

Building Nordic networks

Established bioregions across Scandinavia are increasingly joining forces in an effort to increase their international competitiveness. Paul Smaglik gets connected.

Taina Pihlajaniemi, director of Biocenter Oulu at the University of Oulu in Finland, travelled thousands of miles to a meeting on angiogenesis at Cold Spring Harbor Laboratory in New York this March — only to find herself having lunch with colleagues from neighbouring Sweden and Norway. Between courses, the conversation turned from the conference to each scientist's interest in extracellular matrixes. The meal ended with a predictable dessert. "We decided to combine our efforts and apply for European Union funding," Pihlajaniemi says. The three Scandinavian scientists have since gathered more European collaborators to seek funding from the European Commission's Sixth Framework Programme, which aims to award grants to researchers who set up cross-border networks in applied research.

Many other Scandinavian researchers find themselves in a similar situation, being driven together by varying degrees of serendipity, proximity and necessity. Of these, necessity is perhaps the dominant force. Norway, Denmark, Sweden and Finland are physically large, but they have small populations and limited resources. So over the past decade, each has built up research networks within its own borders in an effort to maximize what they have.



Taina Pihlajaniemi is building links for Oulu University.

More recently, the countries have turned their attention to their neighbours, seeking to create formal and informal connections with each other, and with nations beyond Scandinavia — particularly in the Baltic region.

FORCEFUL FRAMEWORK

The Sixth Framework Programme, which came into effect last month, is providing probably the largest incentive for this outbreak of cross-border networking. Ideally, it wants to inspire collaborations that involve several partners — and wealthier countries are encouraged to work with groups from less-developed regions. But this focus, along with the emphasis on applied research targeted at specific social outcomes, has drawn fire from many European researchers, who say that funding decisions should be made solely on the basis of the

quality of the science.

Pihlajaniemi sees both sides of the argument. On the plus side, she says, stimulating pan-European cooperation is positive. "It really forces scientists to try to work together," she says. But she is also concerned about the emphasis on research of social relevance and applied research. She says that she would prefer an emphasis on basic research that also fosters collaboration.

The Sixth Framework issues a challenge to scientists to build networks from the top down. But Scandinavian researchers are finding success by building networks from the bottom up — relying on informal collaborations as the basis for bigger endeavours. They are also cementing those extended relationships by having principals from one network sit on the boards of similar endeavours in a similar network in a neighbouring country.

These machinations are



necessary because networks require a large amount of time and effort from all the parties involved if they are to work. Without good communication and coordination, duplicated efforts can trump any benefit of interacting and waste any gains that might have resulted from sharing resources or infrastructure. And the broader and more far-flung the network, the greater the challenge.

A core element of one of the most ambitious pan-Scandinavian initiatives has informal origins. A loose coalition among Nordic resource centres for microarray production and analysis

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SWEGENE: a spreading network for functional genomics.

emerged out of contacts made by Ola Myklebost, professor of biochemistry at the University of Oslo, and Åke Borg, an associate professor in the oncology department at Lund University, during their careers.

Both Borg and Myklebost were collaborating with a lab at the US National Institutes of Health that specialized in using microarrays for cancer research. That technology filtered through to Oslo and Lund when Myklebost met a Swedish contact at a microarray meeting run by the European Bioinformatics Institute. Myklebost was put in touch with Joakim Lundeberg at the Royal Institute of Technology in Stockholm as the central contact for microarray technology within the Wallenberg Consortium North (see page A19). He contacted Lundeberg and was, in turn,

Per Belfrage: establishing networks takes time.



contacted by Borg. The end result is an equal three-way partnership to generate a library of 30,000 complementary human DNA probes.

Now these ties are being strengthened by MedCoast Scandinavia, an initiative from several universities in Sweden and Norway that aims to harmonize efforts between Norway's FUGE and Sweden's SWEGENE functional-genomics programmes.

FORM AND FUNCTION

The Norwegian government started FUGE this year with an initial grant of 100 million kroner (US\$13.5 million), which is set to rise to 150 million kroner in 2003. SWEGENE, meanwhile, gets 60 million Swedish kronor (US\$6.6 million) a year, from the Knut and Alice Wallenberg Foundation, a Stockholm-based charitable organization that funds scientific research and education. Eventually, MedCoast hopes to collaborate with Medicon Valley, which helps to coordinate research activities in Lund, Malmö and Copenhagen (see pages A24 and A27).

One of the challenges faced by MedCoast is the fact that the programmes are at different stages of development. FUGE is just starting up, whereas SWEGENE began in 2000. In fact, the Wallenberg Foundation is likely to stop funding SWEGENE in 2005, with the expectation that the government will take over once



Growth industry: Scandinavia seeks strength in research.

the infrastructure is built.

Meanwhile, another putative player, the Biotech Research and Innovation Center (BRIC), Denmark's equivalent of FUGE and SWEGENE, is barely off the drawing board. After years of discussion, plans for a 27,000-square-metre research facility that BRIC will share with the University of Copenhagen and the Copenhagen Hospital Corporation have only just been approved. But once the initiative is up and running, it is expected to join MedCoast.

Per Belfrage, chairman of the Biomedical Center at Lund University and a member of SWEGENE's board, sympathizes with the difficulties involved in trying to integrate several projects on different schedules. "It takes a long time," he says.

A very personal kind of networking is needed to smooth those considerations, says Claus Braestrup, an executive vice-president at Copenhagen-based drug firm Lundbeck, and chairman of BRIC. To foster ties with the Swedish shore of MedCoast, he also sits on SWEGENE's board and anticipates that scientists in both projects will share resources.

Collaborations between several countries are even easier

when the emphasis is on fostering links with researchers exploring the same questions from different angles rather than on sharing data in formal repositories. That is why Morten Overgaard, a graduate student in the department of psychology at the University of Aarhus in Denmark, formed the Nordic Network for Consciousness Studies two years ago. It allows him to interact with, say, a Finnish philosopher on issues of introspection and first-order consciousness.

Although in this Internet age proximity seems less of a concern, it still has its advantages, and it emphasizes the informal nature on which the network was founded. "We have easy mobility for people to visit each other's labs without much planning or expense," says Overgaard.

The need to share infrastructure may be driving the Nordic nations together, but the demand for personnel is making some scientists look to the Baltic. Leaders of several Scandinavian networks last year formed ScanBalt, which aims to increase mobility for scientists between Scandinavia and neighbouring countries such as Poland, Latvia, Estonia, Lithuania and western Russia,



Finn-Medi Centre part of Finland's fresh impetus in R&D.

especially St Petersburg.

Børge Diderichsen, a vice-president at Danish drug firm Novo Nordisk in Bagsværd and vice-chairman of ScanBalt, predicts that over the next four years there will be a shortage of potentially hundreds of scientists, given the growth of biotechnology in Denmark alone. "It is very likely there will be a labour shortage — particularly among skilled scientists," he says.

Diderichsen notes that the

Baltic countries have a tradition of good training in many of what he calls the "traditional skills" in the hard sciences — mathematics, physics and chemistry. Those skills are in demand in much of the Western world, with fewer students taking courses in chemistry in Britain and the United States, for example, and Scandinavia is no exception.

At the same time, Baltic countries lack some modern facilities such as the proteomics

and structural-biology centres now being developed in Scandinavia by FUGE and SWEGENE. ScanBalt would ideally match the two. "We can make some of the infrastructure and some of the advanced research equipment available to researchers in the east," says Diderichsen.

The tricky part will be promoting a flow of talent to Scandinavia without exploiting it. "We are opposed to any notion of a brain drain in the Baltic regions," he says. Instead, he would like to see a circulation of talent. One way to do that would be to create a ScanBalt University in the Baltics, perhaps in Poland, which could be staffed by scientists from both regions.

BROAD CONNECTIONS

Another initiative has already begun making similar arrangements, but on a smaller scale. Mart Saarma, director of the Institute of Biotechnology at the University of Helsinki, is originally from Estonia, and wants to establish ties between his new country of residence and his homeland.

He is trying to arrange a twin-city science project between Helsinki and Tallinn in Estonia. Apart from Saarma's heritage, two factors make the project potentially viable — proximity (the cities are 1.5 hours apart by ferry and about 20 minutes by helicopter) and politics (Estonia is set to join the European Union in 2004).

But the same factors that have driven other hubs in Scandinavia to network also come into play here. Joining together in research ventures will make the twin cities more scientifically competitive. And combining commercial forces should do the same economically, Saarma hopes.

Within the past few years, Scandinavia has begun to extend its networks beyond the Baltics to the United States, the United Kingdom and the Far East. For example, the University of Oslo this year set up a research agreement in biomedicine with Johns Hopkins University in

Baltimore, Maryland. And in October, the Swedish Consulate initiated a joint biotechnology venture fund with California (see "On the road to California", page A9).

In Finland, the University of Kuopio is actively seeking international partners. A delegation recently returned from Minnesota, where it reactivated an agreement to exchange students, researchers and teachers between Kuopio and the University of Minnesota.

Such free exchange of research is benefiting all of the scientists involved. When, in 1996, Howy Jacobs left the United Kingdom for a post at the Institute of Medical Technology at the University of Tampere, he was more enamoured with Finland's commitment to science funding (see "Finnish envy", left) than he was with the idea of building collaborations — but that was the end result.

Jacobs, a self-described "refugee from the British funding crisis of the early 1990s", stayed in touch with two UK groups, one at the University of Cambridge studying how metazoan mitochondrial DNA replicates, and the other at the University of Glasgow studying the genetics of fruitflies. He has since established a scheme to place Glasgow undergraduates in his Finland lab for 10 months.

His work is part of a project that has been designated as a centre of excellence by the Academy of Finland. Known as FinMIT (the Finnish research unit on mitochondrial biogenesis and disease), the project has helped Jacobs to build strong links throughout the Nordic region. He interacts with fellow FinMIT researchers at the University of Helsinki, and he also works with Nils-Göran Larsson at the Karolinska Institute.

Jacobs' happy landing illustrates how necessity, proximity and serendipity can lead to productive research interactions. And it also shows that building on informal ties can help to sustain them.

Paul Smaglik is editor of *Naturejobs*.

Finnish envy

Finland has a history of exporting much of its scientific talent. Many members of the faculty at the Karolinska Institute in Stockholm are Finnish, for example. So why are scientists in Scandinavia currently looking at Finland with green eyes? The simple answer is money.

Until the 1990s, Finland's infrastructure was relatively underdeveloped. But after a recession in the 1980s, the government invested heavily in science and technology in an attempt to transform the economy. As a result, Finland's budget for research and development (R&D) rose from 2.3% of its gross domestic product (GDP) in 1994 to almost 3.4% in 2000.

"They have really pushed," says Hans Wigzell, president of

the Karolinska Institute, who sees Finland's plans as a way to rally the Swedish government to increase funding for basic rather than applied research.

Norwegian scientists are especially galvanized by Finland's example. Although they are pleased that the government is funding 13 centres of excellence, many say privately that its aim to raise R&D investment from 1.7% of GDP to 2.2% by 2005 is not sufficiently ambitious.

If other countries don't step up their funding, top researchers may head to Finland. "We are now starting to get Swedish researchers in Finland, which was very uncommon 10 years ago," says Kalervo Väänänen, director of the anatomy department at the University of Turku.

P.S.

On the road to California

Sweden and California are separated by 7,000 miles and a large polar ice cap, but that is not standing in the way of a budding partnership in biotechnology. In October, the Swedish consulate in Los Angeles announced a programme to aid and expand academic and industrial ties between California, a giant in biotechnology, and Sweden, which is positioning itself as an emerging global leader.

At a seminar held by the consulate in October, Consul-General Andreas Ekman announced that a major aim of the programme is to "establish a joint Scandinavian-Californian biotechnology venture fund to support advanced biotech research commercialization". Proposed by the office of the governor of California, Gray Davis, the fund is intended to provide a cushion for venture capitalists. Ways of financing it are currently being investigated, but officials at the governor's office say that they hope new companies can be seeded by combining investments from pension funds, Swedish and Californian venture-capital companies and research institutes.

With so many top-notch academic and industrial research institutions in California, why should Californian investors turn to Sweden? Alexander Suh of California Technology Ventures, an

early-stage venture-capital firm in Pasadena, says that foreign investors are attracted by the Swedes' high level of education, mastery of English, commitment to funding social aims, and their strong tradition of supporting scientific research.

Through the Nobel prizes, they have come to be seen as the "arbiters of science in the world", in the words of David Baltimore, president of the California Institute of Technology. And a strong research infrastructure certainly exists in Sweden. In addition to a long tradition of excellence in academic research, medical and technical universities are developing collaborations based on new technology platforms combined with clinical trials taking place within the medical universities.

Unfortunately, the void left by the departure of large pharmaceutical companies from Sweden represents a major gap in the revenue streams needed for funding the later stages of biotech product development. Anders Flodström, president of the Royal Institute of Technology in Stockholm, says that for Swedish biotechnology to succeed, the research base needs to be expanded dramatically, and business models need to be developed that encourage significant reinvestment in university and company infrastructure.

ATTRACTIVE PROSPECT

A major factor in attracting venture capital to Sweden may turn out to be its intellectual property laws, which entitle professors to ownership of inventions developed within academic systems. Flodström points out that the major disadvantage of this system is the lack of reinvestment in research infrastructure that would come out of licensing such inventions, which could create an unsustainable system.

Suh argues that to the contrary, it is professors' ownership of intellectual property that makes Sweden so attractive to foreign investors, who see negotiations with universities that hold rights to inventions as an impediment to investors. He cautions that Sweden should not necessarily emulate business models developed in California if it wants to stimulate foreign investment.

More generally, there are major differences between US and Swedish culture that might affect investment. Whereas Americans are quite used to having no safety net, risk-taking is not

so prevalent in European culture. Moreover, the strong labour laws in Europe represent another downside to investing in European companies. But opportunities for Swedish investment are certainly abundant and needed.

Flodström notes that for biotechnology to succeed in Sweden, the Swedes need to expand their research base dramatically by attracting big grants to fill the void left by the departure of the large drug companies. He stresses that the appropriate business models should be chosen in the initial stages of investment, and technologies that bear products in a short timeframe, such as bioengineering and medical devices, should be developed as a stronghold, saying that they will be much more important in the short term than proteomics and gene sequencing.

STEM-CELL SUPPORT

Although it is a long-term prospect for investors, stem-cell research has nonetheless emerged as a field where Sweden can develop natural synergies with US research institutes. When President Bush announced the US policy restricting embryonic stem-cell research using funds from the National Institutes of Health (NIH) to only those cell lines existing as of that date, it turned out that 24 of those lines were held by the Karolinska Institute and Gothenburg University.

Recently, Governor Davis signalled support of stem-cell research in California by signing a bill that authorized stem-cell research from any source, including embryonic stem cells, as long as it was approved by an institutional review board. Flodström predicts that scientists in Sweden are gearing up towards a major push in embryonic stem-cell research, which should begin within a year, once funding is in place, and that major scientific collaborations will emerge between US and Swedish universities, probably funded by the NIH. It is likely that technologies will grow around handling of the cells, and this in itself could lead to new areas of business.

The consulate's programme also features an ongoing seminar series on areas of biotechnology in which Sweden provides leadership, such as proteomics, immunology and neurobiology, as well as banquets to celebrate California's Nobel laureates, and has helped delegations of journalists and venture capitalists to visit Sweden.

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