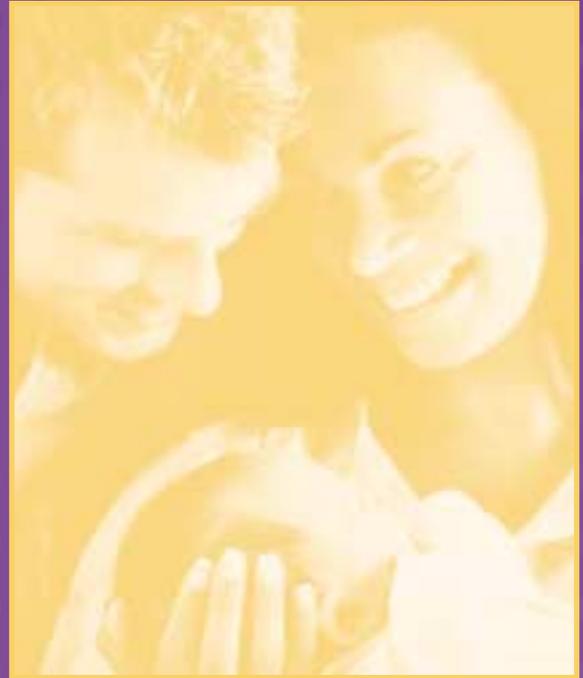


Functional genomics in Norway – a national plan

Summary



Knowledge about genes and their products has become increasingly important in research, medical and industrial circles. Norway will be unable to compete on the global market of the future unless there is considerable investment in research within this area. Over the next 5–10 years, allocations of a minimum of NOK 300 million will be needed annually to finance research in the field of functional genomics.

The research of the future. The successful mapping of the genomes of humans and certain animals, plants and microorganisms has opened new doors for scientists studying biological processes. Landmark technology has made it possible to study tens of thousands of genes and proteins simultaneously. The field of functional genomics utilizes these methods to determine the functions of the genes and proteins, and the ways in which they affect one another.

Research in this field will provide far-reaching new insight into how biological processes function, and will also lead to a vast array of beneficial, innovative products such as pharmaceutical products to combat diseases that are presently incurable, methods that make it possible to increase the food production output of aquaculture and agriculture, and methods to neutralize environmental toxins.

Future impact on society and industry. Functional genomics will play a crucial role in future industrial and commercial development. Today, the applications of biotechnology are reaching into areas that were unimaginable only a few years ago. Internationally, many countries are focusing priority on strengthening research activities in this field: Sweden has allocated an additional NOK 1.2 billion for national research efforts over the next five years; Ireland has allocated NOK five billion; the USA, Japan and a number of countries in Europe are all greatly intensifying their activities.

Increasing Norway's research capacity in functional genomics may be a means of ensuring future productivity as national petroleum and gas reserves gradually become depleted. Enhancement of this research sphere will also be necessary to further develop the marine resource sector, to provide tomorrow's patients with health care services equal to those available in other countries, and to enable Norwegian universities to recruit and supply the expertise that will be needed in future research and industrial development circles.

Norwegian efforts. FUGE is a national plan for research in functional genomics, submitted by a unified Norwegian research community. FUGE entails both a considerable expansion of Norwegian biotechnology research and a nationally coordinated restructuring of the research establishment as a whole. The purpose of the plan is to guarantee that Norway can stay abreast of international developments in research. The plan is based on the distribution of responsibilities and establishment of networks at the national level, the identification and utilization of national advantages, cooperation, design of new models for interaction between universities, research institutions and trade and industry, and systematic strengthening of the priority areas specified in Report to the Storting No. 39 (1998–99), *Forskning ved et tidsskille (Research at the beginning of a new era)*.

Objectives:

- **Basic biological research.** FUGE is intended to bring the level of the basic research disciplines underlying functional genomics up to international standards. Furthermore, Norway will work to develop cutting-edge expertise in areas of particularly strategic importance, or in which the country has special advantages.

- **Medical research.** FUGE will help to make it possible for Norwegian health services to utilize the new knowledge and medical products that result from functional genomics, thus ensuring that Norwegian health care remains on a par with top-quality services available elsewhere in the world.
- **Marine research.** FUGE will play a role in establishing the research basis needed to promote further development of the aquaculture industry and optimal utilization of marine resources, as well as to establish a biomarine industrial cluster in Norway.

National distribution of responsibility. It is essential that basic expertise in functional genomics be established in all regions in Norway. However, Norway does not possess the personnel, expertise or funding needed to be able to “do everything everywhere”. FUGE will delegate responsibility to the various regions and between the various participating bodies within the regions. The specific resources within each region and the country at large will be factored into these efforts.

Regional cooperation. FUGE will set up a system for regional cooperation that integrates universities, institutions, colleges and trade and industry within subject areas that are relevant to functional genomics. Cooperation between these parties will be adapted to local needs.

Industrial development. One of the primary objectives of FUGE is to increase the level of national expertise in basic research in functional genomics. However, FUGE’s efforts also represent part of the national long-term investment in Norwegian industry. In future, most industrial innovation will be rooted in research. The new industrial sector will be dependent on both the expertise and the commercially viable ideas that can only be generated from basic research activities. FUGE will make every effort to ensure that the focus on functional genomics research is designed to boost Norwegian industry. It will be essential to devise constructive models that facilitate interaction between industry and academia in this area.

Cooperation with top researchers abroad. If efforts to raise Norwegian research to international levels are to be successful, then top researchers from abroad, with broad-based international networks, must be encouraged to

come and work in Norwegian laboratories, and Norwegian researchers must be prepared to travel elsewhere and acquire insight into leading research communities in other countries. Norwegian efforts in this field should be linked to activities taking place in the other Nordic countries.

Technology of the future

- In coming years, competition on the international market will grow tougher, not easier. Norway must work fast now to obtain the high-tech expertise needed to remain internationally competitive.
- The number of new enterprises focusing on ICT, biotechnology and functional genomics is quickly rising. Many of these are materializing in close connection to universities that conduct high-level basic research. The economy of tomorrow dictates that proximity to – and organized liaisons with – large-scale, creative educational centres will be a must for emerging companies.
- Norway should immediately initiate activities to establish similar mechanisms. It will take a national effort to acquire the expertise needed within the university and industrial sectors alike.

Ethical issues. Like any other technology, the powers of biotechnology can be used and abused. Thus it is important to ensure that all research conforms to the ethical principles underlying the Norwegian culture. FUGE will therefore also encompass a strengthening of research on the ethical, legal, environmental and safety-related issues pertaining to functional genomics.

Organizational model. FUGE will establish an administrative system for distributing NOK 300 million annually to strengthen top research in the area, to create the necessary infrastructure as regards high-cost equipment with appurtenant personnel, and to recruit and train the research personnel that will be needed.



Now that the genomes of humans and certain animals, plants and micro-organisms have been mapped, a nascent area of international scientific research, called functional genomics, has emerged. New technology has made it possible to study tens of thousands of genes and proteins simultaneously. Functional genomics utilizes these methods to decipher the functions of the individual genes and proteins, and the ways in which they affect one another. This new knowledge is expected not only to enhance understanding of biological processes, but also to spawn a host of new products and production processes. Research in functional genomics will have a considerable impact on various sectors, and will play a pivotal role in future industrial and commercial development. Many countries are now allocating considerable resources to research in this field, and Norway needs to step up national efforts to be able to keep pace. Key players in the research community have taken the initiative to draw up a national plan to boost Norway's competitiveness in this sphere. Over the next 5–10 years, allocations of a minimum of NOK 300 million will be needed annually to finance research in functional genomics.



FUGE
Functional
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The Research Council of Norway
Telefax: (+47) 800 83 001
Telephone: (+47) 22 03 70 00*

