Annual Report 2021

435
research ideas
funded by

almost **1,5**
DKK billions

DANMARKS FRIE FORSKNINGSFOND
INDEPENDENT RESEARCH FUND DENMARK

2021 in Numbers

Funds applied DKK m.
12.905

Funds granted, DKK m.*
1.457

Succes rate, amount
11%

Applications
3.342

Grants numbers
435

Succes rate, applications
13%

*Funds granted exceeds the annual national budget financing as the amount granted includes the distribution of return flow from previous grants.

Content

Front and back

Sapere Aude: DFF-Starting Grant 2021,
Photos by: Morten Larsen

Sapere Aude: DFF-Starting Grant is aimed at providing excellent younger researchers with the opportunity to develop research ideas and carry out research at a high, international level as leaders of a research team.

“ Long-term and risk-taking investments in free, independent research are necessary in solving society’s challenges “

– Maja Horst, Chair of the Board of Independent Research Fund Denmark

PREFACE

In 2021, Independent Research Fund Denmark awarded grants for 435 new, groundbreaking and curiosity-driven research projects. The fund engaged in international collaborations and made a significant green imprint. Researchers applied for more than DKK 12,905 billion in funding – one of the highest amounts in 10 years. This led to a discussion about the success rates at Independent Research Fund Denmark, which this year was just below 13%. This number is too low when taking into consideration that at least a third of our applications would qualify for a grant – if, that is, we had enough funds.

Collaboration and balance

In 2021, for the fourth consecutive year, the fund distributed thematic funds, i.e. funds that are awarded according to politically set priorities with a focus on specific areas of research; this year, funds were set aside for the green transition and for the Inge Lehmann programme. I am pleased that the fund continues to be trusted with the granting of funds to areas that are high on the agenda and of crucial importance for solving some of society's major challenges. During the past four years, the fund has found a good balance in both the formulation of open, thematic calls and the actual implementation of funds ensuring that our instruments focus on both the right themes and the right applicants, while also keeping as broad a scope as possible.

In 2021, I had the great honour of being appointed Chair of the Board of Independent Research Fund Denmark and thereby contributing to the decision-making processes within the Danish research system. I was incredibly well received by both partners and the councils and committees within Independent Research Fund Denmark. Also, I have been pleased to see how the fund is engaged in a positive cooperation with the other public funds, with the Ministry of Higher Education and Science and the Minister, as well as with the research policy spokesmen in the Danish Parliament. Throughout the year, I had valuable talks on promoting independent research in various contexts, not least with the spokesmen of the political parties during their negotiations on the research reserve for 2022. In autumn 2021, I was happy to see that all parties were ready to give priority to funding free and curiosity-driven research for 2022.

The Board of Independent Research Fund Denmark had four new members in 2021: the professors Jørgen Frøkiær, Lasse Horne Kjældgaard, Nanna Mik-Meyer and Lasse Rosendahl, who will all be part of setting the direction for the fund's activities in the coming years.

I continue to be impressed by the care and conscientiousness that all members of the fund put into setting out constructive ideas for the fund's activities, and not least by the energy they put into making the difficult decisions about who is to receive grants each year.

Internationalisation is more important than ever

The world of research is indisputably an international world, which is why, in 2021, Independent Research Fund Denmark consolidated its international work. In 2021, Science Europe set up six new working groups and Independent Research Fund Denmark has engaged in four of them covering open science, research culture, the EU's Horizon Europe framework programme, and the High Policy Network Group. I myself participate in the latter as the fund's Chair of the Board.

Through international partnerships the fund's representatives are part of international research policy discussions, which may have a major impact on future working conditions in the research community. For example, a large number of changes are being considered for how to assess research quality and create career paths for researchers, and there are major developments within the area of 'open science', an area focusing on how to ensure that research results and research data are made openly available to everyone who needs them.

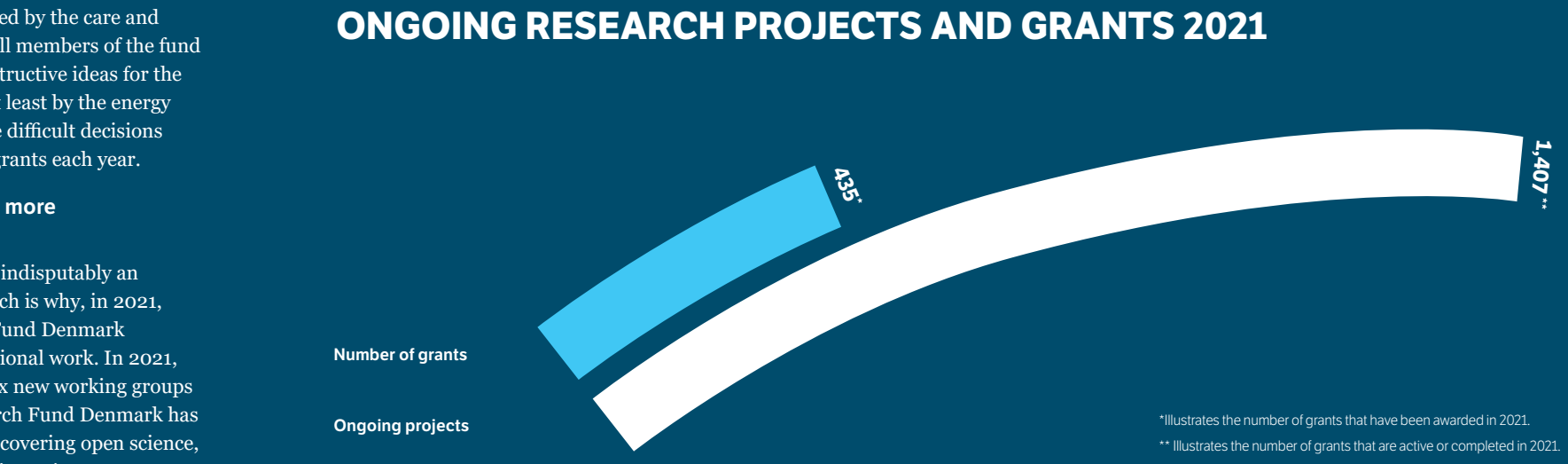
Danish research is strong internationally, and it is important that our researchers continue to be able to participate in relevant international collaborations.

Under the auspices of the EU, Independent Research Fund Denmark took part in three networks in 2021: HERA (Humanities ERA), NORFACE (New Opportunities for Research Funding Agency Co-operation in Europe) and CHANSE (Collaboration of Humanities and Social Sciences in Europe). The CHANSE consortium, which is a collaboration between HERA and NORFACE, includes 27 research funding organisations from 24 countries. In 2022, Independent Research Fund Denmark will give priority to a debate on how the fund should engage in this kind of inter-organisational partnerships in Europe in the future.

2022: A year of breakthrough developments!

The UN has proclaimed 2022 to be the Year of Basic Research, and it is my hope that it will also be the year of breakthrough developments. The year in which we really break ground – both in research and in our perception of the role of research in society. The New Year speeches of both the Prime Minister and the Queen at the turn of the year 2021/2022 highlighted the central role of research in solving society's challenges.

Independent Research Fund Denmark is also engaged in the talk about how free, independent research is the breeding ground for important breakthroughs in our lives and our society – not only when we find ourselves in an acute crisis such as a pandemic that requires vaccines, but also when we need to take a broader and more long-term perspective on the direction in which our society should develop. If we are to reach the ambitious, politically agreed goal of climate neutrality by 2050, we will need completely new solutions that we cannot even imagine yet. It is my hope that the political agreement on the importance of research will carry through all the way to the negotiations on the research reserve in autumn 2022. High quality and breakthrough developments in research presuppose that good conditions exist for free, curiosity-driven research allowing the most skilled researchers to pursue their best and most original ideas for the benefit of society as a whole – and this requires long-term and risk-taking investments in free, independent research.



Professor Maja Horst
Chair of the Board of Independent Research Fund Denmark

Three singular events of the year

MAY JULY DECEMBER

MAY

New report: Diversity in Research and Research Funding

Independent Research Fund Denmark and the Think Tank DEA published the report "Diversity in Research and Research Funding". The report looks at diversity in the world of research with regard to gender, age, career level, nationality and scientific field and is to provide a basis for a further discussion on diversity. The results of the analysis reflect the complexity of the issue of diversity in research, while also highlighting some interesting conclusions. The overall conclusion on actions for the promotion of diversity is that there are no "quick fixes" – it is a matter of a long, steady process and many little streams make a big river. Another conclusion is that there seem to be a correlation between diversity of disciplines and favourable opportunities for breakthroughs in research. Furthermore, it is interesting to see how unclear criteria for excellence seem to be a barrier for diversity in research.

Read the report here (in Danish).

JULY

Strategy 2021-2023: "A basis for breakthrough developments"

With its new strategy 2021-2023 Independent Research Fund Denmark aims to prepare the ground for breakthrough developments by focusing on quality of research, diversity and the role of research in society. Also, the applicant perspective is pivotal for developing the funding strategy. Research equips us for the future, and in order that Danish research may continue to have the highest scientific level, we want to create the best conditions for funding excellent researchers at all levels in Denmark. The new strategy 2021-2023 of Independent Research Fund Denmark supports this aim.

Find the strategi 'Grobund for nybrud' here (in Danish)

DECEMBER

Independent Research Fund Denmark highlights research impact with new publication

Independent Research Fund Denmark launched the publication "DFF Impact #1: A Network of Knowledge" (in Danish) as the first in a series of recurring, yearly publications. The aim is to shed light on the impact of the research supported by the fund with grants totalling several billion kroners each year. Public investments in research are to be a lever for innovation, growth and employment, all to be measured and weighed in, among other things, financial gain. But research is to do more than that. Independent Research Fund Denmark suggests that the results of the fund's risk-taking investments in research are crucial for a variety of stakeholders in all of society. Apart from the academic impact, Independent Research Fund Denmark sees five other areas where research may have an impact on society, areas that will be covered in different ways through the "DFF Impact"-publications.

Find "DFF Impact #1: Netværk af viden" here (in Danish)

Awarded grants in 2021

JANUARY APRIL MAY JUNE OCTOBER NOVEMBER

JANUARY

6 DKK m.
Clinician Scientist Positions | Medical Sciences

23,4 DKK m.
DFF-International Postdoc

APRIL

399 DKK m.
DFF-Research Project1

298 DKK m.
DFF-Research Project2

MAY

0.5 DKK m.
International Research Stays | Social Sciences

JUNE

1.3 DKK m.
Pre-graduate scholarships | Medical Sciences

23,4 DKK m.
DFF-International Postdoc

23 DKK m.
Non-university Research Education (PhD)

0.7 DKK m.
DFF-Danish ERC Programme

OCTOBER

307 DKK m.
Thematic research: Green transition

0.3 DKK m.
DFF-Danish ERC Programme

NOVEMBER

260 DKK m.
Sapere Aude: DFF-Starting Grant

3. DKK m.
Research networks | Humanities

0.8 DKK m
Journals | Humanities

0.7 DKK m.
International Research Stays | Social Sciences

108.3 DKK m.
The Inge Lehmann programme

1.1 DKK m.
Pre-graduate scholarships | Medical Sciences

Overview of instruments 2021

Read about succes rates, number of applications and gender balances on this page or on page 26 and forward.

	Applications number	Grants number	Succes rate number	Succes rate number ♂/♀%	Funds applied for, DKK m	Funds granted DKK m	Succes rate amount	Succes rate amount ♂/♀ %
DFF-Research Project1	1.276	149	12%	11 / 14	3.408,6	399,0	12%	11 / 14
DFF-Research Project2	643	52	8%	8 / 7	3.780,7	298,0	8%	8 / 7
Sapere Aude: DFF-Starting Grant	404	43	11%	11/ 10	2.424,8	260,0	11%	11 / 10
DFF-International Postdoc	215	34	16%	14 / 19	298,4	46,9	16%	14 / 19
Research networks | Humanities	12	6	50%	50/ 50	7,7	3,7	48%	47 / 49
Journals | Humanities	18	7	39%	45 / 29	2,0	0,8	39%	46 / 30
International Research Stays | Social Sciences	18	6	33%	27 / 43	4,8	1,2	24%	16 / 38
Clinician Scientist Positions | Medical Sciences	24	9	38%	23 / 55	19,8	6,0	30%	16 / 44
Pre-graduate scholarships | Medical Sciences	51	17	33%	34 / 32	6,4	2,1	33%	35 / 30
The Inge Lehmann programme	143	39	27%	11 / 28	390,5	108,3	28%	12 / 29
Non-university Research Education (PhD)	56	9	16%	12 / 18	143,1	23,0	16%	12 / 18
DFF-Danish ERC Programme	3	3	100%	100 / 100	1,0	0,9	98%	100 / 98
Thematic research: Green transition	479	61	13%	12 / 15	2.417,5	307,0	13%	13 / 13
Total	**3.342**	**435**	**13%**	**12 / 16**	**12.905,2**	**1.456,8**	**11%**	**11 / 13**

THEMATIC ARTICLES

INTERVIEW WITH CHAIR OF THE BOARD MAJA HORST

Risk-taking and groundbreaking science

A cornerstone of Independent Research Fund Denmark's activities is to ensure the best possible conditions for breakthrough developments in research that will increase our knowledge and contribute to the shaping of the society of the future. In this interview, you can read, among other things, about why the fund decided not to introduce quarantine measures, and about a budding new understanding of the concept of excellence in research.

The fund is always looking for breakthroughs in the best projects

In spring 2021, Independent Research Fund Denmark presented its report on diversity in research funding made in cooperation with the Think Tank DEA. The report showed a frequent correlation between the diversity in a research group and breakthrough developments in its research. "In the fund, we are engaged in evaluating and discussing the fund's instrument portfolio in order that it may match the different needs and demands in today's world of research and society in a satisfying way," says Chair of the Board Maja Horst while emphasising that diversity is not only a matter of gender, but also relates to the make-up of research groups when looking at professional disciplines, age and scientific fields. Maja Horst adds: "We are to support the most groundbreaking ideas, and maybe those are not always the ones that do, at first glance, seem to be the best. It will often be the case that while we fund the top 13% of the projects, we have up to 20% and often even up to 30% qualifying applications, but – and this is the main point and the reason why research funding is so difficult – maybe the last 7-17% of the best qualified projects are not quite as "safe" from a general research assessment point of view, that is from what we – with a nicer word – determine as excellence. Maybe those projects are actually a little more innovative, a little more interdisciplinary, a little more diverse, and thus a little less safe in a traditional way of seeing it, while being just as qualified as the

Main conclusions from the report "Diversity in research and research funding"

- Diversity contributes to favourable conditions for breakthroughs in research including greater variation and relevance.
- Many factors may inhibit or promote diversity in research and the reasons for failing diversity are typically to be found in the interaction between more of those factors.
- There are no quick fixes or universal solutions as to how to encourage diversity in research.

The report is based on a mapping of the literature on diversity with a focus on the researchers' gender, age, career level, nationality and scientific field. It includes insights from a statistical analysis of the diversity situation in Denmark and cases describing various diversity policies, strategies and actions within selected foundations in Denmark and abroad. The report has been prepared for Independent Research Fund Denmark in collaboration with the Think Tank DEA.

top 13% when it comes to potentially creating breakthroughs in research? Therefore, as a fund we should have the tools to be able to assess projects that do combine scientific disciplines in completely new ways, for example, and that may therefore be difficult to assess for the existing councils and committees. Also, we want to contribute to expanding and reinterpreting the concept of research excellence in order to capture some of the new trends in the ways of conducting research." Maja Horst emphasises that diversity and interdisciplinarity are not a goal in itself for Independent Research Fund Denmark, but that both are important paths for the breakthroughs in research needed to solve some of the challenges in today's society.

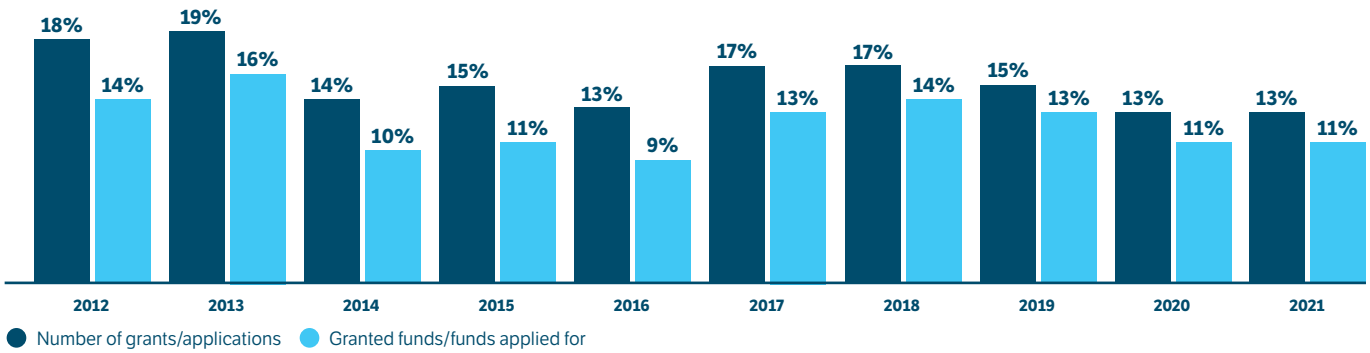
The important dialogue with the research landscape around the world

In 2021, Independent Research Fund Denmark launched "A basis for breakthrough developments", a new strategy 2021-2023 that focuses on the fund's position in the international research landscape. Chair of the Board, Maja Horst, says about the fund's international work: "Denmark is a small, open economy and that is why we have to be open and connected to the rest of the world in order to keep up – also when it comes to research. I can say without any hesitation that Danish research is of the highest international standard. Not only do we foster some of the best researchers, we also profit from the fact that many excellent researchers join Danish research institutions from abroad, while Danish researchers are given the opportunity to join some of the best research environments worldwide." She adds: "The international world of research is, however, undergoing significant changes: the EU Commission works

DFF's strategy 2021-2023 "A basis for breakthrough developments"

In May 2021, DFF launched a new strategy "A basis for breakthrough developments" that designates three benchmarks for the fund's activities for the period 2021-2023: Danish research of high international quality, breakthroughs in research, and research impact. The fund has supplied the strategy with seven strategic actions points that are continuously updated and developed. Among other things, you can read about the fund's work on low success rates and quarantine measures in this interview.

Development of average success rates in Independent Research Fund Denmark 2012-2021 (%)



on introducing extensive changes to the terms for funding research, and Independent Research Fund Denmark sees it as one of its tasks to support the Danish research system in order that it may keep up with and influence these changes. Among other things, the EU Commission works on significant changes to the principles of research assessment, and from this follows that the strategy launched by the fund in 2021 should hold for the set strategy period (2021-2023) and withstand shifting national and international trends, also when the world and the challenges change. The fund has, therefore, made an effort for the strategy to accommodate and capture the many changes happening due to the speed at which things do currently happen within international research policy." Maja Horst says that the fund has set out a more hands-on action plan to supplement the strategy and thus have a practical tool for working within the strategy's framework to ensure that the fund may take in as much inspiration as possible from the outside world in the discussions on Danish research. "And this is important because Denmark and Danish research are definitely able to make valuable contributions internationally," she says.

Low success rates: we have no good solution ... yet

Every year, Independent Research Fund Denmark receives many well qualified applications from all parts of the scientific world. "We are happy that so many researchers find our instruments and grants attractive. Unfortunately, however, many of those do not pass the eye of needle," Maja Horst says and adds: "The low success rates have for many years been a recurrent problem for Independent Research Fund Denmark, and therefore, in 2021, we decided to have a discussion on what we can do about this as a fund." She says about the work: "A quarantine measure for the projects with the lowest score was one of the possible solutions we looked at. We made it a priority to discuss thoroughly how the fund would be able to use quarantine as a measure within the framework set by the law. Our analysis and the following discussion revealed that the number of applicants given a quarantine period would be small, and that the fund would have to use a disproportionate amount of time issuing this quarantine. The conclusion is that we will not introduce quarantine measures in Independent Research Fund Denmark. "But what to do then?" It is of course a shame that we were not able to use quarantine as a measure to handle the low success rates, but it has actually been a really valuable process in the way that we now know – based on facts and a thorough discussion – why we will not make those changes. It has not been a waste of time. On the contrary," Maja Horst notes and adds: "I mean, the problem with low success rates hasn't gone away, so now we have to discuss how to handle it. If Independent Research Fund Denmark does not get more free funds, there is only one area where we ourselves can make adjustments: we can work on reducing the number of applications. This can be done

in three ways: we can make fewer or different instruments, we can make changes or limitations as to who may apply, or we can restrict the number of applications any one applicant may submit. None of those ways are the good solution: they all prevent someone from applying for funds for their research, that is, they prevent a good idea to be challenged by peers. And, this is exactly the discussion we do at the moment have in the fund. No matter what we choose to do, it will for someone be a bad solution, therefore the task is to find the best among a choice of solutions that are not optimal."

Finally, Maja Horst adds:
"If not, the alternative is that we will have to learn to live with the fact that we receive too many applications and therefore have those low success rates. That means that all those people who write really good applications and have really good ideas that would benefit society, will do this to no avail. Many of the fund members regret this acutely. I mean, our task as a fund is to support the researchers' good ideas at all time in their career and within all scientific fields to build the capacity for breakthroughs and excellent research in the Danish research system. This should happen across disciplines and scientific fields with an eye on the balance between career and private life choices for the individual researcher. When I see the high quality of those projects, I feel confirmed in the enormous wealth of ideas in Danish research, and in that there will always be new breakthroughs developing if we continue to prepare the ground for them."

"The problem with low success rates hasn't gone away, so now we have to discuss how to handle it"

– Maja Horst, Chair of the Board, Independent Research Fund Denmark

THEMATIC ARTICLES

Green basic research

Excellent basic research is pivotal for the green transition

THEME: GREEN BASIC RESEARCH

We need to act now to develop and prepare the ground for a strong Danish research landscape that will nurture the breakthroughs of the future. We have to do this if we want to reach the goal set for the green transition and find solutions to other unforeseen challenges of the future. This will need investments in basic research.

We have all recently experience the impact of years of basic research when scientists and the life-science industry were able to develop COVID 19-vaccines in very short time. They only succeeded because of the basic research that scientists had already been conducting for decades.

The green transition is a good example of a field where we still do not know the solutions and inventions that are to help us fulfil the 2050-goals, i.e. zero emissions of carbon dioxide. But this is exactly what basic research does: it brings unforeseen breakthroughs within fields that today have no known solutions.

The Danish research landscape is strong and various reports show that Denmark holds a top position when it comes to excellent basic research. When, however, looking at Denmark's "trade balance" in knowledge exchange, the "knowledge balance", Denmark's growth is below the OECD average on almost all parameters when looking at the countries we normally compare with. This is shown in a report made by the Danish Council for Research and Innovation Policy (DFIR).

By strengthening basic research systematically in Denmark, we would act to respond to this trend: a better knowledge balance will increase quality and relevance in Danish research. But it takes time before the knowledge drawn from basic research has an impact on the knowledge balance, and therefore investments are needed now. Also, it is important that investments are made on a broad basis as no one knows what will be needed in the future.

"The grant that I received in 1999 at the very onset of my research career, was determining for me in finding the path that I have followed since throughout my research"

– Trine Bilde, professor in evolutionary biology and evolution, Centre director at Aarhus University

Basic research creates the basis for breakthroughs and novel solutions

In 2021, Independent Research Fund Denmark launched a new strategy with the title "A basis for breakthrough developments" focusing on how the fund should ensure the best possible conditions for those breakthroughs in research that will increase our knowledge and contribute to the shaping of the society of the future. This also goes for the green transition, which at present has worldwide attention because of the need for immediate action if we are to reach the necessary and politically set climate goals for 2030 and 2050.

We have neither the technology nor the knowledge needed to reach the 2030-goals and even less the 2050-goals.

No one yet, however, has the right answers to how we are to reach those goals.

There is no doubt that basic research will play a pivotal role in this, and that we are to prepare the ground for and develop a strong Danish research landscape today that will nurture the breakthroughs of the future. We need to invest in excellent basic research now if we are to reach the goals for the green transition in 2050.

New green basic research 2021

Every year Independent Research Fund Denmark funds between 350-450 new innovatory projects, and in 2021 the fund had 1,407 active research projects. Trine Bilde's journey in research, tingling and crawling through the landscape of evolution with spiders as the guiding star, presents unique discoveries and is a fantastic example of how the ability to reach new knowledge needs to be built gradually through risk-taking investment in basic research without expectations of a set goal or output.

Bilde's journey reached a major milestone with the grant for a new research centre "Ecological Genetics", set up in 2021 at Aarhus University.

The centre will house researchers that, headed by Trine Bilde, will study the dramatic decline in insect populations registered at present, to see whether this decline leads to a decrease in genetic diversity. Also, they will study how a decrease in genetic diversity could threaten biological functions of the species and possibly make them less adaptable to climate and environmental change or disease onset. All of this rests on and builds from the experience, the knowledge and the discoveries – in other words, the basic research – that Trine Bilde has undertaken during her journey of research into the social life, inbreeding, epigenetics and genomes of spiders.

You can dive into all this on the timeline on the next page. →

Why spiders?

Trine Bilde's research is about evolutionary trade-offs that is to say weighing the pros and cons in respect of which systems and strategies offer the best reproduction options.

Spiders as species are very suitable for research in evolution and diversity because there are both social and non-social spiders and spiders who use either inbreeding or outbreeding as reproduction strategy. That makes it possible to compare the various evolutionary strategies.

Trine Bilde's research has proved that e.g. inbreeding is an efficient short-term strategy, but at the long-term it may threaten the adaptability of a species.

Source: Trine Bilde, Professor, Centre Director

From inbreeding to biodiversity: Trine Bilde research journey

Trine Bilde, professor in evolutionary biology and evolution, Centre director at Aarhus University

1999 2000 2002 2005 2007 2009 2011 2012 2014 2017 2020

1999
Life history biology of arthropods
DANMARKS FRIE FORSKNINGSFOND

Trine Bilde does research in the evolution of social life style: why does some animals have or develop cooperation in groups?

2000
Life history biology
DANMARKS MILJØUNDERSØGELSER

Trine Bilde does research in population effect (effect on population) of landscape structure combined with life history.

2000
Life history and mating system in pre-social spiders
BIDR

Trine Bilde is hired as postdoc at Ben Gurion University where she develops an interest in the mating systems and the genetic variation of spiders.

2002
Genetic variation: Why do species become social?
DANMARKS FRIE FORSKNINGSFOND

Through spiders, genetic variant of natural populations, mating systems and inbreeding become subject of Bilde's research.

2005
Genetic variation: Why does inbreeding develop with social species
CARLSBERGFONDET

Trine Bilde investigates the development from non-social species to social species. She discovers that it depends on the expense of spreading or type of mating system like inbreeding or outbreeding.

2007
Genetic variation: what is the effect of mating rituals and mating systems?
European Commission

Trine Bilde discovers "the negative arms race". The strategies that the male spiders develop in order to be selected as the preferred mates can be harmful to the female. The females then develop countermoves e.g. resistance to mating with multiple males. This may result in negative consequences to the success of reproduction because energy is allocated to "defense" instead of reproduction.

2009
Shift from inbreeding to outbred mating system
4,3 mio. DANMARKS FRIE FORSKNINGSFOND

In order to understand what drives evolution of an inbred mating system Trine Bilde studies a species of spiders which lives in colonies of more than 1,000 individuals on the African savannah.

2011
Inbreeding: genome studies
11 mio. erc European Research Council

With a research team Trine Bilde travels around the world to observe and examine various groups of spiders. She maps the genome in order to understand the consequences of inbreeding mating systems to the genetic diversity of the species.

2012
Special recognition award
WCC WORLD CULTURAL COUNCIL

Trine Bilde receives the WCC prize for her remarkable contribution to research and science.

2014
Mating systems
2,5 mio. DANMARKS FRIE FORSKNINGSFOND

The mating systems of Danish spiders: The evolution of alternative mating strategies e.g. death feigning and worthless nuptial gifts.

2017
Epigenetic
6,5 mio. DANMARKS FRIE FORSKNINGSFOND

New aspects of research: Epigenetic which means the mechanisms behind evolutionary adaptation. How can populations adapt without genetic diversity? Does epigenetic hold the answer?

2017
Social spiders as a source of antibiotics
15 mio. novo nordisk fonden

According to the hypothesis of Trine Bilde social spiders might because of the low genetic diversity hold symbiosis with microorganisms which can produce antimicrobial compounds.

2020
Centre for Ecological Genetics: Links genetic diversity and biodiversity
59 mio. novo nordisk fonden

Trine Bilde combines her knowledge about genetic diversity with research in bio diversity and the correlation between the two fields as something new.

2020
Phenotypes with social spiders
2,8 mio. DANMARKS FRIE FORSKNINGSFOND

Research in which molecular mechanisms control the shift in behavior from solitaire to social species (phenotypes), in other words how do phenotypes come into existence?

New type of environmentally friendly coating to replace volatile hydrocarbons

THEME: GREEN BASIC RESEARCH

A new, environmentally friendly surface treatment is to replace traditional coating containing harmful, volatile hydrocarbons. This is the aim for the researchers behind a new project at DTU that in 2021 received funds from Independent Research Fund Denmark.

Ships and offshore constructions such as wind turbines, drilling platforms and weather stations, should be able to withstand wind, weather and wear for many years. Therefore, they are given a surface treatment, a so-called coating, in order that the construction material avoid direct contact with sea water and thus last for longer.

For the coating to be manageable, it needs to be liquid, sprayable and applicable in an even and homogenous layer. This is only possible because solvents such as volatile hydrocarbons, also called Volatile Organic Compounds or VOC's (cf. fact box), are added to the coating.

"When using volatile hydrocarbons today we solve one problem while possibly creating others. The problems arise when the hydrocarbons evaporate during the hardening process. In this process, we often see occurrences of "residual stress" that will make the coating crack after which it will have to be reapplied. Or – if things are really bad – it will make the material bend, and then you have to start all over," says Anne Ladegaard Skov, professor at Department of Chemical and Biochemical Engineering at the Technical University of Denmark (DTU).

Also, volatile hydrocarbons are harmful for the environment and for humans. This is why Anne Ladegaard Skov plans to develop a novel, efficient and environmentally friendly coating without harmful hydrocarbons.

The new solvent forms "Olympic rings"

The project is running for the next three years, and the aim is to develop a coating that will be industrially relevant, environmentally friendly and make it unnecessary to reapply coating because of residual stress.

"Our idea is to create a completely new solvent that works through chemical binding such that instead of evaporating during the hardening process the molecules in the new coating will "bite each other's tail" and thus form a kind of Olympic rings. That is, a blend of short, ring formed molecules and so-called reactive polymer chains that can act as a solvent instead of the volatile hydrocarbons," Anne Ladegaard Skov says

What are volatile hydrocarbons (Volatile Organic Compounds, VOC) and how much do they pollute?

If volatile hydrocarbons for coatings were phased out globally, it would mean a 2.4 million tons CO_2 reduction in emissions into the air environment each year.

Through photochemical air pollution, volatile hydrocarbons contribute to the formation of ozone, give rise to odour nuisances and are toxic in themselves.

Volatile hydrocarbons come from many sources other than the ones described here. For example, they also derive from fuel evaporation, incomplete combustion, emissions from industrial processes and from gasoline vapours.

Source: Anna Ladegaard Skov og Miljøstyrelsen: Hvilke stoffer forurener? (mst.dk) in Danish

The authorities are working on reducing the emission of volatile hydrocarbons as much as possible. This is done instead of a complete phase-out because there is no real alternative today.

"As I see it, we should not be using volatile hydrocarbons at all, for coatings or anything else, but without the coatings the environmental cost would be even worse as ships and offshore constructions would corrode much quicker every year. There would also be obvious benefits for the work environment and for the employees not having to work with harmful chemicals," Anne Ladegaard Skov says.

The ring formed molecules are built into the coating

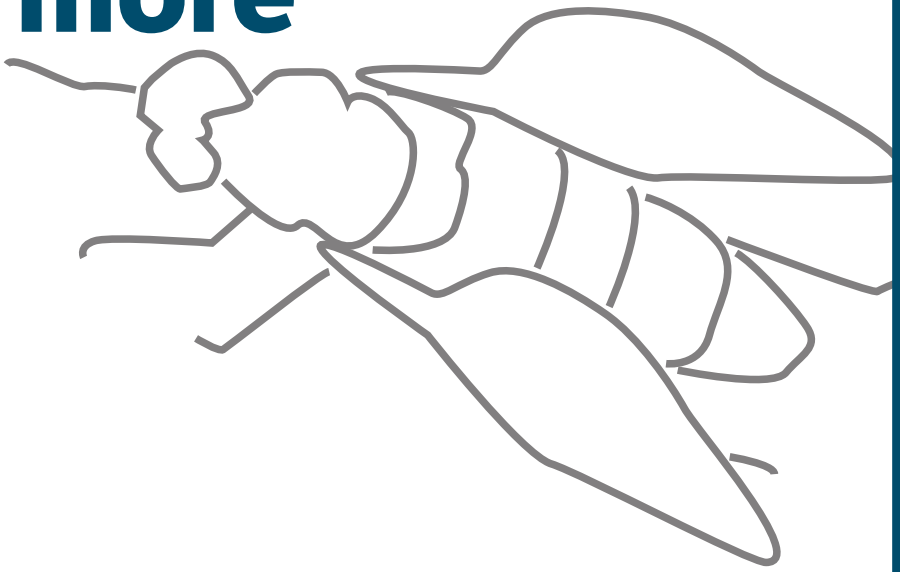
The researchers' hypothesis is that, once hardened, the short, ring formed molecules will physically bind in the coating, and because of the molecules loose, ring formed structure, the hardened coating will not involve problems with residual stress, while, at the same time, having considerable strength and resistance.

"We have done some preliminary tests that show that there is no residual stress. The challenge now, is to see how quickly the new coating will dry up, and how robust the new chemical will actually be. The aim is to explore what will happen on a large scale in order that we may prove that the coating has a commercially viable future",
Anna Ladegaard Skov says.

The ambition is to establish the final proof that the new solvent works.

"I hope we will be able to create ring molecules that prove efficient enough for industrial applications, that is, that we will have a "proof of concept" and be able to prove that the coating works in a demonstration model. With that, we will have gone far," Anne Ladegaard Skov concludes.

The black soldier fly can help make food production more eco-friendly



THEME: GREEN BASIC RESEARCH

How do you best optimise the production of insects for a sustainable feed and food production? Researches at Aarhus University are to help a budding insect industry to handle exactly this question.

A lot of the processed food found in supermarkets contains added meat protein, in the same way as fishmeal is widely used in animal feed – and the protein demand is increasing. Instead of using animal protein sources, it is possible, and advantageous, to use insect meal, from e.g. soldier fly larvae, and thus contribute to both less environmental impact and a more sustainable food production.

Insects are already today in production within a new, but growing industry in Denmark and the EU, and are considered to have a huge potential. This is what professor Jesper Givskov Sørensen from Aarhus University tells us and he explains further: "Insects are incredibly well-suited as a protein source as they demand much less space, food and water than our traditional domestic animal such as cattle and swine. Furthermore, insects have a much more efficient food energy conversion than domestic animals."

With his knowledge from basic research into the genetics and physiology of insects, Jesper Givskov Sørensen has the best prerequisites for helping companies that have gone into breeding of soldier fly larvae. And that is exactly what he aims to do.

Optimising soldier flies for production

Jesper Givskov Sørensen has received a grant from Independent Research Fund Denmark for a 4-year project: "Optimisation of resource utilisation, environmental impact, and consumer barriers in the breeding of the black soldier fly".

The aim of the project is to pave the way for a profitable and sustainable breeding of flies on industrial scale, and thereby contribute to a greener food production.

»We want to help the producers explore to which extent it is possible to optimise the black soldier fly for production. We will do this, partly, by exploring what happens if we feed the flies different food items and let them grow under different living conditions. We thus hope to establish how the flies obtain the optimal food conversion, and at which temperature they thrive the best,» Jesper Givskov Sørensen says.

In addition, the researchers will look at the importance of the flies' intestinal flora for the emission of greenhouse gasses such as methane. "The intestinal flora in soldier flies is crucial for their food conversion and the ensuing emission of gasses. You could say that soldier flies "fart" methane just like cows, although to a much lower degree, and therefore we will look at whether there are bacteria in the intestines that may change their food combustion and thus reduce the emission of methane," Jesper Givskov Sørensen explains.

Soldier flies live of the leftovers from our unusable food waste

Apart from the fact that the flies produce valuable protein, the idea behind the production of

soldier flies is that they feed on food waste that would not be used otherwise. That could, for example, be organic waste residue from beer or apple production, ordinary food waste, or other unusable organic material.

»In this way it is possible to draw valuable protein from a waste product and thus contribute to a better circular economy. The principle of circular economy is, in fact, that everything can be used and recycled so as not to have any waste left. In practice, however, we will never have a 100% waste free production,»
Jesper Givskov Sørensen explains.

Collaboration with the industry is crucial

For the project to have the best outcome, the researchers want to collaborate with the companies that have already started breeding soldier flies: "We want to collaborate with all the production companies in this sector so that we can have information on how they work today, what they see as their challenges, and where they still lack knowledge. Eventually, we hope to be able to give them some efficient tools for a better production," Jesper Givskov Sørensen says

The consumer perspective is important

But all their efforts will be to no avail if, in the end, the consumers will not buy the new products.

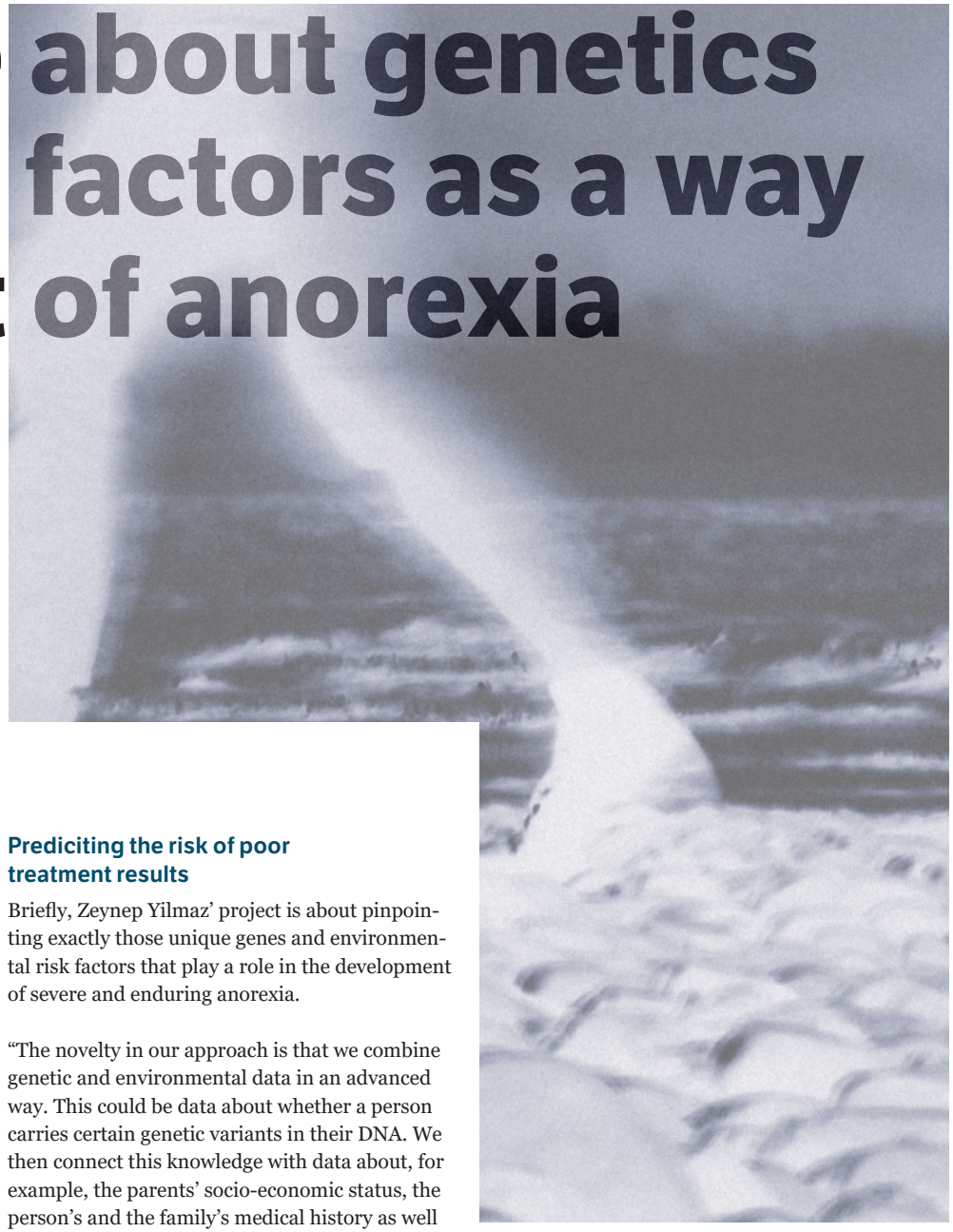
Therefore, a third and last branch of the project is included under the care of researchers at the MAPP-centre at Aarhus University headed by professor Jessica Ascheman-Witzel. She and her colleagues will study how consumers see insects as food and what it will take to make them buy and eat them.

"If, for example, consumers do not like the idea of chickens fed insect feed, well, then our work won't matter. We therefore want to know what triggers people, whether they could get used to insects, and whether the products will sell. Some may be persuaded because of the environmental advantages, while others may think mostly about it being a healthy alternative to meat. This is important knowledge for the companies to be able to market the products," Jesper Givskov Sørensen concludes.

THEMATIC ARTICLES

Data and our health

Unique knowledge about genetics and environmental factors as a way to better treatment of anorexia



THEME: DATA AND OUR HEALTH

Which combination of inheritance and environment can predict whether a person suffering from anorexia is at risk to develop a severe case of the disease and will not react to treatment? This question is explored in this research project. The aim is a reliable prediction tool for the course of the disease such that treatment can be targeted the individual patient.

Anorexia nervosa, or just anorexia, is a serious eating disorder which predominantly affects young teenage girls and younger women. The disease is characterized by a marked weight loss and is very serious for the patient, family and carers as it is often difficult to treat (cf. fact box).

"Even today, after decades of research, we know far too little. We know that both inheritance and environment are determining for the risk of developing anorexia, but also have to acknowledge that poor results from treatment are a recurrent issue. It is therefore crucial that we are able to find both the young and the adults who are particularly at risk of developing enduring and severe anorexia as early as possible, in order that we may prevent the disease from becoming chronic," says senior scientist Zeynep Yilmaz from The National Centre for Register-based Research at Aarhus University.

She has researched in anorexia for many years in USA and Canada – and now in Denmark as well: in her new, ambitious research project "Predicting Severe and Enduring Anorexia Nervosa and Associated Outcomes: Genes and environment" Zeynep Yilmaz will have the opportunity to come a little closer to solving the puzzle of anorexia.

Prediciting the risk of poor treatment results

Briefly, Zeynep Yilmaz' project is about pinpointing exactly those unique genes and environmental risk factors that play a role in the development of severe and enduring anorexia.

"The novelty in our approach is that we combine genetic and environmental data in an advanced way. This could be data about whether a person carries certain genetic variants in their DNA. We then connect this knowledge with data about, for example, the parents' socio-economic status, the person's and the family's medical history as well

as data about possible complications during birth and early childhood," Zeynep Yilmaz explains and continues:

"That is, we will find exactly those unique genes and environmental factors that may predict who is at high risk of not benefitting from treatment. This is a huge problem today. Firstly, however, we will develop a measure for the level of severity of the disease based on Danish register-data, and thus learn which environmental factors are related to the disease."

Access to Danish and Swedish data makes this study unique

All the above Zeynep Yilmaz intends to do by combining a series of data from the Danish register-databases.

"The special thing about my research project is that I will have access to genetic and environmental data from 6,000 persons with anorexia nervosa. This data I will compare with available data from 50,000 persons who do not have a prehistory of eating disorders. Also, I will be able to conduct the same research in Sweden where we are given access to genetic and environmental data from 5,000 persons suffering from anorexia nervosa."

»It is important to find out whether the results we find in Denmark are as valid in other countries. Otherwise, we will not know whether the results apply more generally or are only relevant in Denmark, for example,«
Zeynep Yilmaz says.

As part of the project, she will also examine health and social consequences of anorexia.
"I want to discover the factors about the disease that are significant for the social circumstances of the person afflicted, for example education and employment. Also, I want to look at the person's general health condition in relation to mortality, and whether there are other psychiatric or physical disorders beside anorexia," Zeynep Yilmaz explains and adds:

"Furthermore, I will look more deeply into the genes that show to be a risk factor for the disease. In this way I hope to develop a risk score which will help us predict the severity of the disease."

Developing a complex model for risk prediction

The ambition is to combine all the gathered risk factors into one complex prediction model:
"The model is to predict which persons fall within the group at risk of developing enduring and severe anorexia. It will include both genes and environmental factors and connect all this data with the impact that the disease has on the person's health and social functioning. The aim is to reach a reliable prediction of the course of disease such that treatment can be targeted the individual patient."

Zeynep Yilmaz also hopes that the project's results will help both building knowledge and breaking down prejudices.

"Not only is the disease potentially lethal if it is not discovered and treated in time. It is also a trauma for all of the people involved and is expensive for society. Unfortunately, there is a widespread ignorance about the disease and therefore ensuing prejudices and stigmatisation associated with the disorder," she says.
"Just like with other psychiatric disorders, as for example bipolar disorder or schizophrenia, there is a serious stigma linked to suffering from an eating disorder. But, on top of this, society as a whole, sadly, shows a tendency to blame the person themselves, even if we know from research that it does not work like that," Zeynep Yilmaz concludes.

Anorexia Nervosa is, among others, characterised by:

- Very low body weight
- Fear of putting on weight
- A dysfunctional and abnormal relation to food, body weight, eating and calories
- Being one of the most lethal psychiatric disorders.

Source: Zeynep Yilmaz
To read more: Lægehåndbogen – Anorexia nervosa – sundhed.dk

Method development is to increase drug safety for patients

THEME: DATA AND OUR HEALTH

The development of a completely new method for systematically monitoring serious adverse events from drugs is to increase safety for patients and doctors. This is the aim of one of the new research projects that has received a grant from Independent Research Fund Denmark in 2021.

When you are prescribed a new drug at your doctor's, the patient information leaflet will tell you about the risk of a long list of adverse events. This knowledge will primarily come from doctors' and patients' spontaneous reports. The information is, however, actually neither very reliable nor necessarily recorded in any systematic way.

»Our current monitoring of drugs is based on a system that has remained more less unchanged since it was established in the 1960's after the so-called Thalidomide-scandal. This could be done much better by using data we have at our disposal now, but didn't have then.«

So says Anton Pottegård, professor of Clinical Pharmacy and Pharmacoepidemiology at Department of Public Health, University of Southern Denmark.

He received the prestigious Sapere Aude-grant from Independent Research Fund Denmark for his new research project as well as an Elite Research Prize in 2021.

The aim is to establish a research group that will develop a new method for systematically monitoring drugs, not only in Denmark, but also globally.

A more proactive and systematic system

The idea behind the project is that the new method should add to the current system:

> **All those health data can be used for the systematic monitoring of what happens among users of a given drug**
>
> **– Anton Pottegård, professor**

The Thalidomide-scandal – what is it?
The Thalidomide-scandal is why we have the current reporting system for adverse events from drugs.
Thalidomide was a drug, which from 1959 onwards was prescribed against agitation and nausea in, among others, pregnant women. The drug was said to be harmless, but resulted in about 10,000 children being born globally with a disability such as a deformed arm or leg.
"Then, there was no systematic mapping of adverse events. That came in the wake of the Thalidomide-scandal, but today we can do much better by developing new tools," Anton Pottegård says.

"My hypothesis is that we should work more systematically and proactively to ensure that we catch the serious adverse events in time to a much higher degree than we do today. My aim is to do this by developing a system that works without preconceived notions, but is able to find patterns in the available data and through this raise safety issues for drugs that should be examined more closely," Anton Pottegård says and elaborates his point:

"We want to exploit the fact that for decades we have registered a lot of data in our health care system, for example in hospitals or when prescription drugs are redeemed in pharmacies. All those health data can be used for the systematic monitoring of what happens among users of a given drug without having to specify on beforehand the adverse events we wish to examine."

Collecting large amounts of data

The results of a previous study on the risk of cancer in drugs, are a good example of what may come out of his new research project.

"We have previously been able to link a widely used blood pressure drug to an increased risk of skin cancer. The suspicion was raised by using exactly this sort of open screening, followed by a series of more targeted studies. Since, our results have been confirmed in several other countries, and the authorities have recognised it as an adverse event, so now it is mentioned on the packaging. As a result, about 100,000 Danes are now given a different treatment," Anton Pottegård explains.

In the new study he will, among other things, investigate the influence of drugs on the cardiovascular system as well as the use of antidepressants and drugs based on morphine – all in order to develop his method.

"In my new project we will look at how drugs influence the cardiovascular system. We will do this by comparing health data from drug users with data from patients not using the drug. In this way we will have an enormous amount of results that we will need to learn to prioritise and distinguish as irrelevant or relevant findings which then have to be studied more closely. Eventually, we will have to repeat the results, in Denmark and after that in Norway and the Netherlands to see whether they are valid in other countries as well," Anton Pottegård says and continues:

»A good example of how difficult it can be to differentiate between adverse events and illness due to other causes, is the Vioxx-scandal. The drug was put on the market against arthrosis, and it took many years before it was realised that people were dying from heart attacks because of the drug. As it was prescribed for elderly people with arthrosis, it was difficult to differentiate as elderly people often have heart issues anyway and die.«

Duty to do something extra for safety

The importance of this research project is thus immediately obvious because of the resulting improved drug safety. But there is yet another reason according to Anton Pottegård:

"Today, we use really many drugs. As a society, we owe all the millions of people using drugs to find a more systematic way of investigating drug safety. That is the only right thing to do, both ethically and morally," Anton Pottegård says.

Still, he hopes he will not find any serious, unknown adverse events in the drugs he is studying. However, if he does, he wishes for two things for the project:

"First of all, I hope that any possible new knowledge about adverse events will be put into practice so that drugs will be used in a more targeted way, for example by giving patients that are at risk of a specific adverse events a different treatment. Secondly, I hope that the methods that we will develop, may be used in other parts of the world and thereby contribute to an increased drug safety globally," Anton Pottegård concludes.

2021 IN NUMBERS

2021 in numbers

On the following pages you will find overviews of applications for and grants from Independent Research Fund Denmark. Due to reversal from previous grants, the total amount from Independent Research Fund Denmark 2021 exceeds the national budget grant.

DFF | Humanities	Total	♂	♀
Number of applications	465	243	222
Number of grants	60	25	35
Success rate measured in numbers	13%	10%	16%
Amount applied for, million DKK	1.870	983	887
Amount granted, million DKK	189	76	114
Success rate measured in amount	10%	8%	13%

DFF | Natural Sciences	Total	♂	♀
Number of applications	626	486	140
Number of grants	78	53	25
Success rate measured in numbers	12%	11%	18%
Amount applied for, million DKK	2.430	1.919	511
Amount granted, million DKK	277	196	81
Success rate measured in amount	11%	10%	16%

DFF | Technology and Production Sciences	Total	♂	♀
Number of applications	668	509	159
Number of grants	76	53	23
Success rate measured in numbers	11%	10%	14%
Amount applied for, million DKK	2.700	2.092	608
Amount granted, million DKK	283	213	71
Success rate measured in amount	10%	10%	12%

DFF | Social Sciences	Total	♂	♀
Number of applications	348	191	157
Success rate measured in numbers	12%	10%	15%
Amount granted, million DKK	133	65	69

DFF | Medical Sciences	Total	♂	♀
Number of applications	673	390	283
Number of grants	111	60	51
Success rate measured in numbers	16%	15%	18%
Amount applied for, million DKK	1.899	1.144	755
Amount granted, million DKK	248	152	96
Success rate measured in amount	13%	13%	13%

DFF | Cross-counsil Committee*	Total	♂	♀
Number of applications	83	50	33
Number of grants	7	3	4
Success rate measured in numbers	8%	6%	12%
Amount applied for, million DKK	325	206	119
Amount granted, million DKK	19	9	10
Success rate measured in amount	6%	4%	9%

*Applications for the Cross-council Committee have been processed jointly by two committees and are therefore only listed under the Cross-council Committee and not on the individual statements of the respective committees.

DFF | Thematic – Green Transition	Total	♂	♀
Number of applications	479	373	106
Number of grants	61	45	16
Success rate measured in numbers	13%	12%	15%
Amount applied for, million DKK	2.417	1.887	530
Amount granted, million DKK	307	241	66
Success rate measured in amount	13%	13%	13%

Funding instruments distributed on research councils 2021

DFF | Humanities	Applications numbers	Grants numbers	Succes rate numbers	Funds applied for, DKK m.	Granted funds, DKK m.	Succes rate amount	Avg. grant, DKK m.
DFF-Research Project1	120	11	9%	330,1	29,0	9%	2,6
DFF-Research Project2	149	12	8%	893,6	71,8	8%	6,0
Sapere Aude: DFF-Starting Grant	76	9	12%	458,6	53,9	12%	6,0
The Inge Lehmann programme	17	5	29%	48,1	12,8	27%	2,6
DFF-International Postdoctoral Grant	46	5	11%	63,2	7,0	11%	1,4
Non-university Research Education (PhD)	26	4	15%	66,5	10,2	15%	2,6
Explorative Network | Humanities	12	6	50%	7,7	3,7	48%	0,6
Journals | Humanities	18	7	39%	2,0	0,8	39%	0,1
DFF-Danish ERC Programme	1	1	100%	0,3	0,3	95%	0,3
Total	**465**	**60**	**13%**	**1.870,2**	**189,5**	**10%**	**3,2**

DFF | Natural Sciences	Applications numbers	Grants numbers	Succes rate numbers	Funds applied for, DKK m.	Granted funds, DKK m.	Succes rate amount	Avg. grant, DKK m.
DFF-Research Project1	320	39	12%	885,2	109,7	12%	2,8
DFF-Research Project2	117	10	9%	709,2	59,5	8%	6,0
Sapere Aude: DFF-Starting Grant	114	12	11%	694,8	73,5	11%	6,1
The Inge Lehmann programme	24	8	33%	68,4	23,0	34%	2,9
DFF-International Postdoctoral Grant	47	8	17%	64,4	10,8	17%	1,3
Non-university Research Education (PhD)	3	0	0%	7,7	0,0	0%	-
DFF-Danish ERC Programme	1	1	100%	0,4	0,4	100%	0,4
Total	**626**	**78**	**12%**	**2.430,1**	**276,8**	**11%**	**3,5**

DFF | Social Sciences	Applications numbers	Grants numbers	Succes rate numbers	Funds applied for, DKK m.	Granted funds, DKK m.	Succes rate amount	Avg. grant, DKK m.
DFF-Research Project1	120	11	9%	303,2	26,1	9%	2,4
DFF-Research Project2	96	8	8%	565,1	47,1	8%	5,9
Sapere Aude: DFF-Starting Grant	40	5	13%	235,9	30,8	13%	6,2
The Inge Lehmann programme	27	6	22%	74,3	17,2	23%	2,9
DFF-International Postdoctoral Grant	34	4	12%	47,8	5,7	12%	1,4
Non-university Research Education (PhD)	13	2	15%	32,9	5,0	15%	2,5
Forskningsophold i udlandet | Samfund og Erhverv	18	6	33%	4,8	1,2	24%	0,2
DFF-Danish ERC Programme	0	0	-	-	-	-	-
Total	**348**	**42**	**12%**	**1.263,8**	**133,1**	**11%**	**3,2**

DFF | Medical Sciences	Applications numbers	Grants numbers	Succes rate numbers	Funds applied for, DKK m.	Granted funds, DKK m.	Succes rate amount	Avg. grant, DKK m.
DFF-Research Project1	365	50	14%	900,7	125,3	14%	2,5
DFF-Research Project2	81	7	9%	408,4	30,8	8%	4,4
Sapere Aude: DFF-Starting Grant	69	7	10%	389,4	39,9	10%	5,7
The Inge Lehmann programme	43	10	23%	111,1	27,6	25%	2,8
DFF-International Postdoctoral Grant	34	10	29%	47,8	14,0	29%	1,4
Non-university Research Education (PhD)	6	1	17%	15,3	2,6	17%	2,6
Clinician Scientist Positions | Medical Sciences	24	9	38%	19,8	6,0	30%	0,7
Pre-graduate Scholarships | Medical Sciences	51	17	33%	6,4	2,1	33%	0,1
DFF-Danish ERC Programme	-	-	-	-	-	-	-
Total	**673**	**111**	**16%**	**1.898,9**	**248,3**	**13%**	**2,2**

DFF | Technology and Production Science	Applications numbers	Grants numbers	Succes rate numbers	Funds applied for, DKK m.	Granted funds, DKK m.	Succes rate amount	Avg. grant, DKK m.
DFF-Research Project1	327	34	10%	922,3	97,6	11%	2,9
DFF-Research Project2	173	15	9%	1.045,5	88,8	8%	5,9
Sapere Aude: DFF-Starting Grant	97	10	10%	597,9	61,9	10%	6,2
The Inge Lehmann programme	24	8	33%	67,8	22,8	34%	2,8
DFF-International Postdoctoral Grant	44	7	16%	61,0	9,4	15%	1,3
Non-university Research Education (PhD)	2	1	50%	5,2	2,6	50%	2,6
DFF-Danish ERC Programme	1	1	100%	0,3	0,3	100%	0,3
Total	**668**	**76**	**11%**	**2.700,0**	**283,3**	**10%**	**3,7**

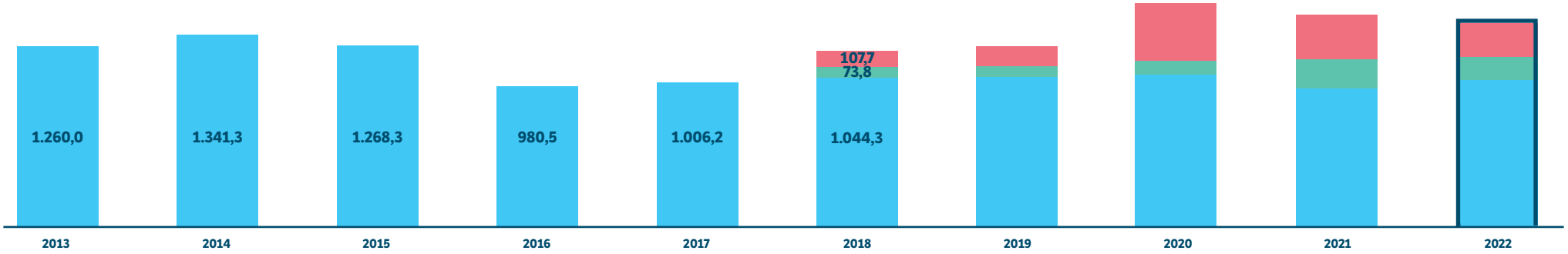
DFF | Cross-counsil Committee	Applications numbers	Grants numbers	Succes rate numbers	Funds applied for, DKK m.	Granted funds, DKK m.	Succes rate amount	Avg. grant, DKK m.
DFF-Research Project1	24	4	17%	67,0	11,4	17%	2,8
DFF-Research Project2	27	0	0%	158,8	0,0	0%	-
Sapere Aude: DFF-Starting Grant	8	0	0%	48,1	0,0	0%	-
The Inge Lehmann programme	8	2	25%	21,0	4,9	23%	2,5
DFF-International Postdoctoral Grant	10	0	0%	14,2	0,0	0%	-
Non-university Research Education (PhD)	6	1	17%	15,5	2,6	17%	2,6
Total	**83**	**7**	**8%**	**324,7**	**18,9**	**6%**	**2,7**

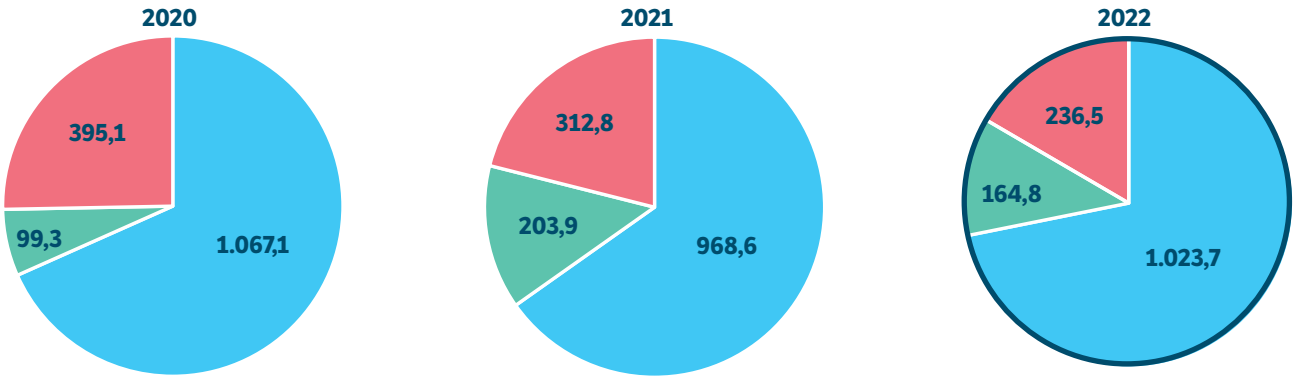
DFF | Thematic – Green Transition	Applications numbers	Grants numbers	Succes rate numbers	Funds applied for, DKK m.	Granted funds, DKK m.	Succes rate amount	Avg. grant, DKK m.
DFF-Research Project1 (thematic)	237	33	14%	663,8	93,0	14%	2,8
DFF-Research Project2 (thematic)	183	20	11%	1.086,9	120,5	11%	6,0
DFF-Research Project3 (thematic)	59	8	14%	666,8	93,4	14%	11,7
Total	**479**	**61**	**13%**	**2.417,5**	**307,0**	**13%**	**5,0**

National budget grants for Independent Research Fund Denmark 2013–2022

Independent Research Fund Denmark has experienced an increase in the total national budget grant since 2018 whereas the funding for independent research has declined. In 2018 1,044.3 million DKK were allocated for independent research equal to 85% of the total national budget grant of the fund. In 2022 1,023.7 million DKK have been allocated which is equal to 72% for independent research. The remaining share of the national budget grant is allocated for "Politically fixed instruments" like Non-university Research Education (PhD) and the Inge Lehmann programme or for "Politically fixed themes" like "Green transition" or "Strengthened clinical and independent research".

National budget grant 2013-2022 (all amounts have been adjusted compared to present prices





Independent research is:

- Based on researchers' own initiatives
- Decisive to a healthy research ecology as the first link in the food chain of research
- Both basic research and applied research
- The basis for the strategic future efforts

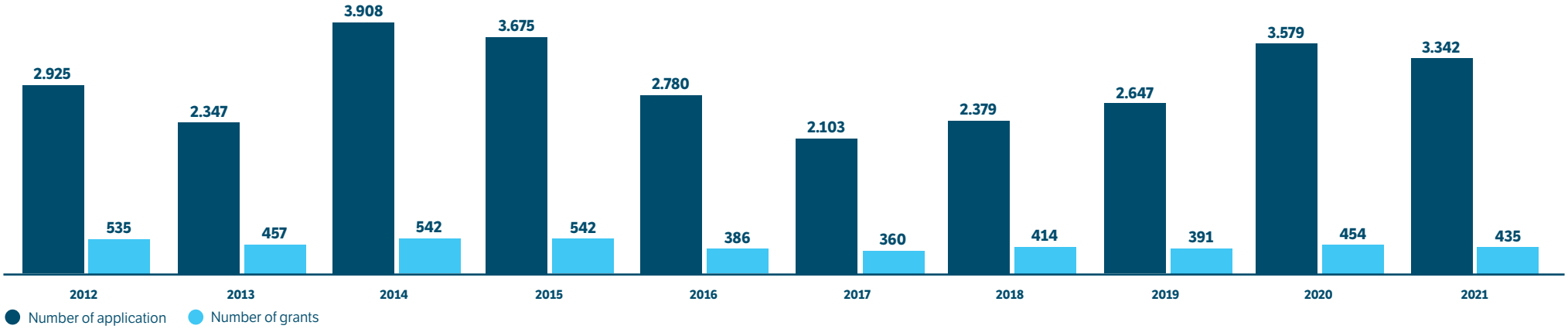
Thematic research is:

- Politically fixed themes for research activities
- Strategic efforts in respect of research and society
- A supplement to independent research which strengthens the growth layer of researchers and build up capacity in the research environment within the theme

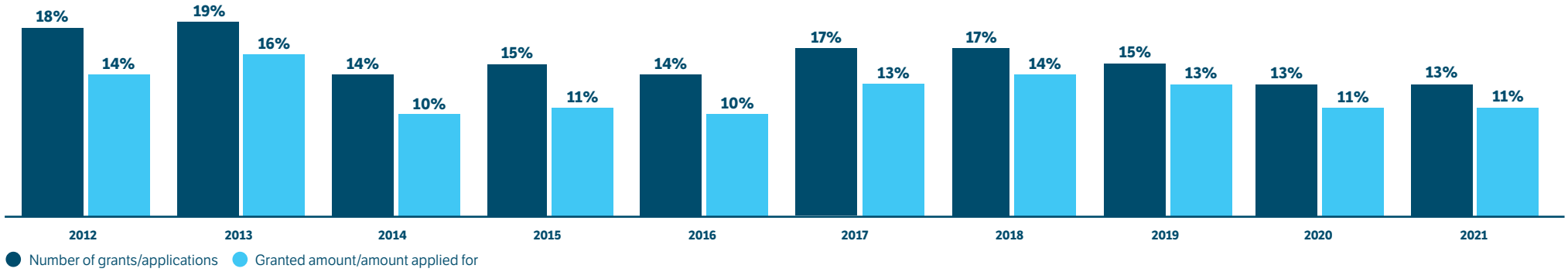
Success rates

Below you find an illustration of the development in number of applications and grants and thus the success rates of the fund throughout the past 10 years. The development shows that there has been a decline in the success rates of the fund both measured in number of applications and amount applied for from 2018 to 2021. The decline is due to an increased number of applications which is not compensated for by a corresponding increase in the national budget grant.

Number of applications and grants from Independent Research Fund Denmark 2012 – 2021



Success rates with Independent Research Fund Denmark 2012 – 2021

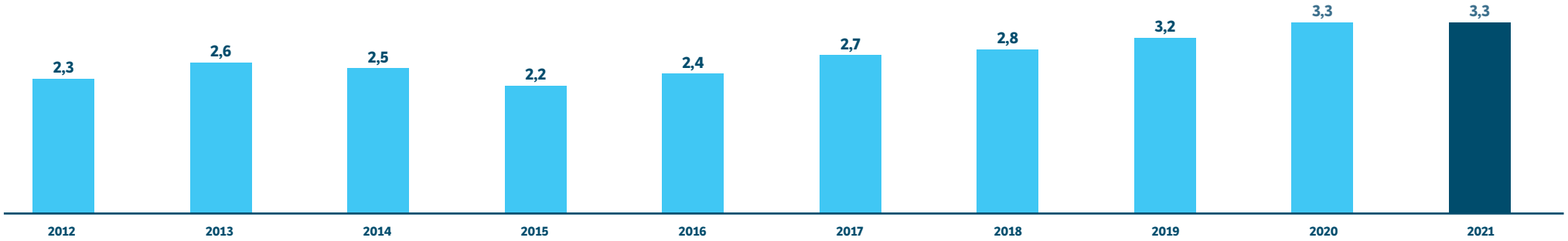


The average grant

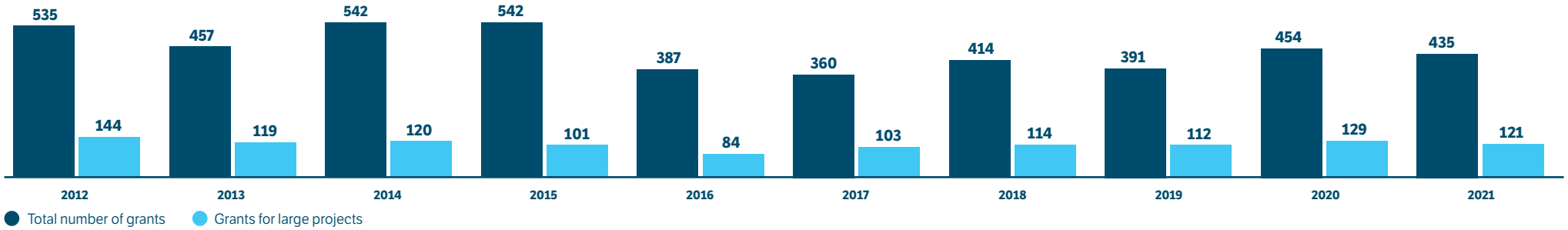
On the following pages facts about the individual grant recipient of Independent Research Fund Denmark 2012–2021 are illustrated. You can dive into age, gender and grant sizes from 2021. The illustrations show that e.g. the average grant from Independent Research Fund Denmark has increased from about 2.5 million DKK in 2012 to 3.4 million DKK in 2021.

3.3 million DKK is the average grant

The average grant from Independent Research Fund Denmark (all amounts are adjusted according to present 2022 prices).



Total number of grants as well as number of grants for large projects (above 3 million DKK) **2012 – 2021.**

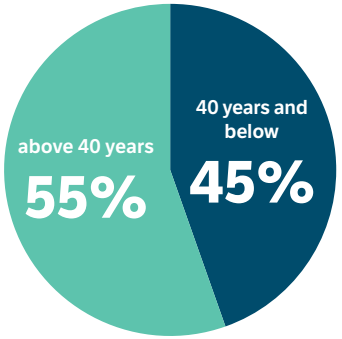


The age of the grant recipient

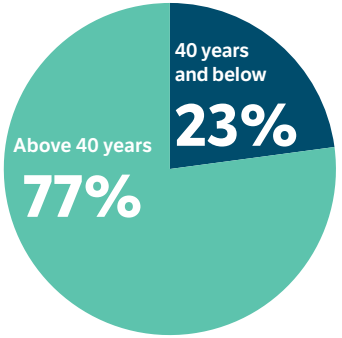
On average the main grant recipient is 43 years old. Below you find an overview of the average age of the main grant recipients compared to the individual instruments. There is an average age difference of more than 10 years for FP1 and FP2 compared to e.g. Sapere Aude: DFF Starting Grant and the research talent programme Inge Lehmann which target young researchers.

Funding instrument	40 years and below	Above 40 years	Average age
DFF-Research Project1	40	109	47
Sapere Aude: DFF-Starting Grant	39	4	37
Research networks | Humanities	1	5	52
International Research Stays | Social Sciences	3	3	42
Pre-graduate scholarships | Medical Sciences	3	14	49
Non-university Research Education (PhD)	6	3	36
DFF | Thematic research: Green transition	18	43	47
Total	194	241	43

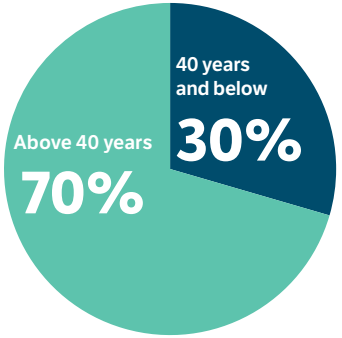
Age distribution of main grant recipients of all instruments



Age distribution of main grant recipient 2021 for FP1 and FP2



Age distribution for main grant recipient 2021 for thematic research projects



The main grant recipient is

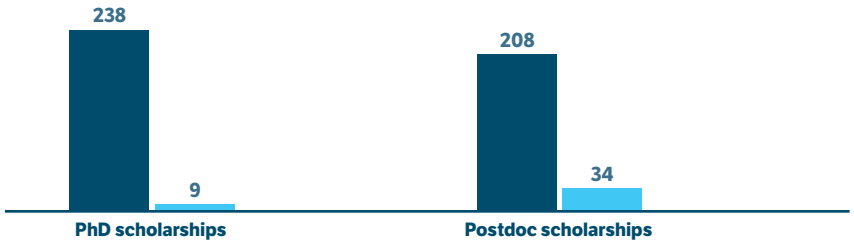
43 years

old on average

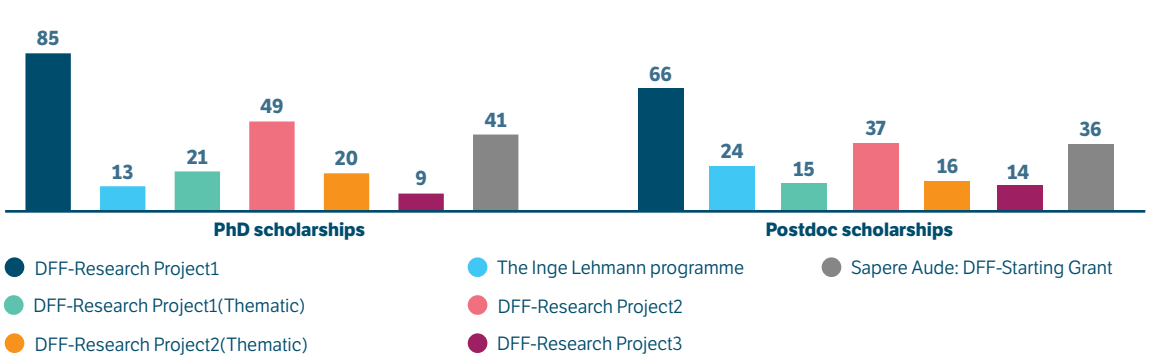
Younger grant recipients (PhD and postdoc)

Below illustrations show how many young researchers (funded PhD and postdoctoral scholarships) received funding from Independent Research Fund Denmark in 2021.

PhD and postdoctoral scholarships, embedded and individual, 2021 (number)

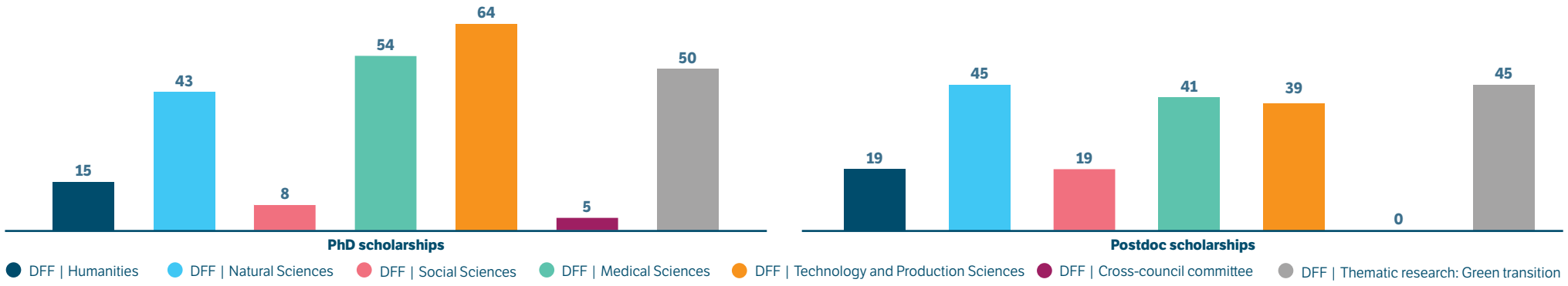


Embedded PhD and postdoctoral scholarships distributed on instruments, 2021 (number)



The figure below illustrates the number of projects which include funded PhD and postdoctoral scholarships distributed on counsils. The majority of the scholarships are financed via the research counsil for Technology and Production Sciences, the counsil for Natural Sciences, the counsil for Medical Sciences as well as the thematic research counsil for Green Transition. These counsil cover research areas where large research projects involving postdoctoral and PhD scholarships are more frequent.

Embedded PhDs and postdocs divided by councils 2020 (numbers)



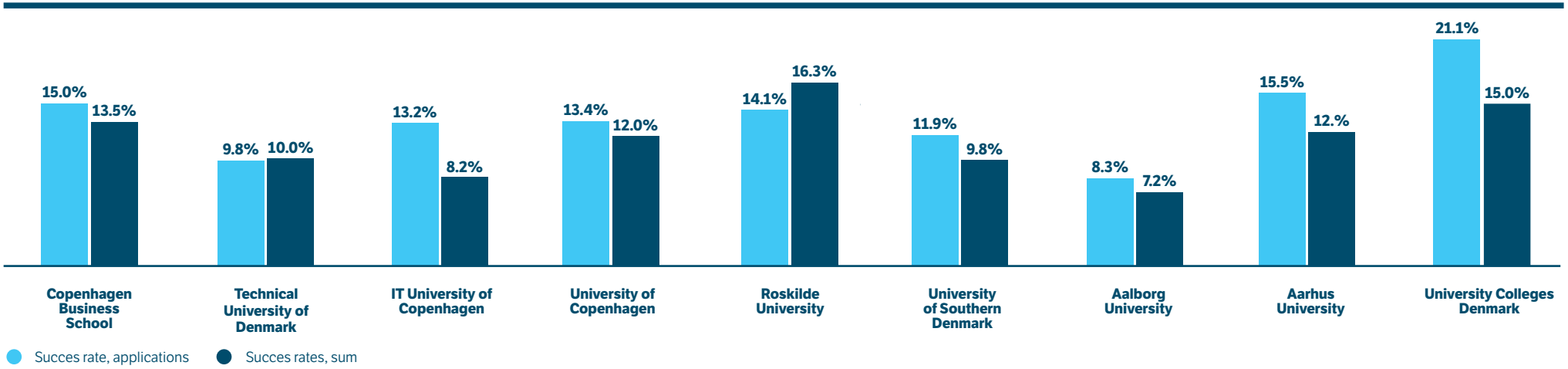
Applicant's place of employment

Below you find the average success rates of the eight Danish universities and university colleges in 2021. The average success rate is 13% measured in number and 11.3% measured on amount. The university colleges has the highest success rate compared to number of applications which is 21.1%, whereas Roskilde University has the highest success rate compared to amount which is 16.3%.

Type of institution	Applications number	Grants number	Succes rate number	Funds applied for, DKK m	Funds granted DKK m	Succes rate amount	Avg. grant, DKK m.
Copenhagen Business School	60	9	15.0%	259	35	13.5%	3.9
IT University of Copenhagen	38	5	13.2%	144	12	8.2%	2.4
Roskilde University	64	9	14.1%	323	53	16.3%	5.9
Aalborg University	205	17	8.3%	871	63	7.2%	3.7
University colleges	19	4	21.1%	54	8	15.0%	2.0
Total	**3,342**	**435**	**13.0%**	**12,905.2**	**1,456.8**	**11.3%**	**3.3**

*Other institutions and organisations comprise of e.g. Danish hospitals (including university hospital), state archives, museums, libraries, Advanced Technology Group (GTS) institutes, sector research institutions, other non-university research institutions, private non-profit organisations and foundations, foreign universities and foreign public institutions.

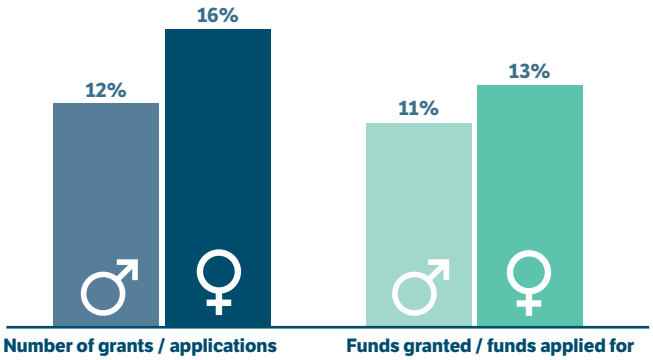
Succes rates of research institutions



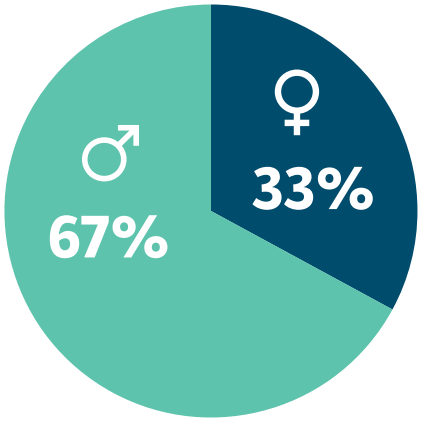
Applicant's gender

In 2021 women accounted for 33% of the applications received and 41% of the grant recipients. The fund has noted the same success rates for men and women in the past years, but in 2021 the female success rate measured in number of applications is four percentage points higher than the male success rate and two percentage points higher measured in sum applied for.

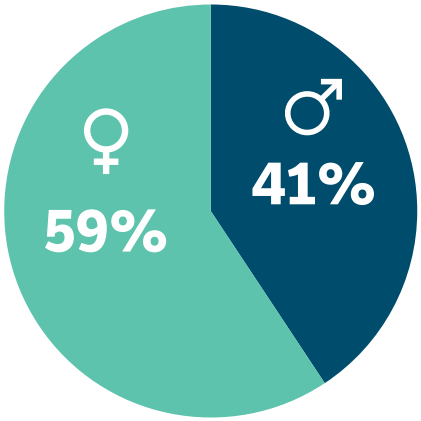
Success rates distributed on gender



3,342 applications distributed on gender



435 grants distributed on gender



Disciplines applied for

The tables on the following pages show how applications and grants are distributed on the six main fields of science: natural sciences, medical sciences, technology and production sciences, veterinary and agricultural sciences, social sciences and humanities in 2021.

Applicants are to list 1–5 OECD classification codes in order of priority according to the scientific fields which are most relevant for the project in question. The OECD codes must reflect the project's scientific disciplines. If e.g. four OECD classification codes have been listed for a project, each OECD classification code reflects 25% of the scientific disciplines of the project.

DFF | Humanities	Applications	Grants
Natural Sciences	4%	3%
Technology and Production Sciences	1%	1%
Medical Sciences	5%	6%
Veterinary and agricultural science	0%	0%
Social Sciences	45%	43%
Humanities	45%	47%

DFF | Natural Sciences	Applications	Grants
Natural Sciences	85%	90%
Technology and Production Sciences	6%	4%
Medical Sciences	6%	5%
Veterinary and agricultural science	1%	1%
Social Sciences	1%	0%
Humanities	0%	0%

DFF | Social Sciences	Applications	Grants
Natural Sciences	4%	3%
Technology and Production Sciences	1%	0%
Medical Sciences	3%	1%
Veterinary and agricultural science	1%	0%
Social Sciences	89%	89%
Humanities	3%	7%

DFF | Medical Sciences	Applications	Grants
Natural Sciences	18%	17%
Technology and Production Sciences	1%	2%
Medical Sciences	78%	80%
Veterinary and agricultural science	0%	0%
Social Sciences	1%	1%
Humanities	0%	0%

DFF | Technology & Production Sciences	Applications	Grants
Natural Sciences	40%	47%
Technology and Production Sciences	37%	31%
Medical Sciences	13%	11%
Veterinary and agricultural science	7%	9%
Social Sciences	2%	2%
Humanities	0%	0%

Applications and grants processed by the Thematic committee – Green transition are mainly distributed on natural sciences, technology and social sciences, while the scientific share of projects which belongs to medical sciences, veterinary and agricultural sciences and humanities is below 15%.

Thematic research: Green transition	Applications	Grants
Natural Sciences	35%	37%
Technology and Production Sciences	33%	28%
Medical Sciences	72%	1%
Veterinary and agricultural science	7%	6%
Social Sciences	20%	27%
Humanities	3%	1%

Cross-council committee	Applications	Grants
Natural Sciences	31%	31%
Technology and Production Sciences	11%	10%
Medical Sciences	21%	6%
Veterinary and agricultural science	0%	0%
Social Sciences	26%	35%
Humanities	11%	17%

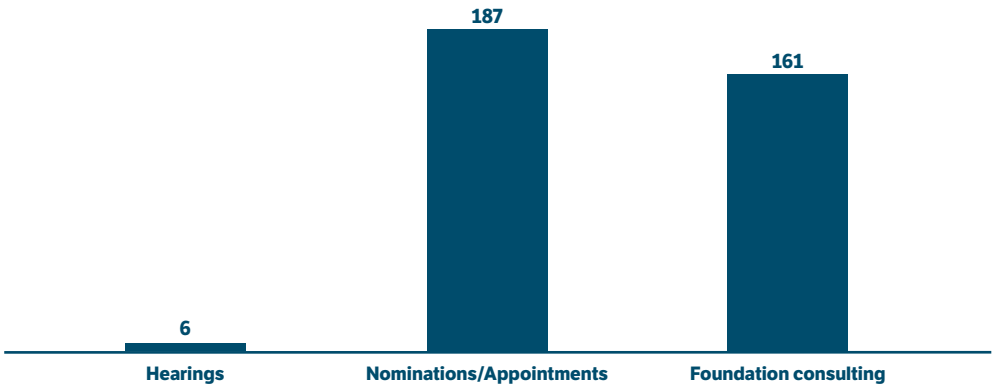
All	Applications	Grants
Natural Sciences	34%	35%
Technology and Production Sciences	14%	11%
Medical Sciences	21%	24%
Veterinary and agricultural science	3%	3%
Social Sciences	20%	20%
Humanities	7%	8%

Research advisory service by Independent Research Fund Denmark

Independent Research Fund Denmark offers research advisory service within all fields of research and as the council members are among the foremost experts within their respective fields of research, the fund is able to offer broad, socially relevant guidance.

On a yearly basis Independent Research Fund Denmark processes between 250–400 scientific advisory cases be it consultation procedures to questions related to laws and regulations and scientific questions about recommendations and nominations for councils, committees and boards as well as international consultancy procedures and questions regarding tax scheme for researchers.

Research advisory cases in Independent Research Fund Denmark (number)



Who requests advisory service?

- The Danish parliament and the Ministry for Higher Education and Science
- Other ministries and agencies
- Other public funds
- Danish universities
- Science Europe
- Other organisations which conduct research

Types of research advisory service:

- Consultation related to laws and regulation
- Scientific questions about recommendations and nominations for councils, committees and boards
- International consultancy procedures
- Questions regarding tax scheme for researchers

The funding instruments in 2021

Independent instruments

Funding instruments	Objective	Amounts (Exclusive of overheads)	Duration	Requirement in respect of position and PhD age (applicant)
DFF-International Postdoctoral Grant	• Strengthen the international mobility of young talented researchers • Develop the competencies of researchers in the beginning of their research career • Enable the grant recipients to consolidate their individual research profile by independently managing a concrete research project at a research institution abroad	Max. 1,300.000 kr.	2 years	PhD degree or corresponding qualifications. PhD-age max. 3 years
Sapere Aude: DFF-Starting Grant	• Promote the education of researchers and strengthen internationalization • Develop the qualifications and competencies of the best research talents, both nationally and internationally • Provide excellent young researchers, i.e. researchers who have carried out top class research in their field, with the opportunity to develop and strengthen their research ideas. • Aims at promoting careers, the mobility internationally as well as nationally among research environments, and thereby to strengthen networks.	Max. 4,300,000 DKK	4 years	PhD degree or equivalent qualifications PhD age max. 8 years
DFF-Research Project1	• Advance the quality of Danish research • Is characterised by having a clear and well-defined research question, where the research activities are expected to be of a high, international level of quality.	Max 2,000,000 DKK	3 years but it is possible to apply for a 4-year project if PhD students are involved	PhD degree or equivalent qualifications. Research experience typically corresponding to 3 years or more (not fixed)
DFF-Research Project2	• To advance the quality of, and develop collaboration within Danish research, DFF offers funding for research projects carried out by multiple researchers (including postdoctoral candidates and PhD students). • A DFF-Research Project2 is often characterised by a coordinated and mutually binding collaboration featuring a well-defined, joint research question. However, it may also be a project formulated by a single researcher, which is to be carried out in a research team, when it can be argued that the project is particularly ambitious and resource demanding, and that the research objective cannot be obtained through a DFF-Research Project1. • The research activities must have the potential to create synergy among any sub-projects, involve an international level of collaboration (if relevant) and be of a high, international standard.	Between 2,000,000 DKK and 4,300,000 DKK	4.5 years	PhD degree or equivalent qualifications Research experience at high international level and typically corresponding to 5 years or more (not fixed)
Explorative Network | Humanities	• To strengthen a broadly based collaboration between different Danish and, ideally, international research environments. The network is expected to facilitate the exploration of new opportunities across institutions, research traditions and scientific fields, though with the main emphasis on the fields that fall within the scope of DFF | Humanities. • In the assessment of applications, emphasis is placed on the originality of the conceptual idea and the network's potential for scientific innovation. • Funding will not be provided for actual research projects.	Max 500,000 DKK	3 years	As a minimum researcher at associate professor/ senior researcher level.
Journals | Humanities	• To support the dissemination of humanistic research through digital scientific journals • To support both to established as well as new journals of a high scientific value that strive for an international level of circulation. However, it is taken into account that certain areas of humanistic research will primarily be targeted at a Danish readership.	Max 40,000 DKK (is awarded as a deficit guarantee without overhead)	3 years	Editor-in-chief of the journal and have associate professor/senior researcher level qualifications as a minimum
International Research Stays | Social Sciences	• In order to promote the internationalisation of social sciences research. • Provides funding for research stays at a foreign research institution for consecutive periods of at least three months. • The research stay should be based on specific research activities within the field of social sciences and contribute to those activities through strengthened international collaboration or networks and collection of data.	Max 200,000 DKK	Min. 3 months	PhD degree or corresponding qualifications.
Clinician Scientist Positions | Medical Sciences	• Buyout from a clinician scientist position (including from the main studies) so that 20 – 50 % of the yearly duty hours are dedicated to research for a period of up to three years, while the remaining time is spent in a clinical position remunerated by the employing institution.	20% - 50% of annual hours in a period of 1 – 3 years	1 – 3 years	PhD degree or corresponding qualifications. Primarily awarded to medical doctors, dentists and veterinarians.
Pre-graduate Scholarships | Medical Sciences	• Fund pre-graduate scholarships for a duration of 6-12 months for the purpose of giving the most talented students the opportunity to undertake scientific work and strengthening their interest in a further scientific career.	Fixed amount of 100,000	DKK 6 – 12 months	None. (Supervisor applies. Supervisor must have obtained a PhD degree or achieved equivalent qualifications.)

	Funding instruments	Objective	Amounts (Exclusive of overheads)	Duration	Requirement in respect of position and PhD age (applicant)
Funding instruments which are part of political agreement	**DFF-Research Project1 (Inge Lehmann)**	• The programme is a part of the political agreement on the allocation of the Research Reserve for 2021 • The objective of this specific programme is to strengthen the talent development within Danish research by promoting a more even gender ratio in research environments in Denmark • The programme is open to all scientific areas and to men as well as women, but through exemption pursuant to section 3 of the Equal Opportunities Act, DFF will, as a general rule, choose female applicants over male in case of equal qualifications between two applicants. An objective assessment will, however, be made taking into consideration all specific criteria regarding applicants, regardless of gender. • An Inge Lehmann grant is awarded to young researchers, who demonstrate potential for research and project management at the highest international level.	Max. 2,000,000 DKK	As a general rule same as Research Project1, but not stipulated in the call.	PhD degree or corresponding qualifications. PhD-age min. 2 and max. 6 years
	Non-university Research Education (PhD)	• Special grant from the funds under the Danish National Budget, which are earmarked for strengthening the education of researchers at public non-university research institutions. • The instrument covers national non-university research institutions, sector research institutions, university colleges, business academies as well as state archives, libraries, museums etc.	Max. 1,800,000 DKK	Not specified in the call (typically 3 years)	Master's degree or equivalent qualifications
	DFF-Danish ERC Programme	• Aims to strengthen the opportunities for talented young researchers to obtain grants from the ERC (European Research Council) for excellent and ground-breaking research based on researchers' own ideas within all areas of research. • The intention is to give researchers the opportunity to improve their applications, which the ERC has already assessed to be of high quality but not been able to finance.	Max 35,000 DKK per month	Grants can be awarded for the number of months required to improve the application, but only for a maximum of 24 months	At the time of reapplication, the age of your PhD must be within the ERC's restrictions for maximum PhD age for either ERC-Starting Grant or ERC-Consolidator Grant
Politically fixed themes	**DFF-Research Project1 (Green Transition)**	• To advance the quality of Danish research • Is characterised by being a clear and well-defined research question, where the research activities are expected to be of a high international quality. • The application includes a clear account of the ways in which the project contributes to the green transition.	Max 2,000,000 DKK	3 years but with an option of 4 years (if PhD students are involved)	PhD degree or equivalent. Research experience typically corresponding to 3 years or more (not fixed).
	DFF-Research Project2 (Green Transition)	• To advance the quality of, and develop collaboration within Danish research • Is often characterised by a coordinated and mutually binding collaboration featuring a well-defined, joint research question. However, it may also be a project formulated by a single researcher, which is to be carried out in a research team, when it can be argued that the project is particularly ambitious and resource demanding, and that the research objective cannot be obtained through a DFF-Research Project1 (thematic). • The research activities must have the potential to create synergy among any sub-projects, involve an international level of collaboration (if relevant) and be of a high international standard.	Between 2,000,000 DKK and 4,300,000 DKK	4.5 years	PhD degree or equivalent. Research experience at high international level and typically corresponding to 5 years or more (not fixed).
	DFF-Research Project3 (Green Transition)	• In order to strengthen the quality and to develop the level of research collaboration within Danish research, DFF offers funding for research projects to be carried out by groups of researchers (including postdoctoral candidates and PhDs) • The activities of a DFF–Research Project3 (thematic) can be characterised as coherent and focused research initiatives, the purpose of which is to strengthen or develop research fields with specific Danish potential and competencies. Thus a DFF–Research Project3 (thematic) may be comprised of several subprojects, each with a clear and well-defined problem statement that is being investigated jointly by several researchers, e.g. as a research consortium, and preferably drawing on various research traditions and disciplines. • There must be synergy between the sub-projects, a level of international collaboration, and the activities must represent research of a high international quality.	Within a framework of DKK 4,300,000 to DKK 8,300,000	5 years	Internationally recognised researcher, typically at professor level and able to document original research and experience with research management.

Kilde: Danmarks Frie Forskningsfonds opslag med uddelinger i 2021

Board








Photo: Lars Svankjær/ Videnskabernes Selskab

Maja Horst, chair of the board
Professor, PhD
Responsible technology,
DTU Management
Technical University of Denmark
On 1 September 2019 Maja Horst took charge of responsible technology in a new professorship. She is former board member of the Danish Council for Research and Innovation Policy (DFIR) and she is president of the European Association for the Study of Science and Technology (EASST). Maja Horst received the Research Communication Award in 2009.

Anette Warring
Professor, PhD
At Department of Communication and Arts, Roskilde University
Anette Warring is a historian and has previously held the position as chair of Independent Research Fund Denmark | Humanities and she is a member of the Royal Danish Academy of Sciences and Letters. Anette Warring does research in the 19th and 20th centuries history and social conditions and especially historical memory and the use of history are of interest to her.
She is the author of several publications about these subjects and participates in European and Danish interdisciplinary research projects and networks.

Birgit Schiøtt
Professor, PhD
Head of Department of Chemistry, Aarhus University
Birgit Schiøtt is head of the Biomodelling Group which engages in the interaction of proteins and other biomolecules with special focus on the chemistry of the brain, but she also works on other subjects like e.g. peptides related to Type 2 Diabetes and various technologically important peptides and proteins.
Birgit Schiøtt is also on the staff off iNANO and is involved in many collaborative projects with pharmaceutical and biotechnological companies as well as academic research groups in both Denmark and abroad.

Jesper Wengel
Professor, PhD
Department of Physics, Chemistry and Pharmacy University of Southern Denmark
Jesper Wengel does research and drives innovation within DNA chemistry. In collaboration with his research team he has invented the LNA (Locked Nucleic Acid) which is a chemical imitation of nature's genetic molecules. LNA is part of the development of drugs to fight public health diseases like cancer and increased cholesterol level. Wengel is heading the research centre BioNEC financed by the Villum Foundation (The Velux Foundations) and has received an ERC advanced grant. His LNA patents form the basis of a number of biotech companies which collaborate on development of drugs and diagnostics. Wengel is co-founder of the biotech company RiboTask ApS.

Lone Gram
Professor, PhD,
Head of DTU Bioengineering,
Technical University of Denmark
Lone Gram studies bacterial eco-physiology and biotechnology. Her research focuses on aquatic bacteria (freshwater and marine) and includes both pathogenic bacteria as well as beneficial bacteria. As former chair of the research council of Independent Research Fund Denmark Natural Sciences Lone Gram has knowledge about the fund. She is also head of Centre of Excellence for Microbial Secondary Metabolites.

Mette Marie Rosenkilde
Professor, PhD,
Deputy head of Biomedical Sciences (BMI), University of Copenhagen
Mette M. Rosenkilde received the international KFJ Award in 2017 for her groundbreaking research in protein receptors focusing on the development of new drugs.
Mette M. Rosenkilde is also head of the research group of the Molecular Pharmacology Laboratory.

Ole Kirk
PhD, Vice President
Novozymes A/S
Ole Kirk holds a PhD in chemistry from Technical University of Denmark. He is Vice President of Research and Development with Novozymes A/S. Ole Kirk is also Research Manager of the division Household Care & Technical Industries Division where he does research in e.g. bio technology solutions for production of enzymes and microorganisms.

Søren Kragh Moestrup
Professor, PhD,
Institute of Molecular Medicine, University of Southern Denmark
Doctor Søren Kragh Moestrup has done research as professor in medical biochemistry in Denmark and abroad throughout the past 16 years. His research is in molecular inflammation biology and he is head of inflammatory research at the Institute for Molecular Medicine. In 2012 he became member of The Royal Danish Academy of Sciences and Letters. He is also the co-founder of two biotech companies and a staff member of the Clinical Biochemistry Department, Odense University Hospital, as research head doctore. Moestrup's research is partly financed by the European Research Council (ERC).

Councils

Humanities

Anne-Marie Søndergaard Christensen, Professor, University of Southern Denmark (Chair)
Anders-Christian Jacobsen, Professor MSO, Aarhus University
Dorte Marie Søndergaard, Professor, Aarhus University
Helle Vandkilde, Professor, Aarhus University
Jens Seeberg, Professor MSO, Aarhus University
Jørgen Bruhn, Professor, Linnaeus University, Sweden
Kim Christian Schrøder, Professor, Roskilde University
Lone Kofoed Hansen, Associate Professor, Aarhus University
Maria Fabricius Hansen, Professor, University of Copenhagen
Per H. Hansen, Professor, Copenhagen Business School
Pia Quist, Professor, University of Copenhagen
Randi Starrfelt, Professor MSO, University of Copenhagen

Natural Sciences

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Lars Nielsen, Professor, University of Copenhagen
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Søren Bak, Professor, University of Copenhagen
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Troels Skrydstrup, Professor, Aarhus University

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Kathrine Vitus, Associate Professor, Aalborg University
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Toke Reichstein, Professor, Copenhagen Business School

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Bo Torben Porse, Professor, University of Copenhagen/Rigshospitalet
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Eva Irene Bossano Prescott, Professor, Bispebjerg Hospital
Eva Ran Hoffmann, Professor, University of Copenhagen
Helle Prætorius Øhrwald, Professor, Aarhus University
Henrik Nielsen, Professor, Aalborg University/ Aalborg University hospital
Inge Marie Svane, Professor, Herlev Hospital
Irene Petersen, Professor, Aarhus University/University College London
Jakob Balslev Sørensen, Professor, University of Copenhagen
Marianne Skovsager Andersen, Professor, Odense University hospital/University of Southern Denmark
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