

16
17
18
19

20

YEARS OF
WORLD-CLASS
RESEARCH

EXCELLENCE TRUST TRANSPARENCY

The Danish National Research Foundation (DNRF) has three overall core values:

Excellence should pervade all aspects of the organization.

Trust stimulates creative research. Accordingly, the DNRF's philosophy is that center leaders should have considerable freedom in handling the large and flexible grants at their disposal.

Transparency, fairness and quality are key words in the assessment process. It is essential that the scientific communities be able to trust the integrity of the Board of Trustees and the assessment and selection processes used by the foundation.

**20 YEARS OF
WORLD-CLASS
RESEARCH**

Danish National
Research Foundation

CONTENTS

6	Foreword
10	The first steps
12	A new era heralded
14	Congratulations to Denmark and to the foundation
16	Research for scientific breakthroughs
20	Foundation assets and funding base
22	Centers of Excellence - room for vision
30	Research that makes a difference
32	<i>They have taken biochemistry into a new epoch</i>
34	Centers of Excellence - within and across all scientific fields
36	<i>Respect and humility</i>
40	<i>Focus on the self</i>
44	<i>Passionate commitment to the ice cap and climate</i>
46	Research training - an investment in the future
48	<i>The muscle wizard and his many apprentices</i>
50	Commercialization and application
52	<i>Innovations originate in scientific freedom and courage</i>
54	Internationalization - paves the way for insight and access
56	Cross-border collaboration
58	<i>Internationalization is a must</i>

FOREWORD

Twenty years have passed since a visionary Danish Parliament and government established the Danish National Research Foundation (DNRF) and thus gave Danish research a marvelous gift, one that, so far, has provided more than 5 billion Danish kroner in funding for excellent research.

We take this opportunity to look back at what a difference 20 years with the DNRF has made, the values on which the foundation was established and some of the results it has helped to achieve.

We have asked a number of people to contribute to the publication by presenting their views on the foundation. To begin with, Peder Olesen Larsen, the first chairman and director of the foundation, relates the story of the foundation's establishment and the fundamental principles that a visionary Board of Trustees laid down right from the start. Jens Oddershede, who, throughout the years, has followed the foundation's activities from the perspective of the university community, offers his outlook on what a difference the foundation has made. Lars Goldschmidt, from the Confederation of Danish Industry, reflects on the role he believes the foundation plays in the research funding landscape. Finally, we have also asked one of "our own", Gunnar Öquist, member of the board, to assess how groundbreaking research is best supported.

As the current chairman and director of the Board of Trustees, we are impressed when we look back on the results achieved by the foundation. We are standing on the shoulders of previous Boards of Trustees and their wise decisions, both in terms of the research they funded and the path they followed from the start. This applies to the core principles and values of supporting excellent research through large, long-term and flexible grants and thereby providing an optimal framework for research communities that, transcending disciplines and generations, bring together researchers from all over the world. Above all, however, it is about having the courage to support groundbreaking research that will help bring us tomorrow's breakthrough.



Pursuing unpredictable research takes vision and courage, both of which must come from the researchers, the foundation and the politicians who set the framework for the foundation's activities.

We are proud of the principles of trust, transparency and excellence that characterize the foundation's application process. A grant from the DNRF can have an enormous impact not only on an individual's career, but also on the development of an entire field of research. For this reason, confidence in the foundation's procedures is vital. We have chosen a model based on a very high degree of transparency and openness. This is unique in an international context, and we hope that, over time, the foundation will also become an international role model in this area.

Pursuing innovative ideas that may lead to scientific breakthroughs requires vision and courage. It takes great courage from the researchers who tread new ground, and it requires a high degree of trust from the foundations that must dare to fund unpredictable research. The capacity to show such courage is crucial. Great visions and new breakthroughs take science and the world to the next level, thus providing the basis for future discoveries and technologies. However, the benefits reaped in a distant future are not the only reasons for investment. Already now in the centers' grant periods, the foundation is seeing results that are reshaping science and the way we live and think. Stories from some of the different centers provide examples of this on pages 32-59.

On the whole, it is clear that the centers have a profound influence and help draw attention to Danish research. Thus, as much as 20% of all Danish contributions to the journals *Science* and *Nature* come from DNRF centers, and every sixth patent application in 2010 also came from DNRF centers. This shows how the DNRF, with its Centers of Excellence strategy, has developed a funding mechanism that works and makes a difference. We hope that the foundation will continue playing a key role in the Danish research funding system in the next 20 years as well.

Klaus Bock

Chairman of the DNRF Board of Trustees since 2004. Professor and former research manager at Carlsberg A/S. Klaus Bock plays a key role in a wide range of Danish and international research organizations. He is deputy chairman of the Danish National Advanced Technology Foundation and a member of the Standing Selection Committee of the Canadian Government's Network of Centers of Excellence program.

Thomas Sinkjær

Director of the DNRF since 2007. Professor and former leader of the Center for Sensory-Motor Interaction (SMI), a basic research center, at Aalborg University. Thomas Sinkjær holds a wide range of honorary offices in both Danish and foreign research organizations. He has received several prizes in recognition of his research.

EXCELLENT RESEARCH – A BASIS FOR THE FUTURE

Climate change, energy and food crises, major diseases, and new epidemics are just some of the challenges the world faces today. And while the future undoubtedly holds more challenges, it also holds new solutions and opportunities. Many of these solutions and opportunities will come from basic research and probably also from fields of research we cannot imagine today. To best prepare ourselves for future needs, we must have a distinctive funding source that enables pioneering research and has the added courage to fund unpredictable research and to encourage the pursuit of big ideas.

The foundation believes that society will benefit the most and will best be able to meet those major challenges if we have confidence that good researchers have no wish to waste their time or talent on trivial matters, but rather want to contribute new knowledge that drives the world forward.

The photo shows from the left: Gunnar Öquist (Sweden), Birte Svensson (Denmark), Bo Ernø Honoré (USA), Klaus Bock (Denmark), Eivind Hiis Hauge (Norway), Kirsten Hastrup (Denmark), Mogens Nielsen (Denmark), Pirjo Nuutila (Finland), and Jörn Thiede (Germany).

Research ideas should be ambitious, original and bold.
We must have the courage to pursue unexplored avenues,
even if some of them turn out to be dead ends.



VI MARGRETHE DEN ANDEN, af Guds Nåde Danmarks Dronning, gør vitterligt
Folketinget har vedtaget og Vi ved Vort samtykke stadfæstet følgende lov:

THE FIRST STEPS

By Peder Olesen Larsen
Director and Chairman of the DNRF Board of Trustees from 1991 to 1998

Lov nr. 409 af 6. juni 1991 om Danmarks Grundforskningsfond

Kapitel 1

Fondens oprettelse og formål

§ 1. Til styrkelse af Danmarks forskningsmæssige udviklingsevne oprettes
Danmarks Grundforskningsfond med en grundkapital på 2 mia. kr., som
som overføres til fonden fra staten.

One Saturday afternoon in October 1990, I received a phone call from Inge Thygesen, Permanent Secretary of State for Education and my superior. Inge Thygesen asked me whether I was sitting down. I was not, but even though it was not a direct order, I thought it best to sit.

I was then told that the Ministry of Finance had endorsed the establishment of a research foundation with a capital of 2 billion Danish kroner and that the first draft of a bill was expected on the table at my earliest convenience, that is, at the end of the following week. My first thought was that if research was being given that much money, it had to be spent sensibly. My second thought was that it was a declaration of no confidence in the universities and research councils.

The Ministry of Finance feared that if the universities received the money, it would vanish without a trace, and that if the research councils received the money, it would be spread too thinly.

On May 31, 1991, the act establishing the Danish National Research Foundation was passed by the Danish Parliament with the support of all parties, except the Progress Party, and on June 6, 1991, the act was signed by the Queen. The Board of Trustees was appointed in the early days of September 1991. The 2 billion kroner were transferred to the foundation on October 15, 1991. On Sunday, October 20, the first meeting of the Board of Trustees was held at Schæffergården in Gentofte, and in the first days of 1992, the research community was invited to submit proposals.

Before the deadline expired in early May, we had received 350 five-page proposals. We decided to proceed with about 60 proposals and asked that more detailed applications of up to 25 pages be submitted. The ensuing proposals were submitted for peer review by researchers from all over the world. The peer reviews were kept separate from the decisions, for which the Board of Trustees was solely responsible. But the reviews enabled all the board members to join in a discussion of each proposal and accordingly to make their own assessments.

The act establishing the Danish National Research Foundation was passed by the Danish Parliament on May 31, 1991, and signed by the Queen on June 6, 1991.

OUR FUNDAMENTAL PRINCIPLES WERE:

- to let something happen in Danish research that would not otherwise have taken place;
- to provide large grants;
- to ensure that grant recipients were good researchers as well as good research leaders;
- to pay the amount necessary to implement the research plan to which the grant recipients had committed themselves;
- to ensure that there was no shared funding (when two or more parties provide grants for the same purpose, there is a tendency for all the parties not to keep an eye on the work and the results); and
- to ensure that grant recipients would have considerable freedom in spending the means at their disposal.

In May 1993, we decided to proceed with 23 proposals, and the first research center started work on September 1, 1993. From the outset, we focused on the active monitoring of grants, research education programs and communication.

We endeavored to minimize bureaucracy. This is evidenced by the 5-page and 25-page limits. The foundation's phone was to be answered within two rings. We kept administrative expenses far below 3%, including expenses for managing the foundation's finances.

If things have gone well (which is not for me to judge), there are four reasons why:

- An independent Board of Trustees, with no members wearing other hats, and two expatriate Danes on the board.
- All board members having integrity and a commitment to and knowledge of Danish research.
- No quota thinking; no fields of research or institutions were entitled to receive a certain piece of the pie.
- First and foremost: A large number of outstanding Danish researchers.



Peder Olesen Larsen

Peder Olesen Larsen is a former professor in organic chemistry at the Royal Veterinary and Agricultural University, head of the Research Directorate at the Ministry of Education from 1988 to 1991, and the first director and chairman of the DNRF Board of Trustees from 1991 to 1998.

A NEW ERA HERALDED

By Jens Oddershede,
Vice-Chancellor at the University of Southern Denmark
and Chairman of the Danish Rectors' Conference

The establishment of the DNRF 20 years ago heralded a new era for Danish research funding: significant grants, a focus on the merits of the research leader, an international assessment of all applications in the final round, negotiations with the host institution and a grant period of up to ten years if you passed through the eye of the needle. Twenty years ago, some of these elements could be found in other research funding programs, but no other program included all of these elements. The situation is different today, one reason being the valuable experience we have gained from the DNRF.

The funding of the DNRF was also unique. The total proceeds of the sale of a state-owned company – Statsanstalten for Livsforsikring – went to promoting excellent basic research in Denmark. This was a highly visionary move that bears repeating.

Scientifically, the DNRF has boosted Danish research. The foundation has also served as a carrot for the best Danish researchers, as well as helped to attract excellent foreign researchers to Denmark. All of this has helped put Danish research, in terms of citations per article, among the top three in the world.

Initially, university managements were probably somewhat hesitant to embrace this new instrument in research funding. Would the significant grants distort the institutions' own priorities? How would research leaders backed by a basic research grant act toward colleagues with far fewer funds? As I perceive it, after an initial process where we all had to learn how to respond to the new situation, these concerns no longer exist. Instead, universities have been able to benefit from involving the DNRF in their own prioritization, and employees have experienced the truth in the old adage that "a rising tide lifts all boats."

■ The DNRF was a welcome innovation that has subsequently justified its existence.

The DNRF was a welcome innovation that has subsequently justified its existence. I am delighted to congratulate the foundation on its 20th anniversary. I have personally had the pleasure to see at close range how the foundation has developed over the past 20 years, first as head of the faculty and subsequently as vice-chancellor. Research must be elitist, and the DNRF has greatly contributed to ensuring that this is also the case for basic Danish research.

I hope that those responsible for Danish research funding in the future will also understand the value of the DNRF's continued existence to Danish research and that they will therefore ensure that the foundation continues to play an important role in the Danish research funding system for many years to come.



Jens Oddershede

Throughout the life of the foundation, Jens Oddershede has been a key player from the university community. Since 2001, he has been vice-chancellor at the University of Southern Denmark, and from 1992 to 2001, he was head of the Faculty of Science at the same university. Since 2005, he has been chairman of the Danish Rectors' Conference, having served as deputy chairman from 2002 to 2005.

CONGRATULATIONS TO DENMARK AND TO THE FOUNDATION

By Lars B. Goldschmidt
Deputy Director General, Confederation of Danish Industry

It was a visionary Danish Parliament that decided to establish the DNRF back in 1991. Whether that Parliament had already envisaged the foundation that we now look back on as delivering such groundbreaking results for the benefit of Danish society is obviously difficult to know.

Today it is clear, however, that with its decision, the Parliament created an institution in the Danish research system that has consistently contributed to lifting Danish research to the highest international level and which now, 20 years on, is probably stronger than ever.

Particularly central to the foundation's activities is the impressive list of Centers of Excellence and not least the research leaders who have headed these centers. The range of center leaders clearly shows that the foundation, with its ability to spot excellent researchers and set the bar high for research, has been and continues to be a very important stepping stone for a host of researchers who today distinguish themselves as global leaders in their fields of research.

When it comes to attracting private research investments to Denmark, strong public research communities in fields that are relevant to the corporate sector are among the most essential factors. With their high-quality research, the DNRF centers also play an important role in this respect.

The high ambitions of the Centers of Excellence have also had a strong impact on Danish research in general – not least by the fact that receiving funding to establish a basic research center is largely considered the ultimate accolade in Denmark. A basic research center is a clear, personal recognition not only of the research leader put in charge of the center, but also of the research community in which the researcher works.

Against this background, the Confederation of Danish Industry sees the DNRF as one of the cornerstones of the research funding system in Denmark.

■ ■ Against this background, the Confederation of Danish Industry sees the DNRF as one of the cornerstones of the research funding system in Denmark.

With a clear focus on long-term frontier research, the DNRF and the work undertaken under the auspices of the Danish National Advanced Technology Foundation, the Danish Council for Strategic Research, the Danish Council for Independent Research and the Danish Council for Technology and Innovation make up an overall system that strikes an appropriate balance between funding for research that has both short- and long-term prospects for implementation in the Danish corporate sector and which overall delivers the research breakthroughs and innovation on which we in Denmark must base our future prosperity and welfare.

It is therefore only fitting to express our warmest congratulations on the first 20 years.

Keep on raising the level of ambition of the research funded, keep on spotting the best Danish talents and research leaders, get even better at attracting international top researchers to Denmark, and continue developing the joint international research centers, of which the Danish-Chinese centers are prime examples.

Denmark and the Danish corporate sector will experience a growing need to focus on such activities over the next 20 years if we are to succeed in the sharply intensifying international competition for top researchers and, of course, the results they achieve and the researchers and candidates they train.



Lars B. Goldschmidt

Lars B. Goldschmidt is deputy director general of the Confederation of Danish Industry. He is also an assistant professor at the Copenhagen Business School and the Technical University of Denmark. As chairman and a member of various councils, he has distinguished himself as a key player in the field of research.

RESEARCH FOR SCIENTIFIC BREAKTHROUGHS

By Gunnar Öquist
Member of the DNRF Board of Trustees

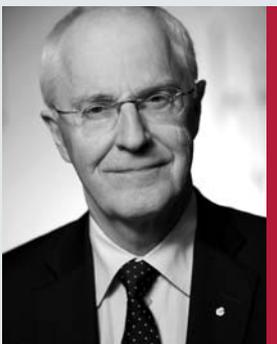
Internationally, research is increasingly aimed at goals considered strategic in the light of nations' interests. These so-called strategic fields share many similarities around the world. They attract large groups of researchers, competition is fierce, and research communities must continuously maintain high productivity to avoid losing funding for research groups. This results in solid but not terribly risky research within the framework of today's scientific paradigm. These research communities, though perhaps productive, are rarely in the vanguard of the innovation that comes with what we call scientific breakthroughs and that opens up unprecedented opportunities, often with a wealth of implications and a major international impact — in other words, the kinds of research breakthroughs that win prestigious international awards like the Nobel Prize.

To meet today's global challenges by using rational methods, we need more groundbreaking research.

This makes it all the more gratifying to see how the DNRF pays special attention to the conditions necessary to maximize the potential of research and thus achieve genuine breakthroughs. The Board of Trustees is charged with identifying the most competent researchers with the most innovative ideas, regardless of field. Innovation through mobility and interaction across disciplinary boundaries are pivotal elements, which is why center leaders are encouraged to recruit researchers with complementary competencies both nationally and internationally. The exchange of experience with the most successful scientific communities in the world is also encouraged in various ways. Furthermore, since funding is also relatively long term, centers can embrace more complex scientific challenges that hold the risk of failure but also the potential for scientific breakthroughs.

- **Sitting on the Board of Trustees is one of the most rewarding experiences of my professional career, both nationally and internationally, which has focused on research issues in general and research funding in particular.**

In this connection, I would also like to stress the importance of the cooperation between the DNRF and the host universities. This cooperation enables universities to focus intently on their strongest researchers, those with the potential for receiving a long-term grant from the DNRF. In this way, the DNRF becomes an important player that universities can use to develop their research profiles. Today, we see positive trends in groundbreaking Danish research, which, in bibliometric analyses, is classified as high-impact research. I would be surprised if these positive trends do not chiefly stem from the results achieved by the DNRF over the past 20 years. This question should be explored in more detail.



Gunnar Öquist

Gunnar Öquist is professor emeritus of Plant Physiology at Umeå University; his field of research is photosynthesis. He is classified as a highly cited researcher (ISI) in WOS.

Professor Öquist was formerly secretary general of Sweden's Natural Science Research Council and has served on the board of a number of European research organizations. From 2003 to 2010, he served as secretary general of the Royal Swedish Academy of Sciences in Stockholm and, in this connection, developed a deep insight into the work of selecting Nobel Prize laureates. He has extensive knowledge of the criteria for quality characterizing groundbreaking research.

Öquist was a member of the international panel that evaluated the DNRF in 2003. Since 2005, he has been a member of the DNRF Board of Trustees.

PEOPLE BEHIND THE FOUNDATION

The success of the DNRF is largely attributable to the people who established the foundation and ensured that it got off to a good start. Without a visionary Danish Parliament and government as well as a visionary Board of Trustees with the courage to establish a foundation able to make large grants with no criterion but scientific excellence, Danish research would hardly have performed as well internationally as is the case today.

Some of the people who have helped shape and develop the DNRF for the past 20 years are listed on the opposite page.

Center leaders, former and current board members and secretariat employees are listed on the opposite page. Board members and directors are in bold.

Peder Olesen Larsen / Jørgen Pagh / Finn Borgen / Edith Christensen / **Henriette Giese** / Marianne Holm / Flemming Besenbacher / Nils Brünner / Jens Stougaard / Eva Lessøl / Lene Rasmussen / Frans Gregersen / Karen Jespersen / **Jörn Thiede** / Troels Halck Pedersen / Inga-Lill Bjerre-Nielsen / **Jens Rehfeld** / Peter Falck / Jesper Grodal / **Kirsten Hastrup** / Jessie Tvillinggaard / Torkild Vinther / Mogens Klostergaard Jensen / **Kell Mortensen** / Connie Hansen / Trine Danø / Nikolaj Borg Burmeister / **Bodil Norrild** / Andreas Boe Sjøholm / Rasmus Borum Rydahl / **Mogens Nielsen** / Lars Arge / Niels Haldrup / Laura Hammershøj / Metha Nielsen / **Klaus Bock** / **Thomas Sinkjær** / Geeske de Witte Vestergaard / Jeanne Meinholt / **Niels Chr. Nielsen** / Marianne Gauffriau / **Pirjo Nuutila** / Niels Lagergaard Pedersen / Niels Jørgen Cappelørn / Jørn Olsen / Niels Westergaard Nielsen / **Gretty Mirdal** / Ulrik Andersen / Mogens Nielsen / **Eivind Hiis Hauge** / Per Madsen / Søren Nørvang Madsen / **Gudmund Hernes** / Hans Christian Larsen / K. Darwin Murrell / **Lauritz Holm-Nielsen** / Søren Brunak / Peter E. Nielsen / **Erik Nilsson** / Bengt Saltin / Jørgen S. Nielsen / John Couchman / Peter Bro Miltersen / Thomas Sinkjær / Axel Michelsen / Sine Larsen / Kaj Frank Jensen / Lars-Inge Larsson / Per Aage Brandt / Mogens Herman Hansen / Søren H. Andersen / Peter Birch Sørensen / **Else Marie Bukdahl** / Morten Meldal / **Henrik Tvarnø** / Karl Anker Jørgensen / **Leena Peltonen** / Henriette Giese / **Gunnar Öquist** / Hans Chr. Johansen / Gary Shaffer / Ole E. Barndorff-Nielsen / Birger Lindberg Møller / Vibeke Schrøder / Matthias Mann / Annelise Mark Pejtersen / Henning Friis Poulsen / Jesper Wengel / **Elsebeth Budolfsen** / Martin Browning / **Ole Fejerskov** / Ole G. Mouritsen / **Torben M. Andersen** / Eugene S. Polzik / Søren Nielsen / Henrik Bohr / Leif Østergaard / Igor Novikov / Niels Tommerup / Nils Holger Petersen / Pia Bilde Guldager / Dan Zahavi / Don Canfield / **Bo Ernø Honoré** / Ib Chorkendorff / Bente Klarlund Pedersen / **Ole Hansen** / Jiri Lukas / **Karsten Laursen** / Jacobus J. Boomsma / **Birte Svensson** / Torben Heick Jensen / Niels Chr. Nielsen / **Birgit Løgstrup** / Peter R. Ogilby / Jens Kehlet Nørskov / Jeppe Dyre / Jens Hjorth / **Karin Hammer** / Marie-Louise Nosch / Kim Sneppen / Søren-Peter Olesen / **Birte Svensson** / Claus Hviid Christensen / Martin Meedom Nielsen / **Gisela Sjøgaard** / Rasmus Nielsen / **Aage Bødker** / Kurt Vesterager Gothelf / Klaus Robert Svendsen / Kristian Helin / Dorthe Dahl-Jensen / Poul Nissen / Dorthe Berntsen / Peter Hansen / Bo Brummerstedt Iversen / **Else Marie Friis** / Eske Willerslev / **Ulrik V. Lassen** / Jørgen Ellegaard Andersen / Carsten Rahbek / **Elsebeth Lyngø** / Martin Bizzarro / David E. Arnot / Dale T. Mortensen / Nicolai Reshetikhin / Christopher Frith / Catherine Martin / Hassan Aref / Francesco Sannino / Marie-Louise Munch / Steen Rasmussen / Kim Guldstrand Larsen / Tom Høholdt / Frederik C. Krebs / Niels J. Bjerrum / Dorte Juul Jensen / Thomas Bjørnholm / Peter A. Andreasen / Bo Barker Jørgensen / Lars Arendt-Nielsen / Søren Bo Nielsen / Ole Crumlin-Pedersen / Peter Nansen / Peter Roepstorff / Albert Gjedde

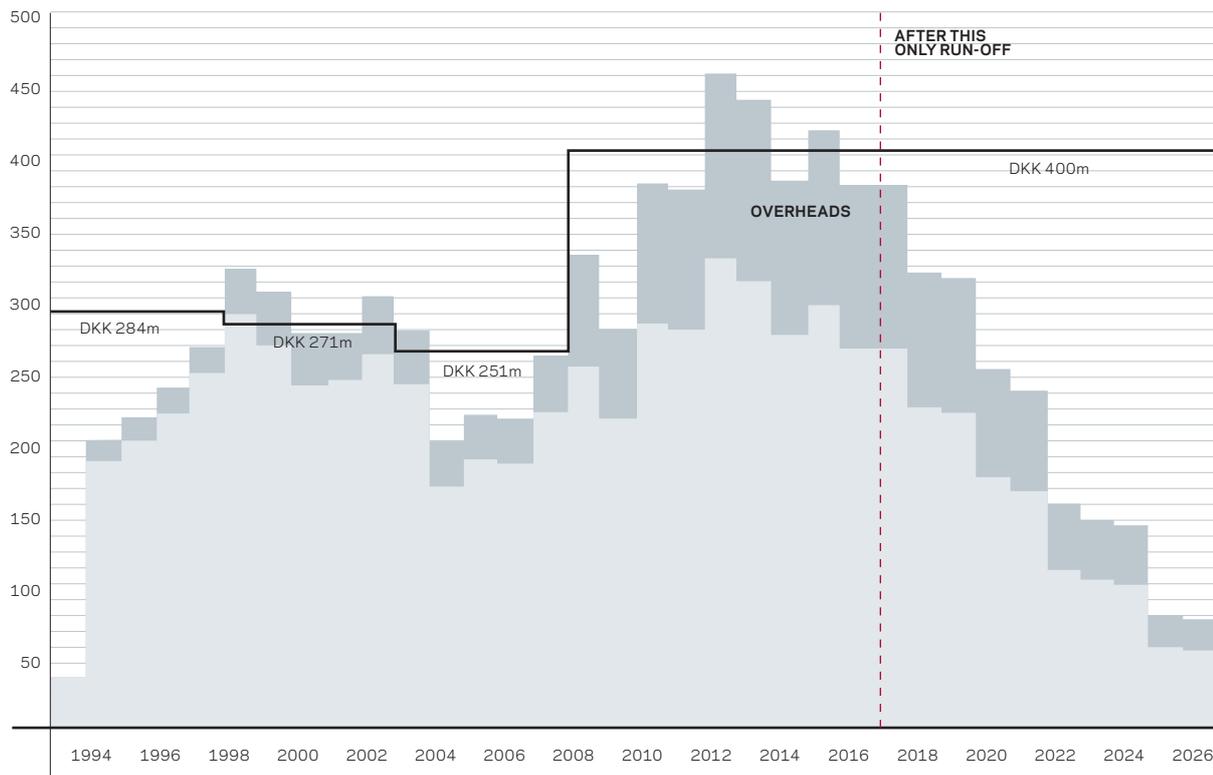
FOUNDATION ASSETS AND FUNDING BASE

Five billion kroner worth of excellent research

On its establishment in 1991, the DNRF received start-up capital of 2 billion kroner. Following a legislative amendment in 2008, the foundation received an additional 3 billion kroner and concurrently decided to aim for annual grants totaling an average of 400 million kroner (~53 million euro) as from 2010, equal to about 2% of total public research grants.

Since its establishment, the foundation has provided funding worth 5 billion kroner to Danish research communities.

The legislative amendment and the large capital injection made it possible for the foundation to maintain its level of activity, although overheads have increased to 44% of the grants. At the same time, the capital injection extended the foundation's life span until 2026.



The figure shows the grants provided by the foundation and the proportion of the grants used on overheads compared to the level of grants intended under the relevant legislation. The capital injection of 3 billion kroner received by the foundation in 2008 extended the foundation's life span until 2026. With 10-year grant periods, the foundation will have established the last 10-year centers in 2017.

THE DNRF'S PERCENTAGE SHARE OF PUBLIC RESEARCH FUNDS



Two grant rounds left

With assets currently amounting to 4 billion kroner, Danish research communities can continue to benefit from grants provided by the foundation. With 10-year grant periods, the foundation will, as early as 2017, establish the centers that will be up and running until 2026. Potential applicants for new centers should therefore note that the next call for new centers is expected to be announced in the summer of 2013, while the last call for new Centers of Excellence will be announced in mid-2015.

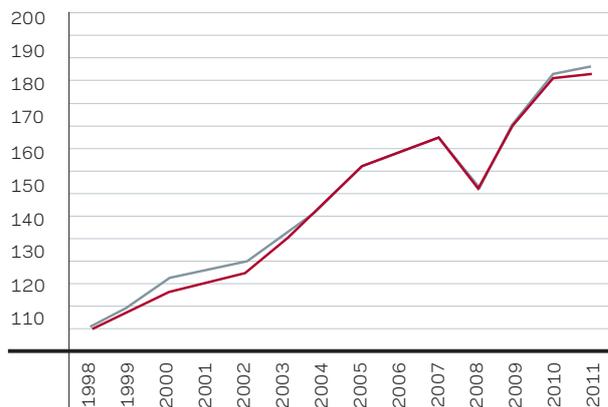
Autonomy in the management of funds

The foundation's structure - according to which the DNRF enjoys full discretion to manage its funds within the given legal and regulatory framework - has proven to be the perfect model. It is a model that has prevented the foundation's activities from depending on annual finance bills or changing political landscapes. Its assets and independence ensure that the foundation is able to make large and long-term center grants and thus provide an optimal framework for excellent frontier research.

Under the current financial framework, the last call for new Centers of Excellence will be announced in mid-2015.

RETURN ON FOUNDATION CAPITAL 1998-2011 COMPARED TO BENCHMARK

ACCUMULATED RETURN INDEX, JAN. 1, 1998=100)



Since 1998, the foundation has measured its return against a market-related benchmark. Throughout the period, the return has matched or exceeded the benchmark.

■ Benchmark
■ Foundation return

CENTERS OF EXCELLENCE – ROOM FOR VISION

The DNRF aims to identify and fund outstanding researchers and research with the potential for breakthroughs that might transform science itself, open up new opportunities and, ultimately, change the way we live and think.

Excellent frontier research

As the Danish name "Danmarks Grundforskningsfond" suggests, the DNRF provides funding for basic research. However, the boundaries between basic research and applied research have become increasingly blurred, and for that reason, it does not always make sense to maintain the distinction. Instead, the term frontier research can be used to denote groundbreaking research, which is often situated in the borderland between different research disciplines and scientific fields.

THE DNRF IN BRIEF

The DNRF is an independent foundation established by the Danish Parliament in 1991 with the objective of strengthening Denmark's research development capabilities through funding for excellent research of international caliber. The foundation provides funding for research within all scientific fields.

The establishment of Centers of Excellence is the primary funding mechanism, but a number of initiatives have also been launched to further the internationalization of Danish research.

The foundation operates on the philosophy that large, flexible and long-term grants for outstanding researchers will result in creative and strong research communities that pave the way for excellent research and, hopefully, new breakthroughs.

The foundation's strategy is underpinned by three overall core values:

- **Excellence** should pervade all aspects of the organization.
- **Trust** stimulates creative research. Accordingly, center leaders should have considerable freedom in handling the large and flexible grants at their disposal.
- **Transparency**, fairness and quality are key words in the assessment process. It is essential that the surrounding scientific communities be able to trust the integrity of the Board of Trustees and the assessment and selection processes used by the foundation.

GRANTS IN 2010 BY PROGRAM IN DKK MILLION/PERCENT

Centers of Excellence	322	83.2
Professorship programs	33	8.5
Joint funding activities	32	8.3

The foundation has so far established 77 Centers of Excellence, and contract negotiations have been initiated with another 11 centers that are expected to start on January 1, 2012. An overview of all grants made by the foundation is provided at the end of this publication.

CENTERS OF EXCELLENCE - THE FLAGSHIPS OF THE FOUNDATION

A Center of Excellence is a creative research environment where ideas are exchanged across generations and disciplines. The centers differ in size and organization and may consist of one or more research teams, which, armed with ambition and vision, join forces to solve complex research matters. Some centers employ more than 60 people, while others have 15 employees or less.

The crucial point is that the center shares an overall idea or vision and has a well-defined and relevant framework and composition, under which the whole is greater than the sum of its parts and where the necessary and complementary competencies are put into play.

STRUCTURE AND LIFE CYCLE

Center start

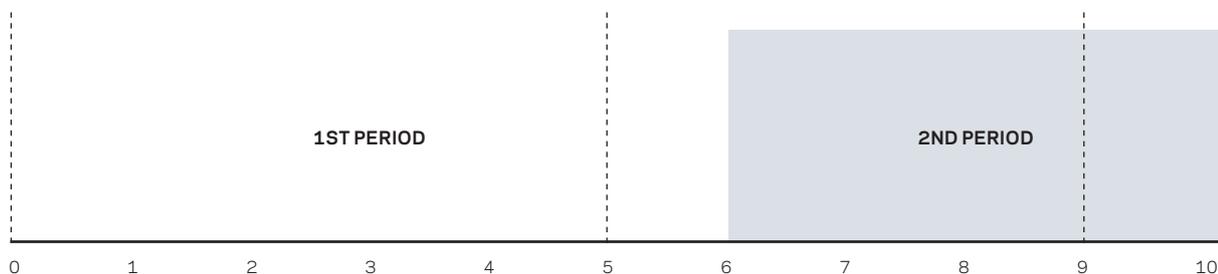
Large, flexible grants (6+4 years)
Max. 2 grant periods

Mid-term evaluation

After 5 years, the board decides
whether centers will be extended

Final evaluation Phase out

After 9 years



Follow-up meetings are held annually

A center may receive funding for up to ten years over two grant periods of six and four years, respectively. After five years, a mid-term evaluation is performed and a decision made about whether to continue the center for a second grant period. The foundation takes a keen interest in the development of the centers and visits each one annually at follow-up meetings.

The close contact provides an opportunity to monitor the results achieved by the centers and to give advice or intervene early on if a center is off track. The follow-up meetings also give great insight into the flexibility and opportunities provided by the center funding mechanism.

Incubator for top researchers of tomorrow

Since the centers are dynamic, creative, and internationally oriented research environments, they provide an optimal setting for training the next generation of first-rate researchers. The foundation considers it highly important that research training and the “growth layer” play a key role in the centers. On the whole, the foundation would like the centers to have a strong rub-off effect on the educational environments. For more information about research training, see pages 46-49.

International profile

The centers produce world-class research and are obvious partners for researchers from abroad, just as they are highly capable of attracting top researchers and talents to Denmark from abroad. For more information about the internationalization approach adopted by the centers and the foundation, see pages 54-59.

Center leaders need to be outstanding researchers and visionary leaders at the same time

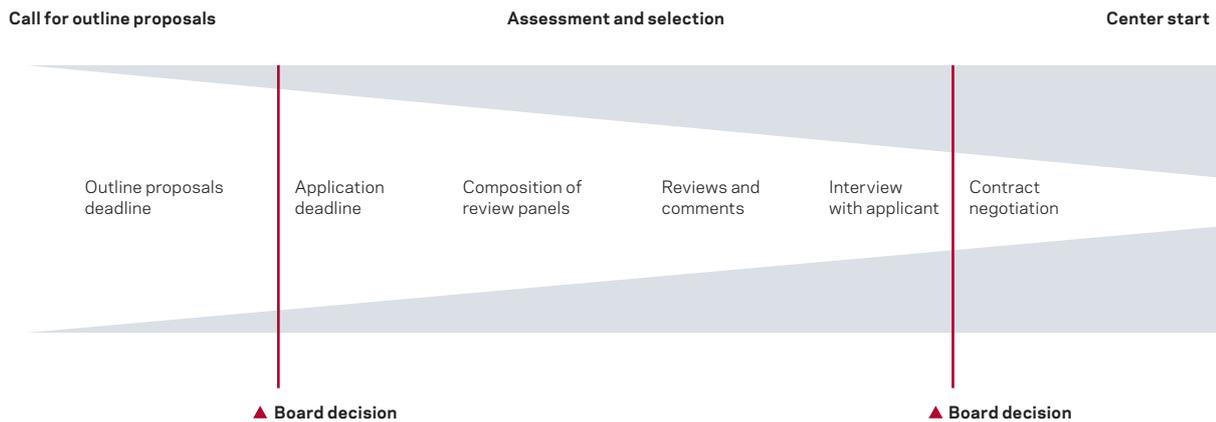
A center leader should not only be an outstanding researcher but also a visionary leader capable of fostering a creative and dynamic research environment, building the right team and inspiring others to deliver their best performance.

The centers are based at research institutions, the vast majority at universities. In the foundation's experience, the best results are achieved if the center largely shares a common physical embedment. The immediate proximity and accessibility ensures that knowledge is shared and used throughout the center, often in an informal context.

Photo: Mikal Schlosser



ASSESSMENT AND SELECTION PROCESS



The competition for a Center of Excellence is fierce. The success rate from submitting an outline proposal to obtaining a center grant is around 6%. In the latest calls, about 15-20% of outline proposals have moved on to the full application phase. About 30-40% of the full applications have resulted in new centers.

Assessment and selection

Calls for new centers are announced approximately every two years. The next call will be announced in 2013. The application process consists of two stages: 1) letters of interest with outline proposals processed by the board alone, and 2) full applications sent for external peer review by a number of international experts.

The paramount criterion in the assessment of proposals for new Centers of Excellence is the quality of the research. Applications must outline ideas for ambitious and innovative research that may potentially lead to new breakthroughs. Relevance and immediate utility value are not key criteria; nonetheless, the centers produce surprisingly many application-oriented results. For more information, see pages 50-54.

Composition of review panels

The foundation seeks advice on identifying potential peer reviewers from a number of external sources such as:

- The Danish Council for Independent Research (DFR)
- The European Science Foundation (ESF)
- The National Science Foundation (NSF)
- Applicants

Each applicant may submit the names of three experts, one of whom will be selected to serve on the review panel that assesses the application.

The reviewers are not asked to assign a grade or rank to applications. In general, no reviewer is used to assess more than one application in a given application round.

Open and transparent process

Full applications are sent to international experts within the relevant scientific area(s) for external peer review. The reviewers must be true peers and should, at a minimum, enjoy the same international recognition as the applicant.

The process applied by the foundation is very open and transparent. Reviewers and applicants know each other's identity. Applicants are given an opportunity to comment on the composition of the review panel and can, in addition, comment on the reviews prior to the board's final decision.

Interview

The board conducts an interview with each applicant (the proposed center leader) prior to the final decision. During the interview, the applicant presents the overall research idea and elaborates on the strategy for realizing the idea.

Contract and inauguration

When the board has made its decision on which applications to fund, contract negotiations are initiated with the host institution. An official inauguration of the new center is held when the contract has been signed and the center has started operating.

Thoroughness and transparency are key elements of the application process. The foundation considers it essential to have a process in which both applicants and the external community can have complete confidence.

THE FOUNDATION EMPHASIZES THE FOLLOWING DIMENSIONS:

- the research idea is ambitious and innovative and has the potential to lead to genuinely groundbreaking results;
- the center leader enjoys wide international recognition in his or her field and demonstrates leadership skills;
- the center employs the right staff with strong scientific competencies, thus making it possible to build a creative and dynamic international research environment that provides an optimal framework for research training and young researchers;
- the objective, structure and/or size of the center set the stage for research that is otherwise very difficult to conduct under conventional funding mechanisms.

MYRIAD PRIZES FOR CENTER LEADERS

Center leaders and the research they represent enjoy wide recognition in Denmark and internationally. A host of center leaders have received the Danish EliteForsk prize, awarded to internationally outstanding young researchers. Since 2007, the prize has been bestowed on 27 people, 14 of whom lead a DNRF center, while three prize winners are key employees at one of the centers.

The centers are successfully securing grants from the European Research Council (ERC). Center leaders or key employees from the centers have received 75 percent of the Advanced Grants received by the Danish research communities so far.

In 2010, 4 out of 5 recipients of the EliteForsk prize headed a DNRF center. The photo shows Lars Arge, Adrian Favell, Crown Princess Mary, Kurt Vesterager Gothelf, Carsten Rahbek, Francesco Sannino and Helge Sander, then Minister of Science, Technology and Innovation, at the award ceremony.

17 out of 27 EliteForsk prizes have been awarded to key employees of DNRF centers.



RESEARCH THAT MAKES A DIFFERENCE

The DNRF wants to promote and stimulate research that may lead to groundbreaking results, research that transforms and takes an innovative approach to science, research that ultimately changes the way we live and think, and research that requires us to have the courage to think big and innovatively. This is hardly a humble ambition – quite the contrary! But if we look down the list of centers that have received funding from the foundation over the years, it becomes clear that our ambition has frequently been fulfilled.

The DNRF is proud to have taken part in funding some of the foremost research communities, communities that are not only among the best in Denmark but also enjoy international recognition as some of the best in their field. The Center for Experimental Bio Informatics (CEBI), which was headed by Professor Matthias Mann,

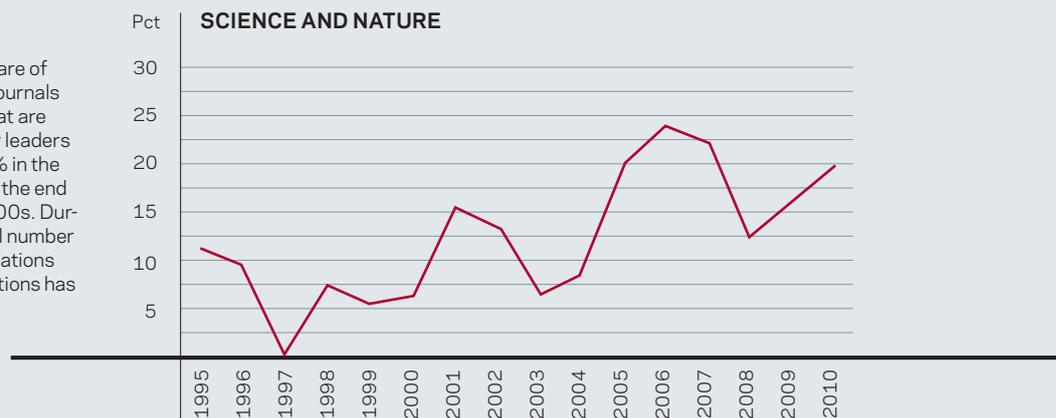
is a prime example. When the center received its final evaluation, it was regarded as a world leader in protein research, and Matthias Mann has undoubtedly been one of the most influential researchers in this field over the past 15-20 years. More details on CEBI are available on pages 32-33; on those pages, Matthias Mann describes what being awarded a Center of Excellence grant has meant to him.

Every fourth center is world class

However, CEBI is not the only example. When an international panel evaluated the foundation in 2003, one of the conclusions read as follows:

...around one fourth of the centers have achieved distinction as world leaders in their scientific fields.

The figure shows that the share of Danish contributions to the journals *Nature* and *Science* (in %) that are co-authored by DNRF center leaders has increased from about 5% in the mid-1990s to about 20% at the end of the first decade of the 2000s. During the same period, the total number of *Nature* and *Science* publications from Danish research institutions has more than doubled.



Only 2% of public research funds are allocated to the Danish National Research Foundation, but 20% of all Danish contributions in *Science* and *Nature* are based on DNRF grants.

Subsequent mid-term and final evaluations have confirmed this figure. In continuation of the mid-term evaluation of 14 centers in 2009, the reviewers were asked to assess whether the center they had evaluated ranked in the top 5, 10, 20 or below globally. Five of the centers were ranked in the top 5 globally, while all the other centers were ranked in the top 10. We consider this a great achievement.

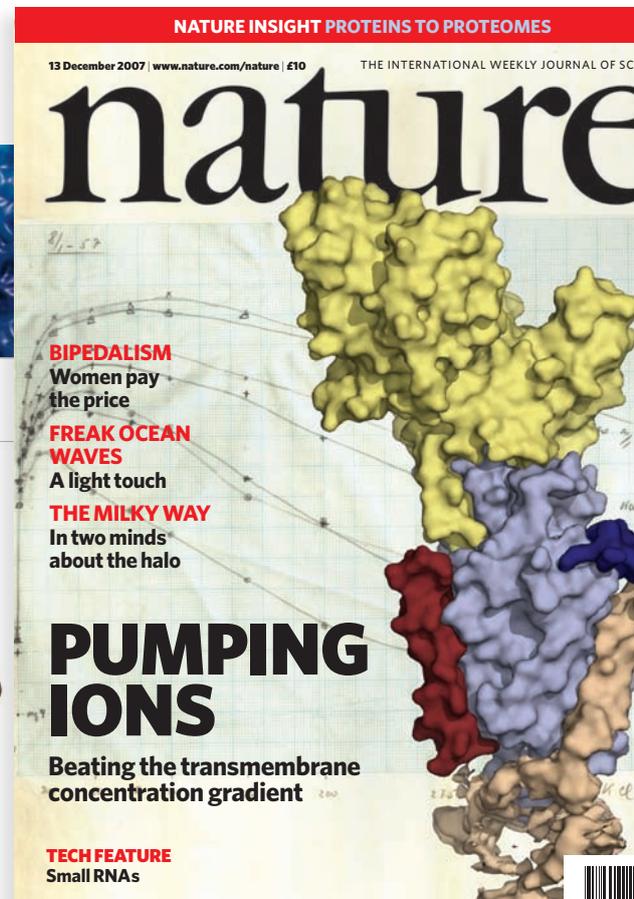
Much published in *Science* and *Nature*

Science and *Nature* are two of the most prestigious journals in which researchers can have their articles published. Articles in these journals inspire respect and strike a responsive chord in other media. Both journals

cover a broad range of scientific fields, but social science and humanistic research receive only limited coverage, as do clinical and technical research. The DNRF has established centers covering all scientific fields, and despite the fact that many of the centers focus on research that cannot be published in *Science* and *Nature*, more than 20% of all contributions written by Danes in these journals come from DNRF centers.

The centers frequently publish articles in *Science* and *Nature*. The two covers of *Nature* originate from articles published by the Center for GeoGenetics and Centre for Membrane Pumps in Cells and Disease (PUMP-KIN) respectively.

Source: Nature Publishing Group



Center	Center for Experimental Bio Informatics
Location	University of Southern Denmark
Period	1997-2007
Grant	DKK 70.3 million (~ EUR 9.4 million)
Further information	www.cebi.sdu.dk



■ It's greatly thanks to the significant and long-term grant received from the Danish National Research Foundation that we at CEBI have achieved the results that have made us a global leader in our field of research. The peace of mind and stability afforded by a center grant have allowed us to concentrate on research, which is what we do best. We have avoided the constant hunt for new sources of funding.

MATTHIAS MANN

THEY HAVE TAKEN BIOCHEMISTRY INTO A NEW EPOCH

By applying a trailblazing combination of biology, physics and data processing, Matthias Mann and the Center for Experimental Bio Informatics (CEBI) have breathed new life into biochemistry. The results produced include new methods that provide swifter and more accurate information about what proteins are active in both sick and healthy cells and how they interact. These protein profiles can be the key to more effective medicine and diagnosing.

The universe of music can help explain the complexity of CEBI research. If we compare a symphony score to the codes of the human genome, all the instruments correspond to the proteins produced on the basis of these genome codes. Only here, the proteins playing in the human "protein symphony" number in the thousands.

Matthias Mann has carried out revolutionary research at various stages in this process. He has linked the

proteomics protein field of research with mass spectrometry and advanced data processing in system biology, thus paving the way for a method unprecedented in biochemistry. Instead of analyzing proteins one by one, we can now take a complete snapshot of all the thousands of proteins active in a cell at the same time. Mann's and CEBI's research has also provided the essential ability to distinguish how the cell acts in the role of conductor and swings the baton to conduct the interplay of the proteins.

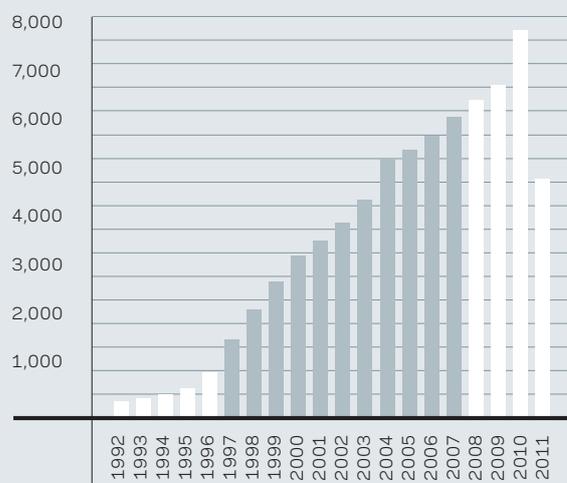
These results could have a major impact on tomorrow's medicine and diagnostic techniques.

Placing Denmark in the world elite

The combination of doing a Ph.D. program at Yale University in the USA and meeting a Danish woman originally brought the German researcher to Denmark and the University of Southern Denmark. He was not, how-

Matthias Mann is a clear global leader in protein research and one of the world's most frequently cited protein researchers. The figure shows the number of annual citations in scientific magazines. The grey columns indicate the period during which the Danish National Research Foundation funded the Center for Experimental Bio Informatics (CEBI)

ANNUAL NUMBER OF CITATIONS (MATTHIAS MANN)



Source: Web of Science

ever, destined to stay in Denmark, since the country, at the time, lacked the optimum conditions for a top-level researcher who could pick and choose where he wanted to pursue his career. The chance to establish a basic research center at the University of Southern Denmark made Denmark attractive not only for family reasons but also for professional ones. As the head of CEBI between 1998 and 2005, he was instrumental in placing CEBI in the absolute world elite within protein research, second only to the Max Planck Institute in Munich.

Head of research in both Germany and Denmark

Today, Matthias Mann is director of Proteomics and Signal Transduction at the Max Planck Institute for Biochemistry in Munich, but, fortunately, this top-level German researcher has not given up Danish research

altogether. After his success at CEBI, Mann wanted to maintain his research ties with Denmark. Thus, when a large donation from the Novo Nordisk Foundation enabled the University of Copenhagen to inaugurate the Center for Basic Metabolic Research in 2007, Professor Mann spearheaded the proteomics arm, a position he now fills in tandem with his managerial position at the Max Planck Institute.

CENTERS OF EXCELLENCE WITHIN AND ACROSS ALL FIELDS OF RESEARCH

Centers of Excellence can be established within and across all the fields of research. There is no standard template for the design of a Center of Excellence. Centers may vary in size and structure, depending on the relevant fields and scope of the center's objectives.

77 centers and 11 new centers on the way

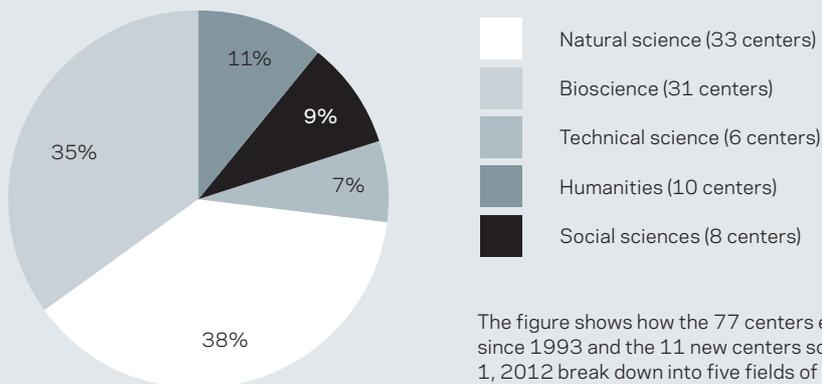
So far, 77 centers have been established, and the seventh application round has led to contractual negotiations with another 11 new centers slated to start up on January 1, 2012. A list of all centers

established by the foundation since 1993 appears at the back of this publication.

Only for natural science and bioscience?

As the pie chart shows, the majority of the centers established by the foundation until now lie in the fields of natural science and bioscience. This is a pattern with several likely explanations, one being that these fields

88 CENTERS OF EXCELLENCE, BROKEN DOWN INTO FIVE FIELDS OF RESEARCH



The figure shows how the 77 centers established by the foundation since 1993 and the 11 new centers scheduled for launch on January 1, 2012 break down into five fields of research. It should be noted that some centers fit into more than one field.

A Center of Excellence may consist of one or more research teams, which, armed with ambition and vision, join forces to solve complex research questions.

have a long-standing tradition and significant need for working in bigger units. Moreover, the breakdown of centers into fields varies considerably from one grant round to the next.

Also for the humanities and social sciences

In the humanities and social sciences, interest in establishing large-scale coherent research communities with the possibility of dialogue and critical knowledge sharing seems to be growing. The Center for Subjectivity Research, covered in the article on pages 40-41, illustrates the value of applying the center idea to the humanities.

Mostly interdisciplinary

The fact that the vast majority of the centers are interdisciplinary is part of the story. The level of interdisciplinary interaction in some centers is so high as to span all five fields. This is the case with the Center of Functionally Integrative Neuroscience, covered in the article on pages 36-37. Many of the other centers involve competencies from various disciplines within the same or across several fields of research.



Marie Louise Nosch, leader of the Centre for Textile Research, speaks at the foundation's annual meeting in 2010.

Center	Center of Functionally Integrative Neuroscience (CFIN)
Location	Aarhus University
Period	2001-2011
Grant	DKK 76 million (~ EUR 10.1 million)
Further information	www.cfin.au.dk



■ Given the growing specialization and fragmentation in research and teaching, we face an increasing risk of overlooking important relations and possibilities if we don't keep abreast of the cognitive and methodological breakthroughs seen in other disciplines. Research groups and knowledge institutions must be reorganized to meet this challenge on an ongoing basis.

LEIF ØSTERGAARD

RESPECT AND HUMILITY

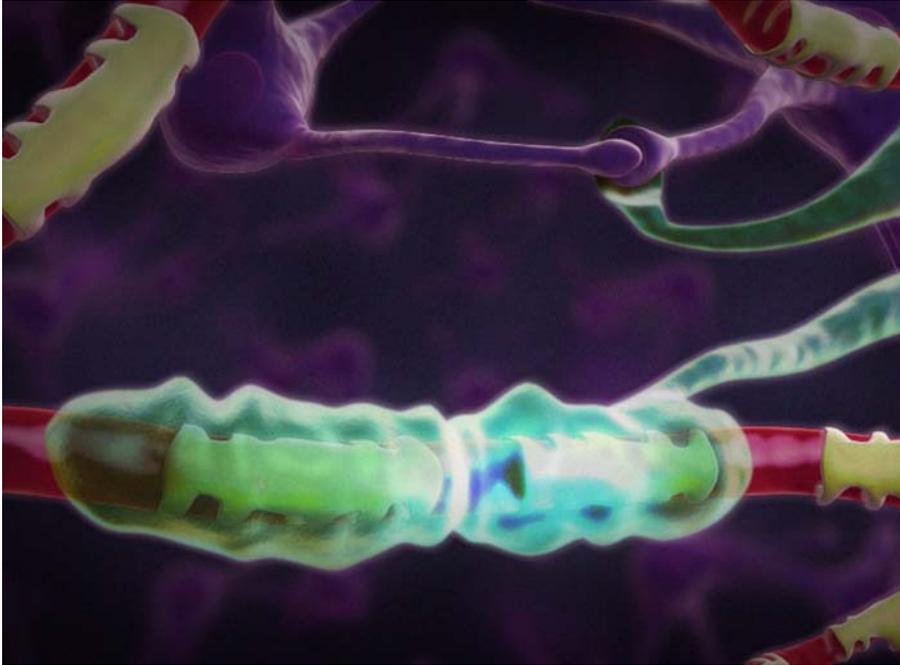
Pick the most scientific beacons. Take into consideration that innovative ideas may come from unexpected quarters. Then add a cocktail of respect, humility, curiosity and patience. The Center of Functionally Integrative Neuroscience has used this recipe since 2001. And the recipe has proved to be more than successful.

In a time when individual disciplines are increasingly divided into sub-disciplines and where new disciplines emerge in the cracks between the more classic ones, the Center of Functionally Integrative Neuroscience (CFIN) has lifted its eyes and chosen a markedly interdisciplinary or integrative approach. The center consolidates disciplines as varied as medicine, physics, music, anthropology, psychology, linguistics, theology, philosophy and computer science into a collective ambition to learn more about how the brain works – the grey organ that can have Nobel-Prize-winning ideas and still have difficulty understanding itself.

By including competencies and insights from various disciplines without bias, the center has, for instance, contributed new knowledge about what signal substances are active when certain moods govern our interior world and how music can be used to alleviate pain.

Interdisciplinary science calls for a high level of expertise

To Leif Østergaard, successful interdisciplinary science depends on the will and ability of individual researchers to meet each other with an open mind and mutual respect. It takes equality to create a community where 1+1 equals 5, says Østergaard, highlighting the necessity of having beacons in the respective disciplines meet. In scientific circles, only one thing engenders respect and results and that is competence.



Some research at CFIN targets the mechanisms that ensure oxygen for brain cell activity. The photo illustrates a possible explanation, namely that the signal substances of brain cells are transported to the smallest blood vessels of the brain (the capillaries) via "supporting cells" (astrocytes). There, a hitherto overlooked type of cell, the pericyte, redistributes the blood flow through the brain and thus increases the local amount of oxygen for brain cell activity.

Bridge builders with dual expertise

The success of CFIN has also depended on the fact that several of the center's key researchers have mastered more than one discipline and thus managed to bridge the gap and "translate" between the disciplines. Leif Østergaard himself has degrees in mathematics, physics and medicine, but other center members have degrees in disciplines ranging from mathematics to music and from biology to anthropology. These people have been paramount in establishing a coherent and diverse technical environment at CFIN, an environment in which a new generation of brain researchers has been raised on vision and insight across disciplines and tradition.

Time and patience

Interdisciplinary research at CFIN has called for more than beacons and bridge builders. Time and patience have been equally important conditions for success. This is because it takes time to gain sufficient under-

standing and establish a common language when interdisciplinary research based on true cooperation is the actual goal and not just for show. In return, results can be far-reaching and surprising.

En route to epoch-making results

As a consequence of CFIN's interdisciplinary angle, Leif Østergaard is tracking a phenomenon in the smallest veins of the body - the capillaries, a phenomenon that can revolutionize our understanding of how diseases such as diabetes, Alzheimer's, and cancer and conditions such as blood clots arise and develop. Østergaard calls the discovery "a cognitive bomb" if the theory can be proved. And the center can continue its work because its period as a basic research center has ensured adequate critical mass to attack a problem of this complexity.

FOCUS ON RESEARCH MANAGEMENT

Achieving exceptional results in a Center of Excellence rests on good leadership, but managing a center is also a challenge for the majority of researchers. Since 2007, the foundation has arranged courses in research management; these courses target leaders of foundation centers in particular. The courses offer advice on and inspiration for how best to handle difficult situations, as well as providing a forum for center leaders to exchange experience and inspire one another.

Center leaders need to be outstanding researchers and visionary leaders at the same time.

The courses in research management and other center leader events help establish a forum for exchanging experience and building a strong network among center leaders.

Research leaders have to lay out the vision and show the way. A leader must be able to give staff members latitude and manage them with a fresh approach.



Center	Center for Subjectivity Research
Location	University of Copenhagen
Period	2002-2012
Grant	DKK 36.4 million (~ EUR 4.9 million)
Further information	www.cfs.ku.dk



■ Good research is best performed and best thrives in an environment with dialogue and critical discussion. That's why the center design is so valuable.

DAN ZAHAVI

FOCUS ON THE SELF

In the humanities, organizing research in major centers is relatively rare. However, at the Center for Subjectivity Research, Dan Zahavi has created a community with room for research that challenges the traditional boundaries of philosophy. The center also integrates philosophic approaches with psychology and psychiatry in an attempt to understand the complexity of the mind and analyzing the self.

In addition to critical mass and a diversity of disciplinary backgrounds, a crucial factor for the success of the center has been open doors.

"True, you can e-mail and phone fellow researchers in Denmark and abroad. But it's much more inspirational, intense and productive to be physically surrounded by colleagues working together," says Dan Zahavi. Young researchers and Ph.D. students are especially pleased

with the milieu and access to colleagues at a center. Many disciplines in the humanities tend to encourage isolated individual research, but the possibility of daily discussions with colleagues and visitors to the center is deeply appreciated.

International clout and visibility

The center's volume, diversity and status as a Center of Excellence have opened a wealth of new possibilities. The center's innovative approach and many activities have resonated with people outside Denmark and attracted numerous visitors to Copenhagen. This has led to greater cooperation and made it possible to apply for international funds – e.g. from the EU framework programs – for which private individuals are unable to apply.

Systematic look at the mind

Research at the center pivots on a systematic study of what it means to be conscious. For instance, what is the relationship between the mind and the "self" – the "self" that seems so close and intimate, but which nevertheless can appear so elusive? Is the self real at all or just an illusion? What is the relationship between the self, our emotional life and the values we adopt? There are no easy answers, and the center explores the possible interactions that can be established between traditional humanistic disciplines such as philosophy and the scientifically oriented approaches found in cognitive science, neuroscience and psychiatry.

New tool in psychiatry

The unorthodox link between psychiatry and philosophy has, for instance, resulted in a new diagnostic tool for psychiatrists. The tool is known as EASE: Examination of Anomalous Self-Experience. It is a manual that explores in great detail various dimensions and aspects of patients' self-experience. The precise description and identification of subjective disorders may improve the diagnosis and, in the long run, the treatment of patients suffering from disorders like schizophrenia. "It's been very interesting to help develop this diagnostic tool, which can make a substantial and practical difference to a large number of people. Without the link to philosophy, it would probably not have seen the light of day," says Dan Zahavi.

Young researchers and Ph.D. students are especially pleased with the milieu and access to colleagues at a center.



The Center for Subjectivity Research addresses questions about what the self is and about what significance it might have. Research is based on a host of philosophic traditions and bridges the gap to empirical research, especially in psychiatry and cognitive science.

RESEARCH IN SOCIETY

Fascinating stories

Some centers operate in areas that have always fascinated man - e.g. astronomy and the universe. What is more, although science may seem impenetrable to the lay person, the centers manage to share their fascination and knowledge with the surrounding society.

Research that transforms

The research carried out at other centers produces results that have a direct impact on our everyday lives and our quality of life. A prime example of this is the Copenhagen Muscle Research Center; see the article on pages 48-49. Key elements in health policy in Denmark and abroad rest on the center's results and findings.

Knowledge rather than beliefs and myths

Other centers hold knowledge - and carry out research - in areas that affect all of us. One such center is the Center for Ice and Climate, which undertakes research on how and how quickly the climate has previously developed. This knowledge is important to bring into play so we, as a society, have the best platform for meeting the challenges of the future. Dorthe Dahl-Jensen, leader of the Center for Ice and Climate, is a shining example of a researcher who very actively shares her knowledge with politicians in Denmark and abroad as well as with society in general. The article on pages 48-49 the following pages offers more information.

The DNRF centers reach for the sky like beacons in the research landscape, showing the way. The centers are led by people who want to make a difference and who want to take science and the world forward. These centers are far from being ivory towers sealed off from the real world. Quite the contrary in fact: the centers are part of the wider community and contribute to it in a variety of ways.

Francesco Sannino, leader of CP³ - Origins, considers it highly important to share his knowledge and make physics interesting. For instance, center staff visit kindergartens and schools where they talk about the solar system, and they tour upper secondary schools, illuminating the physics in the film "Angels & Demons."



Center	Centre for Ice and Climate
Location	University of Copenhagen
Period	2007-2017
Grant	DKK 116 million (~ EUR 15.5 million)
Further information	www.iceandclimate.nbi.ku.dk



■ Climate research is a fine example of knowledge that must be communicated to the surrounding society so we on the Earth can devise joint strategies based on knowledge instead of beliefs and myths.

DORTHE DAHL-JENSEN

PASSIONATE COMMITMENT TO THE ICE CAP AND CLIMATE

For many years, the Centre for Ice and Climate has been drilling in Greenland to comb through the ice cap's treasure trove of climate history, generated layer by layer over more than 100,000 years. The vast amounts of data are more than testimonies to the prehistoric climate. They also hold patterns useful in predicting what to expect from the future climate - if we want and dare to listen.

At COP15, Dorte Dahl-Jensen was on the stage in the Bella Center, sitting on a panel with Al Gore, former US vice president and the man behind the film "An Inconvenient Truth." She hosted the visit from German chancellor Angela Merkel to the Greenland ice cap in 2007 and is a frequently cited expert on climate change in the Arctic and its global impact. She knows what she is talking about, and she is not afraid to share her knowledge. What is more, the necessity to communicate this cool insight into the secrets of the ice is becoming increasingly urgent.

Cold gold mine of knowledge

The more than 2.5 km of ice cores drilled by the Centre for Ice and Climate from the Greenland ice cap are a gold mine of information about the prehistoric climate. The ice shows that a warm period with a temperature 3-5 degrees Celsius above today's mean temperature has existed before. That was in the Eemian interglacial period 130,000-115,000 years before our time. Then, the oceans stood much higher, and a similar development could be a realistic future scenario if global warming continues at the current pace. There are indicators that it will, perhaps at an even faster pace than originally assumed.

Faster warming

Instead of anticipating that global average temperatures will rise by 2 degrees Celsius toward the end of this century, we must prepare ourselves for a rise of 3 or 4 degrees Celsius. Moreover, this change may not necessarily occur along a straight line because the climate



Ice cores from the Greenland ice cap can provide insight into today's and tomorrow's climate.

system is capable of making radical and sudden changes from one year to the next. This is knowledge and insight that may be of significance to the whole world, not only the Arctic regions. Dorthe Dahl-Jensen is very keen to communicate this knowledge beyond her own technical circles.

No horror scenarios - but common sense and action

How do we approach the disturbing insights into future climate change? Dorthe Dahl-Jensen does not want to conjure up horror scenarios. She points out, however, that we need to change our behavior and, for instance, limit our dependence on fossil fuels, not only in individual countries but all over the world. Moreover, we must be ready to adjust to the change we do not have time to avert. Cities like New York, Amsterdam and Shanghai will be flooded unless strategies are devised soon for protecting these cities and many others against the rising sea levels we know will come. Such strategies

should be heavily embedded in the knowledge that the Centre for Ice and Climate, among others, has worked - and is still working - so intensively to produce.

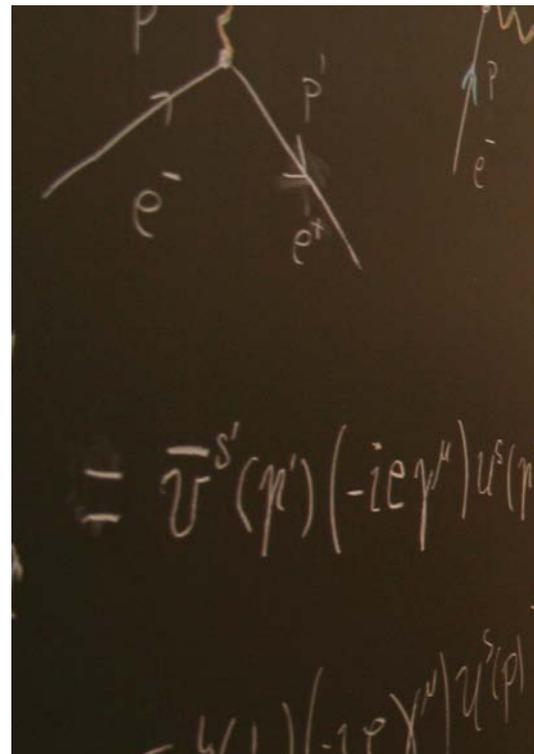
RESEARCH TRAINING – AN INVESTMENT IN THE FUTURE

Incubators for tomorrow's top-level researchers

The centers constitute the optimum framework for training the first-rate researchers of the future. In a dynamic and international atmosphere with colleagues across disciplines, nationalities and generations, young researchers have ample opportunity to learn from each other and explore their fields.

The foundation finds it important for research training to play a key role at the centers. It is paramount that the new knowledge generated at the centers has a large rub-off effect on educational environments.

The foundation has previously established two graduate schools at Aalborg University and Aarhus University, respectively, to serve as role models for how to run international graduate schools. Today, research training forms a significant and integral part of all centers.



NUMBER OF PH.D. STUDENTS

	2010
Denmark, total	8764
DNRF share	754
DNRF percentage	9 %

INTERNATIONAL STUDENTS IN FULL-TIME PH.D. PROGRAMS IN DENMARK

	2010
Denmark, total	1871
DNRF share	254
DNRF percentage	14 %



Ph.D. students from CP³ - Origins. Photo: Jens Svalgaard Kohrt

Foreign talents

Foreign Ph.D. students are a real boon for the centers. Their commitment and desire to be at these centers provide a great inspiration to other center staff.

According to the legal framework, center grants must have a significant element of research training.

Center	The Copenhagen Muscle Research Centre (CMRC)
Location	University of Copenhagen
Period	1993-2003
Grant	DKK 157.4 million (~ EUR 21 million)



■ If we want a big center to succeed, we must be able to appreciate each others' successes – even when we haven't produced the results ourselves.

BENGT SALTIN

THE MUSCLE WIZARD AND HIS MANY APPRENTICES

When the Copenhagen Muscle Research Centre was established in 1993, Bengt Saltin was its only professor. Since then, 15 of the center's researchers have become professors at the University of Copenhagen. There is no mistaking the number in terms of the center's success, a success that follows in the footsteps of Danish Nobel Prize winner and physiologist August Krogh and reaches far beyond the walls of the university and deeply into the individual human being's efforts to stay healthy throughout life.

There are several reasons for the success of the Copenhagen Muscle Research Centre, including the center's brainpower and its visionary and inclusive community headed by Bengt Saltin. From day one, the center concentrated on one joint goal: understanding how skeletal muscles affect man's function and health. Targeted efforts have been made to achieve this goal with an open management style and close dialogue between researchers and with space for both vision and passion.

Room for commitment and drive

Bengt Saltin decided to recruit from a broad pool of expertise when putting together the large team of highly qualified researchers in biology, biochemistry and medicine who were able to intertwine the disciplines while, at the same time, using their characteristic differences to shed light on physical activity from various angles. Saltin was not only on the lookout for established researchers who had already proved their worth but also for talents from Denmark and abroad who displayed commitment and drive. This allowed more people to show their worth, which in turn gave the center its unique, multi-faceted profile.

"The center was formed by all the strong researchers who had been instrumental in applying for the grant from the Danish National Research Foundation. We were one group on our way forward. We knew each other well and respected and were responsive to each other's work and contributions to the whole," says Saltin.

When the Copenhagen Muscle Research Centre was established in 1993, Bengt Saltin was its only professor. Since then, 15 of the center's researchers have become professors at the University of Copenhagen alone.



Pictured above are a few of the researchers who have based their careers on the CMRC. The top row shows four generations of professors now working at the University of Copenhagen. The CMRC attracted many young researchers from different countries. The four researchers seated in front come from various countries and are now assistant professor, associate professor or professor at the University of Copenhagen.

Breakthrough on several fronts

Another explanation for the success lies in a range of external circumstances. When the center was established, physiology was in the midst of an unusually dynamic period. The biopsy technique had been enhanced, and it was possible to examine the energy conversion of muscle cells in tissue samples weighing only 5-10 mg – less than the amount of sulfur at the end of a matchstick. Insects like grasshoppers could suddenly lend a thigh to muscle biopsies. Moreover, data analysis techniques made quantum leaps, paving the way for analyzing and finding patterns in much greater volumes of data than before. These were breakthroughs that presented the center with a unique opportunity to develop the methods today used for examining muscular tissue from both patients and healthy individuals.

Physical activity from a health-policy perspective

At an early stage, the center decided to take a holistic view of the body by examining physiology and biochem-

istry right from the gene and protein level through the organ level to how the body's circulation and metabolism interact. This highly complex and balanced view of the body has provided documentation showing that physical inactivity is a top killer and that exercise is alpha and omega to our health. This is true not only in the prevention of diabetes and circulatory diseases but also for our general health profile. The results generated by the center also constitute key health policy platforms in both Denmark and countries like the US.

Bengt Saltin's research contributions enjoy worldwide recognition, and he has received a large number of prestigious prizes and awards throughout his career, including the Novo Nordisk Prize in 1999 and the IOC Olympic Prize on Sport Sciences, which he received in 2002 and is regarded as the top accolade for research in exercise, health and disease prevention.



Breakthroughs in basic research may be of high social value

COMMERCIALIZATION AND APPLICATION

Application and commercialization prospects are not high priorities when the members of the foundation's board consider applications for new center grants. Scientific quality and the potential to come up with scientific innovations and make new breakthroughs are what matters. Nevertheless, the research conducted at the centers leads to cooperation with companies, spin-offs, patents, etc., to a surprisingly high degree. In 2009, 9% of all patent applications were submitted by public research institutions from the DNRF centers; the percentage rose to 16% in 2010.



INTERACTION BETWEEN BASIC RESEARCH AND APPLICATION - AN EXAMPLE FROM THE CENTER FOR SENSORY-MOTOR INTERACTION

The Center for Sensory-Motor Interaction (SMI) at Aalborg University represents an example of how commercialization and application activities originate in curiosity-driven research initiatives. In addition to research partnerships with Danish and foreign biomedical companies, a number of patents and licenses stem from the center, as do eight public and private limited companies. One of these companies is Neurodan A/S, a developer of neural prostheses that can help people who have difficulty walking due to sustained brain damage regain their mobility. The company currently employs a staff of about 50.

One in six patent applications submitted by a public research institution in 2010 was from a D NRF center.

The combination of selection criteria focusing on the ability and courage to think new and big ideas and the freedom and flexibility offered by a center grant produces results that make a difference. On the following pages, Jesper Wengel from the Nucleic Acid Center (NAC) explains how it takes trust from the surroundings and great scientific freedom to follow uncharted paths that can lead to new breakthroughs.

Center	Nucleic Acid Center (NAC)
Location	University of Southern Denmark
Period	2001-2011
Grant	DKK 66.9 million (~ EUR 8.9 million)
Further information	www.nac.sdu.dk



■ I'm driven by a curiosity to understand how nature works so I can develop some absolutely basic chemical tools able to interact with nature. And it's incredibly fulfilling when others pick up the baton and apply the tools to develop better medicine or diagnostic methods.

JESPER WENGEL

INNOVATIONS ORIGINATE IN SCIENTIFIC FREEDOM AND COURAGE

Major breakthroughs in research are rarely seen when you have already decided which way to go, says chemical scientist Jesper Wengel, head of the Nucleic Acid Center (NAC) at the University of Southern Denmark. Realizing the dream to invent something new takes the courage to follow uncharted paths. This requires great scientific freedom and trust from the surroundings.

According to Jesper Wengel, a narrow focus on application can strangle a research and development process. So care must be taken not to involve too many companies from the beginning, for this risks discouraging innovative ideas and surprising angles.

On the other hand, it is essential that companies be available and ready to pick up the baton when the contours of a new invention are visible. Unfortunately, locating companies with matching interests in Denmark

can be difficult, Wengel believes. That is why he calls for communities involved in innovation to show more courage in facilitating the establishment of new companies. This, in conjunction with a focus on support for mature innovative ideas, could help create new jobs and improve the application of basic research.

No chasm between basic and applied research

In the context of biotechnology, it is often difficult to distinguish between applied and basic research. Leading companies in the area need to validate their results in cooperation with researchers. As a result, the serious biotech companies conduct their own research and publish their own work, which pleases investors and customers alike because it helps rubber-stamp companies' results and products. Such validation does not take place overnight, so getting a new biotechnology phenomenon across the finish line can take a long time in the corporate sector.

This being the case, no one should expect that an investment in research produces an immediate return. When the process succeeds, however, investments are typically repaid in the long run, e.g. in the form of more jobs or new possibilities for treating diseases.

Brand-new chemical substance invented

Jesper Wengel is the man behind an epoch-making invention that has forged all-new paths in the development of medical, diagnostic and biotechnological tools. In concert with his Ph.D. student at the time, Poul Nielsen, he designed and built the substance locked nucleic acid, or LNA, which can be used to silence genes and thus change the course of a disease. Wengel came close to selling his idea outside Denmark but opted to team up with a small Danish company, Exiqon, instead. Together, they patented LNA in 1998. As head of the NAC, Wengel has been the motivating force in exploiting the potential of LNA. This work has paid off, and Exiqon is today listed on the stock exchange and employs a staff of more than 100. Furthermore, the company Santaris Pharma A/S, which employs a staff of about 70, is developing LNA-based medicine.

Driven by curiosity

Originally, Jesper Wengel had no desire to develop a new medicine. Rather, he was, and is, driven by a fundamental curiosity about and interest in understanding and using some of nature's most fundamental building blocks. "I'm fascinated by the chemistry itself and the possibility of being able to create brand-new biotechnology tools," says Wengel. "But it also gives me personal satisfaction that the potential of LNA is so great in disease treatment and that the invention has helped create jobs not only in Denmark but also abroad."

Success opens doors

Jesper Wengel's current focus is on enhancing the basic idea of LNA to create the next generation of new drugs known as aptamers. After the grant from the Danish National Research Foundation expires, this research will continue within the framework of an ERC Advanced Grant received by Wengel from the European Research Council in 2011.

THE DRUG THAT CAN SILENCE GENES

LNA holds the potential for use in both the diagnosis and treatment of disease. The drug can be "designed" to connect with certain single-string sequences of DNA or RNA. As medicine, LNA will be able to down-regulate and silence pathogenic genes and stop the development of cancer and hepatitis, and other diseases. Moreover, in diagnostics, it can demonstrate the presence of certain DNA or RNA sequences that may be indicative of a given genetically conditioned disease.

Originally, Jesper Wengel patented LNA together with the company Exiqon A/S. Today, the company Santaris Pharma A/S is also involved in developing LNA medicine. In 2006, Wengel co-founded the biotech company RiboTask ApS, a manufacturer of very basic biotechnological "ingredients" used by other companies in medicine, diagnostics, and research.

In addition, the Danish National Advanced Technology Foundation has funded a so-called platform project on LNA in which the partners, apart from the NAC, include the Biotech Research and Innovation Centre at the University of Copenhagen, Santaris Pharma, RiboTask and Lundbeck.



Miravirsen (SPC 3649) is Santaris Pharma's LNA-containing drug candidate to fight hepatitis C.

Source: Santaris Pharma A/S



INTERNATIONALIZATION – PAVES THE WAY FOR INSIGHT AND ACCESS

Increased internationalization is a top priority for the Danish National Research Foundation. Although Danish research is thriving on many fronts, it is inconceivable that Denmark can be self-sufficient as a knowledge nation. Cooperation with researchers from many places around the world is a must to achieve optimum results and to stay abreast of where the research front is moving as well as to be ready to receive and use new knowledge created elsewhere.

Internationalisation

- “an essential tool for providing the best staff, ensuring a constant influx of ideas and perspectives, and exploring new research areas.”

DNRF ACTIVITIES FOREIGNERS' NUMBER/ PERCENTAGE IN 2010

	Number	Percentage
Professors/ assoc. professors	124/416	30
Post-doctoral staff	294/489	60
Ph.D. students	254/754	34
Guest researchers	125/163	77

The Danish National Research Foundation has learned that internationalization automatically goes hand in hand with a focus on elite research communities. The centers are appealing partners, like powerful magnets attracting other outstanding top-level researchers in their fields. However, young talents – Ph.D. students and post-doctoral staff – are also drawn to the centers from all over the world, thus engendering superlative dynamics, creativity and commitment.



The theme of the foundation's annual meeting in 2010 was internationalization - why and how

International vision and cooperation are essential factors in attracting the best of the best and ensuring a constant influx of ideas and perspectives.

Focus on the elite leads to internationalization

Other researchers in a field are the first and best to assess the results and potential of a research center. Moreover, people's readiness to move great distances to participate is in itself an expression of the interest the center sparks in the world around it. Foreign staff members are valuable not only to the center where their competencies, commitment and approaches are often catching but also to Danish research in general. Although they may opt to pursue a career elsewhere, if they have a good experience in Denmark, they will remain ambassadors of Danish research and points of access to new foreign environments.

Special initiatives required

However, special targeted initiatives are also required to promote the internationalization of Danish research communities and to strengthen and cultivate the potential for cooperation in specific fields. The following pages set out some of the special initiatives launched by the foundation to boost internationalization.

CROSS-BORDER COLLABORATION

A vision of making Denmark a research nation capable of commanding a place in the global arena and providing a breeding ground for future growth and prosperity makes it paramount to set up research communities that can attract top-level researchers and research talents from Denmark and abroad. The majority of the foundation's centers have a large number of staff members who are recruited from outside Denmark and who help to establish highly dynamic international research communities. In addition to the Center of Excellence program, the foundation has launched a number of other initiatives to boost cooperation and interaction with creative research communities in the world around us.

The DNRF professorship has provided “an opportunity of a lifetime”. This program has secured financial support and academic freedom in an international and scientifically excellent environment.

JOHN COUCHMAN, DNRF PROFESSOR

Niels Bohr Professorships for international top-level researchers

With the Niels Bohr Visiting Professorships and the DNRF Professorships, the foundation aims to bring in top-level researchers from abroad for the purpose of enriching Danish research communities in the form of repeated stays or in permanent positions on favorable terms. The two programs were introduced in 2005 and 2007, respectively, for five-year periods. Yet another professorship program was announced in 2011: Niels Bohr Professors. On August 1, 2012, six to eight new Niels Bohr Professors are scheduled to begin work. The foundation has earmarked a total of DKK 200 million for this program, which has a term of five years.

The experience gained in previous professorship programs shows that special efforts to draw top-level researchers also bring a rapid flow of young foreign talents.

Research and new knowledge come about through interaction and collaboration. Looking beyond national borders in search of new inspiration and new ideas is necessary and natural. That is how today's research develops in a world that seems smaller and more accessible, but this was also the case in the days of Galileo, Newton and Ørsted.

The fight for the best brains

Realizing that competition for the best international research talents is fierce, the foundation embarked on a special talent recruitment initiative in 2007-2008; the purpose of this initiative was to give the centers the opportunity to develop and test new recruitment measures. Various interesting initiatives have sprung from the talent recruitment initiative, but two programs stand out as examples of new and original efforts to make a stay in Denmark attractive to foreign researchers. In Aarhus, five centers have teamed up to attract exceptionally talented students in the field of molecular and chemical biosciences to undertake research training at one of the centers, and the Dark Cosmology Centre (DARK) has established the prestigious Brahe fellowship. Jens Hjorth, leader of DARK, talks about this on the following pages.

Collaboration and joint funding schemes

The foundation has set up collaborative and joint funding schemes with a number of large foundations and organizations from various research-intensive nations. One of these is the German Max Planck Society, with which the Danish National Research Foundation established the Center for Geomicrobiology at Aarhus University in 2007. Moreover, the foundation has ongoing cooperative agreements with foundations and research institutions in France, the USA and China.

Danish-French collaboration

In 2008, the foundation signed an agreement with the Centre National de la Recherche Scientifique (CNRS), which, makes it possible for researchers affiliated with CNRS laboratories/institutes or a center of the Danish National Research Foundation to obtain additional support for a range of cooperative activities.

Collaboration with the United States

In 2009 the foundation entered into a cooperative agreement with the NSF, providing an opportunity for graduate research fellows funded by the NSF to spend up to a year at a DNRF Center of Excellence.

Collaboration with China

The Danish National Research Foundation and the National Natural Science Foundation of China (NSFC) have teamed up to establish 10 Danish-Chinese research centers in the following areas: cancer research (2), nanotechnology (3), renewable energy (2) and ICT (3). The Danish-Chinese centers run for a three-year period, with a possibility of renewal for another three years.

New collaboration in the pipeline?

The future is very likely to bring new cooperative agreements with foundations and research institutions in other countries holding a special potential for enhanced collaboration.

Center	Dark Cosmology Centre
Location	University of Copenhagen
Period	2005-2015
Grant	DKK 114.2 million (~ EUR 15.2 million)
Further information	www.dark-cosmology.dk



■ Internationalization means more than improved research results; it also means enhanced competitiveness in all areas. Meeting with different cultures forces people to reflect on things in new ways and, at the end of the day, to understand each other better.

JENS HJORTH

INTERNATIONALIZATION IS A MUST

They are writing nothing less than the genesis of physics – about how the universe was created and the nature of the mysterious dark matter that makes up most of the universe. They long ago recognized that this is a goal they cannot achieve on their own. That is why the Dark Cosmology Centre operates in an eternal interchange with some of the best researchers from Denmark and abroad.

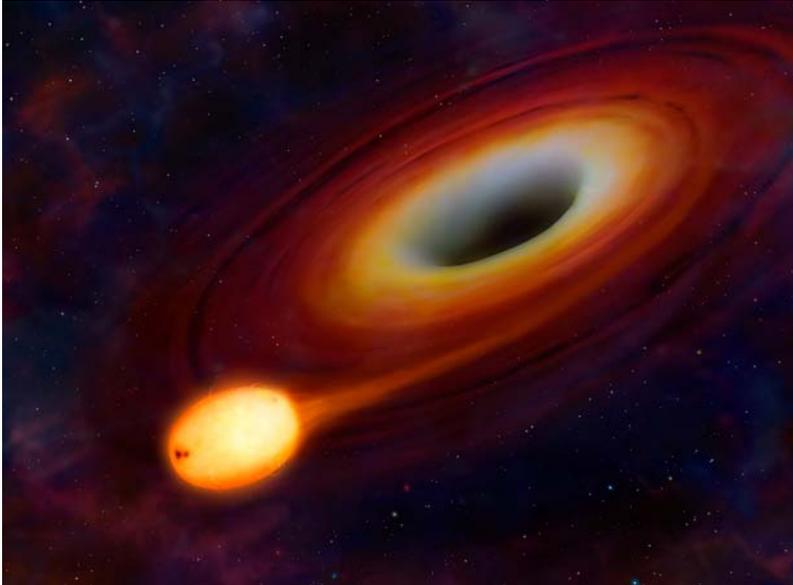
It is far too easy to be lulled into a smug sense of self-satisfaction if the aim is no higher than to become king of the pond. With this in mind, the Dark Cosmology Centre – or just DARK – regards internationalization as not only a possibility but also a must that yields improved research results and helps ignite the spark in the center’s work. “Moving in an environment with so diverse a range of competent people who are very enthusiastic about what they do is inspiring and motivates you to give it your all,” says Jens Hjorth.

Reaching for the stars in more than one sense

Over the past five years, DARK has placed itself among the world’s best astrophysics research centers. Researchers from around the world have felt the center’s gravitational pull. This trend is the result of a deliberate strategy to establish an attractive and recognized international community where foreign researchers are regularly invited to attend workshops at the center and thus take part in and relate to the research conducted.

Attracting the best foreign researchers

The Sophie and Tycho Brahe Prize Fellowship in Astrophysics is another element in the strategy launched by the center in concert with a number of American universities such as Yale, Berkeley and Santa Cruz. The fellowship targets post-doctoral researchers, who are offered a two-year stay at DARK and another one or two years at the American university.



Researchers at DARK make use of artistic reproduction to explain physical phenomena. The image shows a star that has come too close to a supermassive black hole, which pulls in the star. The gravitational pull distorts the shape of the star until, finally, it is shredded.

"It's our impression that the cooperation with the American universities greatly influences the popularity of the fellowship. This model with a researcher in both Denmark and the USA combines the best of both worlds," says Jens Hjorth.

Ripple effect

While DARK attracts foreign researchers, most researchers eventually apply for posts elsewhere. That is the way it is supposed to be, according to Jens Hjorth. "In reality, this presents a unique opportunity to extend international relations. When one of "our" researchers sets up shop elsewhere, we also gain invaluable and more direct access to establishing ties with the new base of researchers. That strengthens international cohesion in our research community and offers ample opportunities for future researchers and students," says Hjorth.

The advantages outweigh the disadvantages

However, internationalization does not come without its challenges. Foreign students come from disparate backgrounds and traditions. In some countries, the tradition is to learn by rote and "obey" the professor.

"We need to peel away that layer so they can form part of a center like ours, where we expect and appreciate that people work independently and assume responsibility. In the big picture, however, there's no doubt that the advantages of internationalization outweigh the disadvantages," says Jens Hjorth.

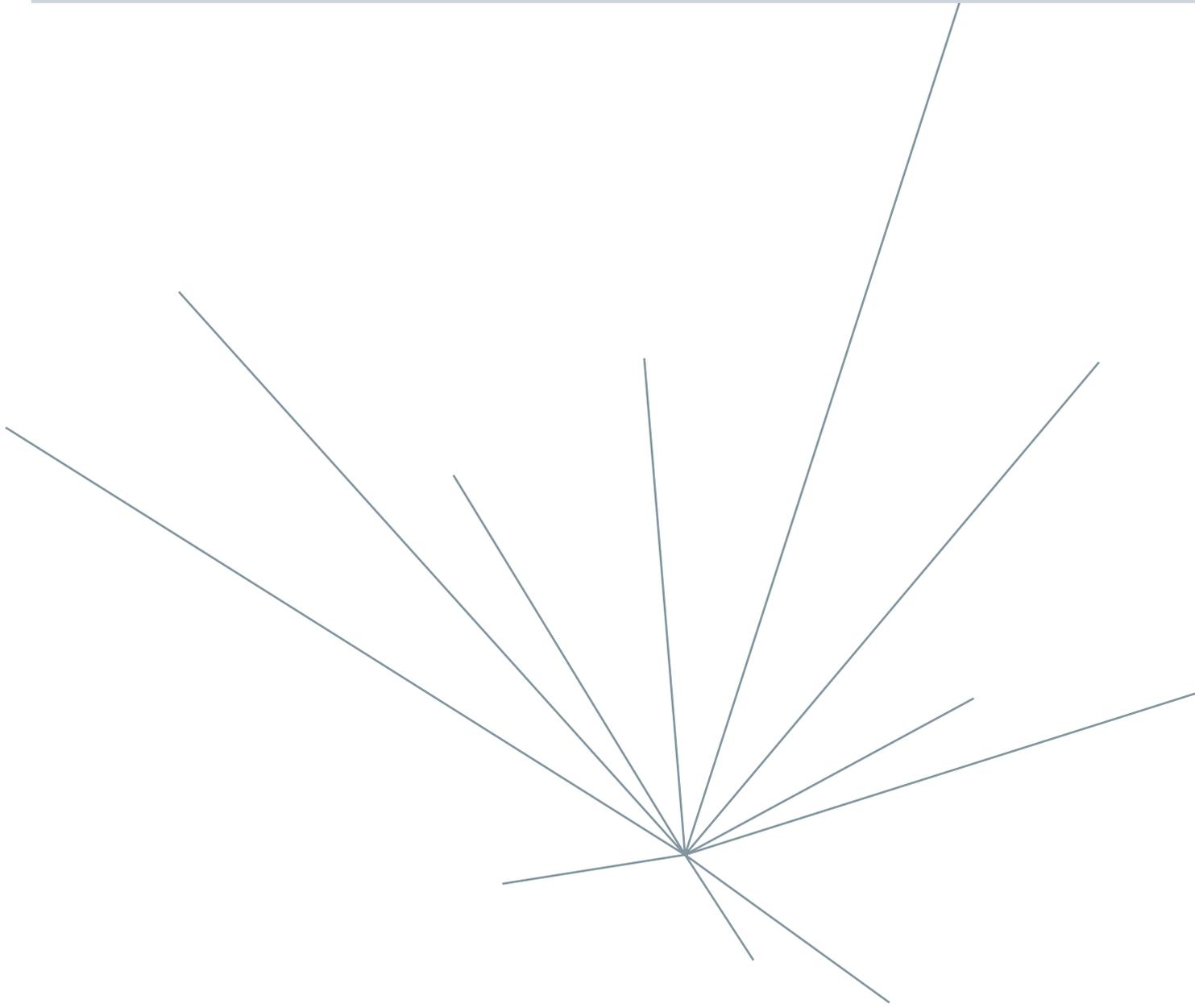


Dale Mortensen, a Niels Bohr visiting professor at Aarhus University since 2006, was awarded the Nobel Prize in economic sciences in 2010.
AU Photo Service/Lars Kruse



The grant received from the Danish National Research Foundation has allowed me to continue my research in a manner that, to be honest, would not have been possible at an American university. It is my hope that I have had a positive influence on Aarhus University; if so, the influence goes both ways.

DALE MORTENSEN



The “Star of Excellence” symbolizes what is unique. It also symbolizes focus, network and direction, exactly like the foundation’s centers.

SECRETARIAT



Thomas Sinkjær
Director, Professor,
Dr. Med.Sci., Ph.D.
ts@dg.dk



Marie-Louise Munch
Research Adviser,
MA
mlm@dg.dk



Mogens Klostergaard Jensen
Deputy Director,
MSc (Pol.Sci.), MA
mkj@dg.dk



Niels Lagergaard Pedersen
Research Adviser,
MSc
nlp@dg.dk



Vibeke Schrøder
Senior Adviser,
MSc
vs@dg.dk



Metha Nielsen
Accounting Officer,
BSc (Econ. and Business Adm.)
mn@dg.dk



Marianne Gauffriau
Research Adviser,
MSc (LIS)
mg@dg.dk



Connie Hansen
Secretary,
Trilingual Commercial Correspondent
dg@dg.dk



Jeanne Meinholt
Research Adviser,
MSc (Pol.Sci.)
jm@dg.dk

We hope that the foundation will continue playing a key role in the Danish research funding system in the next 20 years as well.

20
21
22



LIST OF GRANTS

Centers of Excellence

New centers on the way (scheduled establishment 2012)	Center leader	Location
Center for Non-Specific Effects of Health Interventions (CENSEI)	Christine Stabell Benn	Statens Serum Institut
Research on the Sun, Stars and Extra-Solar Planets (SAC)	Jørgen Christensen-Dalsgaard	Aarhus University
Copenhagen Center for Glycomics (CCG)	Henrik Clausen	University of Copenhagen
Center for Permafrost Dynamics in Greenland (CENPERM)	Bo Elberling	University of Copenhagen
Center for Dynamic Molecular Interactions	Barbara Halkier	University of Copenhagen
Center for Nanostructured Graphene (Holey Graphene)	Antti-Pekka Jauho	Technical University of Denmark
Center for Geomicrobiology (CfG)	Bo Barker Jørgensen	Aarhus University
Friction-Finance Research Initiative Copenhagen (FRIC)	David Lando	Copenhagen Business School
Center for International Courts (CIC)	Mikael Rask Madsen	University of Copenhagen
Center for Quantum Devices (QDev)	Charles Marcus	University of Copenhagen
Literary Interfaces of Medieval European Societies (LIMES)	Lars Boje Mortensen	University of Southern Denmark

Centers established in 2009/2010

Center on Autobiographical Memory Research (Con Amore)	Dorthe Berntsen	Aarhus University
Centre for Particle Physics Phenomenology & Origin Mass, CP ³ - Origins	Francesco Sannino	University of Southern Denmark
Center for Particle Physics (DISCOVERY)	Peter Hansen	University of Copenhagen
Centre for Symmetry and Deformation (SYM)	Jesper Grodal	University of Copenhagen
Center for Materials Crystallography (CMC)	Bo Brummerstedt Iversen	Aarhus University
Center for GeoGenetics (AGE)	Eske Willerslev	University of Copenhagen
Centre for Quantum Geometry of Moduli Spaces (QGM)	Jørgen Ellegaard Andersen	Aarhus University
Center for Macroecology, Evolution and Climate (CMEC)	Carsten Rahbek	University of Copenhagen
Centre for Star and Planet Formation (STARPLAN)	Martin Bizzarro	University of Copenhagen

Centers established in 2007

Center for Research in Econometric Analysis of Time Series (CREATES)	Niels Haldrup	Aarhus University
Centre for Carbohydrate Recognition and Signalling (CARB)	Jens Stougaard	Aarhus University
Centre for Comparative Genomics	Rasmus Nielsen	University of Copenhagen
Centre for DNA Nanotechnology (CDNA)	Kurt Vesterager Gothelf	Aarhus University
Centre for Epigenetics	Kristian Helin	University of Copenhagen
Centre for Ice and Climate	Dorthe Dahl-Jensen	University of Copenhagen
Center for Massive Data Algorithmics (MADALGO)	Lars Arge	Aarhus University
Centre for Membrane Pumps in Cells and Disease (PUMPKIN)	Poul Nissen	Aarhus University

Centers established in 2005

Nordic Center for Earth Evolution (NordCEE)	Don Canfield	University of Southern Denmark
Center for Individual Nanoparticle Functionality (CINF)	Ib Chorkendorff	Technical University of Denmark
Centre of Inflammation and Metabolism (CIM)	Bente Klarlund Pedersen	Copenhagen University Hospital
Centre for Genotoxic Stress (GENOTOXIC)	Jiri Lukas	Danish Cancer Society
Centre for Social Evolution (CSE)	Jacobus J. Boomsma	University of Copenhagen
Centre for mRNP Biogenesis and Metabolism	Torben Heick Jensen	Aarhus University
Center for Insoluble Protein Structures (inSPIN)	Niels Chr. Nielsen	Aarhus University

Centers established in 2005	Center leader	Location
Center for Oxygen Microscopy and Imaging (COMI)	Peter R. Ogilby	Aarhus University
Centre for Viscous Liquid Dynamics	Jeppe Dyre	Roskilde University
Dark Cosmology Centre (DARK)	Jens Hjorth	University of Copenhagen
Centre for Language Change in Real Time (LANCHART)	Frans Gregersen	University of Copenhagen
Centre for Textile Research (CTR)	Marie-Louise Nosch	University of Copenhagen
Center for Models of Life (CMOL)	Kim Sneppen	University of Copenhagen
Danish Arrhythmia Research Centre (DARC)	Søren-Peter Olesen	University of Copenhagen
Center for Sustainable and Green Chemistry (CSG)	Claus Hviid Christensen	Technical University of Denmark
Centre for Molecular Movies (CMM)	Martin Meedom Nielsen	University of Copenhagen

Centers established in 2002		
Centre for the Study of the Cultural Heritage of Medieval Rituals	Nils Holger Petersen	University of Copenhagen
Centre for Black Sea Studies (PONTOS)	Pia Guldager Bilde	Aarhus University
Center for Subjectivity Research (Cfs)	Dan Zahavi	University of Copenhagen

Centers established in 2001		
Center for Fundamental Research: Metal Structures In Four Dimensions (M4D)	D.J. Jensen/H.F. Poulsen	Technical University of Denmark
Nucleic Acid Center (NAC)	Jesper Wengel	University of Southern Denmark
Centre for Applied Microeconometrics (CAM)	Martin Browning	University of Copenhagen
Center for Biomembrane Physics (MEMPHYS)	Ole G. Mouritsen	University of Southern Denmark
Center for Quantum Optics (QUANTOP)	Eugene S. Polzik	University of Copenhagen
Water and Salt Research Centre	Søren Nielsen	Aarhus University
Quantum Protein Centre (QuP)	Henrik Bohr	Technical University of Denmark
Center of Functionally Integrative Neuroscience (CFIN)	Albert Gjedde/Leif Østergaard	Aarhus University
Wilhelm Johannsen Centre for Functional Genome Research (WJC)	Niels Tommerup	University of Copenhagen

Centers established in 1997/1998		
Center for Demographic Research	Hans Chr. Johansen	University of Southern Denmark
Centre for Solid Phase Organic Combinatorial Chemistry (SPOCC)	Morten Meldal	Carlsberg Laboratory
Center for Catalysis	Karl Anker Jørgensen	Aarhus University
Center for Plant-Microbe Symbiosis	Henriette Giese	RISØ National Laboratory
Danish Center for Earth System Science (DCESS)	Gary Schaffer	University of Copenhagen
Network in Mathematical Physics and Stochastics (MaPhySto)	Ole E. Barndorff-Nielsen	Aarhus University
Center for Molecular Plant Physiology (PlaCe)	Birger Lindberg Møller	The Royal Veterinary and Agricultural University
Center for Experimental Bio Informatics (CEBI)	Peter Roepstorff/Matthias Mann	University of Southern Denmark
Center for Human-Machine Interaction	Annelise Mark Pejtersen	RISØ National Laboratory

Centers established in 1993/1994		
Søren Kierkegaard Research Centre (SKC)	Niels Jørgen Cappelørn	University of Copenhagen
The Danish Epidemiology Science Centre (DESC)	Jørn Olsen	Statens Serum Institut
Centre for Labour Market and Social Research (CLS)	Niels Westergaard Nielsen	Aarhus University
Theoretical Astrophysics Center (TAC)	Igor Novikov	University of Copenhagen
Center for Atomic Physics (ACAP)	Jens Ulrik Andersen	Aarhus University
Center for Atomic-Scale Materials Physics (CAMP)	Jens Kehlet Nørskov	Technical University of Denmark
Centre for Basic Research in Computer Science (BRICS)	Glynn Winskel	Aarhus University
International Research Centre for Computational Hydrodynamics (ICCH)	Per Madsen	Technical University of Denmark
Danish Centre for Remote Sensing (DCRS)	Søren Nørvang Christensen	Technical University of Denmark
Danish Lithosphere Centre (DLC)	Hans Christian Larsen	Geological Survey of Denmark and Greenland
Danish Centre for Experimental Parasitology (CEP)	Peter Nansen/K. Darwin Murrel	The Royal Veterinary and Agricultural University
Center of Biological Sequence Analysis (CBS)	Søren Brunak	Technical University of Denmark
Centre for Biomolecular Recognition	Peter E. Nielsen	University of Copenhagen
The Copenhagen Muscle Research Centre (CMRC)	Bengt Saltin	Copenhagen University Hospital
Center for Sensory-Motor Interaction (SMI)	Thomas Sinkjær	Aalborg University
Centre for Sound Communication (CSC)	Axel Michelsen	University of Southern Denmark

Centers established in 1993/1994	Center leader	Location
Centre for Crystallographic Studies (CCS)	Sine Larsen	University of Copenhagen
Centre for Enzyme Research	Kaj Frank Jensen	University of Copenhagen
Centre for Gene Regulation and Plasticity of Neuro-endocrine Network	Lars-Inge Larsson	The Royal Vet. and Agri. University
Centre for Semiotic Research	Per Aage Brandt	Aarhus University
Copenhagen Polis Centre (CPC)	Mogens Herman Hansen	University of Copenhagen
Centre for Maritime Archaeology	O.C. Pedersen/S.H. Andersen	The National Museum of Denmark
Economic Policy Research Unit (EPRU)	S.B. Nielsen/P.B. Sørensen	University of Copenhagen

Professorship initiatives

Niels Bohr Professorships established in 2006-2007	Danish contact	Location
David E. Arnot	Thor Theander	University of Copenhagen
Dale T. Mortensen	Svend Hylleberg	Aarhus University
Nicolai Reshetikhin	Jørgen Ellegaard Andersen	Aarhus University
Christopher Frith	Andreas Roepstorff	Aarhus University
Catherine Martin	Birger Lindberg	University of Copenhagen
Hassan Aref	Tomas Bohr	Technical University of Denmark

DNRF Professorships established in 2007	Location
Steen Rasmussen	University of Southern Denmark
Jørgen S. Nielsen	University of Copenhagen
John Couchman	University of Copenhagen

Co-funding initiatives

Danish-Chinese research centers established 2008-2011	Danish leader	Danish institution
Center for the Theory of Interactive Computation	Peter Bro Miltersen	Aarhus University
Center for IDEA4CPS: Foundations for Cyber-Physical Systems	Kim Guldstrand Larsen	Aalborg University
Center for Applications of Algebraic Geometry in Coding Theory	Tom Høholdt	Technical University of Denmark
Center for Organic-based Photovoltaic Cells with Morphology Control	Frederik C. Krebs	Technical University of Denmark
Center for Intermediate Temperature Proton Conducting Systems	Niels J. Bjerrum	Technical University of Denmark
Centre for Nanometals	Dorte Juul Jensen	Technical University of Denmark
Center for Molecular Nano-Electronics	Thomas Bjørnholm	University of Copenhagen
Centre for Self-Assembly and Function of Molecular Nanostructures	Flemming Besenbacher	Aarhus University
Centre for Breast Cancer Research	Nils Brünner	University of Copenhagen
Centre for Proteases and Cancer	Peter A. Andreasen	Aarhus University

Max Planck Society	Center leader	Location
Center for Geomicrobiology	Bo Barker Jørgensen	Aarhus University

Other initiatives

	Leader	Location
Registry research initiative		
Graduate School Aarhus	Mogens Nielsen	Aarhus University
Graduate School Aalborg	Lars Arendt-Nielsen	Aalborg University
Birth Cohort	Jørn Olsen	Statens Serum Institut
National Platform for Infrastructure for Systems Biology	Søren Brunak	Technical University of Denmark



Great vision and new breakthroughs
take science and the world to the next level,
thus providing the basis for future discoveries
and technologies.



Danmarks
Grundforskningsfond
Danish National
Research Foundation

The Danish National Research Foundation is an independent foundation whose objective is to promote Danish research in all fields of research. The foundation was established in 1991 with an initial capital of 2 billion Danish kroner and most recently received 3 billion Danish kroner in 2008.

The foundation's primary funding mechanism is to support the establishment of "Centers of Excellence" at the highest international level for periods of up to 10 years.

Since the first distribution of funds in 1993, the foundation has supported Danish research with 5 billion Danish kroner and established 88 "Centers of Excellence".

Danish National Research Foundation
Holbergsgade 14, 1
DK-1057 Copenhagen K

T +45 3318 1950
F +45 3315 0626
E dg@dg.dk

www.dg.dk