detailed light. What does this closer look reveal?

Jimmy Kurian, 28, came to Finland from India 18 months ago to study in HUT International Master's Programme in Telecommunications. He is majoring in Software Engineering. Jimmy knew a little about Finland, because he has a friend studying at Tampere University of Technology. Jimmy has a Bachelor's degree in Engineering and Computer Science from Coch University of Science and Technology in India, and now he is pursuing post-graduate studies.

"The application deadline to Helsinki is much earlier than in other European universities, but on the other hand, when I got the decision I had some time to work and put my affairs in order before I started my studies," says Jimmy, who has worked for some years in Bangalore, also known as the Silicon Valley of India.

Chinese student **Yue Feng**, 28, is especially happy for the free application process of Finnish universities. In many countries, an applicant has to part with an application fee just to get his application approved, but in most European countries, this is free, even though it entails some red tape.

Yue has lived and studied in Finland for four and a half years, and he had first taken note of Finland and Finnish culture about ten years ago, when the Nokia mobile phones appeared on the market.

"I graduated from Beijing Union

Jimmy Kurian and Yue Feng think that HUT is a great place to study.

University and was already working, but I wanted to continue my studies. A friend of my father's was starting his career in Stockholm, and he advised me to apply to Helsinki University of Technology, since it was growing fast in the field of Communications Engineering," Yue explains.

Great place to study

Both men are quite satisfied with their studies. According to Jimmy, the premises and circumstances for studying are great at HUT. "If a student wants to learn, there are no restrictions, the students receive support for their everyday living and all study programmes are free," he enthuses about the good sides of the Finnish system. He only wonders why all Finns do not want to take advantage of this great educational system.

Of course, there is always room for improvement. Jimmy would like to see more support from the university in creating connections with industry and companies, the bridge building. Yue agrees. Recruiting events, company visits every once and while, or the recommendation often heard in the university career services or the company presentations to visit the recruiting pages or company website are not enough.

"Maybe the university and the companies could arrange recruiting events with a chance for interviews at the university? And more low-paid or volunteer practical work in the companies would also be welcome," both men suggest.

Yue has noticed that the Master's programme is very theoretical, and this does not necessarily meet the expectations of the employees. And the present slump in the ITC field does not necessarily help Yue, who is working on his thesis and looking for work. However, Yue believes that better times will come. He is convinced that whatever you study, you will be needed.

Cold climate and strange food

It is a long way from India and China to Finland, not only geographically but also culturally and in terms of the environment. But the differences can be overcome. "I like my room here, because it has a beautiful view of the sea. But my first two weeks in Espoo were quite a shock to me, since there were so few people and it was so quiet. In India, my flat was near a busy traffic route. Here, I called my father and told him that I can actually hear the clock ticking in my room – for the first time in my life," explains Jimmy, who can now laugh at this.

"I like this quietness, even though some of my Chinese friends feel Finnish life is not very exciting. In China, I was very concerned for the environment, and I have especially liked the green, clean environment in Finland," says Yue.

Jimmy says he has now acclimatised to the Finnish weather, even though he wore a sweater all through his first summer here. For first-timers to Finland, he recommends arrival in September, which leads to a gentle lead into to winter as the temperature gradually drops below zero.

The winter has one great drawback: the lack of light. "The winter does not make me depressed, but my energy drops and I'm very drowsy. The snow cheers me up, and I can even stand the slush, but the lack of light has at times made me consider moving somewhere else," Jimmy confesses.

"For me, the light or lack of it has not been a problem. The only thing I really don't like in Finland is the food," Yue reveals. "For example chicken and blue cheese sauce is horrible. I think we should get a 50 per cent discount for that particular experience at the student café," laughs Yue.

"But I like it," cries Jimmy, and proves that there is no accounting for taste.

The language – a barrier or not?

To the question of studies in the Finnish language, both men say they are still beginners. "I usually answer with the question, why study Finnish, when everybody I meet here speaks good English. Not learning Finnish does not mean you do not like the culture," explains Jimmy.

"India has 20 main languages and 600 other languages, and it's impossible to learn all of them. That's why I think people are more important than languages," he elaborates.

Studying at HUT is possible even if you do not speak Finnish, but both Jimmy and Yue have noticed the importance of language in making Finnish friends. A group of Finns tends to speak in Finnish, even if a foreign student is present, and if you do not speak the language, you can easily feel like an outsider.

"It may be difficult for the Chinese to join Finnish society, partly because there are many Chinese students at HUT, and we tend to spend our free time together in the local Chinese community. But I must say that the Finns are friendly and honest, and the country is the least corrupt country in the world, which is great," Yue lists the positive sides.

"And the Finnish way of working, where you concentrate on your work for eight hours and then go home to your leisure time is definitely something we should learn in India. Eight hours of effective working," Jimmy says.

"The taxation is high, though," Yue adds. "But you get something for your tax money," Jimmy retorts.

Both would be willing to work in Finland after their graduation. But if they cannot find jobs here, Jimmy will move back to India and Yue will consider moving to a third country. But that is not important in the immediate future, because both still have more studies ahead of them as well as more time to get acquainted with both sides of Finnishness. ■

Language, interpretation and technology: **In search of a wise computer**

In search of a wise computer program, together with language and cognition researchers in the humanities, Professor Timo Honkela and the cognitive systems research group at HUT have begun to track the sources of human information.

By Eeva Pitkälä
photos: Adolfo Vera

While searching for a theory to describe systems that are able to learn, information technologists challenge language professionals in the dimensions and meanings of language from a completely new perspective.

"Traditionally, knowledge has been thought of as a set of rules and structures based on traditional logic," says **Timo Honkela**, Professor of Information Technology at HUT. "I want to define things differently. Our linguistic interpretation is always relative: it is personal and dependent on the situation. It is the diversity of the world and the non-linearity of language where we actually want to start."

"Variation is important when interpreting language," Professor Honkela explains. "One of the basic motivations for our project is to give support to the notion that nobody understands language quite the same way as everybody else. This is a phenomenon that seems impossible to approach within the framework of traditional logic."

A computer program wise enough to make interpretations

"Research in linguistic processing and development has traditionally attempted to build models based on certain rules and language and its processing, and computers were programmed to imitate these models," Professor Honkela says.

Information technologists have deliberated about the problems of artificial intelligence since the 1950s, when the need for an intelligent language translation program arose. Ever since, two schools of thought have competed with each other in the research into artificial intelligence.

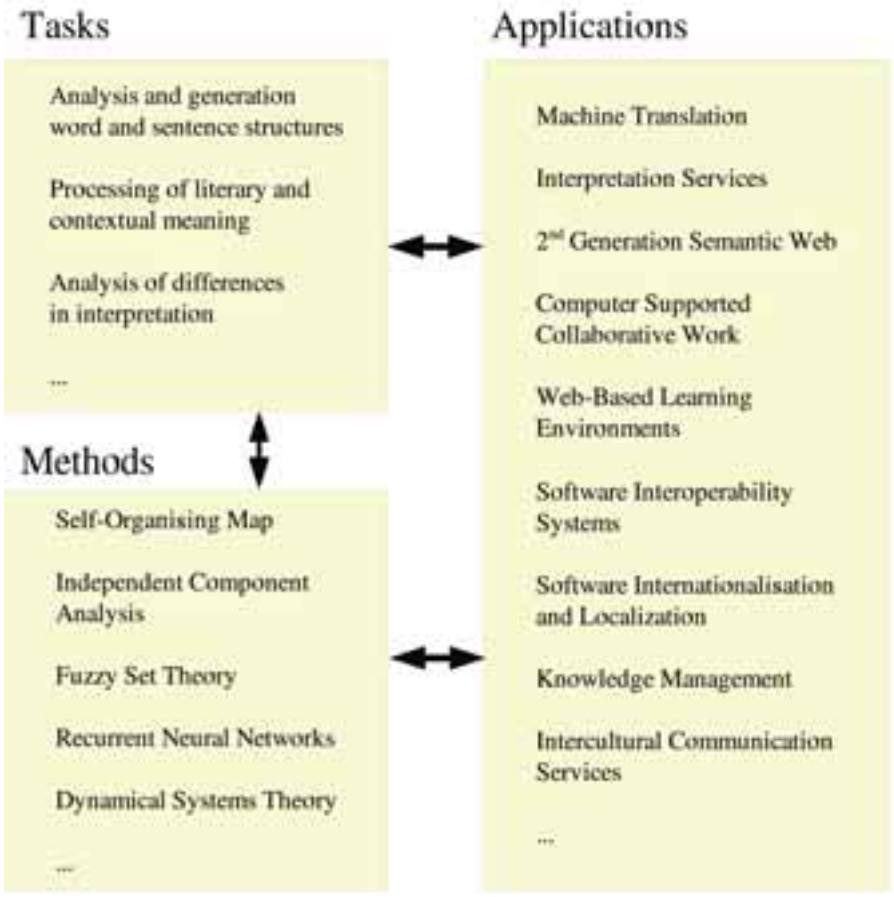
The first is based on the notion that intelligent activity can be successfully modelled using symbolic or linguistic forms of representation. The other school, critical of the symbolic structure approach and inspired by research on brain physiology, claims that models of activities considered intelligent should be based on artificial links between neurons, or neural networks.

Knowledge in neural networks

In a way, neural networks function like associative memory. The network can restore patterns from its memory and can even be taught to make interpretations if offered enough examples.

"When it comes to the meanings of words and sentences, the automatic processing of language becomes extremely difficult," Honkela says. "From the point of view of several phenomena linked with interpretation, the examination and processing of language as a mere structural system is not enough.

"When it comes to traditional or symbolic manipulation and predicate logic in artificial intelligence systems, the delicate relationships between reality and language have been almost unattainable. Interpretation is always tied to the situation."



The research group led by Professor Honkela has embarked on a mission to develop a computer programme to translate professional jargon into everyday language. An interpretative translation is what would be needed when a layperson is talking with an expert, or two experts from different fields are communicating with each other.

The nature of understanding

One of the key problems for linguistic programming concerns the amount of knowledge needed to understand something by means of language. "The knowledge and understanding we have of the world is not linguistic," says Honkela. "It's what we see, do, and experience."

In the United States, an artificial intelligence project ran between 1985 and 1995 in which the goal was to record all the knowledge one person had of the world. Researchers attempted to store the knowledge as code. There were dozens of people involved in the project. They formulated objects, relations, scripts, and other such representations of facts and simple situations, such as when a person goes to a restaurant.

Altogether, about fifty million dollars were spent on the project, and the final output had encyclopaedic dimensions. However, the researchers did not make any crucial breakthroughs. The entire project failed with respect to its goal, which was to build a basis for intelligent systems.

"Our research aims at similar long-term goals through the development of learning and embodied systems," Honkela says. Embodiment refers to the idea that the system receives direct "experience" from the external world in the form of images, sounds, and so on.

The system needs information about the language

"Knowledge cannot be depicted as symbolic structures, which is what logic is," explains Professor Honkela. "Instead, we must have something which is statistical and probabilistic, dynamic and complex.

"The fact that the system can learn language is especially important in our research. Language is not dealt with by a 'knowledge engineer' who records rules and teaches them to the computer. The system needs the 'experience' of language that makes the learning of language possible.

"We no longer begin with the assumption that all human understanding can be mechanised. Rather, we try to introduce the idea that the system can possess a certain type of artificial experience. The material in our study includes various texts and corpora, but in the future, it is our intention to pick up on modalities such as images, sounds, and other such things relating to a situation. One of our most important areas is the relationship between the visual and the linguistic. We would like to clarify more precisely just how those associations are constructed."

Data mining using self-organising maps

"Learning and concept formation are essential areas for study," Honkela explains. "We contemplate how conceptual systems in different languages among people of different ages take shape. Methods like the self-organising map create a feasible starting point for research."

The self-organising systems and self-organising maps developed by Professor Teuvo Kohonen are practical methods used in data mining and data visualisation. Self-organising maps can be used to characterise the relationships between words.

Further, independent component analysis gives features that can easily be interpreted by humans. This is a novel method of data analysis that is currently under study in the Neural Networks Research Center at the Helsinki University of Technology. It is one of the leading laboratories in the world in this area.

Artificial intelligence and learning systems

Symbolic artificial intelligence had the upper hand throughout the 1970s, and even in the 1980s, different rule-based expert systems were still being developed.

By the latter half of the 1980s, 'soft computing' began to gain ground. In addition to neural networks, it included fuzzy logic and genetic algorithms.

A neural network typically consists of a group of simple nodes ('artificial neurons'), which are connected together ('artificial synapses'). Data is handled in the network through connections that gradually spread from one node to another as the knowledge base increases. Using these basic principles, a great number of different types of models have been developed.

A neural network learns on the basis of the examples given to it, and it is taught to make an interpretation by showing it enough examples.

In a way, neural networks function as associative memories. The network can restore patterns from its memory, and it can also generalise, which means that it can learn general principles based on individual examples.

The most widely used neural network model based on competitive learning is the self-organising map (SOM, also called the Kohonen map). ■

The fuzzy set theory can be used to cleverly model various continuums. The aim of the theory is to more accurately define the essentially imprecise relationship between language and reality.

"The research group does its work based on the ideals of analytical science, but without overlooking the complexity and transitional nature of the phenomena it is trying to describe, a problem unique to the humanities," says Professor Honkela. "It is not enough to look for laws of nature, which is the tradition in the natural sciences."

Stepping on toes politely

According to Honkela, his group does not run a separate research project as such. On the contrary, it concerns a research area, or theme. The theme provides a framework in which individual research topics may be pursued.

"We are working in a new research area which has connections to the humanities, computer science, mathematics, and the physical sciences," says Honkela. "Our goal is to begin building research co-operation within the confines of the theme under development. In a way, it also involves some criticism of certain traditional approaches to philosophy and linguistics.

"We step on toes politely from time to time. The nature of our work requires different combinations of researchers and critical discussions. In a way, we are participating in the creation of a theory to understand language."

People in the research group not only form an organisational project, but also a community of expertise and motivation comprising researchers who are experts in different fields. "When people do what inherently motivates them, they are much more likely to conduct excellent and innovative research," Professor Honkela concludes. ■

Data mining using SOM

Human beings are not very good at noticing important structures or deviations from a large collection of numerical data. Numerical sets or tables can, however, be made easier for humans to understand by visualising them as an image.

Using an image, humans may observe such characteristics from a large amount of data, which are not otherwise easy to find.

A hidden structure can be found by converting the problem into visual form, in which case it is possible to utilise the human ability to recognise patterns.

Such data mining methods have developed from the need to analyse enormous sets of data which, from the perspective of traditional statistics, are problematic to handle.

Generally, the results of a SOM analysis can be readily visualised as a display of data, or a map. The map is usually two-dimensional. Those items of data that are similar in their characteristics appear close to each other on the map. The map efficiently reveals relationships otherwise hidden in complex data. ■

A short history of the self-organizing map (SOM)

The development of self-organising maps (SOMs), actually began by the end of the 1960s.

The auto-associative correlation matrix was published nearly simultaneously by researchers Anderson and Nakano, as well as Teuvo Kohonen, researcher at Helsinki University of Technology, now a Doctor of Engineering, Emeritus Professor of the Academy of Finland and an Academician.

Kohonen's primary objective was not to model a computational map. On the contrary, he wanted to create a mathematical model as advanced and functional as possible.

While developing his model, Kohonen created a way of thinking which was crucial for the future, and which led to the development of the first algorithm based on competitive learning.

The development of the actual SOM began at the beginning of the 1980s, when Professor Kohonen began to refine his idea.

The first application area for the SOM algorithm was speech recognition. The SOM-based system became one of the most advanced systems of its time and was widely applied. Since then, the SOM has been used in a wide variety of areas, ranging from the analysis of astronomical, medical, industrial, and economic data to robotics, telecommunications, and information retrieval. Currently, the number of entries in the bibliography of work that is directly based on the SOM exceeds 5000.

The most recent work of Professor Kohonen is outlined in his newest book Self-Organizing Maps, Springer Series in Information Sciences, Vol. 30, 1995; Second edition, 1997; Third extended edition, 2001.

The home page of Emeritus Professor Teuvo Kohonen is http://www.cis.hut.fi/research/som-research/teuvo.html ■

HUT and Otaniemi – trademarks of knowledge and innovation

The Finnish Parliament adopted new paragraphs in the legislation governing universities in January. It is written that universities should work in active co-operation with society when fulfilling their basic obligations as research and education units. In the daily work of universities this means new activities in regional development and also strengthening the innovation system, which handles the technology transfer from university to co-operation parties.

One year ago universities and polytechnics in the Helsinki metropolitan area adopted a joint regional development strategy. They all like to highlight the status of the Helsinki area as a powerful vehicle of knowledge and technology innovation, which is largely responsible for technology transfer in Finland. HUT has a professional role as an expert in innovativeness.

HUT and all organisations in the Otaniemi Campus have outstanding experience of innovation activities. Otaniemi has twice received "The Award of Excellence for Innovative Regions" by the European Commission. We acknowledge the award, since we really have created prominent "best practices" to manage innovation systems, evaluate inventions and professionally support start-ups. Good results are based on excellent scientific knowledge and mutual specialisation, flexibility and trust among partners. Our innovation model is highly appreciated internationally. We are also ready to transfer our expertise to Finnish parties.

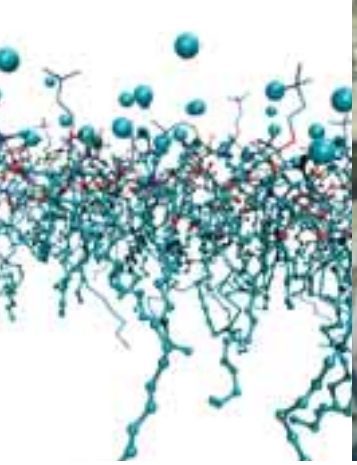
Co-operation is power! According to the principles of the network economy, we are as competitive as are the weakest parties in our innovation chain. Therefore, it is most productive to share our knowledge instead of hiding it.

HUT has a long tradition of working with Finnish industry. This is an excellent foundation on which to develop further our technology transfer practices. However, we should keep in mind that HUT must remain a university also far into the future, not a business- oriented organisation. The mission of HUT will guarantee sustainable development since it strongly focuses on both scientific expertise and the free publication of scientific knowledge, as well as a high level of education and dissertations.

Alumni are essential members of the HUT society. We have more than 7000 members in PoliAlumni. On-line services for alumni have been developed so that contacts with HUT are as easy as possible. We call on you, honourable alumni, to develop our joint innovation system. Your mentoring expertise and resources are invaluable for supporting new high tech start-ups during their first difficult years. Research activities with your companies could be more active. Education would be more targeted with your participation. A future forum for new alumni activities is the first anniversary jubilee of HUT, April 2008.

Otaniemi is an excellent campus on which to gain an international reputation and success. It is important that we all, who work or have worked or studied in Otaniemi, openly emphasise our joint trademarks and privilege: "I am a member of HUT in Otaniemi." Let´s be proud of that – innovatively! ■

Veijo Ilmavirta
Director
Otaniemi International Innovation Centre (OIIC)




The Research Council selects HUT's Outstanding Junior Research Groups

By Eeva Pitkälä, Tiina Korkiakoski, Riikka Hopiavaara, Kaarina Lahti

The Helsinki University of Technology Research Council has nominated four research teams as Outstanding Junior Research Groups.

The Research Council's principal aim is to encourage promising teams led by young researchers and to draw attention to teams with obvious prospects for rising to national or international prominence. Each appointee will receive a EUR 25,000 incentive grant for two years running.

The groups are:
– Academy Fellow **Mikko Karttunen** and Academy Fellow **Ilpo Vattulainen's** group *Biophysics and Soft Matter*
– Doctor **Petri Pihko's** group *Tomorrow's Chemistry - New Catalysts and Reactions*
– Academy Fellow **Olli Varis**' group *Water and Development*
– Doctor of Technology **Iikka Virkkunen's** group *Thermomechanical Treatments*

Researchers of biological physics model cells using a computer

A research group gathered at Helsinki University of Technology by young Academy researchers Mikko Karttunen and Ilpo Vattulainen study cells using computer modelling. The group focuses on theoretical and computational research of biological physics and soft materials.

Instead of a laboratory, the researchers work with a virtual model created from the object of study, for example, a cell membrane. With the help of experiments performed in partnership laboratories, the way the actual molecules used in the modelling behave and what kinds of forms they take in different conditions is examined.

A larger entity is constructed from interactive models gathered from small units using computer modelling. Equations of motion of the system are then calculated using computer simulation. In this way, the researchers obtain information, which can be used to describe the motions of different parts and their mixing together in the system to be studied, and learn about cell behaviour.

Using this method, studying, for example, the transfer of drugs or even alcohol in the cell membrane and separating cancer cells from healthy cells is possible. In the future, this information can be applied, for example, to movements of nano-sized molecule motors to be transferred to cells.

Mikko Karttunen and Ilpo Vattulainen have partners all over the world. They co-operate, for example, with the Max Planck Institute for Polymer Research, University of Southern Denmark – Odense, University of California, and Biomedicum in Helsinki. ■

Intelligent materials pose a fascinating challenge to chemists

"Intelligent materials and molecules have the capacity to react in a specific way to changes in their environment and cause a certain type of action. Synthetic chemistry has reached the point where we are able to create intelligent molecules in laboratories," says Petri Pihko, senior lecturer and researcher at the Laboratory of Organic Chemistry.

Antibiotics are defence molecules produced by bacteria; humans have learned to use them in health care. Several of the antibiotics we use are extracted from nature but many can also be produced in laboratories, although the processes are very complex. Antibiotics and cancer medicines are the most difficult to synthesise because of their complex molecular structures. It is also expensive to produce antibiotics and the profits are small considering the lengthy production process. What is more, the effectiveness of antibiotics declines with time. Pihko's research team has set out to tackle these problems with the aim of finding new tools and better methods for synthesis.

"We want to develop more efficient tools for synthesis by imitating nature a little. Bacteria are often considered primitive organisms but from a chemist's viewpoint they are the best synthesisers; they easily outperform the chemists themselves. They are also pretty quick at what they do. In fact, the methods used by chemists in the laboratory differ quite a lot from the synthesis carried out by bacteria. Some of our methods are in fact better than those used by bacteria and we are able to cause reactions in circumstances and with catalysts that cannot be used in nature," Pihko says.

Pihko's research team has accomplished its objective, in recognition of which it has been nominated one of HUT's Outstanding Junior Research Groups. ■

The Politics of Water

The research team headed by Academy Fellow Olli Varis surveys the links between water, urbanisation, poverty and food production in five different geographical areas. The purpose of their project, entitled *Water and Development*, is to tie in the knowledge provided by research with social and political decision-making.

The water cycle, food production, poverty and urbanisation are all interrelated. "The problems are complex. As cities grow, a decreasing number of people in rural areas are supposed to feed an ever-increasing number of people. Moreover, food cannot be produced without water – to produce a kilogram of rice requires 1,900 litres of water," says Olli Varis. 40% of the food produced in the world already comes from irrigated fields.

The study looked at China, Southeast Asia, South Asia, the Nile region and West Africa because within the next 25 years the four factors surveyed in the study will be particularly challenging in just these regions. "Our choice was also influenced by the fact that most of these regions have a very high population density. 80% of the rural population of the world lives in these areas. Urbanisation will especially affect these areas because the rural population there is so large."

The purpose of the project is to tie in the results of the study with social and political decision-making. "It is difficult to pinpoint individual decisions that we have influenced but we have tried to reinforce awareness of the link between the environment and poverty," says Olli Varis.

"I believe that research which combines several fields is the only way to try and resolve problems. Those who decide where universities invest research funds and academics themselves may not always have a high opinion of a comprehensive outlook although they should. Science is going towards increasingly narrow specialisation while the challenges of the real world are moving in the opposite direction," Olli Varis argues. ■

Research on thermomechanical treatments yields producible pilot constructions

Industrial components are subjected to extreme thermal and mechanical loads in demanding applications. Mastering material behaviour under thermomechanical loads and treatments in both manufacturing and handling finished products is of utmost importance. Iikka Virkkunen, Jyrki Romu, Yuriu Yagodzinkij, Mika Kemppainen, Janne Mononen, Hans Gripenberg, Jukka Mononen and Juho Talonen of the Laboratory of Engineering Materials work with these problems.

The research comprises five projects: Thermal Fatigue, Measuring and Modelling of Residual Stresses, Mechanical Spectroscopy, Friction Stir Welding and Superplastic Forming. The laboratory combines expertise in many fields and versatile research capabilities in order to master thermomechanical loads and processing. The work is collaborative, and each researcher studies the problems of thermomechanics from their own standpoint. Corporate co-operation is part of the team's everyday activities.

The thermomechanics research team at the Laboratory of Engineering Materials uniquely combines expertise in many different fields. The team forms a centre of competence with wide international contacts. Each field of research has its own natural co-operation partners in industry and close co-operation with international research institutes and companies. ■

HC600 fuel cell accumulator (10A, 14.5V) equipped with a regenerable carbon dioxide filter.

Europe boosts **fuel cell research** investments

A fuel cell itself is an "old" invention - its principle was discovered as early as 1839. In the past few years, fuel cell research and development has become a target of intensive study. "The attitude towards the fuel cell has changed. The fuel cell is no more hyped with advertising slogans; on the contrary the emphasis is now on the practical work," says **Michael Gasik**, Professor of Material Processing Technology.

By Riikka Hopiavaara
photos: Laboratory of Applied Thermodynamics

Great investments are being made in fuel cell research and development in the United States, Japan and other countries. The EU has decided also to invest more than ever in hydrogen and fuel cell activities.

"A significant change has taken place on a general political level. The EU has established a hydrogen and fuel cell technology programme, officially launched on 21 January, 2004. The purpose of the programme is to combine research and development outside the ordinary research of the EU framework programme as well. In addition, the industry and governments of different countries are advancing the practical use of hydrogen and fuel cell technology and are invited to form public-private partnerships." Helsinki University of Technology is one of the organisations representing the EU hydrogen and fuel cell programme in Finland.

"All options are open. We do not need to constantly ponder over whether it is worthwhile or not to invest in fuel cells and hydrogen. It has now been decided to focus on the essential, the development of fuel cells," says Gasik.

Cars emitting water vapour

A fuel cell can be used in many different applications, where production of electricity and heat, in portable power sources are required – from mobile phones to military and space applications. One application is in vehicles. A fuel cell car uses energy generated by the fuel cell and emits water vapour. "An alternative to

traditional petrol is needed, because we are worried about the availability of oil and the greenhouse effect. A traditional combustion engine car, even when equipped with a catalytic converter, pollutes and produces a lot of impurities in the air locally. Air quality is a problem, especially in big cities," points out **Seppo Hannus**, Director of the Centre for Energy Technology at HUT. The United States invests several hundred millions a year in the development of car fuel cells.

The aim is to reduce the use of oil by developing a hydric and a fuel cell car. "There are already hybrid cars on the market, which are equipped with both a combustion engine and an electric motor. These vehicles consume only half the energy compared to a car equipped with a combustion engine. Fuel cell cars have also been developed. The efficiency of a fuel cell can be as high as 70–75 per cent. With a petrol engine, the efficiency is 20 per cent, and with an advanced diesel engine slightly higher. An electric car has been under development for several decades, but scientists have not been able to come up with sufficiently developed, cost-efficient batteries. Other alternatives are being developed, such as a turbine jet engine, well-known from aircraft technology," says Hannus. Hydrogen cars already exist; for example, hydrogen buses are being used in Iceland and several EU cities (the CUTE project).

Seppo Hannus surmises that the high price of fuel cells and supporting infrastructure, referred as a "balance of plant", slows down the wider use of fuel cell vehicles. "The price creates a problem. At present, it is far too high. The fuel cells systems are approximately ten times more expensive than the combustion engine. When fuel cells become more common, the price is likely to decrease. There is no agreement so far, however, on just how low the price can go."

Hannus anticipates that the fuel cell vehicles might become more common in the 2020s. Moreover, traffic might be a more attractive object of application for fuel cells than heavy industry. "The service life of a power plant is 30–50 years. The average age of a car is less than 15 years, which means that the car population renews quicker, so new solutions can be applied in cars much faster."

Several issues must be solved in order to make fuel cells cars more popular. "The entire traffic system should be renewed. Parallel systems cannot be maintained for a long period of time. Replacing the petrol station network with another system at once is difficult and expensive. If a new infrastructure must be built, it will require standardisation of many things to prevent countries from each developing their own system," says Hannus.

Hydrogen does not explode

The image of hydrogen is slightly intimidating. Professor Gasik points out, however, that if hydrogen explodes, it does not cause as much damage as, for example, petrol. "If a fuel tank ruptures in a car crash, a petrol car will explode and be destroyed. This never happens with hydrogen. Hydrogen diffuses quickly into the air, and it burns directly upwards in flames, and it does not normally explode. The amount of explosive energy is even smaller than with the mixture of air and natural gas, which we use in our kitchens every day. Safety issues should not be underestimated, but they should not be exaggerated either."

"For comparison, imagine that this interview was made 150 years ago, and I would suggest using a petrol car. It would be dismissed by stating that petrol is dangerous. Nobody would have even imagined that this inflammable, poisonous and explosive liquid would be transported all over the world and be used in vehicles. Who would be so mad as to sit inside the vehicle that could explode and burn," Professor Gasik remarks.

Various technologies can be utilised in handling hydrogen. There are two ways to store pure hydrogen fairly

What is a fuel cell?

A fuel cell is a device with which fuel can be directly converted into electricity through a chemical reaction. In principle, hydrogen, and in some cases a mixture of hydrogen and carbon monoxide, is used as a fuel. Some fuel cell types are capable of internal reformation, in which case methane or methanol can also be used as a fuel. Oxygen is also needed for the reaction, which is generally supplied to the fuel cell with air. Advantages of the fuel cell include a good efficiency, quietness and environmental benefits. No moving parts are needed in air-breathing fuel cells.

The most common fuel cell types are the alkaline fuel cell, the polymer electrolyte fuel cell (PEM), the phosphoric acid fuel cell, the molten carbonate fuel cell and the solid oxide fuel cell. A bio-fuel cell may use some of these types depending on the biomass grade it uses as a fuel.

200-W fuel cell battery connected to the solar panel system of a summer cottage. The fuel cell battery will secure electricity in the spring and autumn.

safely: the hydrogen can be absorbed in metal or cooled to the liquid state. "Hydrogen can be obtained from anywhere, the question arises from the fact that storage and transport (i.e. the whole supply chain) should be economically profitable and safe," Gasik points out.

Research at HUT

Fuel cell and hydrogen research in Europe is represented by various projects and activity groups, in which issues related to hydrogen production, hydrogen storage, fuel cell technology and fuel cell materials are being studied.

"Iceland for example does no direct fuel cell research. They are focusing on research related to hydrogen production, storage and transportation but they offer their know-how to others as well," says Professor Gasik.

At HUT, fuel cells are mainly studied in five departments: in the Department of Materials Science and Rock Engineering, the Department of Chemical Technology, the Department of Engineering Physics and Matematics, the Department of Automation and Systems Technology and the Department of Mechanical Engineering. In the Laboratory of Materials Processing and Powder Metallurgy, technical problems related to fuel cell materials and structures are studied. These problems include for instance efficient processing, a long-term durability, performance and degradation.

"Among all new energy technologies, the fuel cell technology has developed the most. And the development has been quick. For example, no new solutions for storing electricity have been discovered in the past 100 years. It remains to be seen if the development leads to changes on a concrete level as well. During the next couple of years it will probably become clearer, whether fuel cell technology is a large scale solution," Seppo Hannus explains. ■

The International Energy Agency

The International Energy Agency (IEA) was established in November 1974 in response to the oil crisis as an autonomous intergovernmental body within OECD to ensure the energy security of industrialised nations. Under the Agreement on an International Energy Program (IEP), IEA Member countries commit to keep emergency oil reserves equivalent to 90 days of net oil imports and to take effective co-operative measures to meet any oil supply emergency. In the long run, the members strive to reduce their vulnerability to supply disruptions. The means to attain this objective include increased energy efficiency, conservation, and the development of coal, natural gas, nuclear power and renewable energy sources, with a strong emphasis on technology. Finland joined in the hydrogen implementing agreement of the IEA in April 2004. Tekes appointed the Laboratory of Materials Processing and Powder Metallurgy at HUT and the Centre for Energy Technology to represent Finland in this hydrogen agreement. ■
http://www.iea.org/

Centre for Energy Technology

The purpose of the Centre is to combine personnel and other resources of the member laboratories and to coordinate their use for research in the energy field, especially for large multidisciplinary co-operative projects which extend beyond the boundaries of individual faculties and laboratories. The Centre keeps abreast of development in the energy field and maintains contacts with industry and with other universities and research bodies. The Centre also promotes development in its field through international co-operation by means of personal contacts and by organising scientific meetings.

From the customer's point of view, the Centre for Energy Technology is a contact point through which any project can be directed to the laboratories which are most competent for the task in question. In addition, the Centre facilitates an efficient and responsible project administration and reporting, which is especially important in the case of large, co-operative projects. ■
http://www.hut.fi/Units/Energy/

The fuel cell battery as the source of power for a 300W electric outboard motor.

Minna Nieminen: A skilled teacher creates a free and encouraging atmosphere for learning

Photos: Laboratory of Organic Chemistry, Jukka Vatanen

My teaching philosophy is based on the idea that learning requires engagement on the part of the learner. This is especially true in adult education, for example at universities, where students are responsible for their own learning. The duty of the teacher is to set goals for learning and help students to see what should be learned, how information should be processed, and what kinds of learning skills and strategies are appropriate for each situation.

While teachers must take principal responsibility for course content, in my opinion it is useful to hear the views of students when planning content. Students make good and often workable suggestions, especially about how courses are run. Personally, I try to discuss this issue during the course. I want to know immediately about any problems or suggestions for improvements. I also request feedback after the course. Such feedback is obviously too late for the course in question but is helpful for planning the next one.

I consider course feedback vital because it lets me know how I have managed, and most importantly, how I could improve my teaching. I have also noticed that surprisingly enough, the opinions of students about a course are very frequently related to how the course was run. If the problems are solved, the students appreciate the course much more and pay more attention to actual content.

I feel that asking for feedback on a course obligates the teacher to take it into account as well. It is also important that students are told what effect previous feedback has had. Of course, students do have opinions that teachers cannot or will not put into practice. In such cases students should be told why.

Practical examples

Motivating students to learn is an essential duty of any teacher. Especially in the early stages of their studies, students do not have a very clear picture of what their future profession will involve; their ideas may in fact be based on just a few notions. It is vital that teachers show the practical relevance of the subject in question. As often as possible, I try to use examples and problems similar to those that students will confront on the job. It is also important that reference is made to future courses. Students should be told how what they learn will help them in subsequent courses.

In fact, I believe in the constructivist idea of learning; new things are learned on the basis of what has been learned before and in such cases knowledge is constructed by learners themselves. I consider my courses in inorganic chemistry very important because together with other basic chemistry courses they create the necessary foundation for further studies in chemistry and for the fields in which it is applied.

Interaction is easier in the laboratory

Laboratory exercises play an important role in the teaching of chemistry. In my experience, learning results improve when students can apply what they learn on a course in practice. Their own observations and conclusions often stick in mind better than what they hear in a lecture. Nevertheless, teachers should always make certain that the students' conclusions are correct. At best, lectures and exercises complement and thus support one another.

In my experience, interaction between the teacher and the student comes about much easier in laboratory exercises than during lectures because in the laboratory, the teacher usually interacts with one student at a time. It is very difficult to activate students to learn in large lectures of over 100 participants, where the teacher is remote from the students, often physically, too. Ideally, the maximum group size would be 50 to give the teacher an opportunity to have direct contact with each student.

Teaching is learning together

The learning atmosphere has also a great influence on the results. A good teacher can create a free and encouraging atmosphere for learning, one that encourages and inspires students to debate. Students must be able to feel that they can answer the teacher's questions or pose questions themselves without fear of humiliation. Moreover, the teacher does not have to have all the answers. What is important, however, is that the teacher is willing to look for the answers. At its best, a teaching situation means working together, examining together, and learning something new together because teachers can learn from their students.

I also try to look at teaching from the students' point of view and I often try to remember what I found difficult to learn. I also try to remember that students learn in different ways and to see them as individuals. I try to be as approachable as possible and available for questions outside lectures or office hours. An easily approachable teacher is not, however, an indulgent one. I can be very demanding and always insist that assignments are done conscientiously.

Teaching is best improved in groups

In the last two years I have spent a lot of time improving the courses I give in inorganic chemistry. One of the aims I have pursued is to move from mechanical learning of individual items to learning about entities and relationships between things. Courses have also been reworked so that they give students better skills to acquire information by introducing them to professional literature and various sources of information. As students must be able to assess the relevance and correctness of the information they discover, attention is also paid to critical assessment of literature.

In my opinion teaching should never be a lone task. Teaching can best be improved when it is done in a group, by exchanging ideas. I have been lucky to be a part of a working community where such teaching team has emerged. In inorganic chemistry we are a small but motivated group of teachers who consider teaching and its improvement very important. ■

Minna Nieminen, Doctor of Science (Technology)
The author is a lecturer at the Department of Chemical Technology. She was awarded the Teacher of the Year Award at Helsinki University of Technology in 2003.

Tomorrow's World Wide Web will be more intelligent and user-friendly

The World Wide Web, one of the services provided by the Internet, may be even more fascinating in the future. The XML-based markup languages under development will help us to create more versatile multimedia content on the WWW while multimodal interfaces will enable a dialogue between the user and the WWW page through new channels such as speech. Some developments in the WWW services indicate that computers will be able to use WWW services just like we do at the moment.

By Inna Linnee
photo: Raimo Laurén
Illustration: Adolfo Vera

When the World Wide Web was being developed in the early 1990s, the central components included Hypertext Markup Language HTML, Hypertext Transfer Protocol HTTP and Universal Resource Locators, URLs. HTML is used for writing WWW pages, HTTP enables the retrieval of WWW pages from the server, and URL is the address scheme for pointing the system to a particular location within the WWW. Although these basic components still exist, the WWW has developed in big leaps, thanks to research and intelligent people.

The creator of the World Wide Web, Tim Berners-Lee, wanted to design an open and non-commercial system which strongly directed the development of WWW. Tim Berners-Lee runs the World Wide Web Consortium (W3C) which focuses on the development of the WWW. "The World Wide Web Consortium is an efficient unit: it has further developed different standards and sees to the compatibility between solutions by various manufacturers," says **Petri Vuorimaa**, Professor of Interactive Digital Media at Helsinki University of Technology.

XML offers several application opportunities

Helsinki University of Technology engages in a great deal of research in relation to the WWW. Vuorimaa himself heads the GO-MM, Brocom, and XML Devices projects in the Telecommunications Software and Multimedia Laboratory. XML, which will be an essential component in tomorrow's World Wide Web, is a common denominator for the research projects. "Through XML, the WWW is a central part of all IT. It is being utilised in a vast field of IT research in one way or another," Vuorimaa says. For example, the GO-MM project explores the use of XML in multimedia interfaces, mobile phones in particular. The research group headed by Vuorimaa has also studied the use of XML in communications and digital television, the basic service of which – Super Text TV – is based on XML. Furthermore, he has also co-fathered the XML browser X-smiles. A total of 30,000 people have already downloaded the browser onto their computers. In addition, Vuorimaa's research group has co-developed WWW standards in the World Wide Web Consortium.

Designing WWW pages is easy

Although the different letter combinations related to the WWW may sound difficult to a layman, one reason for the global popularity of the WWW has been its user-friendliness. "The HTML language is quite simple. Anyone can write it without programming or IT skills. Web servers and other necessary software are easily available, even for free. The Web makes possible that anyone is able to build his or her own website or a service there and it also enables the building of high-standard digital services on top of the same technology in large companies," says Vuorimaa.

Vuorimaa emphasises XML in improving user-friendliness. "There are features which make XML easier to process than HTML. XML has stricter rules how the code should be written and, it can also be used for describing other languages. " XML is a meta language, a language for describing other languages. One example of this is XHTML, an XML version of HTML. Other XML languages include SMIL (Synchronized Multimedia Integration Language) used for determining multimedia content, SVG in graphics, X3D used for 3D graphics, and Voice XML for speech. These languages make the WWW content even more versatile.

Professor Vuorimaa believes that in the future a great majority of different electronic and digital devices will utilise the Internet of the WWW in some way.

Three future trends

Vuorimaa identifies three trends in the development of WWW. One of them is the XML markup language and multimodal user interfaces built with the help of XML. Multimodal user interfaces enable human–computer interaction with the traditional keyboard and mouse, but also provide other channels such as speech, written text or gestures. We are able to change the way we communicate with the WWW user interface, which enhances computer interactions, for the visually impaired in particular.

The second development goal is WWW services. "In the future, computers will be able to use the Web, which means that programmes can talk over the Web. Computer programmes have become increasingly decentralised: they will be run in a number interfaces

and servers simultaneously while software will be decentralised on different computers. Today, software is being coded, but in the future, it will be built from software units that communicate with each other in a decentralised way." Vuorimaa estimates that software production is increasingly changing to the development of WWW services.

The third future trend is metadata, which can be understood as data about data, or additional information about WWW pages on WWW pages. When WWW services are complemented with information understood by computers, the computers will be able to utilise services, which makes retrieving information with search engines easier. With the computers utilising services, the programmes function more flexibly and information can be filtered, processed, classified, and edited according to the needs of different user groups, which should make the WWW intelligent. All of this offers an opportunity to manage the staggering amount of information surrounding us.

"WWW can be seen as a focal component in the development of information society services. Today, the WWW is mostly used via PCs connected to the Internet, but in the future a great majority of different electronic and digital devices – such as computers, mobile phones, and digital TV boxes – will utilise the Internet or the WWW in some way," says Vuorimaa.

Independent of place and time, electronic and digital services will facilitate our everyday chores. In this, the WWW is an excellent tool. Despite the horror scenarios of some critics, Vuorimaa does not believe that Internet or WWW would collapse. The Internet was originally designed to survive nuclear wars and other crises. "The open standardisation of the Internet makes it possible for any expert to take part in standardisation. I believe that the Internet will also be an open system in the future. The Web and the Internet are far more error-resistant than many other telecommunications systems," says Vuorimaa. ■

Tim Berners-Lee wants to develop WWW into a semantic web

When Tim Berners-Lee invented the World Wide Web, he did not want to make it commercial, to prevent the destiny of Gopher, a text file relay system, predecessor of the WWW. Non-commercial approach, openness and input of many people in the development of WWW has been important to Berners-Lee. One of his challenges is to correct people who think the WWW is now ready. There is still much to develop in the WWW, as Berners-Lee's passionate speech about the semantic web proves. The semantic web is one great database, as if all the web materials would be put into one single book. This enables collecting data from different information sources and transferring it from one computer or application to another automatically, without human help. In a semantic web, the computer handles tasks we now do manually. This would allow routine tasks to be passed to the computer and people could concentrate on more creative tasks requiring human contact. Berners-Lee hopes to develop the WWW into such a semantic web.

Berners-Lee talks a lot and fast, gesturing with his hands. His energy can seem almost nervous. His inexhaustible flow of words makes the listeners breathless when they try to keep up. But Berners-Lee makes a lot of sense.

World Wide Web to serve the whole world

One significant aspect Berners-Lee wants to emphasise is device independence. It is not only true for computers, but also for mobile phones, since the WWW can be used in mobile applications. Berners-Lee hopes that WWW pages would be readable with all possible browsers, independent of the device. He also feels that protecting the international nature of the Web is very important, and that does not only extend to the text, but also cultures. He raises the question of how we could promote the entry of developing countries to the WWW world. As of yet, the benefits of the WWW development have not much helped the people in developing countries.

In more developed countries, people with handicaps can compensate for their physical or functional restrictions with the WWW. "50 percent of computer users have customised their computers because of handicaps," says Berners-Lee. Alongside the positive development of the Web, there are also negative phenomena, such as violence and sex. Berners-Lee feels they cannot be removed from the Web, since they are very relative concepts; it is difficult to set the right guidelines. He is also concerned about the growing amounts of spam mail, but does not believe it will bring the Internet down. Patents, on the other hand, are a threat. Especially in the US, software patents are granted too easily, according to Berners-Lee. "Sometimes the level of innovation required from patents is ridiculously low," he says.

The presentation of the Millennium Award brought four days of technology limelight to Finland, and the events around the award were widely reported in the international media. ■

Tim Berners-Lee explained his views on the present state and future of the WWW in Dipoli, Otaniemi and the Finnish Science Centre Heureka in Vantaa on 16 June 2004.

By Inna Linnee

Meadow flowers and internet contribution: Residents in the jungle of Finnish urban planning

By: Eeva Pitkälä
photos: Adolfo Vera, Aija Staffans and Hille Kaukonen

"Inhabitant participation is a game of skill and competence," claims the architect **Aija Staffans** in her dissertation published at Helsinki University of Technology this year. She examines Finnish urban planning from the point of view of the residents.

Aija Staffans' dissertation brings forth the stagnating features of urban planning that hinder reciprocal action and, at worst, completely distance residents from the planning of their own residential area. According to Staffans, a culture of interactive discussion, which supports decision-making and planning, is difficult to achieve.

Norms aiming at wellbeing have always played a chief role in shaping the Finnish urban environment. Urban planning has strongly been connected with the normative ideas of a welfare state. The Finnish urban planning ideal continues also the European urban tradition. "As public places open to everyone, the streets and market squares of ancient Greece and Rome symbolise the notion of democracy, of free people and the freedom of assembly. Finns have fostered this ideal as well, even today," states Aija Staffans.

Technical quality is also emphasised in Finnish cities. The wall mortar is not allowed to crack and show signs of age; on the contrary, the facades of the town houses have been kept in good shape, underground pipes have been protected from frost and vehicles stay in their own lanes.

In a cottage in the countryside by a lake in the middle of the city

A good number of Finns still have their roots in the countryside, however. A close connection to nature can still be seen in Finland's urban tradition today, despite the quick pace of urbanisation. The agrarian way of doing things for oneself is valued and builders who 'built with their own hands' are still heroes.

Ordinary Finns who try to understand modern urban planning solely on the basis of their own daily experiences, are, to say the least, left out of the whirlwind of planning. Such terms as, ´urban sprawl´, 'social segregation´ or 'service structure' merely represent office jargon to most people.

Right and wrong ordinary residents

Further, Staffans states that there is a built-in, strong set of norms which dictates the principles of urban planning in Finland. Planning is prescribed by the distinct preconceptions of the planners concerning people, their activities and needs.

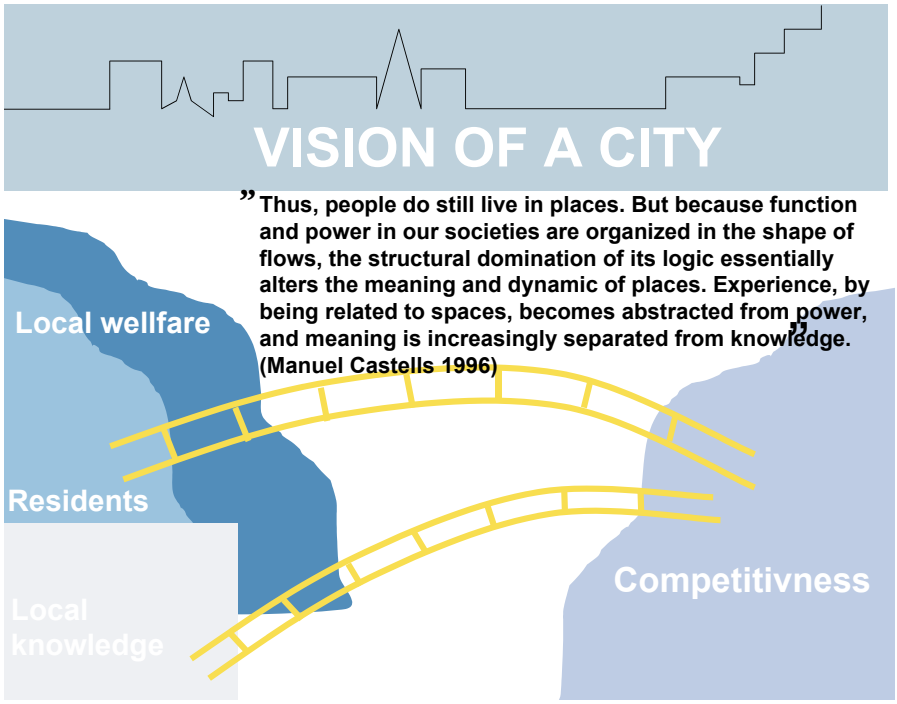
"Politicians and planners love the so-called 'ordinary resident', Staffans asserts. Officials are happy to plan and use power on behalf of this 'ordinary resident'.

Those real ordinary residents, who participate in meetings for planning, are often seen as the 'wrong' type of people in the eyes of the planners. They are too old, too highly educated or too one-sided in presenting their own points of view; they do not understand the whole picture – they do not represent the norm of the ordinary man.

Say it so everyone can understand

According to Staffans, the interaction between the residents and decision-makers falls through because often the planning documents contain jargon and expressions not familiar to residents. Currently, being able to participate in discussions for urban planning requires mastering the language used by the planning profession.

Documents have not been changed in the past 30 years at least. This fact applies especially to the most important document, the land use plan drawn on a map. Staffans feels that the planning documents, in their present form, provide limited opportunities to withstand today's challenges in urban



planning.

Staffans says that nowadays especially, new working models which are bound to large planning and development unities are being sought after and the traditional planning procedure unavoidably receives a less important role. “Designing and planning are more and more connected to many types of developer networks and consortia for the realisation of the project, which, together, seek new working models. Organisations of citizens and residents who are increasingly more active also work within these development groups and networks. Who here masters the unity – no one?” Staffans claims.

Case Lauttasaari

Staffans presents the case of Helsinki’s Lauttasaari as a good example of how difficult it is for residents and planners to meet eye to eye. Geographically, Lauttasaari is an island connected to the Helsinki cape by a bridge. It is located in the western part of Helsinki between Ruoholahti and Espoo’s Keilalahti.

The spacious townscape of Lauttasaari dates back to the 1950s. (The idea of building densely populated housing estates came to Finland later.) Lauttasaari’s residents enjoy living in the district: you are not ‘forced’ to live there; you live there because it is your choice to do so.

A new western route for the metro that runs through the entire capital region is closely linked to the general planning process for Helsinki. This has been reflected in the contents of the General Plan 2002. The new route has been planed via Lauttasaari and this has quickly increased the attraction of Lauttasaari and its immediate surroundings for developers.

For the residents, the area’s increased attraction is visible as a change in the townscape and intensified use of land, neither of which are welcomed by the current residents.

The big role of a small meadow plant

As a result of the plans for a metro, which should run through Lauttasaari, a need for planning arose for a new metro station in nearby Koivusaari, now an island used for recreation. Plans for building housing next to the metro have also been made.

The first drafts contained plans for an area of 6,000 residents, which would have meant a considerably dense housing stock in the eyes of the current residents. The local interest and the metropolitan interest were strongly conflicting. The residents of Lauttasaari opposed the plans and quickly acted upon the situation. They launched a campaign, in which the Helsingin Sanomat newspaper, among others, visibly participated, emphasising the strong networking of residents, expertise, publicity and lobbying.

There is an interesting detail in the planning process of Koivusaari to be mentioned. “A protected meadow plant was found during the planning process on the southern tip of Koivusaari and with one limitation set by officials, the number of residents in the plan was cut in half.” The influence of one plant was amazing compared to all citizen participation.

Because of all these difficulties the plans for building were frozen. “Koivusaari is, at the moment, an ‘unresolved area’, which will be decided upon at a later date, along with two other politically difficult areas,” says Staffans, summarising the chain of events.

“We don’t want a Beer Paradise.”

Another example of the difference between the general opinions of the locals and of the city officials, and also the influence of the residents in the matter, is the case of Helsinki’s Maunula district presented in Staffans’ study.

The 40-year lease of the service and shopping centre located on a lot leased by the city expired. The local residents felt that the shopping centre disturbed the environment, weakened the image of the area and increased the feeling of fear and insecurity. It did not even offer services the residents needed. The residents launched a campaign to demolish the shopping centre and to renew the entire area of the Maunula centre.

A close connection to nature can still be seen in Finland' s urban tradition today, despite the quick pace of urbanisation.

The views of the city officials and the residents concerning the matter were different. For the city, it just meant renewing another lease on a single lot with an old tenant of the area. The residents felt, however, that the expiring lease was a great opportunity for renewing the entire shopping centre.

The residents of Maunula chose the Internet for their channel to influence and prepared material that they felt would get the ball rolling. The result was that the planners were surprisingly in favour of the residents' point of view.

The city planning office began working on an alternative that would be consistent with the residents' wishes. The need for Maunula residents to be able to influence their environment certainly has not subsided; the shopping centre project is still unfinished and planning continues.

Norms stifle innovations

According to Staffans, a broad citizen discussion cannot be applied to generating new ideas and solutions. She feels that the structures and ways of interaction in urban planning should be developed while recognising these different goals.

"Interaction has two different functions in urban planning. First, interaction supports democracy. Broad, open discussion where several types of views are brought forth is a basic prerequisite for democratic processes," Staffans says.

" Second interaction and dialogue are excellent sources of innovation. This has been too easily ignored in Finnish urban planning. The strong professionalism together with normativity and sticking to what is familiar and generally accepted stifles innovation.," Staffans says.

"It would be important from the residents' point of view that the planning process should include, among other things, approaches with which their experiences and cultural understanding could be tied in as a part of urban planning," Staffans says. Discussion runs much smoother in small-scale round-table meetings than in mass meetings held in large lecture halls.

Active residents challenge urban planners

In both the Lauttasaari and Maunula cases, a group of residents clearly played the role of interpreter or mediator between the local residents and the experts. An interest in urban planning, multifaceted know-how beneficial to the issue and an opportunity for persistent work unite these brokers, proven effective 'doers' even in the theory of network.

"Active citizenship and the questions that unavoidably arise from it are anything but repressors of development; they are a challenge to urban planning. Society's ability to assess the knowledge of people about issues concerning them may just end up being a repressor in and of itself. The one who wants to succeed in urban development in the future is the one who is able to gather into a working network all those interested in the future of the city," Staffans concludes. ■

The article is based on a speech at the Casa Humana ceremony organised by the Finnish Housing Fair Co-operative in May 2004, and an interview given by the architect Aija Staffans.

Teaching and research at HUT since 1849

Engineering education began in Finland in the first half of the 19th century as part of Government measures to modernise the economy of this small grand duchy on the northern periphery of Europe. Teaching began at the Technical School of Helsinki on January 15, 1849, in the house of master upholsterer Litonius' in the very centre of town.

By Panu Nykänen
photos: HUT archive

Engineering education began in Finland in the first half of the 19th century as part of Government measures to modernise the economy of this small grand

duchy on the northern periphery of Europe. Teaching began at the Technical School of Helsinki on January 15, 1849, in the house of master upholsterer Litonius' in the very centre of town.

The first director of the Technical School of Helsinki was the chemist Anders Olivier Saelan, a recent graduate of the University of Helsinki. The school's curriculum was designed to compete with the novice system of the trade guilds so that students who completed the entire course received both a general education and training for technical occupations. Actual technical vocational training began in Helsinki after a legislative reform in 1858. The technical trade departments of engineering, mechanical engineering, architecture, chemical technology and surveying were founded at the same time.

The Finnish general basic education system was created after the 1860s on the basis of the system used in Switzerland. As the Finnish system evolved, opportunity arose to give mathematics and natural sciences and technical vocational subjects greater emphasis in the curriculum of the Technical School.

Alongside the University

In 1872 the school was renamed the Polytechnic School and in 1879 the Polytechnic Institute. In conjunction with the latter change, preparatory courses were discontinued and the Institute began to offer the highest technical training in the country. In 1877 the Polytechnic School moved to its own premises when the building designed by F.A. Sjöström was completed next to Hietalahti Market. Since then, the complex of buildings has been expanded on several occasions. A new, up-to-date chemistry laboratory was completed in 1899. The main extensions of the main building were completed in 1904 and at the end of the 1920s a storey was added to the chemistry laboratory. During the 1920s, new technical laboratories

The main building in 1886

were built in the neighbouring blocks to replace those the Institute had used since the First World War. When the building of the Technical Research Centre of Finland was completed in 1942, the University of Technology had taken over an entire district of the city.

By the beginning of the 20th century, the Polytechnic Institute had a little over 200 students. After a legislative reform in 1904 and with a new, larger main building capable of accommodating more students, the number grew to over 400. After the First World War severed Finland's close links with Germany, the number of students grew to almost 600.

The Polytechnic Institute was made a university-level school on April 2, 1908 and renamed the Technological University of Finland. The change in name brought its students the rights of university students, and its permanent teachers became professors, the degree requirements of doctor of technology were defined and the school-like system was replaced by restricted study rights. In the late 19th century, students who had passed every course with the highest degrees received a special diploma, as was the custom in German-speaking countries. After 1908 every engineer got the diploma, but the actual title 'diploma engineer' was adopted in the early 1940s when the

Internal Combustion Engine Laboratory in 1958

lower technical degrees were defined in Finland. Likewise, those receiving a doctorate from the institution received a doctoral diploma.

The first doctorate was awarded at the University of Technology in 1912. By the time the first conferment of degrees was arranged in 1934, the University had awarded 11 doctorates. The one hundredth dissertation was completed in 1961.

Move to Espoo

Moving the University of Technology to a more spacious area in the outskirts of the city or to Tampere was already discussed in the 1910s. Various plans were made for moving to northern Helsinki to districts that were at the time largely undeveloped, including Meilahti and Haaga. As the city grew in the early 1940s, areas even further from the centre, such as Lauttasaari and Puotinharju, were discussed. However, in 1945 an architectural competition was held to expand the operations of the University in Hietalahti.

The rapid advance of technical sciences after the Second World War changed plans for good. To keep in step with post-war progress, the University and the Technical Research Centre of Finland needed substantial amounts of land to build laboratories. The city blocks available were much too small. The final decision to move the University out of the city was made in 1948. The State bought the lands of Otaniemi Manor in the eastern part of the rural municipality of Espoo to serve as the campus of the University and the Technical Research Centre on January 15, 1949. The area was being farmed at the time and the plan was to incorporate it into the City of Helsinki, but instead the area remained part of Espoo and the University is today located in the City of Espoo.

Development began in Otaniemi with housing for students, called Teekkarikylä or student village. Its first residents were not students, however, but athletes taking part in 1952 Helsinki Summer Olympics. The first functions of the University moved to Espoo in 1955. The main part of the main building was completed in 1964 and the move from Hietalahti was finalised ten years later. At the same time the main building was completed, work on the student union building Dipoli was finished. In the 1970s Dipoli became the best-known venue for congresses and training courses in Finland.

In the 1950s and '60s Otaniemi became one of the most interesting sites of Finnish architecture. The general plan of the campus was made by the architect Alvar Aalto. His office was in charge of the main building and the Otahalli sports hall, built for the Olympics, and of several other buildings. The oldest dormitories, the Servin Mökki restaurant and the Otaniemi chapel were designed by the office of Heikki and Kaija Siren. Dipoli was designed by Reima Pietilä and Raili Paatelainen.

The Teekkarikylä and the University of Technology were built in the woods in the rural municipality of Espoo. Espoo gained town status in 1972 and has since then grown to become Finland's second largest city. The campus of the University has expanded to include business incubators and a technology park. It has become one of Espoo's best known districts. Today, some 11,000 people work and 14,000 study in Otaniemi. ■

The campus in the 21th century

Web-based course workshop develops web-supported courses

The Web-based course workshop is arranged by the Unit of Teaching and Learning Development of Helsinki University of Technology. It is aimed at all personnel interested in developing a Web-based course. A Web-based-course is at least partially taken over the Web. The workshop's target group includes the teachers and other teaching personnel of HUT.

By Inna Linnee
photos: Inna Linnee

The workshop helps to find new options that could be useful in developing one's course. The workshop does not start from scratch, but rather concentrates on developing and working on existing material. The workshop is not a technical course, but one for designing a Web-based course. During the first three sessions of the workshop, the participants do not even touch a computer, but in the fourth session they will use Optima work group software.

"The strength of Optima is that the students can produce and save documents in it, read each other's documents and get peer feedback," explains **Olli Hyppönen**, one of the leaders of the workshop held in June.

The workshop consists of four phases, the first of which emphasises the significance of target setting. The targets are the core for the course design. When you have clear targets, you can consider which teaching methods to use to reach them. Both teaching and learning targets are combined with assessment, which is especially important for the student. The teachers also need to assess their own success. If students do not know what will be assessed, they cannot steer their activities toward their targets and they tend to memorise everything. Thus, the learning does not exceed the level of mere memorisation and genuine understanding is never reached.

In the workshop, the issues are addressed within the group, people work in pairs and receive tutoring from the workshop leaders. Outside the workshop, the time put into developing the course is up to the individual. However, designing a Web-based course initially requires more input than a regular course, and the possible savings in time will be apparent only later. Still more important than the savings of teacher's time, are the improved learning possibilities for the students, as well as their general satisfaction with the course arrangements. As clients, even the students want added value from Web-based courses compared to conventional teaching methods.

Web-based courses require constant improvement

This workshop had three participants: **Kirsi Heino** from the Library, **Eva Lönnholm** from the Language Centre and **Kaisa Tiippana** from the Department of Electrical and Communications Engineering. All participants were equally motivated to develop a good course.

Information specialist Kirsi Heino from the HUT Main Library tutors students with five other information specialists on the Searching for Scientific Information courses. She thinks the use of the Web as a teaching aide has eased the teacher's work. "The material is easily available. Our students are technology-oriented, and therefore the information technology does not pose problems for them," Heino says.

After the first day, the participants seemed satisfied with the workshop. However, developing a Web-based course is not limited to the workshop, and each course needs constant improvement. Eva Lönholm, teacher of commercial Swedish, says that one could spend one's life developing and improving a course. ■

Kirsi Heino from the Library participated in Web-based course workshop. Olli Hyppönen was one of the leaders of the workshop.

EUNITE: European co-operation in development of ICT for teaching

■ Would you be interested in studying in an international group from your home computer? One such opportunity comes from the European Network of Excellence on Intelligent Technologies for Smart Adaptive Systems EUNITE and the courses offered within the network. HUT's EUNITE partner universities include Aalborg Universitet (Denmark); Fernuniversität Hagen (Germany); Universidad de Granada (Spain); Katholieke Universiteit Leuven (Belgium) and the University of Strathclyde (Scotland). The European University Network for IT in Education is collaborating with the EuroPACE community, whose task is to establish a pan-European virtual university.

CLUSTER: HUT joins the network of leading universities

■ Helsinki University of Technology has been accepted as a member of CLUSTER, an acclaimed consortium in the field of science and technology. The acronym stands for the Consortium Linking Universities of Science and Technology for Education and Research, which unites universities of technology graded as excellent. There is one from each European country, with the exception of Germany, which has both Universität (T.H) Karlsruhe and Technische Universität Darmstadt in the network. Imperial College London and EPFL Lausanne represent perhaps the most cutting edge of the network. The Indian Institute of Technology (Delhi) is an associate member. CLUSTER operates mainly through task forces to establish best practices in the processes of teaching, research and administration.

ICT studies attract international students

■ 30 international students took the entrance examination, 19 of whom were admitted. The subjects that attract the most international students are computer science, electronics and electrical and communications engineering. Interest in the ICT branch is evident, for instance, in the number of applicants to the English-language Master's programmemes at the Departments of Electrical and Communications Engineering and Computer Science and Engineering. A total of 411 international applicants sent their applications by the January deadline, 91 of whom were admitted.

FOREIGN STUDENTS AT HUT IN 2003
M.Sc. students 431
Licentiate and doctoral students 260
Exchange and visiting students 263
In addition, there are foreign students in the laboratories completing their practical training.

A 21st century wooden kiosk in Liisanpuisto Park, Helsinki

■ Johanna Rope, a student of architecture, received first prize in the student competition arranged by the HUT Department of Architecture (Wood Studio) and Wood Focus Ltd. The task was to design a café kiosk in a park for a restaurant operating in Helsinki. The kiosk is open only in the summer. In the winter, the kiosk stands as a minimalist wooden box and because all its façades are identical, it does not reveal its purpose to passers-by. In the summer, the walls of the kiosk are opened, revealing the bar, encouraging visitors to spend time on the terrace.
Each façade of the kiosk is made of square opening wall elements. Once opened, the wall elements divide the space in the surrounding terrace area. The wall elements are clad with traditional 'finger' panels. The façade panels come in different sizes and are combined randomly.
The roof is made of glass. During the daytime, the surrounding trees cast shadows on the inner space. In the dark, the kiosk illuminates overhead tree branches through its roof.

Riikka Hopiavaara

Kimmo Brandt

Finland continues to attract university students from abroad

■ Finland is attracting an increasing number of foreign exchange students. In 2003, incoming students outnumbered Finnish students going overseas for the first time.

In 2003, Finnish universities welcomed a record 6,616 foreign exchange students, an increase of 10% on 2002. From Finnish universities, 7,555 students went abroad to study, which is just under 2% more than the year before.

Student mobility concentrates on Europe

Despite the increase in the volume of exchange, the same countries continue to top the charts. Almost 80% of Finnish students went to a European university and almost 90% of those coming to Finland came from one European country or another. Although an increase in the popularity of more distant countries has been anticipated for a long time, Europe's standing seems unshakeable. The most popular countries among Finnish students are, in order of popularity, Germany, the UK, Sweden, Spain, France and the Netherlands, whereas the main contributors of students to Finland are Germany, France, Spain, Italy, Poland and the Netherlands.

Erasmus still the most important exchange programme

The Erasmus exchange programme of the European Union is still by far the most popular. Some 50% of the Finnish exchange students and over 70% of the foreign students who come to Finland use Erasmus.

Copyright licenses enabling free distribution now available

■ In May, Creative Commons and the Helsinki Institute for Information Technology (HIIT) – a joint research institute uniting efforts from HUT and the University of Helsinki – published official copyright licences which enable the copyright holder to determine the reuse and distribution rights of their intellectual work.

The copyright licences allow copyright holders to easily inform the world that their works are free for copying under specific conditions determined by the author. The system operates via an Internet service. The copyright holder can choose the appropriate licence conditions under which the work may be distributed. Since the web site is able to identify the language settings of web browsers, Finns can now select the appropriate licence forms in Finnish.

Licences help copyright holders specify that only some rights of the work are reserved. These free licensing tools offer a new channel for the distribution of works with generous terms on the borderline between full copyright and public domain.

Almost everyone produces material subject to copyright

"For a long time, Finland has not only been a forerunner in information technology, but also a country where the benefits of sharing information have always been understood. The licences enable the free distribution of works over the Internet on conditions determined by the copyright holder. They also enable the kind of co-operation inherent in Linux communities," says Herkko Hietanen, LL.M, the leader of Finland's Creative Commons project.

"We have reached a point where almost everyone produces material subject to copyright. Camera phones, computers, and personal websites represent only a fraction of the contents subject to copyright. The Copyright Act as such fails to cater to our everyday needs. Creative Commons will change this situation. In the autumn, our aim is to introduce a platform which people can use for developing and sharing mobile phone games," says Professor Martti Mäntylä, Research Director of HIIT.

A non-profit corporation, Creative Commons is based at Stanford University, and dedicated to promoting the creative reuse of intellectual work protected by copyright. It is funded by an impressive number of foundations and the Stanford Law School.
http://creativecommons.org

Rector Matti Pursula appointed Chair of NORDTEK

■ Matti Pursula, Rector of Helsinki University of Technology, has been appointed the chair of NORDTEK for a three-year term beginning 1 August 2004. NORDTEK is a co-operation organ of the rectors of Nordic universities of technology. It comprises 21 Nordic universities concentrating on research and teaching in technology.

The NORDTEK co-operation includes promoting student exchanges with scholarships, joint projects in undergraduate, postgraduate and doctoral education, as well as various conferences and workshops.

HELSINKI UNIVERSITY OF TECHNOLOGY

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- Founded 1849, received university status 1908
- Twelve departments
- Ten separate institutes
- Seventeen degree programmes
- 243 professors
- 15,119 under- and postgraduate students
- 953 master's and 124 doctor's degrees awarded 2003
- Total funding from the state and other sources EUR 212,042,000 (2003)

RECTOR:
Matti Pursula
VICE RECTORS:
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Olli Simula
INDUSTRIAL ENGINEERING AND MANAGEMENT
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Hilkka Lehtonen

JOINTLY WITH UNIVERSITY OF HELSINKI

- **HELSINKI INSTITUTE OF PHYSICS**
- **HELSINKI INSTITUTE FOR INFORMATION TECHNOLOGY HIIT**

RESEARCH INSTITUTES

- **INSTITUTE OF BIOMEDICAL ENGINEERING**
- **INSTITUTE OF ELECTRONICS**
- **INSTITUTE OF ENERGY TECHNOLOGY**
- **INSTITUTE OF INTELLIGENT MACHINES AND SPECIAL ROBOTICS INSTITUTE (IMSRI)**
- **INSTITUTE OF INTELLIGENT POWER ELECTRONICS**
- **INSTITUTE OF OPTICS**
- **INSTITUTE OF DIGITAL COMMUNICATIONS**
- **CENTRE FOR CHEMICAL ANALYSIS**
- **CENTER FOR NEW MATERIALS**
- **RESEARCH INSTITUTE FOR HEALTH CARE FACILITIES SOTERA**
- **CENTRUM FOR NEUROSYSTEMS**
- **MILLILAB (JOINTLY WITH VTT)**
- **MARITIME INSTITUTE OF FINLAND (JOINTLY WITH VTT)**
- **TECHNOMEDICUM (JOINTLY WITH UNIVERSITY OF HELSINKI AND HELSINKI UNIVERSITY CENTRAL HOSPITAL (HUCH)**

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- **ARCHITECTURE**
- **AUTOMATION AND SYSTEMS TECHNOLOGY**
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- **CIVIL AND ENVIRONMENTAL ENGINEERING**
- **COMMUNICATIONS ENGINEERING**
- **COMPUTER SCIENCE AND ENGINEERING**
- **ELECTRONICS AND ELECTRICAL ENGINEERING**
- **ENGINEERING PHYSICS**
- **FOREST PRODUCTS TECHNOLOGY**
- **GEOMATICS**
- **INDUSTRIAL ENGINEERING AND MANAGEMENT**
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- **REAL ESTATES ECONOMICS**