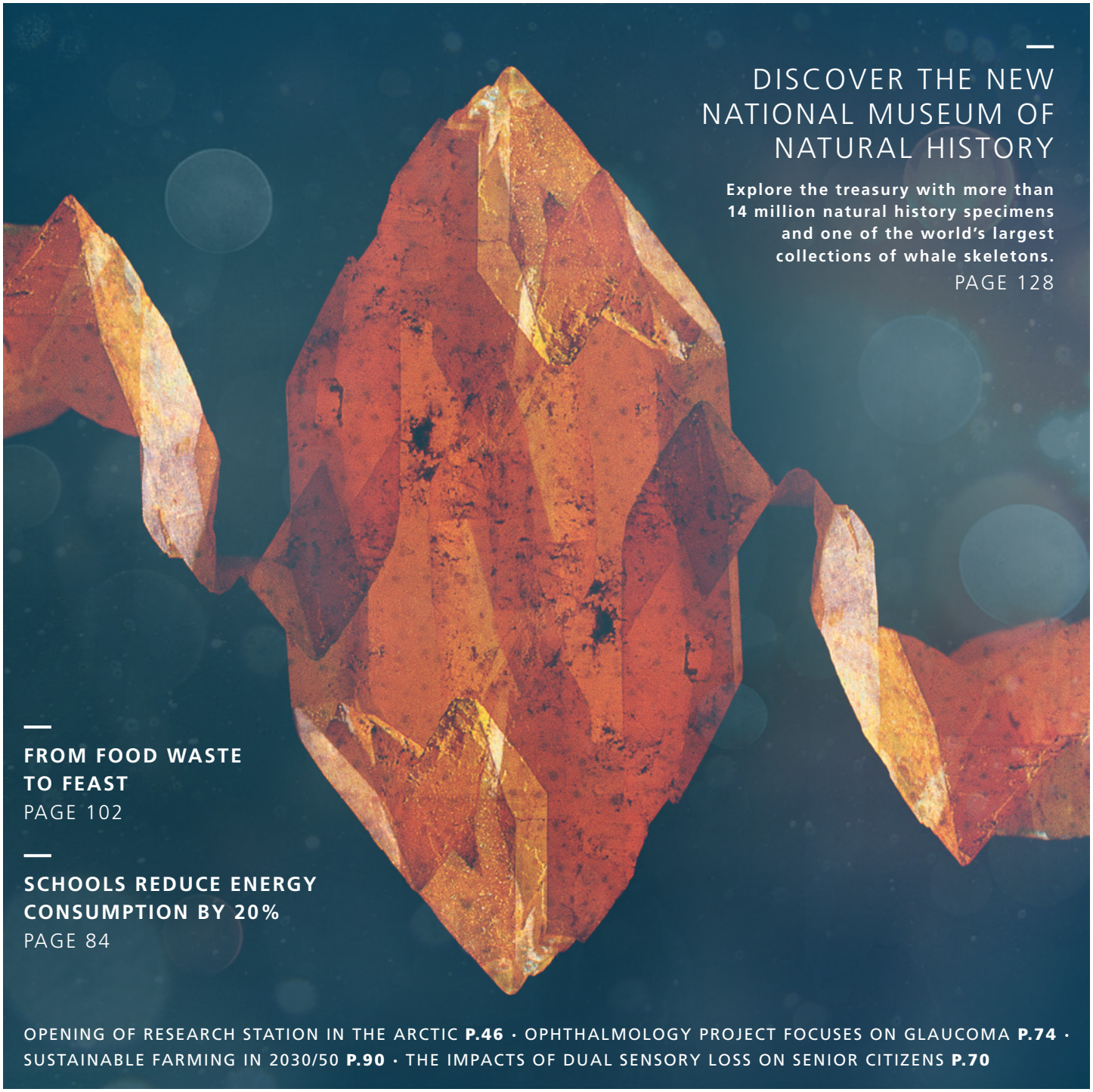
THE VELUX FOUNDATIONS

VILLUM FONDEN ✕ VELUX FONDEN



DISCOVER THE NEW NATIONAL MUSEUM OF NATURAL HISTORY

Explore the treasury with more than 14 million natural history specimens and one of the world's largest collections of whale skeletons.

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FROM FOOD WASTE TO FEAST

PAGE 102

SCHOOLS REDUCE ENERGY CONSUMPTION BY 20%

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Annual Report 2015

Annual Report

2015

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Foreword

Looking back at 2015, a fascinating mosaic is formed of grants and projects, each of which conveys, in words and images, the difference we seek to make in society through our support for non-profit purposes.

It is a great privilege to work towards making a difference. Among notable projects in 2015, we might highlight the opening of the Villum Research Station at 'Station Nord' in Northeast Greenland. This scientific centre will provide the infrastructure for crucial climate-related research in one of the world's most pristine and inaccessible regions. Meanwhile, in humanities and culture, we have established a museums programme with the aim of boosting research and public outreach at Denmark's museums in partnership with the universities. Under this umbrella, five specific projects joined the programme in 2015. Within community initiatives, we would point out the many projects we support under our active senior citizens programme. Book publications, facilities for social activities – and in 2015 a project such as 'Active by Nature – supporting especially active senior citizens engaged in outdoor recreation and nature appreciation' in partnership with the Danish Outdoor Council.

The examples in this Annual Report represent only a fraction of the many projects made possible by the DKK 829 million granted jointly by THE VELUX FOUNDATIONS in 2015. For those interested in more details of the individual grants, a complete listing has now been published on the foundations' updated website. With the new application portal, the funding application process has also been streamlined and simplified.

In addition to funding granted for projects, the foundation statutes permit THE VELUX FOUNDATIONS to present a number of awards and personal grants as a means of recognising and rewarding special achievements. In 2015, this was the case in the conferral of the Building Components Award on the architect Claus Dyre, the inventor of Unidrain, and the presentation of the Villum Kann Rasmussen Annual Award for Technical and Scientific Research to Professor Mikkel Thorup of the Department of Computer Science, University of Copenhagen.

Financial structure

The proceeds from the VKR Group constitute the main contribution to THE VELUX FOUNDATIONS' grants. In 2015, this made it possible to bring the grant-making total from VILLUM FONDEN up to DKK 608 million, and from VELUX FONDEN up to DKK 221 million.

In the past, management of THE VELUX FOUNDATIONS' assets aimed solely to secure long-term returns. This aim has been extended with an ambition for investments to increasingly support THE VELUX FOUNDATIONS' purposes and ensure that beneficiary enterprises follow a more sustainable trend.

Boards of directors

In 2015, the composition of both boards of THE VELUX FOUNDATIONS was significantly affected by the clause in the statutes stipulating that board members are permitted to serve a maximum of ten years. Within VILLUM FONDEN, Kristian Stubkjær and Bodil Nyboe Andersen stepped down and were succeeded by Anja Boisen and Eva Zeuthen Bentsen. Jens V. Kann-Rasmussen was elected the new chair of the board.

Within VELUX FONDEN, Marianne Zibrandtsen left the board and her place was taken by Marie-Louise Bech Nosch. Minik Thorleif Rosing became the new vice-chair.

We would like to take this opportunity to extend our thanks to the former members of the boards of both foundations for their loyal service.

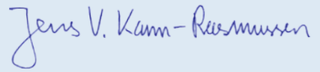
The VKR Group anniversary

Our founder, Villum Kann Rasmussen, founded the VKR Group in 1941, and the 75th anniversary will be celebrated in various ways by THE VELUX FOUNDATIONS over the course of 2016 – initially with the conferral of the Villum Kann Rasmussen Annual Award for Technical and Scientific Research, the amount of which will be raised to mark the anniversary year.

Acknowledgements

Again this year, the selected grantees have made a great, fascinating and highly readable contribution to the Annual Report with their accounts of the benefits of their projects for society at large.

Our board members, working groups, external experts and staff also receive our thanks for their valued efforts over the year. And naturally, we would like to thank the many applicants with whom we are in ongoing and active dialogue. Last, but not least, we would like to convey our appreciation to the employees and management of the VKR Group and its companies, since it is their work that paves the way for THE VELUX FOUNDATIONS, the non-profit activities and the ability to make a difference. Thank you.



Jens V. Kann-Rasmussen
Chair of VILLUM FONDEN

Hans Kann Rasmussen
Chair of VELUX FONDEN

Villum Kann Rasmussen

Behind the foundations

THE VELUX FOUNDATIONS are non-profit foundations established to fund research, environmental, social and cultural projects in Denmark and abroad. In 2015, VILLUM FONDEN granted DKK 608 million, and VELUX FONDEN DKK 221 million, to non-profit purposes.

THE VELUX FOUNDATIONS were established by Villum Kann Rasmussen – the founder of VELUX and other companies in the VKR Group, all of which are dedicated to bringing daylight, fresh air and a better environment into people's everyday lives.

The founder

The graduate engineer and inventor, Villum Kann Rasmussen (1909-1993), founded the VKR Group in 1941. He developed the modern roof window, which opened up a new world of architectural potentials for bringing daylight, fresh air and a better environment into people's everyday lives.

In order to ensure the long-term survival of the company, he established VILLUM FONDEN with an endowment of the entirety of his B-class shares in the company in 1971. In 1981, he established VELUX FONDEN by a cash donation.

The business

Today, VKR Holding A/S (the parent company of the VKR Group) owns companies within four business areas:

- Roof windows and skylights
- Vertical windows
- Thermal solar energy
- Ventilation and indoor climate.

The VKR Group has around 13,500 employees in more than 40 countries, and in 2014 had net turnover of just under DKK 16.4 billion.

2015 KEY FIGURES

1,618
applications

545
grants

DKK 829 million
awarded

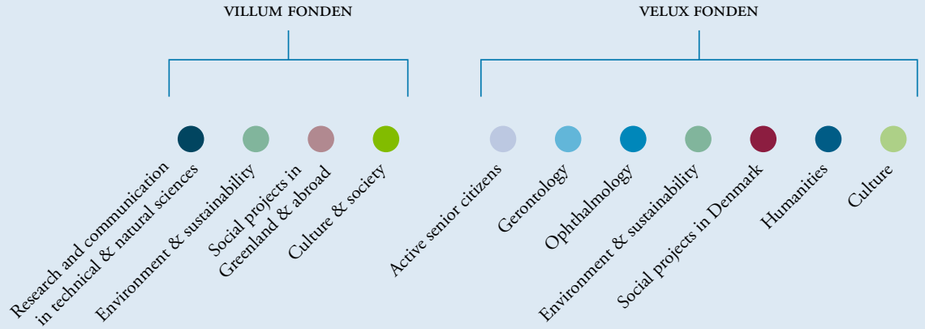
The boards of THE VELUX FOUNDATIONS

The boards of directors for both VILLUM FONDEN and VELUX FONDEN are composed in accordance with the guidelines of their statutes. According to the statutes, the members of the boards shall be 'legally competent, reputable, reliable and of mature age'. For the board of VILLUM FONDEN, at least four of the six board members must be competent in business matters. For VELUX FONDEN, 'both business economics and cultural and educational insight' shall at all times be represented on the board. The statutes of THE VELUX FOUNDATIONS also require that their respective board includes a descendant of the founder.

THE VELUX FOUNDATIONS' funding areas

THE VELUX FOUNDATIONS support a number of non-profit purposes. These comprise research, environmental, social and cultural projects in Denmark and abroad, as illustrated by the chart below.

FUNDING AREAS



Where do the funds for the grants come from?

Proceeds from the VKR Group constitute the main contribution to THE VELUX FOUNDATIONS' grants. The companies within the VKR Group develop, manufacture and market VELUX roof windows, vertical windows and other building components. The VKR Group's around 13,500 employees across the globe work every day to ensure that the business evolves continually and creates value for society. This is achieved through the Group's products, and through a proportion of the proceeds, which is granted via THE VELUX FOUNDATIONS to non-profit projects and activities in Denmark and abroad.

THE VELUX FOUNDATIONS are non-profit

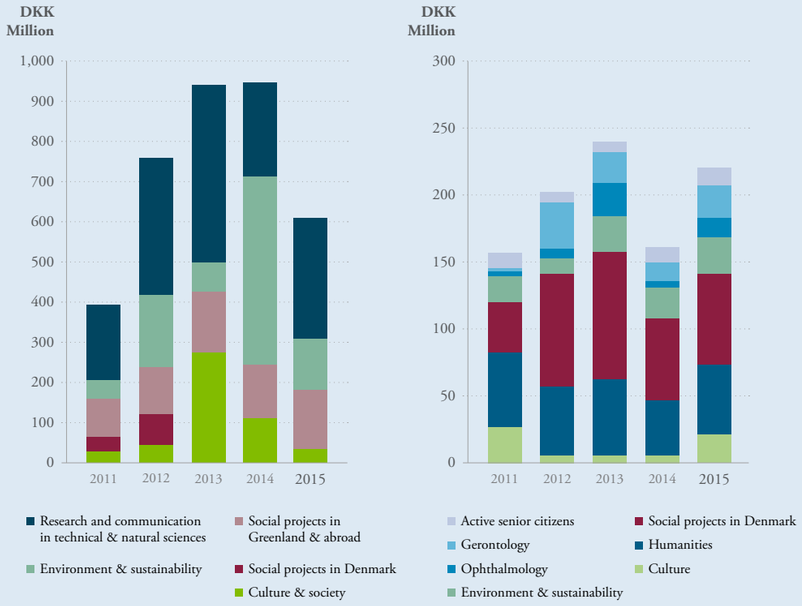
VILLUM FONDEN is the principal shareholder of VKR Holding A/S (the parent company of the VKR Group), while VELUX FONDEN holds no shares in the company. THE VELUX FOUNDATIONS are both non-profit foundations. VILLUM FONDEN has no controlling influence within VKR Holding, and is consequently not a commercial foundation.

However, as laid down in its statutes, VILLUM FONDEN does have significant joint shareholder responsibility vis-à-vis the VKR Group and its employees. One of the main mandates of VILLUM FONDEN is to work to ensure that VKR Holding A/S is served by a board of directors capable of exercising effective corporate governance with a view to ensuring its survival and sustained reputation as a model company.

A system of checks and balances between the three principal shareholders serves to maintain the requisite stability and balance in shareholder decision-making and hence an ideal ownership structure for the benefit of the VKR Group. As the principal shareholder, VILLUM FONDEN owns almost 90% of the share capital in VKR Holding A/S in the form of shares with restricted voting rights. It shares ownership and influence with the founder's sons, Lars Kann-Rasmussen and Hans Kann Rasmussen, both of whom are A-class shareholders with extended voting rights.

VILLUM FONDEN's responsibility for the company is also expressed in the provision in the statutes mandating the foundation to grant financial support to current or former employees of the company. This commitment is honoured through the Employee Foundation of the VKR Group. The Employee Foundation draws on the yield from invested capital from VILLUM FONDEN and VKR Holding A/S to finance its grants.

VILLUM FONDEN's grant total 2011-2015



VELUX FONDEN's grant total 2011-2015

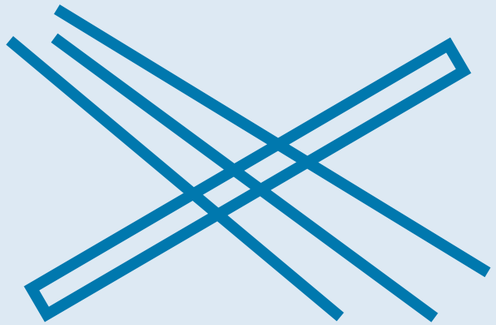
THE VELUX FOUNDATIONS' tax liability

Foundations are essentially taxed according to exactly the same rules as apply to limited companies. However, if a foundation opts to make donations for non-profit purposes, these grants may be offset according to the following tax rules: If a foundation grants at least 80% of its taxable surplus to common societal purposes ('the public good'), which do not serve to financially enrich individuals or companies, a foundation does not also have to pay tax on that surplus. The remaining 20% of the taxable surplus may then be reinvested in the foundation's capital in order to safeguard the actual value of the funds that will also in future enable the foundation to contribute to the common societal purposes. In this way, private foundations have the option of contributing to the common societal purposes either by donating at least 80% of their taxable surplus to non-profit purposes or by paying tax and in so doing allowing central and local government to 'donate' to society.

THE VELUX FOUNDATIONS have both opted to grant in excess of 80% of their taxable surplus to non-profit purposes.

Common values

In their non-profit activities, THE VELUX FOUNDATIONS are subject to no commercial interests, neither in practice nor in line with their statutes. Aside from their common origin, both the company and the foundations also share common values based on Villum Kann Rasmussen's model company objective. This objective entails exercising exemplary conduct towards employees, customers, grant applicants, suppliers, business partners and society as a whole.



The logo represents a sloping glass surface pierced by three straight lines, symbolising a roof receiving rays of unbroken daylight. The founder had this symbol designed in 1941 for DKK 25, and it was incorporated in his very first corporate logo together with the name V. Kann Rasmussen & Co. Today, the logo is integral to THE VELUX FOUNDATIONS' visual identity and symbolises the close links with the VKR Group.

Historical timeline

1971

VILLUM FONDEN

Founded in 1971
Granted DKK 608 million in 2015

VILLUM FONDEN funds technical and scientific research, environmental, social and cultural purposes in Denmark and abroad. VILLUM FONDEN also confers the Villum Kann Rasmussen Annual Award for Technical and Scientific Research.

1980

VELUX STIFTUNG, SWITZERLAND

Founded in 1980
Granted DKK 29.4 million in 2015

This foundation funds research in healthy ageing, daylight and people, daylight and nature, daylight technology and ophthalmology. The funded projects are expected to address issues of concern in science or in society, and to contribute to solving those issues.

1981

VELUX FONDEN

Founded in 1981
Granted DKK 221 million in 2015

VELUX FONDEN funds scientific, cultural, social and environmental purposes in order to advance a knowledge-based, enlightened, diverse, inclusive and sustainable society. Its priority areas are active senior citizens, and ophthalmological and ageing research. VELUX FONDEN also confers the Daylight Award jointly with VILLUM FONDEN.

1991

V. KANN RASMUSSEN FOUNDATION, USA

Founded in 1991
Granted DKK 42 million in 2015

The principal purpose of this foundation is to fund environmental projects within biodiversity, climate and sustainable production and consumption. The V. Kann Rasmussen Foundation's geographical focus is on projects in the USA and small-scale international initiatives. It also supports social purposes in Greenwood, South Carolina, USA, where VELUX has production and sales companies.

EMPLOYEE FOUNDATION OF THE VKR GROUP

Founded in 1991
Granted DKK 7.3 million in 2015

Employee Foundation of the VKR Group grants financial support to the VKR Group's employees in various areas, first and foremost to:

- Employees or their immediate family who have had an unfortunate accident with serious consequences
- The education of the children of employees
- Non-profit purposes in the geographical vicinity of the VKR Group's companies.

The board of VILLUM FONDEN

Steen Riisgaard (b. 1951), vice-chair

Year elected: 2013
Title: Director, MSc, former president and CEO of Novozymes A/S
Other boards etc.: ALK-Abelló A/S (chair); COWI Holding A/S (chair); Xellia Pharmaceutical A/S (chair); Egmont International Holding (chair); WWF Danmark (chair); Novo Nordisk Foundation (vice-chair); Novo A/S; VKR Holding A/S; Aarhus University; Corbion

Jens V. Kann-Rasmussen (b. 1969), chair

Year elected: 2014 \ **Title:** MSc, manager
Other boards etc.: VELUX Deutschland GmbH; ApS JERA; Ventilation Holding ApS (and one subsidiary); Trafalgar Estate Limited; ApS GIN

Bjarne Gråbæk Thomsen (b. 1946)

Year elected: 2009
Title: Consultant, former CEO
Other boards etc.: Danmarks Industrimuseum; Employee Foundation of the VKR Group

Astrid Kann-Rasmussen (b. 1974), the family's observer appointed under the Statutes

Year elected: 2012 \ **Title:** Nurse
Other boards etc.: V. Kann Rasmussen Foundation, USA (vice-chair); KR Foundation (vice-chair)

Eva Zeuthen Bentsen (b. 1964)

Year elected: 2015
Title: Partner, MSc, PhD
Other boards etc.: Synoptik-Fonden (foundation); Københavns Madhus; Procordo

Peter Landrock (b. 1948)

Year elected: 2008 \ **Title:** President, professor, MSc, PhD
Other boards etc.: Cryptomathic A/S and affiliated companies (chair); the technical board of Turing Gateway to Mathematics, Cambridge University

Anja Boisen (b. 1967)

Year elected: 2015
Title: Professor, MSc, PhD
Other boards etc.: Innovationsfonden (foundation) (vice-chair); The Royal Danish Academy of Sciences and Letters; The Danish Academy of Technical Sciences; Danish National Research Foundation's and VILLUM FONDEN's Center for Intelligent Drug Delivery and Sensing Using Microcontainers and Nanomechanics (head); Anja Boisen Holding IVS (owner)

The board of VELUX FONDEN

Minik Thorleif Rosing (b. 1957), vice-chair

Year elected: 2012 \ **Title:** Professor, MSc
Other boards etc.: Ilisimatusarfik - University of Greenland (chair); Ivalo & Minik Fonden (foundation) (chair); Geological Survey of Denmark and Greenland (GEUS) (chair); Arctic Institute (vice-chair); Louisiana Museum of Modern Art; Experimentarium

Hans H. Kann Rasmussen (b. 1945), chair

Year elected: 2006 \ **Title:** BSc Eng.
Other boards etc.: V. Kann Rasmussen Foundation, USA (chair)

Kamilla Kann Rasmussen (b. 1967)

Year elected: 2004 \ **Title:** Educationist
Other boards etc.: VKR's Familiefond (VKR family trust fund) (chair)

Jens Oddershede (b. 1945)

Year elected: 2014 \ **Title:** Professor, DSc
Other boards etc.: The Danish Council for Research and Innovation Policy (chair); Præsidiet for Reformationsjubilæet (Praesidium of the anniversary of the Reformation in Denmark) (chair); Faaborg Gymnasium (6th-form college) (chair); Universe Science Park (chair); Norwegian University of Life Sciences; Swedish Higher Education Authority (Stockholm); Odense Zoo; Universitetskollegiet i Odense (hall of residence foundation); Fjord&Bælt; Naturama

Marie-Louise Bech Nosch (b. 1970)

Year elected: 2015 \ **Title:** Head of centre, professor, MA, PhD
Other boards etc.: Secrétaire général of Comité International Permanent d'Études Mycéniennes (vice-chair); Wissenschaftliche Beirat, Archäologischen Landesmuseum in Schleswig and Zentrum für Baltische und Skandinavische Archäologie (vice-chair); Committee board of the National Key Base for Textile Conservation Research, China National Silk Museum; the international expert commission for the assessment of the German 'Exzellenzinitiative'; Conseil scientifique de la Maison Archéologie & Ethnologie (MAE), Université Paris X/CNRS; The Danish National Commission for UNESCO

Kristian H. Kann Rasmussen (b. 1979), the family's observer appointed under the Statutes

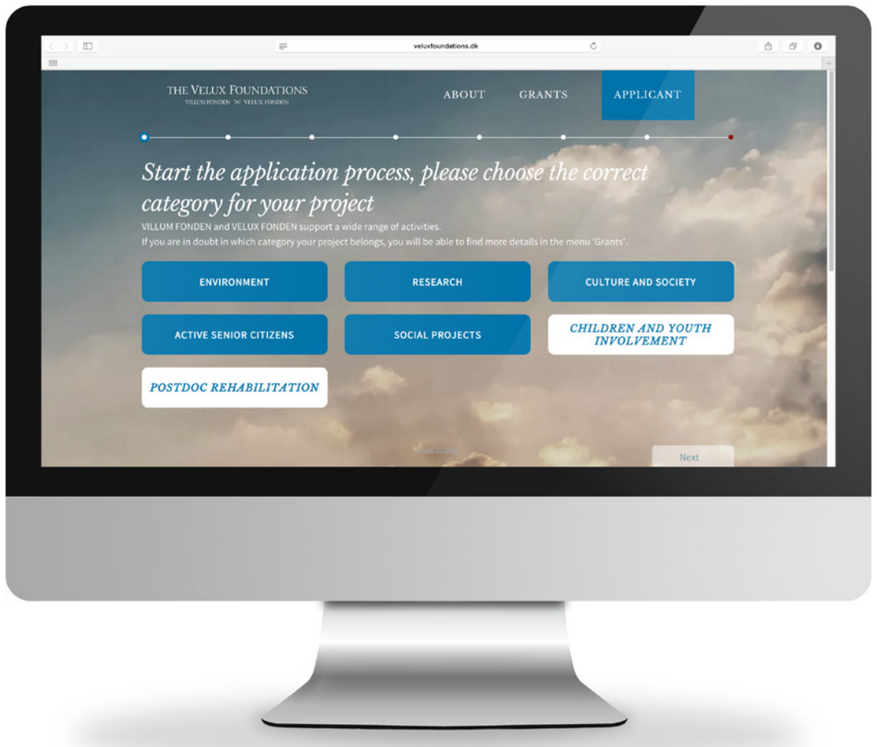
Year elected: 2013
Other boards etc.: V. Kann Rasmussen Foundation, USA

Not present in photo

New website and new application portal

In 2015, the foundations launched a new website and application portal. The ambition is to provide applicants and other interested parties with relevant and up-to-date information on the foundations and funding areas.

Read more on **www.veluxfoundations.dk**

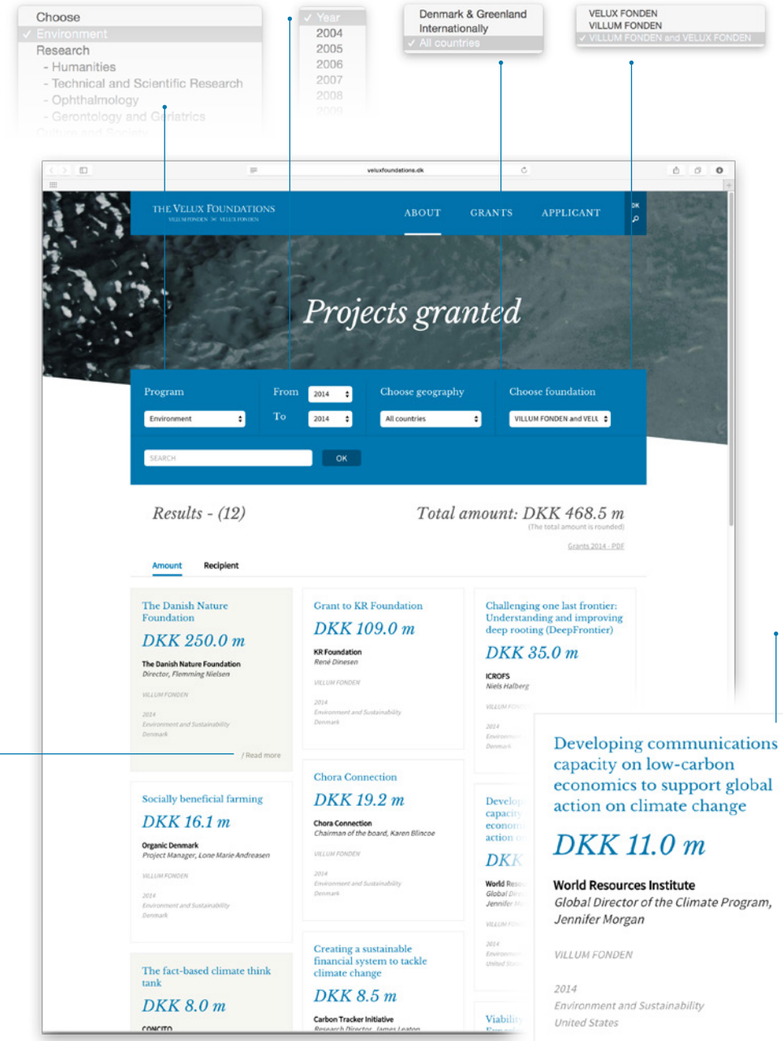


The foundations' grants

On the new website it is now possible to see an overview of the foundations' grants

Read more on **www.veluxfoundations.dk/en/about/projects-granted**

You can search according to programme, year, geography or foundation



You can read more about the project here

Search results show the project, grant amount and grantee for each grant

Themed articles

Young talents conducting Danish elite research

BY LARS ARNSKOV OLSEN
AND HELLE MAYOR

The grants for the young researchers are presented at an event in Den Sorte Diamant. Anja Boisen from the board of VILLUM FONDEN hands the grant letter to associate professor Jan Østergaard from the University of Aalborg.

Photo: Thomas Pedersen

VILLUM FONDEN's programme for young researchers, VILLUM Young Investigator Programme, gives the brightest minds the time and the scope to carve out their own research identity and lay the foundation for their career. VILLUM FONDEN sees it as an important and responsible undertaking to fund up-and-coming talents and thereby helps secure the next generation of top researchers.

YOUNG INVESTIGATORS FACE TOUGH COMPETITION

Competition to secure funding for research is increasingly rife. Young investigators are at a disadvantage since they do not have a lengthy CV to prove that they can deliver original, high-quality research. This may mean that the next generation of researchers fails to secure its own grants, and instead has to fall back on participating in projects defined by more experienced researchers. Therefore there is a risk that crucial talent and novel ideas fall by the wayside. Funding aimed specifically at young investigators is one solution to this problem.

EFFECTIVE RESEARCH PROGRAMME

A grant from the VILLUM Young Investigator Programme frees up-and-coming researchers to think long-term and pursue their own research hypotheses. Aside from spending the grant on research equipment and conferences and the like, the funding makes it possible to employ PhD students and postdoctoral researchers. Thus equipped, the investigator can start to build up his or her own group, follow new directions and carve out a personal research identity.

Mads Græsbøll Christensen, a researcher at Aalborg University, confirms that a grant from the VILLUM Young Investigator Programme provides both scope and opportunities. He was granted DKK 7 million in 2011 for his research in speech signal recognition and filtering. “The grant was crucially important for my research and my career. The grant was what enabled me to form my own research group, Audio Analysis Lab, and subsequently to gain a professorship. The research group had legitimacy in its field from the outset, and the grant gave us sound, independent conditions in which to conduct our research. The ambitious concepts proposed by the project formed the basis for our subsequent research, and have since then resulted in a close partnership with a leading hearing aid manufacturer”, Mads Græsbøll Christensen explains.

In addition to helping to retain and develop leading lights in Denmark, the VILLUM Young Investigator Programme has helped to internationalise Danish research by giving a number of foreign researchers the opportunity to conduct research in Denmark.

A THOROUGH SELECTION PROCESS

Selecting the talents that are to be given the opportunity to develop into the top researchers of the future carries a great responsibility. Above all, the applicants must be able to prove that they have achieved excellent research results compared with their peers. In addition, importance is attached to the applicants having worked, collaborated and performed in different research settings, not least internationally, in order to prove that they have gained a broad perspective on their field.

FACTS AT A GLANCE:

- Each year, VILLUM FONDEN's Young Investigator Programme grants a total of DKK 100 million to up-and-coming researchers.
- The grants are awarded to especially talented young investigators pursuing research in science and technology.
- The grantees all possess international experience and have proven their special merits in previous research activities.
- Since its inception in 2011, *75 young investigators* have received a grant.
- Within the last five years, VILLUM FONDEN has granted a total in excess of DKK 1.3 billion to science and technology research.

Jeppe Dyre, Professor of Physics at Roskilde University, has served on the selection committee for three years, chairing the committee in 2015. “In the space of just a few years, the Young Investigator Programme has gained immense prestige, and it is only possible to grant approximately one application in ten. The many merited applicants make selection difficult. We select the most eligible candidates for interview”, Jeppe Dyre explains, adding: “The way in which applicants discuss and elaborate on their research

VILLUM FONDEN's Young Investigator Programme was granted to eight associate professors and 11 postdocs in January 2015.

Photo: Thomas Pedersen

and reflect on the questions raised by the interviewers is very telling. After the interviews, more often than not, the committee is in resounding agreement".

SUPPORT AT EVERY STAGE

The privilege gained also poses a new challenge for many of the young investigators in living up to the freedom with responsibility entailed by a substantial grant. A good many of them will even have to hire PhD students or postdoctoral researchers, and in that way immediately embark on a whole new role as principal investigator.

Recognising the demands involved, VILLUM FONDEN is committed to helping young investigators to excel in this new role also. In order to provide the grantees with the necessary support, VILLUM FONDEN holds network and other events where the new principal investigators can discuss their common challenges. Similarly, the plan is to follow this initiative up with activities such as courses and sparring from external partners.

LONG-STANDING TRADITION IN SCIENCE AND TECHNOLOGY RESEARCH

VILLUM FONDEN has a long-standing tradition for funding research in science and technology. For more than 40 years, VILLUM FONDEN has contributed to world-class Danish research at Denmark's universities. Within the last five years, it has granted a total in excess of DKK 1.3 billion to research.

The foundation takes great pride in this tradition and is committed to its continuation. It is therefore especially important for VILLUM FONDEN to contribute to paving the way for the next generation of top researchers.

LARS ARNSKOV OLSEN

HELLE MAYOR

Lars Arnskov Olsen is Senior Adviser to VILLUM FONDEN and has served as Head of Programme on the Young Investigator Programme since its inception in 2011. Lars holds a PhD in geology from the University of Copenhagen.

Helle Mayor was formerly Chief Communications Officer of VILLUM FONDEN and VELUX FONDEN and is now Director of Corporate Communications at Hill + Knowlton Strategies. Helle gained a Master of Corporate Communication from Copenhagen Business School.

KR Foundation
– an intensified international climate and environment programme

BY RENÉ DINESEN AND BRIAN VALBJØRN SØRENSEN

KR Foundation was founded in 2014 by VILLUM FONDEN in furtherance of its intensified climate and environment programme.

In that year alone, VILLUM FONDEN was the driving force behind the creation of not only one, but two independent foundations dedicated to nature, climate and the environment. With the establishment of Den Danske Naturfond, Denmark's countryside and environment gained a much-needed boost. With the creation of KR Foundation in December, global climate change and environmental challenges were brought into focus.

According to the chair of the KR Foundation board, Connie Hedegaard, that focus is much needed: "The creation of KR Foundation represents a highly visionary and proactive outlook. Climate change is one of the global community's most pressing challenges and we are currently at a crossroads. Action now is imperative if we are to limit global warming to the two degrees which climate science indicates as the maximum permissible".

VILLUM FONDEN has a strong international board that possesses expertise within the majority of its focus areas: a new, sustainable economy; consumer behaviour; environmental and planetary resilience; climate change and communication; philanthropy; politics; and international cooperation.

A NUMBER OF INITIATIVES HAVE ALREADY BEEN LAUNCHED

KR Foundation's mission is to promote projects and activities that address the root causes of global climate and environmental challenges. These causes are twofold: the economic and political structures which favour short-term interests at the expense of the climate and environment; and unsustainable patterns of consumption and natural resource exploitation.

Connie Hedegaard and Steven Chu.

Connie Hedegaard, former European Commissioner for Climate Action, in conversation with Steven Chu, winner of the Nobel Prize in Physics in 1997 and former US Secretary of Energy, at a dinner in honour of the United Nations Intergovernmental Panel on Climate Change (IPCC) in October 2014 in Copenhagen. VILLUM FONDEN hosted the dinner, which was held in connection with the foundation's grant for improving the dissemination of the IPCC's work. During the dinner the establishment of KR Foundation was announced with Connie Hedegaard as chair of the new foundation.

Photo: Jakob Kofler

FACTS AT A GLANCE

- KR Foundation was founded on 21 December 2014 by VILLUM FONDEN for the purpose of intensifying VILLUM FONDEN's international climate and environment activities. VILLUM FONDEN endowed KR Foundation with *DKK 100 million in 2014,* in addition to which it intends to endow a total of *DKK 1 billion* over a ten-year period in support of the work of KR Foundation.
- The board of KR Foundation is composed of five members and day-to-day management is undertaken by an executive director.
- KR Foundation's overall purpose is to be instrumental in addressing our era's major *global challenges arising out of climate change and environmental degradation.* It does so by promoting projects and activities that focus on the root causes of these challenges. KR Foundation exclusively funds non-profit, scalable projects with an international perspective. This means that the foundation does not fund commercial projects or nature conservation projects.
- The commitment to countering climate and environmental challenges is not a new endeavour for VILLUM FONDEN and VELUX FONDEN. Both have for several years supported a number of international climate and environment projects under their joint Environment Programme. In connection with the creation of KR Foundation, it was decided that VILLUM FONDEN's and VELUX FONDEN's *joint Environment Programme* would exclusively fund projects in Denmark within a number of thematic priority areas.
- In addition, the *V. Kann Rasmussen Foundation* in the USA is likewise engaged in climate and environmental concerns, but with its geographical focus confined to the USA and small-scale international initiatives. KR Foundation and V. Kann Rasmussen Foundation have a close and coordinating partnership.

For more information, please consult KR Foundation's website www.krfnd.org.

KR Foundation operates both as a driver fund – actively identifying and launching initiatives – and as a more traditional donor fund with two open application rounds annually. For 2015 and 2016, KR Foundation's principal focus is on the following two thematic priority areas:

- Phase-out of subsidies for fossil fuels: initiatives to curb subsidisation of fossil fuel production and consumption that has adverse impacts on the climate and environment.
- Divest-invest (divestment and investment): initiatives to curb investment in fossil fuels, and to promote opportunities for 'green' investment that favours the climate and environment.

In its first year of existence, KR Foundation funded a number of projects and activities both under the specific thematic priority areas and more widely within its designated purposes. This includes projects to regulate emissions of HFC gases (gases with an especially powerful greenhouse effect); to phase out coal-fired power plants in Europe; reduce the scale of environmentally harmful export credits; and demonstrate sustainable ways of life.

Connie Hedegaard commenting on KR Foundation's initiatives: "We support both projects that have an effect in the short term, and projects with long-term perspectives and a certain element of risk. As a philanthropic foundation, we can operate with a longer-range view and step in where the government and market have no incentive to take action. Another strength is that KR Foundation has the scope to launch its own initiatives. Within the board, our guiding vision is that a number of solutions to many of the problems already exist, but that the expertise is not applied in the right contexts. We aim to make a difference in those domains".

GLOBAL CHALLENGES REQUIRE INTERNATIONAL COOPERATION

The current climate and environmental challenges know no borders. These are global challenges that call for global responses. KR Foundation has sought close international cooperation with foundations and other actors engaged in this concern. The object of cooperation is to share knowledge, coordinate action and take advantage of synergies.

KR Foundation has decided to continue VILLUM FONDEN's support for European Climate Foundation, which, on behalf of a number of

KR FOUNDATION'S MANAGEMENT IS REPRESENTED BY:

Connie Hedegaard, chair.
Former European Commissioner
for Climate Action & Danish
Minister for Energy and Climate

Astrid Kann-Rasmussen, vice-chair.
V. Kann Rasmussen
Foundation, USA, vice-chair &
VILLUM FONDEN, observer

Anthony A. Leiserowitz, board
member. Director of the Yale
Project on Climate Change
Communication, Yale University

Tim Jackson, board member.
Professor of Sustainable
Development, University of Surrey

Johan Rockström, board member.
Director of the Stockholm
Resilience Centre,
Stockholm University

René Dinesen, Executive Director.
Former Ambassador of Denmark to
South Africa and Afghanistan

Photo: Jonathan Grevsen and KR Foundation

funders, works specifically to promote the energy transition within the EU by funding existing projects and by launching new initiatives.

KR Foundation also cooperates with ClimateWorks, a resource centre and liaison organisation for international climate and environmental funds. ClimateWorks makes the latest intelligence available to funders and helps to coordinate and mobilise large-scale collective initiatives.

KR Foundation will also in future be seeking to engage in international alliances in order to maximise its efforts.

THE FUTURE IS UNCERTAIN, BUT IT GOES THROUGH PARIS

The UN Conference on Climate Change in Paris (COP21)[1] in December 2015, which will seek to conclude an international political agreement on reducing CO2 emissions, will possibly deliver part of the solution to global climate change and environmental degradation.

If the UN succeeds in delivering an ambitious and binding agreement in Paris, the immense task ahead will then be to enforce implementation and compliance with the agreement. There is, however, wide consensus that even an ambitious agreement in Paris will not be sufficient for overcoming the climate and environmental challenges. There will still be a need to put pressure on politicians and other decision-makers to take the challenges seriously. The road to a future free from the untold effects of climate change will thus not come to an end in Paris, but go via Paris.

There is no doubt that the efforts to counter global climate and environmental challenges will be a long, slow haul – regardless of the outcome of COP21. KR Foundation therefore faces a tall task in the coming years as it continues its activities to promote initiatives in this domain.

[1] This article was written shortly before COP21 and it was therefore not possible to take its outcome into account as the publication went to press.

Even though science has proved a link between human activity and climate change, many people do not respond to the problem, i.a. because the consequences are not yet noticeable. KR Foundation has granted DKK 1.5m to Climate Central's work in relation to proving and communicating how climate change increases extreme weather phenomena such as the heat wave in Central and Southern Europe in the summer of 2015. The purpose is to highlight the consequences of climate change and thereby create incentives for action among citizens and politicians.

Photo: Nicolas Longchamps

RENÉ DINESEN

BRIAN VALBJØRN SØRENSEN

The executive director of KR Foundation is René Dinesen. René was formerly Denmark's ambassador to South Africa and Afghanistan. René has 17 years of diplomatic experience, including as Director of Strategy and Policy Planning at the Danish Ministry of Foreign Affairs, Deputy Permanent Representative to the United Nations New York, Private Secretary of Foreign Minister Mr Per Stig Møller, Deputy Head of Mission in Romania, Head of Section within the Danish Ministry of Foreign Affairs with responsibility for international environmental issues and Danish WTO relations. René holds an MA in Political Science from the University of Copenhagen.

Brian Valbjørn Sørensen is COO & Program Director within KR Foundation. Before joining KR Foundation, Brian was COO of CLEAN, Denmark's largest cluster organisation promoting green innovation; Head of Secretariat at Copenhagen Cleantech Cluster; and Chief Special Advisor in the Danish Ministry of Business and Growth. He holds an MA in Comparative Literature from Aarhus University.

VELUX FONDEN's new Museums Programme

BY PERNILLE STENSGAARD

Svendborg Museum, in partnership with the Prison Museum in Horsens and the Centre for Welfare State Research at the University of Southern Denmark received a grant of DKK 5,844,000.

The project will seek to extend our knowledge of the lifeworlds of deprived groups and create a more inclusive narrative of Danish social welfare.

Photo: Svendborg Museum. Revisiting the former orphanage

Back in 2007, VELUX FONDEN decided to create a Humanities Programme to fund independent research projects at Danish universities. In 2014, in extension thereof, it went on to take the initiative for a Museums Programme to boost research and mediation at Danish museums in association with the universities. In 2015, VELUX FONDEN granted a total of DKK 20.8 million to five projects under the new Museums Programme.

The object for a museum is to house our common recollections and serve as a compass point for our national and individual identities. A museum is filled to the brim with things from our past; on show to engage our interest, to be considered in new contexts and tell stories other than those we expected to hear. Some revelations may alter our sense of nationhood, such as the latest research by the National Museum of Denmark that a national treasure, the Bronze Age Egtved Girl found in 1921, was not Danish, but had migrated from Germany shortly before her death. What counts most is that all the stories are based on the best knowledge available right now. This is where research comes into the picture. Whether a museum is large or small, whether it houses two or two hundred museum curators, it is under obligation to conduct high-level research like the universities.

All museums are naturally keen to do so. But some are hard-pressed to find the time, money and resources to sustain a substantial research project. To caricature the situation: one museum employee may be out at a country fair promoting the museum, while another might be rearranging the exhibition, and a third is penning an article for the catalogue. The same is going on at the next museum. And the next one along. So, why not work together on a grander scale? Why not team up with university researchers? Or with experts abroad? With the best mediators?

This is what VELUX FONDEN aims to facilitate with its new Museums Programme grants.

THE INITIAL GRANTS

Vanishing into the sand and the North Sea along the west and northwest coast of the Jutland Peninsula lie the last remnants of the German 1940-45 Occupation in the shape of grey concrete bunkers. These formed part of the Atlantic Wall extending from Northern Norway to the Spanish border, and are virtually the only authentic vestiges of Occupied Denmark. These 'unintended' monuments are striking and fascinating, but are treated carelessly and casually because several thousands of them have survived. Others have been demolished and erased from the landscape without much forethought. For the museums in the region operating independently, preserving them is a huge commitment. And any successes may attract only local and regional interest.

With a grant of DKK 3.2 million from VELUX FONDEN, Museum Thy has formed a partnership with Museumscenter Hanstholm (a museum housed in the largest German bunker in Denmark), Nordjyllands Kystmuseum (a museum devoted to the North Jutland's coastal cultural heritage), Vendsyssel Historical Museum and the Department of Culture and Global Studies at Aalborg University to tell a bigger story that goes beyond each individual bunker and addresses wider issues. What happened to local employment and the local economy during the Occupation? What did the Danish bunkers look like compared with those in other countries? How did the general population deal with the occupying force during the war?

Instead of telling the story of just one local bunker – how many soldiers lived in it and for how long, how many shots were fired – these museums have engaged directly in a heated debate that concerns the whole nation. They are developing an app for locating bunkers in the landscape and communicating the history of the Atlantic Wall in this region of Denmark and further south in Continental Europe.

"A single, small museum cannot undertake a project on this scale independently. The museums have created a joint forum with each other and with the university, and have retained the services of an international bunker researcher. I don't believe this network will be dissolved. And having first attained this high, collective level, the project is likely to catch the interest of international partners", says Henrik Tronier, Programme Manager with VELUX FONDEN.

With a total grant of DKK 20.8 million for five new groups, VELUX FONDEN hopes to boost new modes of collaboration in the museums sector. Closed doors need to be opened, experts in their fields need to interact

Museum Thy in partnership with Museumcenter Hanstholm, Nordjyllands Kystmuseum, Vendsyssel Historical Museum and the Department of Culture and Global Studies at Aalborg University, received a grant of DKK 3,255,000.

The project will consolidate local historical studies in the many concrete bunkers along the North Jutland coasts, shedding light on the reception history of the German Occupation of Denmark in 1940-45 from a regional, national and international perspective.

Photo: Museum of Thy. Vigsø, personnel bunker

in research and mediation. In four of five projects, several museums have joined forces. In the fifth, the results will benefit other similar synchronistic-mode museums. All five are now linked to a university.

IN DIALOGUE WITH THE MUSEUMS

Once VELUX FONDEN had decided on a commitment to museum research and mediation, in 2013 and 2014, two members of staff embarked on a tour of 18 of Denmark's museums of art and cultural heritage. They visited small and large museums, some in remote regions, others in choice locations, some prosperous, others less so. The aim for Henrik Tronier and Rikke Helverskov Jacobsen was to interview the museums themselves to discover their aspirations and ideas. The interviews aimed to identify problems and determine how VELUX FONDEN might help to overcome them. Eventually, a number of challenges became apparent.

One was the risk of driving a wedge between researchers and mediators within the museum's own walls. For researchers today, it's a question of locking the door to concentrate on writing articles for scientific journals. For mediators, the aim is outreach and creating footfall. They are exhibition designers and nowadays have to focus on visitor figures, staging experiences and catering to a public that increasingly expects some degree of interactivity. Today's demands and expectations risk pulling research and mediation in opposite directions.

Another challenge is the research itself: in 2009, the Danish Ministry of Culture introduced more stringent requirements for museum research to comply with university-level conventions and standards. However, the Danish museums have not generally had much success in securing funding for research projects. Not surprisingly, their focus is on the collections, *our things,* and their research applications are therefore concerned more with them than original research hypotheses. For this reason, their applications are often rejected for falling short of the requirement for greater expertise in the theoretical framing of their project. Clearly, researchers at museums and researchers in academia have different foci for their expertise. The former rely on empiricism and the tangible; the latter on theory. This is why university researchers are more successful in landing public-sector research funds.

Another requirement from the Ministry of Culture is for museums' research staff to hold a PhD degree in order to be eligible for research funding. Yet the theoretical research pursued in academia is often at a far remove from the work of the museum with its exhibits and stored treasures. If one of the museum's staff gains a PhD fellowship and is thus physically located at the university, the museum may find that the person becomes distanced from the real world of the museum. And later, the museum risks losing him or her to an academic research career. What was initially and ostensibly a grant for the museum in effect turns into funding for the university.

"There may be a gap between the two worlds. Small museums in Denmark's more remote provinces have found it difficult to strike a joint balance, meaning one that also serves the interests of the museum", says Henrik Tronier. "VELUX FONDEN would like to assist in bridging the gap between museums and academia and allying them in a collective research approach. Both parties stand to gain a great deal from each other. The university researchers would benefit from access to the museums' collections and empirical expertise, and dissemination of their research would be broadened because museums reach a wider public. Conversely, the museums can apply the theories of academic research to frame new perspectives on their collections and as a resource for mediation of the collections in a more effective and relevant manner by placing them in a wider context".

COLLABORATION IS THE SOLUTION

Rather than concentrating on funding an individual museum worker through a PhD, VELUX FONDEN wishes to invest in large-scale, collective projects and on fostering an environment in which the total body of knowledge and the approaches of different people are mutually boosted. This would generate the critical mass required for attaining a high international standard and retaining researchers at museums. And this in turn requires more staffing and more funding. VELUX FONDEN envisages that the new diversified research alliances will be capable of combining the best from the museums with the best from academia, and indeed, reach a wider public with their results.

The Fisheries and Maritime Museum, in partnership with the Museum of South Jutland and the Centre for Maritime and Regional Studies at the University of Southern Denmark, received a grant of DKK 3,982,179.

The project will shed light on the immense influence of Amsterdam on everyday life and material culture in Denmark and the Danish economy in the 1600s-1700s in a precursor of contemporary globalisation.

Photo: Fisheries and Maritime Museum. Cinnamon
Photographer: Brian Kristensen

Of this year's grants, just under DKK 4 million has, for example, been awarded for a partnership between two museums and a university: the Fisheries and Maritime Museum, the Museum of Southern Jutland and the Centre for Maritime and Regional Studies at the University of Southern Denmark. Each possesses detailed knowledge of Dutch and Danish contact in the 1600s-1700s, and they are now jointly investigating and recounting the story of the prosperous Netherlands and the peripheral northern neighbour and placing this in a broader context of globalisation. In seven sub-projects, the research investigates aspects of the world city of Amsterdam's influence in Denmark. The researchers' expertise spans history, ethnology, anthropology and educational theory. In this way, the project promotes interdisciplinarity, which is also part of VELUX FONDEN's ambition.

INDEPENDENT PROJECTS

"Researchers and mediators find each other unaided. We will not be forcing people together, but rather incubating the seeds of their ideas and ventures. All of the projects must be run by the researchers and mediators themselves, and we have no agenda whatsoever regarding topics, but solely for the overarching and long-term aims of the programme", says Henrik Tronier.

Rikke Helverskov Jacobsen: "When we visited the museums, some of the small and medium-sized ones told us that they probably didn't have a chance of mounting research and mediation projects in competition with large museums. We want to construct our museums programme so that everyone is eligible, regardless of size. One way of doing so is by giving small museums opportunities for contributing small-scale sub-projects under the main alliances. We are pleased that this has been possible to achieve".

VELUX FONDEN also places great emphasis on the projects' way of working and organising themselves. Bridging some of the gaps identified by the museums. "We support projects that can achieve reform in the long term. Experiences are gathered and passed on to the whole of the museums sector", says Rikke Helverskov Jacobsen.

The Museums Programme funding is provided by covering payroll expenses on research and mediation. Superficially this may be "boring" and "invisible" funding, and certainly not as noticeable as donating a spectacular museum building, but it may be of crucial importance in the work behind the scenes to ultimately serve a tangible purpose in increasing the cultural value of the museums for the nation.

Why not let orphanage children and prison inmates tell their own stories? Either directly or through the literature. People in the welfare society's institutions could participate, by their own testimonies, in building up the museums devoted to their existence. In addition would be the striking insights into their lives gained by the public from physically stepping into a former orphanage or prison. The Welfare Museum in Svendborg, the Prison Museum in Horsens and the Centre for Welfare State Research and the University of Southern Denmark are allied in the aim of presenting a new social history of Denmark. They have received a joint grant of DKK 5.8 million for combining historical studies with anthropological and literary research.

Again, the principle aim is to bring different people together. To open doors. Between researchers and mediators under the same roof. Between researchers at the museums and in academia. Between one museum and another. Between the museum and its visitors. And next year it continues.

Faaborg Museum in collaboration with the Department for the Study of Culture at the University of Southern Denmark, received a grant of DKK 2,811,270.

The project will juxtapose the contemporary theory of presence as it is applied in the humanities with art appreciation as elicited by the premise of synchronistic-mode museums of history.

Photo: Faaborg Museum – Small paintings gallery.
Photographer: Hélène Binet

Museum of Copenhagen in association with Odense City Museums, the Nya Lödöse medieval-city excavation project in Gothenburg (including the national Swedish museums agency National Historical Museums, Bohusläns Museum and Museum of Gothenburg) and Centre for Urban Networks Evolution, School of Culture and Society at Aarhus University, received a grant of DKK 4,903,500.

The project will investigate the links between urbanisation, migration and the formation of urban identities in Scandinavia in the period 1000-1700 by means of the extensive materials resulting from three major urban archaeology projects in the Danish cities of Odense and Copenhagen and in Gothenburg in Sweden.

Photo: Museum of Copenhagen. Mockup of the envisaged user experience and mediation of physical finds from the excavations.
Graphic design: Spild af Tid ApS

PERNILLE STENSGAARD

Pernille Stensgaard (b. 1960), reporter with Weekendavisen. The author of a number of publications, including 'Da Louisiana stjal billedet' (2008) on Denmark's Louisiana Museum of Modern Art. Most recently 'Københavnerne' (2013) on Copenhageners.

Articles

GRANTED PROJECTS

39 RESEARCH AND COMMUNICATION IN TECHNICAL & NATURAL SCIENCES

VILLUM FONDEN aims at creating world-class research and supports innovative research at a high international level.

Efficient algorithms, randomness, and hash functions

BY MIKKEL THORUP

RECIPIENT
Mikkel Thorup

PROJECT
Villum Kann Rasmussen Annual Award 2015

GRANT
DKK 5,000,000
from VILLUM FONDEN

The volume of data which computers are required to process is exploding under the nickname 'Big Data'. One solution is either to make computers faster or to get many of them to work together. But the most important thing is to have efficient algorithms. An algorithm is a smart way of solving a problem. The smartest algorithms often use randomness and so-called hash functions.

SORTING COSTS TIME AND MONEY

If we want to sort numbers, a straightforward method is to start by finding the smallest number. This is done by looking through all the numbers, always remembering the smallest one we have seen so far. Then, we look at the remaining numbers after the second-smallest and so forth. This is easy enough with just the few numbers shown in Figure 1. If you sort numbers, you end up with n(n-1)/2 number comparisons. This may not sound so bad, but if we are sorting a billion numbers, even using a fast processor it would take more than three years. And even if the task was divided up among a thousand processors, it would take a whole day, and would still cost a lot of energy.

A smarter sorting algorithm is QuickSort *(see Figure 1)*. Here we start by selecting an item at random (number 44) and then we split the rest of the numbers up into those smaller and those bigger than that item. We can then sort the smaller and the bigger numbers separately. This algorithm is only expected to perform 2 n ln n number comparisons, which in terms of time translates into eight seconds as opposed to three years using a single processor. The reason we use randomisation here is because the random number we use for splitting at is very likely going to be somewhere midway.

ABOUT STORING ITEMS ON A COMPUTER

Another important application for randomness is when we store things on a computer. You might like to imagine the store as a gigantic system of boxes. Let's suppose we had a fixed system, where all dolls are stored in box no. 953. Now, if we have nothing but soft toys to store, then they all end up in the same box, which would be overfilled and difficult to

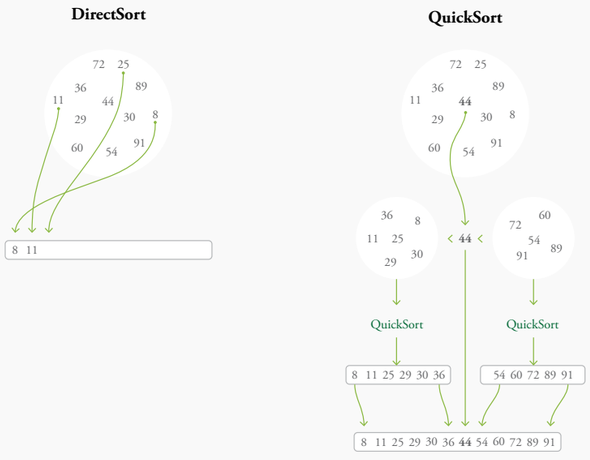


Figure 1. Sorting.

Graphic: Mikkel Thorup

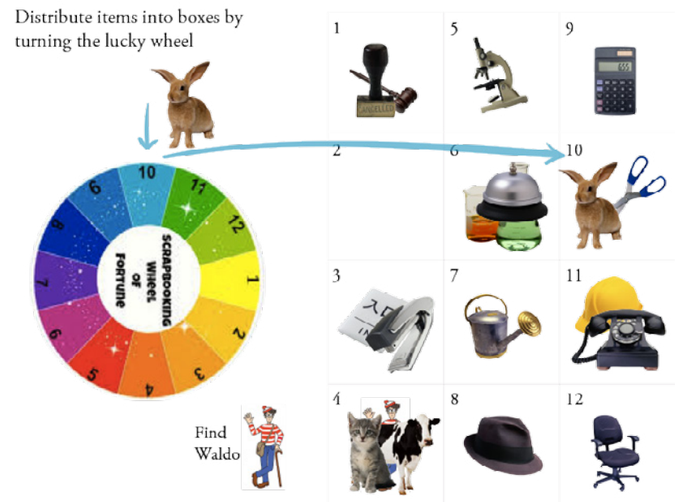


Figure 2. Random sorting of items into boxes.

Graphic: Mikkel Thorup

find our way around in. The aim is to get the items fairly evenly distributed so that none of the boxes get overfilled.

The idea now is instead to place all the items on random shelves. This is illustrated in Figure 2, where we put all the shelf numbers on a wheel of fortune. When we turn the wheel, we get a completely random shelf number. For the rabbit, the wheel says 10, so we put the rabbit in box no. 10. This solution is expected to allocate the items evenly. In purely mathematical terms of n-items and m-boxes, each item is expected to be stored with (n-1)/m other items.

But what do we do when we need to find something hidden in one of the many boxes? It's all well and good using a wheel of fortune to decide where to stuff the items, but then we won't know where we put them. In Figure 2, we want to retrieve Waldo in the red and white striped shirt, but where did the wheel of fortune dispatch him to?

What we need is known as a hash function, which, like our wheel of fortune, assigns all items to random boxes, but where we can always recalculate which box an item belongs in. Ideally, we would want a completely random hash function that assigns independently random numbers to all items, but this can't be done.

The property we need is for two random items to end up in the same box at a probability of 1/m, where m=12 is the number of boxes. To do that, we can get by with two random numbers, a and b, which describe without further ado where everything goes. This concept is illustrated in Figure 3.

On a computer, all items are represented as integers (whole numbers), shown here in red. We picked a prime number, p=1009, which is larger than all of the numbers to be stored. In addition, we have two numbers, a=679 and b=495, and the hash function h is now expressed as h(x)=(((a*x+b) against p) against m)+1. The algorithm may not be pretty, but

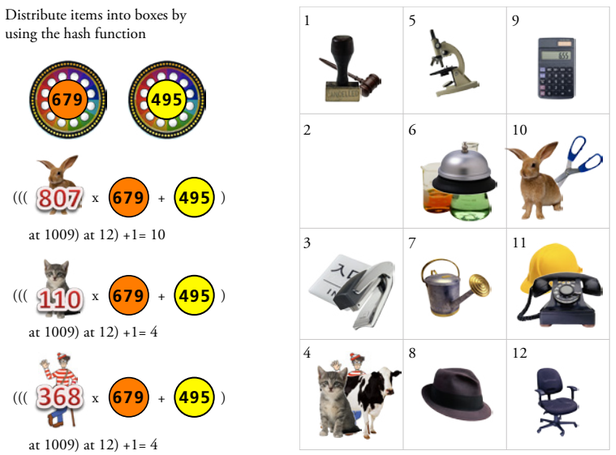


Figure 3. Sorting of items into boxes using a hash function to allow them to be retrieved.

Graphic: Mikkel Thorup

it assigns a hash value, h(x), between 1 and m, to a random x<p. For Waldo, h(368)=4, so he's in box no. 4. The point being that if a and b are randomly selected with a being positive, then the probability of two given items being allocated to the same box is max. 1/m.

When we use a hash function to save items in the computer's storage, we call it a hash table. This is one of the things computers use most.

ABOUT FINDING SIMILAR ITEMS

A completely different application for hash functions is when we want to find out how much two sets of items resemble each other. This kind of process is used everywhere in analysing Big Data. In Figure 4, we illustrate this with lists of favourite films. The idea is that if you can find a user whose film preferences largely overlap with your own, then the two of you can probably rely on each other's recommendations. This is the kind of thing involved when Netflix suggests a film based on what you watched previously.

We now use a hash function for assigning different random numbers to all films. For each user, we store only the smallest hash value. We say that two users resemble each other if they have the same smallest hash value. It may seem pretty naive, but again, there's some neat maths behind it. The probability of two users having the same smallest hash value is exactly the quantity of films they both recommend, divided by the total number of films they recommend between them. For Peter and John, this is 1/19, for John and James it's 2/18 and for Peter and James, it's 7/13. Not surprisingly, Peter and James were the ones with the same smallest hash value.

If we repeat the experiment with different hash functions, we get more precision. Now, this is easy enough when we only have lists of 12 films to compare. But things get really interesting when we use it to compare very long lists using just a few hash

Peter		Hans		Lars	
The Shawshank Redemption	83	A Hard Day's Night	75	The Godfather	21
The Godfather	21	The Godfather	21	Raiders Of The Lost Ark	45
The Godfather II	44	Singin' in the Rain	63	Star Wars Episode V	07
Star Wars Episode V	07	Finding Nemo	40	The Shawshank Redemption	83
The Dark Knight	26	Repulsion	77	Jaws	15
Apocalypse Now	86	Inside Out	39	Goodfellas	68
Pulp Fiction	78	Boyhood	88	Apocalypse Now	86
Goodfellas	68	King Kong	64	Singin' in the Rain	63
The Lord of the Rings III	20	Toy Story 2	73	Pulp Fiction	78
Fight Club	95	The Seven Samurai	15	Fight Club	95
Smallest hash value	07	Smallest hash value	15	Smallest hash value	07

Figure 4. Those with the same smallest hash value also have a similar preference for films.

Graphic: Mikkel Thorup

functions. Search engines use this to rapidly find similar websites on the internet.

The principle at work here is that for any given set of item, each item has the same chance of being assigned the smallest hash value. Hash functions like this are not so easy to come up with, but the best available are the ones I published jointly with one of my PhD students, Søren Dahlgaard, in 2014.

HASH FUNCTIONS GENERALLY

What makes hash functions so challenging to deal with is that most people pretend they have a completely random hash function, yet no such thing exists. Instead, we end up using a set of hash functions that may look random, but which can't actually be trusted at all. For example, during my time working for AT&T, I discovered how attacks on the internet could cause hash tables to crash completely, and this was what really caught my interest. Because often we don't actually need full randomness, just a set of limited probabilistic properties. My aim is to understand the limits of what is doable, and how costly it is to make things secure.

MIKKEL THORUP

Mikkel Thorup (b. 1965), professor in the Department of Computer Science, University of Copenhagen since 2013. Here he heads up the Center for Efficient Algorithms and Data Structures, funded by an elite research grant from the Danish Council for Independent Research. From 1998 to 2013, he was the principal industrial researcher at AT&T in the US. He is a member of the Royal Danish Academy of Sciences and Letters, and his international awards range from industrial influence through computer science to pure mathematics.

Villum Research Station, Station Nord

BY HENRIK SKOV

RECIPIENT

Department of Environmental Science, Aarhus University

PROJECT

Construction of a new, state-of-the-art research station at Station Nord in northeastern Greenland

GRANT

DKK 70,500,000
from VILLUM FONDEN

Over the next century, climate change caused by anthropogenic greenhouse gas emissions will pose one of the greatest challenges for the global community. The research station makes it possible to conduct climate research which was previously not feasible in the High Arctic.

H.M. Dronning Margrethe II in front of the Villum Research Station two days after the opening.

Photo: Kristian Engelhardt Kristensen

Figure 1. Villum Research Station, Station Nord, is located in the High Arctic environment of northeastern Greenland.

Graphic: Wikipedia

TWO-FOLD TEMPERATURE INCREASES IN THE ARCTIC

Over the next century, climate change caused by anthropogenic greenhouse gas emissions will pose one of the greatest challenges for the global community. In the Arctic, the rise in temperature is twice the average in the rest of the world (IPCC, 2013).

Even now, the warmer climate has had great impact on sea ice cover, ecosystems and biodiversity, with impending consequences for local communities, industrial development, transport and international politics. The extent of summer ice in the Arctic Ocean has been reduced by 40%, the composition of multiannual and new ice is radically altered, and spring arrives earlier each year (IPCC, 2013). This has great consequences for the physical, chemical and biological systems and processes. It does, however, permit the utilisation of resources in these otherwise inaccessible regions.

KNOWLEDGE OF THE ARCTIC REMAINS LIMITED

While much new knowledge has been gained about the Arctic in recent years, it is still one of the regions of the world we know least about. One limiting factor is the lack of research logistics in the High Arctic especially. The logistics of conducting research in the High Arctic are very challenging indeed. This is due primarily to the impassable location and the lack of modern research infrastructure. It is therefore crucially important to establish new, well-suited and easily accessible research facilities in the High Arctic region.

STATION NORD IS MADE UP OF THREE KEY STATIONS

The Base Station consists of a researcher building of 360 m2, a garage of 110 m2 and an air measurement facility of 110 m2; see Figure 2. The Station is one of very few High Arctic facilities to be open all year round. The researcher building sleeps 14 researchers at a time. In addition, The Base Station consists of four laboratories, a non-sterile laboratory, a chemistry laboratory, a biochemistry laboratory and a sterile-research, restricted-access laboratory. Finally, the researcher building contains a small flat for the chief logistician, office facilities and a living room and small kitchen where the researchers can relax *(Figure 3)*.

The garage is used for storing scientific field equipment and 'The Mobile Station' including its vehicles.

The air measurement facility is located 2 km away from the Station Nord boundary in order to minimise the effects of local air pollution. Transportation

The complex consists of three main units and is scheduled for completion in 2016:

1. **The Base Station:** a number of buildings containing laboratory and accommodation facilities, for studying air pollution, ice, climate and biological processes in the vicinity.
2. **The Mobile Station:** snowscooters and other snow vehicles, sleds, tents etc., for studies of chemical, physical, geological and biological processes at sites remote from Station Nord.
3. **The Air Station:** drones that will facilitate studies of vertical atmospheric composition and airborne land observations (remote sensing).

Figure 2. Researcher building with accommodation and laboratory facilities for 14 researchers at a time. In extension of this, the garage is dimensioned for storage of a range of field equipment.

Photo: Stephan Ingemann Bernberg

Figure 3. One end of the researcher building contains a living room and small kitchen for use by the visiting researchers.

Photo: Stephan Ingemann Bernberg

Figure 4. The air measurement facility is equipped with specially designed inlets for a range of different air measurements.

Photo: Christel Christoffersen

by snow scooters and other vehicles to the facility is thereby also kept to an absolute minimum. The air measurement facility is equipped with specially designed intakes for measuring particles and gases in the atmosphere *(Figure 4)*.

The Mobile Station will make it possible to conduct research at some distance away from Station Nord, either along the coast or out on the ice.

The Air Station will consist of a fleet of drones, which will be equipped with sensors for measuring the surface properties of the ground, ice, snow and sea. Other drone equipment will measure air pollutants and other critical atmospheric compounds at different altitudes. Finally, this Station will comprise a number of remote sensors for measuring the vertical composition of critical atmospheric compounds. The air measurement facility is capable of operating independently or in conjunction with The Mobile Station or The Base Station.

VILLUM RESEARCH STATION OPENS ITS DOORS TO INTERNATIONAL RESEARCH

Villum Research Station will be open to both the Danish and the international research communities. This will be facilitated via the recently established Arctic Research Centre at Aarhus University and the likewise recently established Arctic Science Partnership made up of research groups in Denmark, Greenland and Canada.

The establishment of the research infrastructure will thus result in an international platform for interdisciplinary research on the impact of climate change in the Arctic regions, including a deeper understanding of the implications for the sea ice,

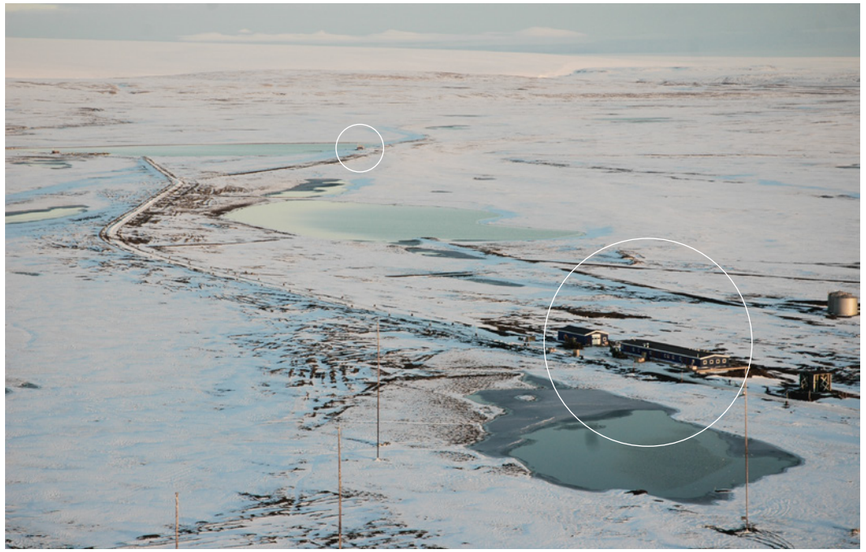


Figure 5. Villum Research Station, Station Nord. The large circle identifies the researcher building and garage, while the small circle denotes the location of the air measurement facility.

Photo: Bjarne Jensen

glaciers, ecosystems and atmosphere. Studies of these elements are necessary in order to answer the significant scientific questions relating to global warming in the Arctic and its impacts on the rest of the world.

A GOOD START

Villum Research Station, Station Nord, has got off to a good start. In this year alone, around 100 researchers from eight different countries spent 1,700 nights between them at the station. The activities range from atmospheric chemistry and physics, geology and microbiology to traditional marine biology and terrestrial biology. The Station is now being readied for season 2016 and great interest in using the facilities has already been registered.

HENRIK SKOV

Henrik Skov (b.1962), professor in the Department of Environmental Science, Aarhus University. He is Director of Villum Research Station, Station Nord, located in the far north of Greenland. He has more than 20 years' experience of research in Arctic atmospheric chemistry, on which he has written many articles, and is principal author of a report to the United Nations Environment Programme (UNEP) on atmospheric mercury, which led to the global ban on mercury.

The zebrafish – a holistic environmental model

BY KURT BUCHMANN ET AL.

RECIPIENT

Department of Veterinary Disease Biology, University of Copenhagen

PROJECT

'The Zebrafish Research Model'

GRANT

DKK 2,424,000
from VILLUM FONDEN

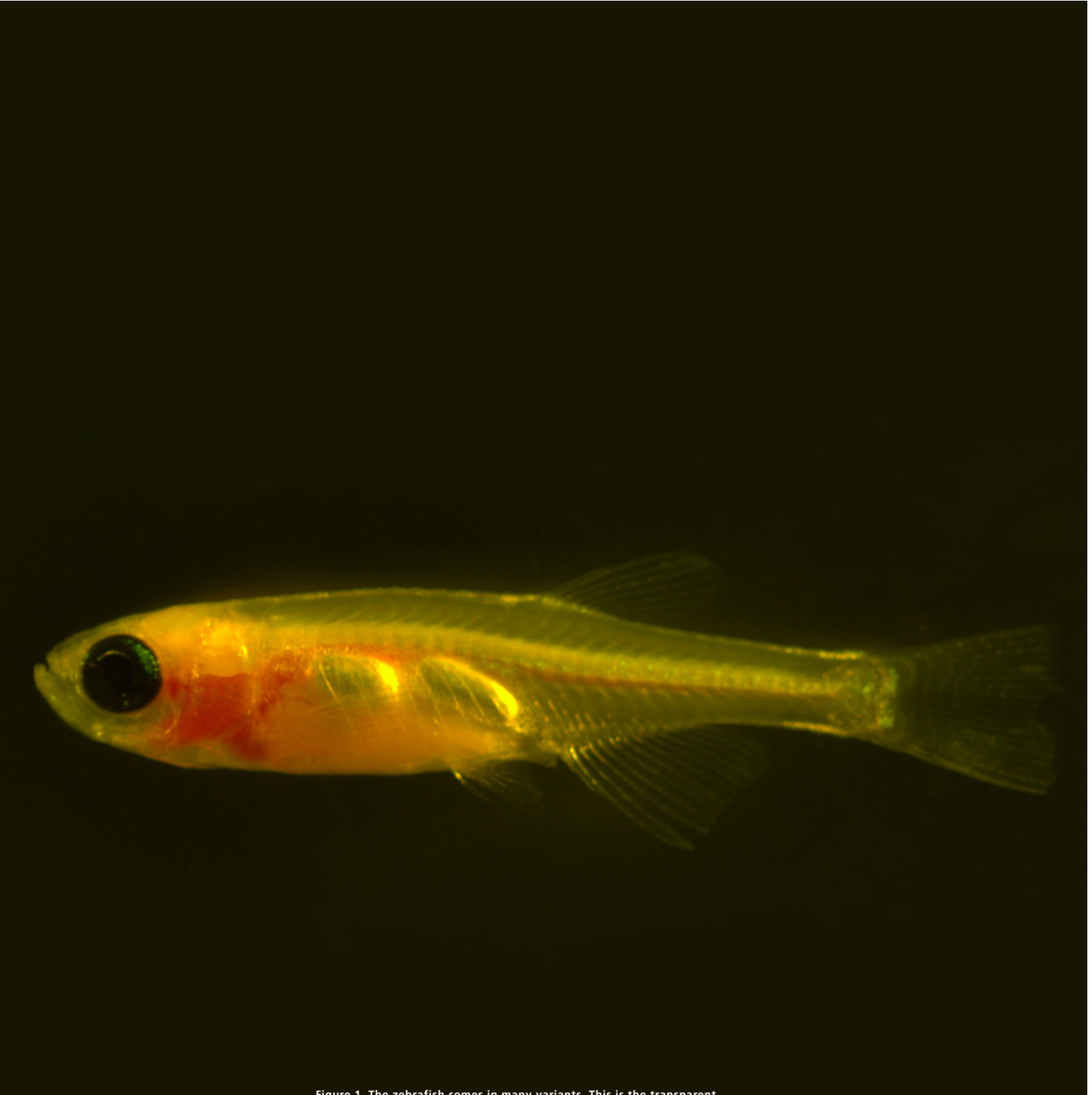


Figure 1. The zebrafish comes in many variants. This is the transparent, non-pigmented zebrafish. The fish may be used in observing physiological events in the adult fish body.

Photo: Louise von Gersdorff Jørgensen

The small tropical fish, *Danio rerio*, a familiar sight in home fish tanks, has in the space of a few years gained star status in the international research community. It is valuable as an experimental animal in most fields of biological research and represents an eminent model of functions in higher vertebrates, including Man. The development of a holistic model, which records all significant physiological reactions, makes it possible to assess environmental impacts on the entire organism all at the same time. This fish model has potential applications in both environmental and medical research.

The project links a number of basic physiological functions in a single zebrafish model. The model will at one and the same time be capable of demonstrating an entire individual's reaction to an environmental factor. The focus is thus not merely on a single topic, but takes into account the entire functioning of the fish. This comprises the fish's immediate behavioural reaction in the spatial dimension; its internal organ functions (heart, brain, liver, spleen, glands), intestinal function, reproductive organs and immune system. The project attaches importance to presenting and viewing the fish holistically rather than as fractioned sections.

FROM HOME FISH TANK TO RESEARCH

The zebrafish, bearing the scientific name Danio rerio, has been a popular pet fish in home fish tanks for decades *(Figure 2)*. This little striped fish, which originated from rivers in northern and central India, has delighted young and old tropical fish enthusiasts all over the world.

However, in the past, this seemingly ordinary fish was not the object of any notable scientific interest. In recent years, though, researchers have discovered the value of the zebrafish as an experimental animal. This fish can easily be kept in limited space in the laboratory as it is usually no more than 3 cm in length. It breeds rapidly in captivity, producing many juveniles (100-300 eggs per female per spawn) and has a relatively short generation time of 2-4 months. Because foetal development in the transparent egg can be followed in a petri dish, the fish is also a valuable resource in biological research.

All details – even each individual cell division – in the early development of the fertilized egg can be observed under the microscope. The tiny fish larva hatches just three days after fertilization. The larva is also transparent, which permits microscopic analysis of all its organ. Researchers have access to many thousands of different variants and mutants with different attributes for detailed study. The transparent zebrafish *(Figure 1)* is especially useful for investigating internal reactions in adult fish too. The zebrafish complete genome is well known which is

Figure 2. The zebrafish *Danio rerio*, an Indian striped tropical fish, has in recent years become popular with researchers conducting animal experiments.

Photo: Louise von Gersdorff Jørgensen

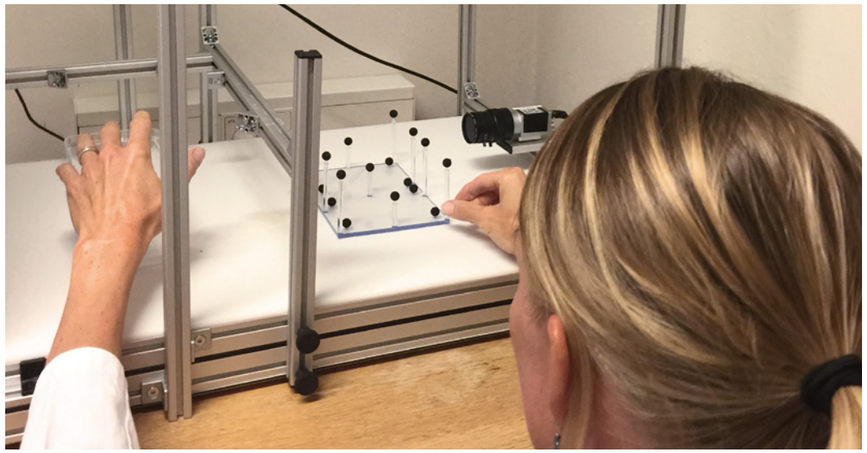


Figure 3. Zebrafish behaviour may be observed in different ways. Here a system is being configured and calibrated for video recording and computer analysis of zebrafish movement.

Photo: Kurt Buchmann

a huge advantage for researchers in their efforts to decode gene regulation in higher animals.

A LITERARY FAVOURITE

Within the last decade especially, the species has risen to unprecedented fame in the international scientific community. From 1990 to 2015, thousands of research articles have been published on zebrafish. Advances in this field of research have been impressive in recent years. This was clearly reflected at the European Zebrafish Meeting this year, which convened more than 800 researchers on the topic of the zebrafish as a model.

The zebrafish is currently aiding research related to the environment, nutrition, human growth, immunity, cancer biology, genetics, cardiac function, diabetes, lifestyle disease, inflammatory bowel disease and pharmaceutical products, to mention but a few of the most popular fields of research.

Because the fish is so easy to keep, it is also used as a model for farmed fish (carp, trout, salmon, seabream, European seabass), which is invaluable for fish farmers, who supply food fish for the planet's population.

BEHAVIOURAL MEASUREMENTS

A zebrafish reacts rapidly to changes in its environment. With its innumerable sensory cells, the fish relays a message from its skin, fins, gills, lateral line (sensory) system, eyes, oral cavity and nares to its brain, which responds by activating the body's peripheral nerves and muscles. The resulting pattern of movement in the fish may be recorded in various ways, but with the aid of a video-based computer system, the researcher can set up reproducible behavioural measurements. The fish is placed in a small tank, and its movements are recorded by two video cameras hooked up to a computer *(Figure 3)*.

"THE ZEBRAFISH'S ANCESTORS AROSE 450 MILLION YEARS AGO, AND, FROM THIS PROTOTYPE, DEVELOPED INTO AMPHIBIANS, REPTILES, BIRDS AND MAMMALS. ALL OF THESE ANIMALS POSSESS AN ADAPTIVE IMMUNE SYSTEM; THE SYSTEM WHICH GIVES HUMANS THE ABILITY TO RECALL AND REACT SPECIFICALLY TO CERTAIN PATHOGENS".

ORGAN FUNCTIONS AND INTERACTION

The zebrafish is equipped with a diverse abundance of organs with glandular functions, as seen in higher animal species. The organs are not always as well-delimited as seen in mammals, and its pancreatic and thyroid tissue is more diffusely arranged along its digestive tract. The kidney is well-delimited, while its adrenal tissue is dispersed as interrenal cells in the anterior portion of its kidney.

Hormonal production in the tissue makes it possible to characterise the location and extent of the organs. By using specific antibodies reacting with insulin it is possible to gain insights into the state of the insulin-producing beta cells in the pancreas. Specific antibodies against the hormone thyroxin bind to cells in the thyroid, just as antibodies against the stress hormone cortisol bind to the interrenal cells. In the same way, sex hormones in the ovaries and testes can be localized and provide information about reproductive dependency on the body's general condition and interaction with other organ systems.

BRAIN ACTIVITY

Sensory impressions are transmitted from the surface of the zebrafish to its central nervous system, where impressions are processed and stored and reactions triggered. Environmental impacts are read as a change in the fish's behaviour, but in advance of the reaction, the process involves a series of biochemical processes in the fish's nervous system. Although the zebrafish nervous system is a good deal less complex than it is in humans, it does allow us to describe a number of basic functions in the central nervous system. Communication proceeds by means of nerve signalling substances known as neurotransmitters. One of those signalling substances is serotonin, which can now be observed in the zebrafish brain during OPT (Optical Projection Tomography) scanning. This technique is based on the knowledge that specific antibodies are able to bind to the transmitter molecule in special sections of the brain.

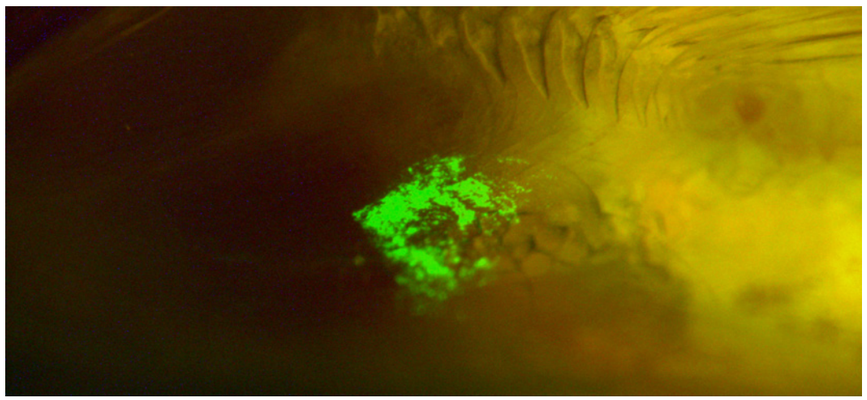


Figure 4. The zebrafish is regarded as an integrated organism that triggers a whole series of immunological functions in response to environmental changes. Here fluorescent bacteria are absorbed through the fish's surface.

Photo: Louise von Gersdorff Jørgensen

IMMUNE RESPONSE

The fish's immune system bears many resemblances to that of human beings, and this is also the reason why the zebrafish has become so popular for modelling the human body's reaction to infectious diseases. The zebrafish's ancestors arose 450 million years ago, and, from this prototype, developed into amphibians, reptiles, birds and mammals. All of these animals possess an adaptive immune system; the system which gives humans the ability to recall and react specifically to certain pathogens (disease-causing germs). This is the reason why we are now able to vaccinate our children against a large number of diseases.

The immune system's main organs in the zebrafish comprise the anterior part of the kidney, the so-called head kidney; the thymus located in the gill cavity and the spleen (in the abdominal cavity). This permits researchers to follow how immune system stem cells from the head kidney mature in the thymus when their fate is to end life as T cells.

The spleen is seen to have both B and T cells, which together with macrophages deal effectively with any pathogens they come across.

SIGNALLING MOLECULES

As far back as 450 million years ago, the early ancestors of the zebrafish possessed basic immune system elements such as B lymphocytes, T lymphocytes, dendritic cells, macrophages and granulocytes. These immune system elements were capable of producing specific antibodies which, combined with a number of other proteins, kept the body free of infections.

The responses are guided and controlled by means of a number of cell-signalling molecules, cytokines, which ensure the smooth functioning of a complex network of reactions. Based on established knowledge of the zebrafish genome, we have developed a toolbox. We use this to shed light on how more than 45 genes for immune system molecules are

activated in a coordinated sequence when the zebrafish is exposed to an environmental impact or infection.

The transparent zebrafish allows us to demonstrate how pathogenic bacteria are absorbed internally via its surfaces (skin, fins and intestine). By using light-emitting bacteria *(Figure 4),* the investigator can observe how particles and even dead bacteria find their way from the environment into the inside of the fish, where defence reactions are immediately initiated with the purpose of eliminating the foreign substances.

ENVIRONMENTAL IMPACT

The zebrafish's functions in its many organs are closely linked. When the fish is exposed to an adverse environmental impact, a stress hormone is produced in the head kidney's interrenal cells. Cortisol, as this stress factor is called, then rushes into the blood stream and bonds with immune cells and organs with the result that resistance is impaired and the invasive bacteria are unhindered in their attempt to debilitate the fish. The fish's basic physiological functions are impaired and the fish's behaviour changes.

Conversely, the zebrafish can also be used to demonstrate how this physiological network is optimised when the fish is stimulated by other factors. Immune-system stimulants optimise the fish's immunological reactions to improve its state of health.

In this way, the zebrafish and our linked system of research tools serve as a flexible model of the complex network of organs, signalling molecules and effector molecules that also occur in higher animals, including human beings. This includes the brain, the peripheral nervous system, the heart, liver, kidney and spleen and, not least, the immune system's amazing responses. From being a cute pet in a home fish tank, the zebrafish has gone on to become an experimental star, blazing a trail for a better environment and improved aetiologies (understanding of how disease is caused).

KURT BUCHMANN, PER W. KANIA, SIMON HAARDER, LOUISE VON GERSDORFF JØRGENSEN

Kurt Buchmann, professor of aquatic pathobiology, Faculty of Health and Medical Sciences, University of Copenhagen. His field of research covers fish health, fish biology, vaccinology and immunology.

Per W. Kania, associate professor of aquatic pathobiology. Conducts research in molecular biology tools for fish.

Simon Haarder, PhD student. His research has particularly concerned intestinal functions in healthy fish.

Louise von Gersdorff Jørgensen, assistant professor of pathobiology. Designs fish models for applications in fish immunology and vaccine research.

Materials under pressure

BY MARTIN BREMHOLM

RECIPIENT

Assistant Professor Martin Bremholm, Department of Chemistry and Interdisciplinary Nanoscience Center, Aarhus University

PROJECT

'High-pressure synthesis and characterisation of new materials'

GRANT

DKK 2,840,216
from VILLUM FONDEN

The discovery of new materials has always been a driver for progress in materials science. High-pressure synthesis is a powerful technique for discovering new materials. The application of high pressure holds unique potentials for stabilising new crystalline compounds, which can often revert without undergoing phase transitions.

A popular example is the formation of diamonds under pressure in the Earth's mantle. The Department of Chemistry at Aarhus University has established Denmark's first high-pressure laboratory devoted to high-pressure synthesis and structural studies of materials under high pressure.

The large-volume press shown in the photo weighs 10 tonnes and is capable of generating an axial force equivalent to 1,000 tonnes. The force is transferred via an ingenious design to eight cubes and finally to the test piece at the centre. In this way, the test piece is subjected to consistent pressure of up to 25 GPa (250,000 atm) and, at the same time, can be heated to 2,000 °C.

Although the equipment could be used for producing synthetic diamonds, instead, research using high pressure is motivated by exotic compounds such as multiferroics, topological insulators and superconductors.

A number of hypothetical compounds are synthesised under high pressure. Pressure also plays a major role in synthesising new members of families

The press in the photo weighs 10 tonnes and wields an axial force equivalent to 1,000 tonnes.

Photo: Max Voggenreiter GmbH

of structures in order to study them more comprehensively and systematically. In addition, researchers study materials under extreme pressure in so-called diamond anvil cells, which generate pressure in excess of 100 GPa. Aside from materials synthesis, the pressure in these cells is used to induce electronic or structural phase transitions, which provide deeper insights into the materials' electronic interactions and physical properties. Seen from a bigger perspective, this means that they are helping to promote new technological breakthroughs.

61 HUMANITIES

VELUX FONDEN awards free research funds primarily in order to promote group projects focusing on basic research at the highest academic level at Danish universities and cultural institutions.

Are boys losing out in the educational system?

BY CHRISTIAN HELMS JØRGENSEN

RECIPIENT

Department of Psychology and Educational Studies, Roskilde University

PROJECT

'Are boys losing out in the educational system?'

GRANT

DKK 4,997,509
from VELUX FONDEN

Boys have a poorer academic record than girls in terms of grades, and in terms of actually completing any education beyond compulsory secondary school. The research project examines whether boys are in fact losing out in the way so often claimed in Danish public debate. The project studies male youths in upper secondary education with an interest in the significance they attach to education and how they envisage their future working lives.

Are the traditional male occupations losing esteem?
Photo: Monkey Business Images

The premise of the project is that boys generally have a poorer academic record than girls, and that fewer boys than girls complete upper secondary education. These factors have engendered a new story in the media and in educational policy of 'males losing out in the educational system'. The project sheds a critical light on this claim by investigating the changes that have occurred in recent decades in how males relate to education. The project also follows four groups in their late teens – most of them young men – on four different upper secondary study programmes over a period of two years. The aim is to arrive at a nuanced and in-depth understanding of the influence of different masculinities on how young males relate to education.

BOYS AND GIRLS FOLLOW DIFFERENT EDUCATIONAL PATHWAYS

The project follows four groups of late-teens, primarily male, on four different upper secondary study programmes over a period of two years. To gain insights into the social and subjective processes that cause student defection, the project also follows those youths who drop out of their studies. This provides access to a nuanced understanding of the very different significances that education holds for different adolescent boys and young men. The project indicates that it is not meaningful to regard male adolescents as a homo-geneous group, or generally as those who 'lose out in education'. The mutual differences between boys are far greater than the differences between boys and girls generally.

The extremely gender-specific Danish labour market is a contributory factor in the tendency for boys and girls, respectively, to follow different educational pathways. Boys make up the majority of the student body on technical vocational programmes, which are challenged both by a shortage of work-experience placements and by the major social policy mandate, which affects individuals with limited resources.

Girls are more likely to enrol in 6th-form education because the female-dominated degree programmes (e.g. nursing and pre-school teaching) now require academic skills and qualifications. Although this means that women formally achieve a higher level of education than men, in fact, ultimately men perform as well on the labour market as women in terms of employment and total lifetime earnings.

"GENDER IS INEXTRICABLY LINKED WITH SOCIAL BACKGROUND, LOCAL AFFINITIES AND ETHNICITY IN A WAY THAT POSES SPECIAL CHALLENGES FOR SOME MEN IN RELATION TO EDUCATION".

BOYS PURSUE DIFFERENT SCHOOLING AND TRAINING

Increasing numbers of young people in Denmark have enrolled in study programmes which are more gender-specific than in the other Scandinavian countries, which have more integrated further education. The Danish education system's early segregation of young people into technical colleges, healthcare diploma courses, commercial colleges and 6th-form colleges is partly responsible for a marked differentiation in youth schooling and training, including by gender.

Some boys in the study are consistently attracted to conventional vocational occupations such as that of car mechanic, which combine familial affinity for the occupation, personal leisure/consumption-related interests and a conventionally masculine occupational identity. Other boys are somewhat unreflecting in 'going with the flow' of young people into 6th-form education, very often without any clear idea of what the resulting qualifications will lead to.

Women and men still pursue different educations.

Photo: Goodluz

Finally, a large and heterogeneous group of young people migrate between different further education programmes, which they start and then drop out of. For some, this is part of a 'quest' in which they gradually define their own interests and square them with the opportunities offered by the education system. For others, repeated defection becomes a self-reinforcing process of disappointments and defeats, which leads them to give up gaining an education altogether, and here boys are the most susceptible.

BOYS IDENTIFY WITH MASCULINE ROLE MODELS

The tendency for fewer boys than girls to gain further education is linked to the fact that, for a number of boys, the future they envisage for themselves is not based on gaining a formal education. The masculine identity figures which these boys relate to are from the world of sport, music, the military and IT. These worlds are extraneous to the ordinary labour market and offer role models with high status in some of the boys' youth cultures.

Surprisingly many young males see themselves as having a future career with the military, which they regard as providing access to a strong social community, to exciting experiences abroad and a means of making a difference for other people. They are also attracted by the strict social structure, clear purpose and the discipline entailed. Other young men in the study had a career in go-kart driving abroad for a period of time, or playing professional football, while some dream of earning a living as musicians.

A CHALLENGED MASCULINITY

The increase in men's educational participation is slightly lower than women's, but male uptake in higher education has, as for women, doubled over the last three decades. Gender is not in itself a determinant for high achievement in the education system.

Gender is inextricably linked with social background, local affinities and ethnicity in a way that poses special challenges for some men in relation to education. This is the case for men from outlying provinces, ethnic minorities and men who were raised by parents with no education.

These particular challenges are due partly to the crisis affecting traditional masculinity which recognises the natural dominance of the male by virtue of his role as breadwinner, his physical strength and dynamism. While this figure prevails in the media and popular culture, it clashes with an education system which increasingly rewards language and social skills. Those boys and men who have problems in the Danish education system are very disparate, which means that interventions to increase their participation in education must necessarily be differentiated.

CHRISTIAN HELMS JØRGENSEN

Christian Helms Jørgensen (b. 1952) is Professor with Special Responsibilities in Lifelong Learning at the Department of Psychology and Educational Studies at Roskilde University. His fields of research are transitions from education to working life, vocational education and comparative research in upper secondary education. Project publications include: 'Drenge og maskuliniteter i ungdomsuddannelserne' ('Boys and masculinities in Danish further education'), published by Roskilde Universitetsforlag, 2013.

Do ideology and political ideas count after the Arab Spring?

BY SUNE HAUGBØLLE

RECIPIENT

Sune Haugbølle, PhD, Associate Professor, Department of Society and Globalisation, Roskilde University

PROJECT

'The Production of Secular Ideology in the Middle East'

GRANT

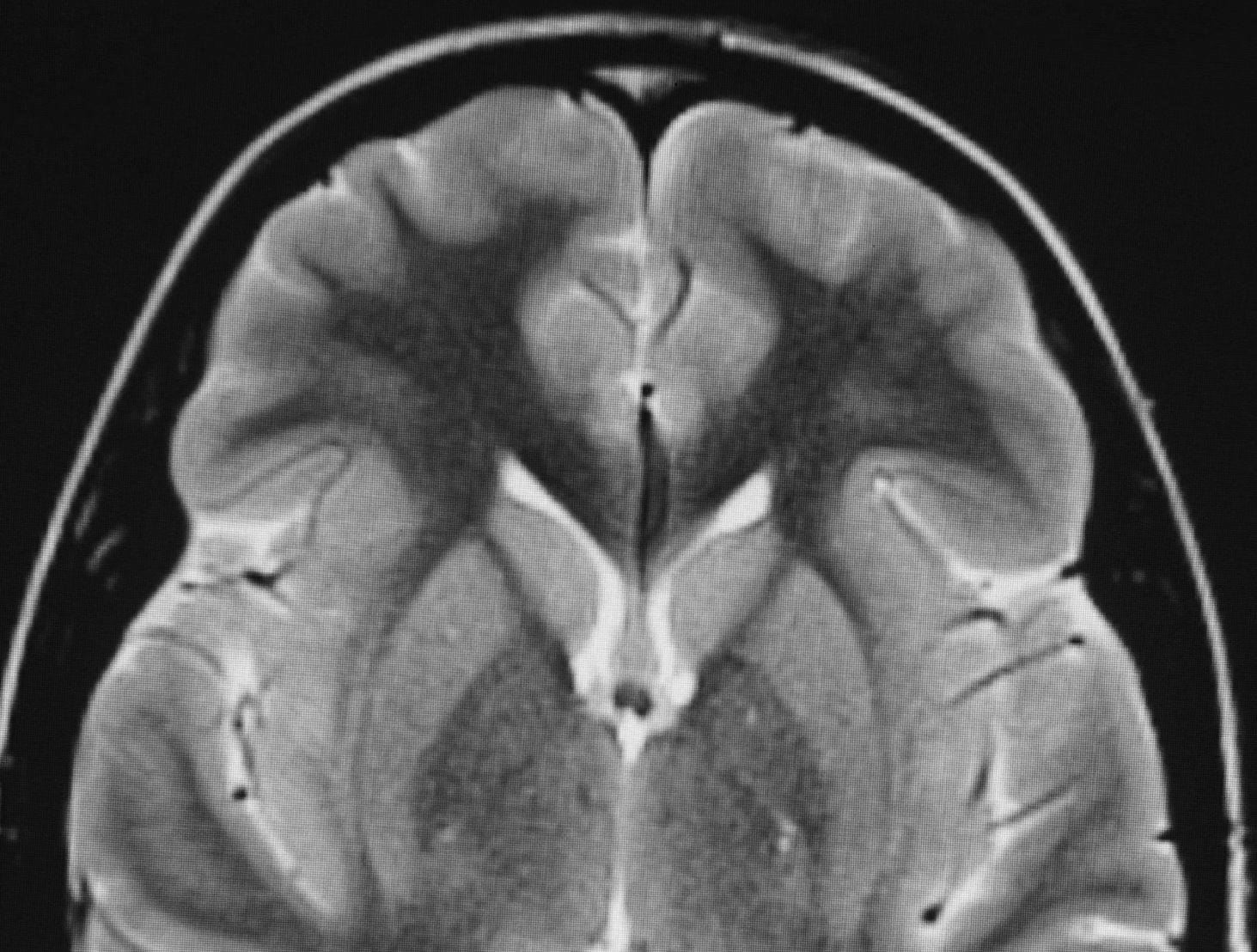
DKK 4,000,000
from VELUX FONDEN

The war in Syria has become the main arena for the democratic Arab uprisings, which with the emergence of Islamic State have taken a very different turn, away from the original hope of free, democratic societies.

The autocratic Syrian regime's use of secularism (where political affairs are discussed independently of religion) to legitimise its power, and the attempts by Islamic factions to set a religious societal agenda have polarised the debate on secularism. Between the two extremes – authoritarian secularism and authoritarian Islamism – secular intellectuals, activists and movements are struggling to maintain standing. These forces have a long-standing history in the region, but have to some extent been overlooked by researchers.

Through ethnographic field work and a study of cultural output, the SIME (Secular Ideology in the Middle East) group at Roskilde University addresses how revolutionary movements and individuals in Syria and Lebanon debate religion and government, minority rights and revolution. The aim is also to gain a better understanding of the influence of ideology and political ideas in the chaotic landscape ensuing from the Arab Spring.

The grant has made it possible to create an internationally recognised research group and attract leading figures to a number of conferences in Denmark.



69 GERONTOLOGY

VELUX FONDEN supports a wide range of projects within gerontology with the aim of improving life quality for the elderly. The foundation supports researchers who contribute to the development and dissemination of knowledge based on research and practice.

Photo: Quinn Dombrowski

The impacts of dual sensory loss on mental health in elderly persons

BY JESPER DAMMEYER, PETER ELSASS,
HANNA HOVALDT, CHRISTINE LEHANE

RECIPIENTS

PCARE multidisciplinary psychology research group, represented by Jesper Dammeyer, the Department of Psychology, University of Copenhagen in collaboration with the CFD non-profit foundation

PROJECT

'Sensory loss in the elderly'

GRANT

DKK 5,131,524
from VELUX FONDEN

Imagine losing both your sight and your hearing. How do you suppose this dual sensory loss would affect your mental state? Or your relationship with your partner?

Dual sensory loss, or combined vision and hearing loss (deafblindness), is most prevalent in the elderly population. Studies reveal that among the over-85s, one in three is afflicted. Given that life expectancy in the general population is increasing, the number of people with dual sensory loss is expected to increase.

To date, only few scientific studies have investigated elderly persons affected by dual sensory loss. These, however, point to an increased risk of depression and dementia, but without the causes being in any way understood.

By collecting data via questionnaires and interviews, the project 'Sensory loss in the elderly' studies the impacts of dual sensory loss on elderly persons' ability to communicate, their social interaction and mental health.

The project also investigates how dual sensory loss affects the individual's relationship with a partner and vice versa, and how partners can best support a loved one affected by combined vision and hearing loss.

In addition to advancing our basic understanding of the impacts of dual sensory loss, the aim for this project is also to extend and optimise the counselling and support services currently available to this elderly population. In this way, the project 'Sensory loss in the elderly' aims to be instrumental in ensuring that the help and support provided are optimised to prevent and counteract the adverse impacts of dual sensory loss on both the afflicted and their partners.

73 OPHTHALMOLOGY

VELUX FONDEN supports promising high-quality research.

Figure 1. Image of the optic nerve in a person with glaucoma. The arrow indicates the thinning of the nerve fibres in the optic nerve, which characterises glaucomatous damage.

Photo: Santibhavank P

Is glaucoma caused exclusively by increased pressure in the eye?

BY MIRIAM KOLKO

RECIPIENTS

Miriam Kolko and the Department of Neuroscience and Pharmacology, University of Copenhagen

PROJECT

'Glaucoma beyond IOP - importance of mitochondrial function in Müller cells' ability to protect retinal ganglion cells'

GRANT

DKK 3,841,007
from VELUX FONDEN

Glaucoma is popularly understood as a disease in which overpressure in the eye results in damage to the optic nerve, the nerve responsible for vision, and ultimately blindness. Eye pressure, called Intraocular Pressure (IOP), is still recognised as the main risk factor for the eye disease called glaucoma, but the cause of the optic nerve damage has not been established. As such, the consensus is that glaucoma is a spectrum of different eye diseases, all of which result in damage to the optic nerve.

This research project concerns non-pressure-dependent causes of glaucoma. In this context, the focus is on Müller cells, which are the nerve cells' support cells. The hypothesis is that Müller cells are essential for maintenance of the optic nerve, and that a greater understanding of their function could potentially provide the basis for new strategies to prevent glaucoma.

IMBALANCE AND INADEQUATE ENERGY SUPPLY CAUSE OPTIC NERVE DAMAGE

At one end of the spectrum, an imbalance in IOP results in damage to the optic nerve, but at the other end, the cause of glaucoma is more complex and is conceivably due to inadequate energy supply to the retinal nerve cells and the optic nerve.

Müller cells are essential in maintaining nerve cell energy supply. Another important function is the ability of the cells to maintain balance in a substance called glutamate, which aids nerve signalling to the brain. Although glutamate is essential for signalling between nerve cells, and hence crucial for vision, an accumulation of glutamate will cause the nerve cells to die off due to overstimulation. Müller cells prevent this very type of overstimulation by removing excess glutamate from nerve cells.

OXIDATIVE STRESS AFFECTS THE ABILITY OF SUPPORT CELLS TO PROTECT NERVE CELLS

During the project period, a number of laboratory models were set up for glaucoma to observe interactions between nerve cells and Müller cells. The hypothesis is that in people with glaucoma, the Müller cells are impaired and therefore unable to protect the nerve cells.

The aim is consequently to investigate how the energy level of Müller cells influences their ability to protect nerve cells. This was investigated in the first instance by altering energy availability and by subjecting Müller cells to so-called oxidative stress.

NERVE CELL ENERGY GENERATOR PUT THROUGH ITS PACES

The preliminary findings indicate that the ability of Müller cells to remove excess glutamate from nerve cells is impaired by the different types of stress. Both oxidative stress and variable energy availability affects the functioning of Müller cells. Because cells' main energy production is handled by their 'energy generators' (the mitochondria), these are focal for the project's research.

Through a number of collaborative projects, the investigators are thus seeking to demonstrate the importance of mitochondrial functioning for Müller cell function. A study currently nearing completion clearly demonstrates that mitochondria are essential for Müller cell maintenance in response to reduced energy availability.

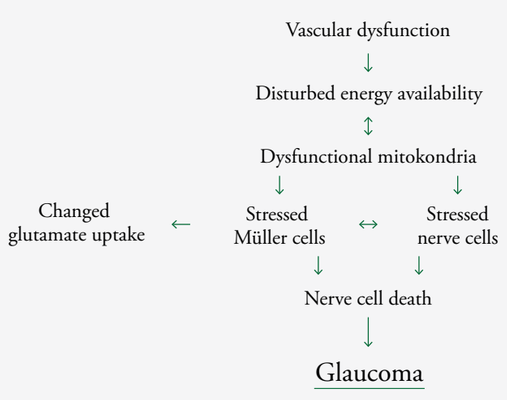


Figure 2. Glaucoma is a systemic disease caused by vascular dysfunction involving impaired mitochondria. This situation results in a change in energy availability. Since nerve cells are generally susceptible to altered and unstable energy supply, the theory is that the eye's inner retina and retinal ganglion cells (a bundle of nerve cells) and Müller cells are adversely affected. The systemic impact on the mitochondria ultimately manifests as retinal ganglion cell death and hence glaucomatous damage.

Figure: Miriam Kolko

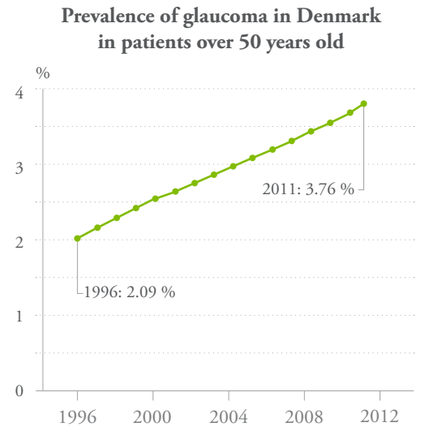


Figure 3. The period 1996-2011 has seen a significant increase in the incidence of glaucoma cases. Women with glaucoma age 50+ are represented in 10-year age intervals. (Kolko et al., PLoS One. 2015 Jul 16;10(7)).

Figure: Miriam Kolko

The hypothesis is thus that well-functioning mitochondria are particularly vital during stress. In order to demonstrate this, a cell model was set up in which cultured nerve cells had 'wells' of cultured Müller cells inserted in them. This system forms the basis for studying the two cell types in close proximity to each other.

The investigators examine how a change in the habitual state (homeostasis) of the Müller cell affects its ability to sustain nerve cells. So far, the research has demonstrated that a change in energy availability impairs the ability of Müller cells to absorb glutamate and hence their ability to sustain nerve cells.

It has also been demonstrated that mitochondrial function is crucial for Müller cells' gene and protein expression, which also affects their homeostasis and ultimately their ability to protect nerve cells.

COLLABORATION WITH THE CENTER FOR HEALTHY AGING AT THE UNIVERSITY OF COPENHAGEN AND RIGSHOSPITALET

The grant has made it possible to elaborate on research to date by applying translational research concepts. To that end, a collaborative project has been initiated with the Center for Healthy Aging (University of Copenhagen) and Rigshospitalet (Denmark's leading teaching hospital) which includes patients with glaucoma.

The project has been approved by a medical ethics committee, and the patients are subjected to oxidative stress. Besides measuring blood flow, blood samples are obtained before and after oxidative stress. The samples are analysed for mitochondrial activity in order to determine mitochondrial performance in glaucoma patients as compared with peer control patients.

MIRIAM KOLKO

Miriam Kolko (b.1972) is a specialist in ophthalmology. She conducted research in the USA for five years where she held both a Fulbright Scholarship and completed a PhD and subsequently a postdoctoral degree. Miriam completed her original medical specialisation in the Capital Region of Denmark and subsequently took up a fellowship in glaucoma. She has been an associate professor at the University of Copenhagen since 2012. In 2014, Miriam was appointed consultant physician with responsibility for the glaucoma unit at Roskilde University Hospital. In addition, she is the principal investigator in a team of researchers at the Department of Neuroscience and Pharmacology at the Panum Institute, University of Copenhagen.

Photo: Tomasz Bazylinski

What role does megalin play in myopia?

BY TINA STORM

RECIPIENTS

Tina Storm and the Department of Biomedicine, Aarhus University

PROJECT

'Megalin – cause and cure'

GRANT

DKK 1,473,100
from VELUX FONDEN

The aim of the project is to investigate the role played by the protein megalin in the normal functioning of the eye and in extreme short-sightedness. In addition, the study will investigate whether megalin is able to mediate drugs designed to separate the eye's inner structures from the blood across the eye's closely sealed barriers.

SHORT-SIGHTEDNESS – MYOPIA – CLOSE UP

Extreme short-sightedness (high myopia) carries an increased risk of degenerative diseases of the eye such as glaucoma (damage to the optic nerve) and retinal detachment. High myopia is one of the commonest causes of blindness worldwide, and in Denmark around 20,000 individuals are affected.

Myopia, derived from Ancient Greek, denotes a type of refractive error in the eye, in which the rays of light entering the eye fail to bend at the right angle for the length of the eye *(see Figure 1)*. This means that the light is focused in front of the retina instead of directly on the retina. The result of this is a blurred image of whatever is viewed. High myopia is a very severe degree of this condition.

Normally, the refractive error is corrected by prescription glasses, or in very severe cases by surgery. Dioptre (D) is the unit of measurement denoting the strength of spectacle lenses needed to correct the eye's refractive error so that the viewer is able to form a sharp retinal image. Myopic dioptres are indicated by a preceding minus, and high myopia is defined as a refractive error with a dioptre of more than -6 D.

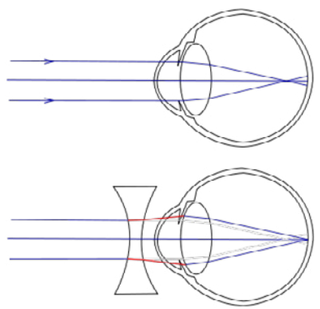


Figure 1. Schematic illustration of a short-sighted eye. The lines illustrate how light focuses in front of the retina. The bottom of the illustration shows how this is corrected by a diverging lens in front of the eye.

Source: Wikipedia

WHAT DO WE KNOW ABOUT EXTREME SHORT-SIGHTEDNESS?

The cause of myopia has not yet been fully established, but so far, research has demonstrated that both genetic and environmental factors play key roles. One finding has been the strong link between myopia and prolonged close work such as reading. Moreover, heredity is typically implicated if myopia occurs in early childhood.

At present we know very little about the molecular mechanisms that result in myopia. There is therefore a pressing need to develop useful pathological models of myopia for in-depth study of its underlying mechanisms. Detailed mechanistic insights will provide a basis for developing new interventions with the potential to remedy refractive errors and arrest the progression of the associated vision-impairing conditions seen in high myopia.

MEGALIN DEFICIENCY AS A CAUSE OF SHORT-SIGHTEDNESS

Although a clear link has been found between heredity and high myopia, so far only few specific genetic errors have been identified in the human genome as direct causes of high myopia. In animals and humans who are deficient in the protein megalin, researchers have consistently observed high myopia.

People with megalin deficiency have a condition called Donnai Barrow syndrome. This is an extremely rare syndrome involving not only high myopia but also problems with hearing, kidney function and cerebral and facial abnormalities. The causes of this have not yet been established at the molecular level. Recently, it was demonstrated that megalin is located in the closely sealed barriers that separate the eye's inner structures from the blood. The next step is therefore to investigate the normal function of megalin in the eye, and how megalin deficiency causes high myopia.

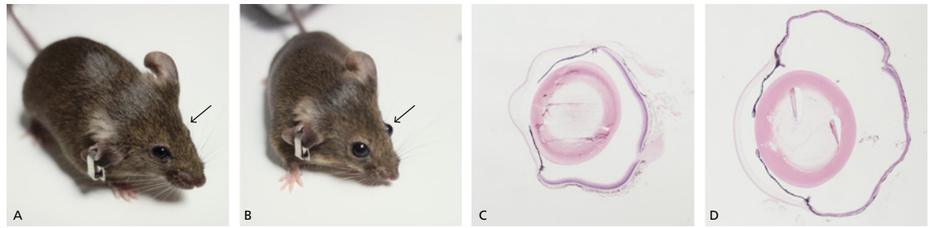


Figure 2. A and B indicate the size of the eye in, respectively, a normal mouse and a mouse with megalin deficiency. C and D show a cross-section of eyes from a normal mouse and a mouse with megalin deficiency. The images reveal a significant enlargement of the eye in the megalin-deficient mouse. The axial length of the eyes in megalin-deficient mice is shown as significantly increased.

CAN RESEARCH IN MEGALIN IN THE EYE HELP TO COMBAT HIGH MYOPIA?

The project aims to establish a panel of animal models to permit study of the normal function of megalin in the eye, and to determine how megalin deficiency causes high myopia. The method used is mouse models *(see Figure 2)*, in which the researchers can control where and when the megalin function is de-activated. Next, the visual function and changes in cell biology in the eye of the mice can be mapped.

In addition, the project will analyse the part of the genome which carries the code for megalin in a small group of high-myopia individuals who exhibit vague signs of impaired megalin function. This will allow the researchers to determine if impaired megalin function is sufficient to cause high myopia in humans.

These studies will allow the researchers to gain a far better understanding of the general physiology of the eye and the molecular mechanisms forming the basis for myopia. This will advance the development of new treatment strategies to combat high myopia and the diseases that arise as a complication of short-sightedness.

BARRIERS SEPARATING THE EYE'S INNER STRUCTURES FROM THE BLOOD

It is particularly problematical to achieve delivery of therapeutic drugs across the closely sealed barriers that separate the eye's inner structures from the bloodstream. Previous studies have demonstrated that megalin is able to mediate the uptake of a large panel of vital molecules across the closely sealed barrier in the kidney.

We therefore also wish to investigate whether megalin can do the same in the eye, and if so, whether this could be used for drug delivery to the inner structure of the eye. If this is the case, it will provide an opportunity for optimising the current options for delivering therapeutic drugs to the inner structure of the eye and hence also treating a number of other diseases of the eye.

TINA STORM

Tina Storm (b. 1983) holds an MSc equivalent in pharmaceutical chemistry (2008) and a PhD in medicine (2012) from Aarhus University based on theses on the structure and function of the endocytosis receptors cubilin and megalin. She is currently a postdoctoral fellow at the Department of Biomedicine, Aarhus University.

THE PROJECT IS ALSO SUPPORTED BY:

Lundbeck Foundation

83 ENVIRONMENT & SUSTAINABILITY

VILLUM FONDEN and VELUX FONDEN support innovative projects, which have the potential to create long-term change. The vision of the foundations is to enable environmentally friendly, socially sustainable and economically sustainable use of the planet's resources.

Schools charting a sustainable course

BY ANETTE SCHJØDT THORSEN
& HELLE MILTON CARLSLUND

RECIPIENT	PROJECT	GRANT
Rudersdal Municipacity	'Sustainability at School'	DKK 5,000,000 from VELUX FONDEN

The 'Sustainability at School' programme run by the Municipality of Rudersdal puts the spotlight on behavioural change, which is helping to reduce energy consumption at schools under its authority by more than 20%. This is achieved by the school pupils learning to switch off the heating, electricity and water, and the vision is for them to take home their new energy-aware behaviour and make it a lifelong principle.

Simon Eriksen, senior caretaker at Skovly School, gives pupils a guided tour of the boiler room.

Photo: Carsten Andersen

Litter patrol at the HOP & ROCK children's festival.

Photo: Thomas H. Nielsen

The project combines technical enhancements with long-term attitudinal and behavioural change. This is achieved in recognition of the fact that maximum impact is achieved from implementing technical solutions in an interaction with behavioural change. The schools' head teachers, caretakers and selected teachers and educators are helping to influence behaviour at the schools in a greener, more sustainable direction.

THE LONG, SLOW HAUL CHANGES BEHAVIOUR FOR THE DURATION

Each year, the 12 schools under this North Zealand local authority draw up action plans for how to highlight and raise awareness of energy consumption and sustainability. Energy-friendly behaviour is timetabled in a number of curriculum subjects; is a topic addressed by pupil councils; some schools hold energy-awareness weeks; while other schools have set up energy patrols, where the pupils themselves check that the lights are out and windows and doors closed in all classrooms at the end of the school day.

- 'Sustainability at School' is a public-private partnership between the NCC construction and property development company and the Municipality of Rudersdal established for the period 2012-2016.
- The project comprises 12 schools under the Municipality of Rudersdal.
- 5,700 pupils and 690 secondary school and pre-school teachers are involved.
- Target: annual saving of 20% of school electricity, water and heating consumption. Results exceed expectations. In 2012, the local authority saved 20%. In 2013, the saving was 25% and in 2014, the schools achieved 27%.
- The estimated saving from behavioural change alone is expected to constitute one third of the total energy reduction.

At Vedbæk School, all classes have their own 'climate monitor' aside from the traditional Danish 'tidy classroom monitor'. The climate monitor ensures that the lights have been switched off and the windows shut before the classroom is vacated.

"It has actually become part and parcel of the school day; neither the pupils nor teachers give it a thought anymore", comments headmaster Toni Besjakov, adding: "We have put a lot of thought and effort into showing the pupils that they are making a big difference by doing their bit in a small way such as by telling the school caretakers that a tap is dripping or a lavatory is running".

CARETAKERS INSPIRE THE PUPILS

The school caretakers play a crucial role in the schools' energy consumption Consequently, this employee group completed a training programme on controlling and reading the new system which registers electricity, water and heating consumption at all the schools. This upskilling of caretaking staff ensures optimal running of the school buildings. As an added benefit, it has also boosted co-worker relations among the local authority's school caretakers. Through meetings and field trips, the caretakers now have the opportunity to exchange experiences and good ideas with each other.

One of the good ideas that has spread to most of the schools, is the 'boiler room tour' for the pupils. Simon Eriksen, caretaker at Skovly School, has already given many classes a tour of the school basement, and explains:

"The children are inquisitive and are often surprised to see where the water comes from and how much water we actually use at the school".

At Skovly School, the basement tour with Simon is followed up by a teacher-led programme in which the pupils have to write an account of their basement visit.

SUSTAINABLE BEHAVIOUR IS OUR JOINT RESPONSIBILITY

The 'Sustainability at School' project is about more than achieving energy efficiency. It is also about understanding that our planet is worth taking good care of. In this way, appreciation of the natural world and the environment is a key component of the sustainability drive. This is all in evidence at Bistrup School in Birkerød.

Topic week devoted to 'Sustainability at School – solar cells from a pizza box'.

Photo: Christina Guldbrandt

To tie in with the local authority's annual children's HOP & ROCK festival, the schools' after-school service offered to set up a 'litter patrol' in order to make the festival cleaner and more pleasant for everyone. The pupil patrol helped to make the pupils aware of the beauty and value of their natural surroundings. As training for the festival day, the pupils started collecting litter on the school grounds. This was such a success that the school now has a permanent litter-picking roster involving the whole school. Over the school year, everyone is assigned to pick litter on the school grounds.

"The heads have already been out on their first litter-picking patrol because I wanted to highlight that we all have a responsibility – and that includes senior teaching staff", says pre-school teacher Christina Ekberg, the initiator of the litter patrol.

RESULTS EXCEED EXPECTATIONS

Energy consumption is the project's most measurable parameter, and this reveals that the results are better than expected. The target for energy efficiency was a 20% reduction per annum. After three years, the schools had achieved 27%.

In periods when the schools have made an extra and particular effort on behavioural change, the savings are significantly higher. This means that attitudes, habits and behaviour have direct impact on actual reductions in energy consumption. New control tools, upskilling and a new, cooperative culture have created optimised conditions for the school caretakers.

SUSTAINABLE SCHOOLS OPTIMISTIC ABOUT THE FUTURE

Following the national school reform to raise standards in Danish primary and secondary education, a number of partnerships have been formed with climate and environmental experts, organisations and cultural institutions. These are involved in the teaching, and help to give the pupils an awareness of, and form their attitudes on, the types of energy-friendly behaviour pupils and their families should be adopting.

Logo designed by students from Vedbæk Skole.

ANETTE SCHJØDT THORSEN

HELLE MILTON CARLSLUND

Anette Schjødt Thorsen (b. 1966) is Development Officer at the Municipality of Rudersdal and Project Manager of 'Sustainability at School'. She has a special interest in childhood and adolescent learning and acculturation in school and society generally. She has worked for many years in project management and management training in the education sector and within FDF, one of the largest voluntary organisations for children and youth in Denmark.

Helle Milton Carlslund (b. 1980) MA in communication and business studies from Roskilde University (2008). Project and Public Relations Assistant to 'Sustainability at School' since 2012. Her special interests include managing and developing change projects.

Scenarios for sustainable farming in Denmark

BY LEIF BACH JØRGENSEN ET AL.

RECIPIENTS

Danish Ecological Council, Aarhus University and the University of Copenhagen

PROJECT

'The Future of Agriculture: Scenarios for Sustainable Farming in Denmark'

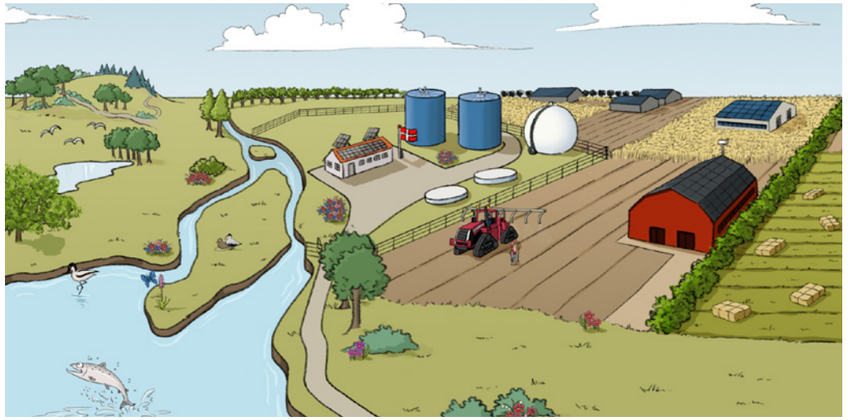
GRANT

DKK 4,500,000
from VELUX FONDEN

In four scenarios, the project proposes how Danish agriculture in the years 2030 and 2050 might meet the major economic and environmental challenges faced by the sector. The scenarios depict a sustainable agricultural sector in relation to the environment, climate and countryside while also envisaging a healthy bottom line for farmers from production, and reflecting a number of societal challenges in relation to food production and rural development.

'The future of agriculture' project to revive debate on the future of farming in Denmark.

Photo: Rasmus Bluhme for Økologisk Landsforening



The four scenarios are illustrated by short animated videos available to watch at www.fremtidenslandbrug.dk. This shows an illustration from the 'Green Growth' scenario in which farming minimises its pollution and climate footprint.

Illustration: Postwork

SUSTAINABLE FARMING IN DENMARK

The Danish Ecological Council in collaboration with the two universities has presented four scenarios for the future of farming in Denmark. The project represents a promising alliance of some of the nation's leading researchers in the field and the Danish Ecological Council, which has long-standing experience of translating research findings into actionable proposals and presentations for public and political debate.

The basic criterion is a level of sustainability that entails clean water – both surface water and ground water. The agricultural sector's impact on the climate must be reduced to a responsible level, and soil fertility must be preserved. The loss of biodiversity must be arrested, and habitats and landscapes must be preserved for future generations. Equally, it must be possible to derive reasonable earnings from food production, for example, by incorporating new functions and products, including energy crops, in farming operations. There must be sufficient employment and activity in Denmark's provinces to sustain thriving rural communities. And cohesion between rural and urban areas and the farmer's pride in producing our foods must be encouraged and restored.

The scenarios are intended to revive political debate on the future of farming in Denmark so that farmers, consumers and politicians rise to the challenge of driving progress and improvements in one of society's most important activities: food production.

FOUR SUSTAINABLE SCENARIOS

The scenarios entail the adoption of effective measures in order to comply with the environmental requirements prescribed by, for example the EU Water Framework Directive, and in order for Danish farmers to contribute to the reduction of greenhouse gas emissions. All the scenarios rely on the national Commission on Nature and Agriculture's recommendation to be resolute in guiding agricultural production in a more sustainable direction. Similarly, the scenarios are to be regarded as being of equal merit and equally sustainable, but each with their focus. The focuses in the four scenarios are:

- **'Green Growth'** – farming should minimise its pollution and climate footprint. Equally, its growth potential must be sustained and increased.
- **'Biodiversity'** – the main objective is maximum biodiversity and nature in balance by 2050. Tracts of open, natural landscape should be enlarged, and the countryside should be assured of continuity and diversity.
- **'The Biobased Economy'** – agriculture produces not only foods, but also raw materials for the production of energy and renewables. The aim is to maximise nutrient recirculation.
- **'Urban and Rural'** – the object is for urban and rural areas to be more closely linked in promoting positive development in the country with increased employment and a better bottom line for farmers.

Superficially, the scenarios tend in opposite directions, but taken together they each highlight the synergies and conflicting concerns involved in addressing all aspects of sustainability. Much potential exists for achieving synergies in which the right initiative benefits the countryside, aquatic environment and climate alike, while sustaining employment in the agricultural sector.

For example, a combination of manure separation and biogas plants would preserve the nutrient cycle, soil humus content and reduce climate footprint. And what is known as Ecological Recycling Agriculture (ERA) with low input of external nutrients would be a good alternative to fallowing of vulnerable fields, as it would sustain employment in farming communities.

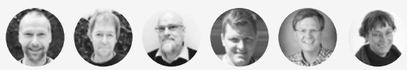
None of the scenarios are perfect in isolation, but together they present a dimension for addressing the future of farming in Denmark. There is, after all, not only one path – sustainable farming of the future must evolve in multiple directions simultaneously.

THE PROJECT IS DESIGNED TO SPUR WIDE DEBATE

Aside from the research challenge of comparing and analysing the many parameters in a composite picture, the project will inspire politicians, organisations, the public and researchers to discuss new waypoints and pathways for the farming of the future. The debate-generating effect is important and is disseminated via conferences, articles and participation in meetings.

At conferences held in the Danish Parliament and in Brussels, the Danish Ecological Council in collaboration with researchers from the University of Copenhagen and Aarhus University presented four scenarios in 2015 for the future of farming in Denmark. The high attendance at both conferences indicates that the scenarios are pertinent not only to the development of Danish agriculture, since other EU countries have also shown an interest in the project.

The partnership has also developed a combined role-play and computer game on the future of farming. The participants in the game have different roles: a farmer, a local politician, an agro-industry executive and an environmental activist. They have differing interests and each has their own position on the future of farming. The game 'The Future of Farming' was awarded first place in the Innovative Communication category in the European Commission's CAP Communication Award in 2014 in Brussels.



LEIF BACH JØRGENSEN, CHRISTIAN EGE, ALEX DUBGAARD, SØREN BØYE OLSEN, TOMMY DALGAARD, INGE KRISTENSEN

Leif Bach Jørgensen (b. 1958) is project manager and agricultural science supervisor, and Christian Ege (b. 1953) is secretariat manager, both of the Danish Ecological Council. Alex Dubgaard (b. 1949) and Søren Bøye Olsen (b. 1976) are both associate professors in the Section for Environment and Natural Resources under the Department of Food and Resource Economics at the University of Copenhagen. Tommy Dalgaard (b. 1970) is a senior researcher, and Inge Kristensen (b. 1954) is a member of the scientific staff of the Department of Agroecology at Aarhus University, Foulum campus.

95 SOCIAL PROJECTS IN DENMARK

VELUX FONDEN supports initiatives and projects that seek to prevent disadvantaged individuals from being isolated, marginalised or impoverished.

Involving children and young people is a good investment

BY ANNETTE JUUL LUND

RECIPIENT
Danish National Council for Children

PROJECT
'Children as Experts'

GRANT
DKK 11,395,000
from VELUX FONDEN

When we involve children and young people in decisions, this is also a means of demonstrating that we regard them as equal citizens, of recognising that they possess valuable insights and that those insights can make a difference. These are three valuable and crucial messages supported and communicated by the 'Children as Experts' project.

Photo taken in connection with the survey on children placed in foster care (2014).

Photo: Jeppe Carlsen

The project comprises further development of the Danish National Council for Children's two main panels: the Child and Youth Panel and the Junior Panel, and the appointment of a number of expert groups on children in special circumstances, including workshops at which children formulate important messages and recommendations to decision-makers and child welfare professionals; thematic studies to shed light on children's encounters with public authorities; and a handbook communicating the Council's insights into, and experiences of, best practice approaches to child involvement.

CHILDREN AS EXPERTS

"One time, they doubled the visitations with my dad, and that wasn't what I wanted. I didn't feel they were right to do that when I'd actually told them I didn't want to see him". This is a statement from one of the young girls who participated in the National Council for Children's survey last year of children placed in foster care.

The young girl's statement gives us many important facts: she knows what she wants and doesn't want; she is able to express – and has expressed – what she wants; and she is disappointed and frustrated not to be listened to. These three aspects highlight the premises for the National Council for Children's approach to children and young people, and the girl's statement also confirms that public authorities and other significant entities are still not good enough at listening to children and young people at-risk.

Children and young people are experts on their own lives, and they want to be involved and consulted, even if their wishes are not always granted. As adults, child welfare professionals and authorities, we have an obligation to take their experiences seriously, and we are depriving not only them, but also ourselves, if we fail to listen to and learn from them.

The cover page of the new electronic questionnaire for the Child and Youth Panel.

Graphic: Buré

Photo taken in connection with the survey on 'Child encounters with the State Administration' (2015).

Photo: Jeppe Carlsen

THE NEED FOR CHANGE

The background to the survey on children in foster care included an increase in the number of foster care placements in the wake of the national Child Reform (2011), but little was actually known about what being placed in foster care actually meant for the children themselves.

For this reason, the National Council for Children invited 11 foster children aged 11-18 years to participate in the expert group 'Children and Youth in Foster Care'. Our dialogue with the expert group resulted in a number of recommendations to politicians and child welfare professionals, a meeting with the then Minister for Social Affairs and a clear political focus on the foster care domain at the negotiations in 2014 on the allocation of special government funding within the social, health, and labour market sectors.

The insights communicated by the children together with the National Council for Children to the political level were thus a contributory factor in the allocation in 2014 of DKK 80 million to raise standards in foster care arrangements. This meant both greater support for network foster families in the shape of the right to more counselling during placement, and a legal amendment so that children placed in care can only be moved between placements against their will if this is crucial to their wellbeing.

THE NATIONAL COUNCIL FOR CHILDREN APPROACH TO CHILD INVOLVEMENT

Within the National Council for Children, the daily practice is professional and targeted involvement of children and young people. The Council has gained the flexibility to further develop both its quantitative and qualitative methods, and also to

involve more groups of children and young people than would otherwise have been possible. Besides involvement in itself being of benefit for the participating children and young people, our surveys serve to give the Council the necessary insights and expertise for driving positive change in child welfare.

CURRENT SURVEYS AND PROJECTS

A number of surveys are currently in progress under the banner project 'Children as Experts', which will result in the identification of changes required both in law and social work practice.

- Within the Council's Child and Youth Panel, activities are ongoing to elucidate the youngsters' experiences of family life, covering topics such as divorce, daily life, leisure time and deprivation. Around 2,500 children in the second last year of compulsory education from state schools, private schools and special needs schools nationwide are participating.
- Each year, Denmark receives unaccompanied refugee minors. This is a growing, and particularly at-risk group requiring special protection. Within the National Council for Children, an expert group survey is currently in progress to examine how these children report their encounter with the asylum system.
- An ever-increasing share of Danish children's parents are divorcing, while the number of child custody cases mediated by or taken to court by the State Administration is likewise increasing. In response to this situation, the National Council for Children examines in a themed study child encounters with the State Administration. The children's experiences bring the child's perspective into the custody cases for the benefit of children facing parental divorce.
- The Council also monitors the conditions faced by juveniles in conflict with the law. We interviewed around 50 young people in prisons, on remand pending trial and detained in secure young offender institutions across Denmark. With a themed study, the aim is to contribute insights and information that may serve to improve the young offenders' conditions and obtain their own inputs on effective crime prevention.
- The National Council for Children will be publishing a handbook of procedures and methodological, legal and ethical considerations in child and youth involvement. The handbook will meet the growing demand from ministries, local authorities, institutions and others who work with children and young people on facilitating and implementing child involvement.

ANNETTE JUUL LUND

Annette Juul Lund (b.1963) has been Head of Secretariat at the National Council for Children since 2006. She holds the national equivalent of a Master of Laws, and has worked in child and youth welfare within the private sector, municipal sector and central government. As the former senior child welfare officer with Roskilde Municipality and director of counselling and adoption with the former Copenhagen County Psychiatric and Social Services Administration, Annette has wide-ranging experience of working at the interface between politics and administration.

Be My Eyes app helps the blind see

BY IDA MARIE PIPER

RECIPIENT	PROJECT	GRANT
Be My Eyes	'Development of a communication platform for blind and visually impaired people'	DKK 1,883,750 from VELUX FONDEN

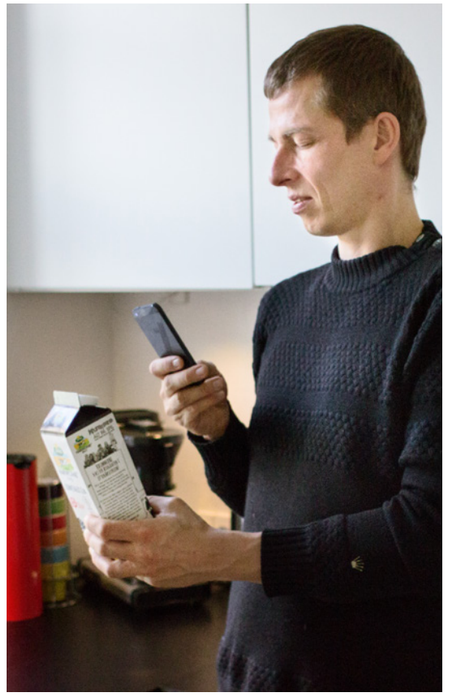


Photo: Thelle Kristensen

It takes only an instant to select the right tin from the cupboard, check the expiry date on the milk or find something to eat in the fridge – if you can see, that is. For many blind people, small domestic tasks pose big challenges, making them reliant on friends and family.

By My Eyes is an app that boosts blind people's independence by connecting them with volunteer helpers. The app provides a direct videochat link between the blind person and the sighted helper. Once the linkup has been made, the blind person videos the problem he or she is facing, and together, the blind person and the sighted volunteer work out a solution.

MORE THAN 23,000 BLIND USERS

Since the application was launched on 15 January 2015, the number of users has exploded. Today, more than 23,000 blind and visually impaired persons and 300,000 sighted volunteers have set up a Be My Eyes user profile. One of the reasons why Be My Eyes has grown so fast is that the media all over the world have publicised the features of the app. The solution has for example received coverage by media as remote from the TV show Good Morning Denmark as Times of India, CNN and the BBC.

From food waste to feast

BY KAREN INGER THORSEN & HENRIK OLSEN

RECIPIENT
fødevareBanken

PROJECT
Development of a model for 'fødevareBanken' (food bank)

GRANT
DKK 22,650,000
from VELUX FONDEN

540,000 tonnes of food fit for human consumption are discarded annually in Denmark, with the food sector accounting for 303,000 tonnes of the food waste.

A record is kept of the collected surplus.

Photo: Søren Jessen

fødevareBanken's volunteers make a delivery to a recipient organisation.

Photo: Maria Pagh

Over a four-year period, the food bank will be developing and quality assuring its operations in Capital Region of Denmark and establishing a new division in East Jutland. In addition, the food bank will engage in new forms of fund raising to reduce its reliance on public-sector funding and donations from private foundations.

TONNES OF FOOD WASTE

540,000 tonnes of food fit for human consumption are discarded annually in Denmark, with the food sector accounting for 303,000 tonnes of the food waste. A large proportion of the foods are rejected for a variety of reasons (logistic, cosmetic etc.) as unsaleable in supermarkets even if they are still within their sell-by-date and fit for human consumption.

fødevareBanken is committed to tackling two key challenges facing society: food waste and food poverty. The food bank is the only organisation in Denmark systematically and on a big scale addressing food waste in industry, while facilitating better food for people at risk of poverty or social exclusion.

Since 2009, the food bank has received surplus food from food producers, the farming industry, supermarkets and wholesalers. It has distributed the food among organisations that work for and with people at risk of poverty and social exclusion, including children, women and men in crisis, homeless persons, substance abusers and the mentally ill.

FØDEVAREBANKEN AS THE STRONG LINK IN THE CHAIN

fødevareBanken is the link between food businesses and non-profit and charitable organisations and has

"FØDEVAREBANKEN'S EFFORTS HAVE SPARED THE PLANET APPROX. 782 TONNES OF CARBON DIOXIDE EQUIVALENTS; THE SAME AS WHAT AN AVERAGE FAMILY CAR WOULD POLLUTE IF IT DROVE AROUND THE PLANET ABOUT 149 TIMES".

a total of more than 3,000 daily users or residents. Small-scale local arrangements between a drop-in centre for the homeless and a local bakery have always existed and will continue to do so, but when it comes to very large volumes of surplus food with more challenging requirements regarding handling and storage, fødevareBanken sets itself apart. It has the necessary expertise and capacity for food banking large volumes of surplus food systematically and safely so the food is stored and dispatched responsibly.

WHAT TO DO WITH 15 TONNES OF CHEESE?

During the Russian trade embargo in 2014, Arla Foods, the largest producer of dairy products in Scandinavia, was landed with 15 tonnes of unsaleable cheese. The volume was obviously far beyond what a 'soup kitchen' could safely store, and such a huge consignment of cheese would never have been consumed. fødevareBanken, however, with its refrigerated storage facilities, refrigerated delivery vans and its agreements with a large number of recipients, was therefore able to offer to bank and distribute the cheese safely and responsibly.

VOLUNTEERS PULL THEIR WEIGHT AND MORE

fødevareBanken's volunteer drivers clock up around 35 trips a week. On some routes, they collect, sort and register the surplus items, such as at Aarstiderne (standing order home-delivery of organic fruit and veg) and deliver them to the food bank facility. On other routes, the refrigerated delivery vans are packed at the food bank warehouse and then take off on a route made up of delivery stops at 4-8 different recipient organisations. On yet other routes, collection from a food donor is combined with delivery to recipients.

The composition of the volunteer pool within fødevareBanken is somewhat atypical of a voluntary association, perhaps because of the work involved. Out of the total volunteer pool of 108 persons in Copenhagen, 63 are men aged 60+.

FØDEVAREBANKEN CREATES SOCIAL AND ENVIRONMENTAL VALUE

The Danish-founded student organisation Economists without Borders performs an annual calculation of the social and environmental value of fødevareBanken's work. The message in the calculations from 2014 is loud and clear:

- The value of the 423 tonnes of recovered food equates to the recipient organisations having purchased food worth approx. DKK 10.1 million.
- 80% of the recovered foods correspond with the

fødevareBanken collecting surplus food.
Photo: Søren Jessen

nationally recognised food pyramid's recommendations to eat most from the bottom layer (vegetables and wholegrain foods) and next from the middle layer (dairy and fruit). Of these, dairy products accounted for 41%, fruit for 17% and vegetables for 16%.

- 423 tonnes are equivalent to the annual food waste of 4,027 families.
- The time put in by the volunteer workers was valued at approx. DKK 1.5 million.
- fødevareBanken's efforts have spared the planet approx. 782 tonnes of carbon dioxide equivalents; the same as what an average family car would pollute if it drove around the planet about 149 times.

CREATIVE IDEAS FROM PARTNERS

Students from the further education college in Silkeborg transformed five tonnes of cake mix into traditional Danish biscuits, apple tarts, apricot cakes, carrot cakes etc. which were distributed to homeless shelters and crisis centres. To 'pimp' the cakes a touch, the mix was supplemented with almonds donated by the retail giant Dansk Supermarked Group and chocolate from the world's leading marzipan makers, Odense Marcipan.

The Kofoeds School non-profit youth-housing project in Amager in the Capital Region of Denmark uses the food both for a weekly communal dinner and a weekly food & meals class in which sustainability is included as an educational resource in the youth scheme. The youths have a very tight food budget and thus cannot afford to let anything go to waste. The unpredictability of the assortment of foods offered by the food bank is seen as an opportunity to test and develop the youths' culinary creativity and ability to combine different produce and ingredients.

GROWING INTEREST IN FØDEVAREBANKEN

fødevareBanken is continually focused on fine-tuning its operations, building partnerships with food donors and providing an even better service to the recipients. The organisation is registering increased interest in its work. It receives regular inquiries from potential partners all over Denmark and its mission is extended outreach with yet another regional division along the lines of the existing ones in Copenhagen and Aarhus or a new model tailored to local opportunities and challenges.

KAREN INGER THORSEN

HENRIK OLSEN

Karen Inger Thorsen (b. 1954) is Director of fødevareBanken. Previously she was Senior Project Manager and Centre Manager with Red Cross Denmark, where she worked primarily to facilitate labour market access for people at risk of poverty and social exclusion.

Henrik Olsen (b. 1971) is a Development Officer with fødevareBanken and was instrumental in drawing up the business plan for development of a model for fødevareBanken as a food bank with nationwide outreach. Previously, he worked on a wide range of causes within different civil society organisations.

109 SOCIAL PROJECTS IN GREENLAND & ABROAD

VILLUM FONDEN aims to improve the living conditions and future prospects for socially marginalised children and young people in Central and Eastern Europe and in Greenland.

Towards an independent life

BY BALÁZC RÁCSOK

RECIPIENT

Hungarian Interchurch Aid

PROJECT

'From institutional care to independent life - job creation by establishing a social farm in south Hungary'

GRANT

DKK 6,788,625
from VILLUM FONDEN

Hungarian Interchurch Aid (HIA) is committed to effective intervention where the need exists by means of humanitarian assistance, that is, by providing food for the starving, homes for the homeless and relief for those in need. Among its many activities in Hungary, HIA has established various types of social institutions such as temporary family shelters, drop-in centres for homeless persons and substance abusers, development centres, HR centres, substance abuse rehabilitation clinics and temporary family shelters for victims of domestic violence and sexual assault.

Instruction in how to make cheese. The instructor is a highly qualified Hungarian cheesemaker.

Photo: Dániel Fekete

The families who participate in the programme each have their own plot of land.

Photo: Dániel Fekete

Developmental activities for children age 3-6 years.

Photo: Dániel Fekete

Goats are tended by an agricultural expert.

Photo: Dániel Fekete

Hungarian Interchurch Aid (HIA) is one of Hungary's largest charities. HIA provides humanitarian assistance through its network of experts, volunteers, donors and corporate partners. The humanitarian interventions comprise all individuals who need them, regardless of nationality, religion or ideology.

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The HIA project is located in a small village called Kastélyosdombó. Its temporary family shelter provides short-term housing and assists socially at-risk families to reintegrate into society. This is achieved through a number of measures to make the necessary stay at the centre as short as possible and to empower welfare recipients to take responsibility for themselves and cope unaided.

The aim of the project is to instruct the temporary residents in microfarming, personal development and labour market skills, and to give the families the chance to settle in the southern part of Hungary. HIA also offers assistance to the children at the temporary family shelter in the form of special developmental activities designed to reduce negative social inheritance and increase their capacity for academic achievement together with successful social integration.

The overarching aims of the development programme is to help families to gain the knowledge that will empower them for independent, self-sufficient living. The families have to face up to the fact that it is their responsibility to solve their problems, and that it is necessary to step up their active involvement in this process.

WHAT DO THE FAMILIES LEARN?

The families receive practical and theoretical training in nursery plant production, livestock breeding and other agricultural coaching (milk production, cheese and soap production from goat's milk, cultivating flowers and herbs for medicinal use and cooking etc.). The training is provided by agricultural experts and includes personal development and acquisition of labour market skills.

HIA has established a social farm on the grounds of the temporary family shelter so that practical instruction of the families can take place on site. As part of the agricultural training, the parents are required to perform at least four hours of practical work on the farm. The agricultural experts, mentors and social workers support the families throughout the project.

The participants learn to cultivate various types of fruit and vegetables such as tomatoes, onions, bell peppers, strawberries, melons, aubergines etc. There are also goats, rabbits and chickens and the project staff teach the families how to tend the animals, milk them, slaughter them and dress the meat.

NEXT PHASE: ENTERPRISE DEVELOPMENT

In the next phase, HIA will be extending its farming activities to include enterprise development. This will entail building a dairy where HIA will produce cheese and other dairy products. The participants in the project will be actively involved in the process.

HIA has also established a community cooperative so that surplus farm produce can be sold. This helps the project participants gain a source of income.

PREPARING FOR INDEPENDENT LIVING

Participants in the project who have successfully completed the development programme will be given the offer of moving out of the temporary family shelter into small detached houses. This will give them a chance to settle permanently and independently start up a plant nursery production and livestock farming on their own farmland, and thus become self-sufficient.

Since the start of the project in 2013, three families have moved out of the temporary family shelter and have embarked on a new phase in their lives with the help and support of mentors. At the end of the

Goats in the stable.

Photo: Dániel Fekete

project (in May 2016), an additional two families are expected to make the transition to independent living in these halfway homes.

DEVELOPMENTAL ACTIVITIES FOR CHILDREN

Another very important area for HIA is to support the children at the temporary family shelter as they have significant problems in meeting the school's academic requirements and lack social skills. HIA works with the teachers, who hold developmental consultations for the children every month.

26 children in the local area and 61 residents of the temporary family shelter have taken part in the development project to date. The teachers provide homework coaching individually or in groups and teach development of learning skills, movement therapy and development, storytelling yoga and therapy.

ROLE MODEL FOR THE SOCIAL WELFARE SYSTEM IN HUNGARY

HIA has implemented a motivation system to empower state benefit recipients to take more responsibility, engage more actively and gain better control over their lives. The organisation has introduced a couponing system at the temporary family shelter by which the residents receive coupons as a motivational resource in return for completing various activities. This allows them to claim extra bonus items when they redeem their coupons.

KNOWLEDGE SHARING

The experiences derived from the project will be published in relevant journals. HIA will be compiling and submitting expert recommendations to policy-makers in the social services sector and disseminating them nationwide in Hungary. HIA

Growing tomatoes in plastic tunnels on the social welfare project's grounds.

Photo: Dániel Fekete

will also be organising social forums and a conference for social workers to publicise its work, its approaches and results.

During the project period, HIA has invited relevant ministries and senior officials to visit the project in Kastélyosdombó in order to give them insights into the innovative methods employed in the project. During these visits, much focus was placed on the new approach to social work; the halfway homes as a transition from institutional care to independent living; the useful and productive activities that have been implemented at the temporary family shelter and the results of the motivation couponing programme. HIA is in ongoing dialogue with policy-makers in the social services sector with a view to implementing the interventions universally in the welfare system in Hungary.

BALÁZC RÁCSOK

Balázc Rácsok (b. 1975) is responsible for social welfare projects and development projects within HIA. He has worked for the organisation for 20 years and is project manager of 'From institutional care to independent life – job creation by establishing a social farm in South Hungary'.

117 ACTIVE SENIOR CITIZENS

VELUX FONDEN encourages elderly people to become actively involved in senior citizen activities when they retire from work. The foundation supports projects which are carried out by senior citizens and which have a social perspective.

‘Active by Nature’ facilitating new access to the countryside

BY RIKKE DAMM

RECIPIENT
Danish Outdoor Council

PROJECT
‘Active by Nature – supporting especially active senior citizens engaged in outdoor recreation and nature appreciation’

GRANT
DKK 2,205,000
from VELUX FONDEN

The purpose of the ‘Active by Nature’ project is to recognise and support senior citizens volunteering to promote outdoor recreation and nature appreciation for the benefit of both themselves and others. The funding programme is administered by the Danish Outdoor Council, an umbrella organisation for some 90 organisations dedicated to outdoor recreation, nature appreciation and the natural environment. The Council serves the interests of both its organisations and the general public in outdoor pursuits and engages actively in creating better opportunities for outdoor recreation through activities such as campaigns, projects and lobbying.

Lunch at Øm Kloster.
Photo: Jan Hansen, Aktive Birkerød Seniorer

The maiden voyage at Stevns Klint.
Photo: Jens Viggo Moesmand, Havkajak Stevns

SENIORS BY RICKSHAW

"Are we going too fast?", inquires a solicitous Mogens. The gravel is crunching beneath the bicycle wheels. The waters of the Kattegat are glittering on the horizon. The sun's warmth casts a glow on the cheeks of the lady in the seat in front of him. "No, if I was in a hurry, I certainly wouldn't be riding with you", comes her smiling retort. But we are far from the busy streets of Delhi, and the rickshaw needs neither to race to its destination nor provide a livelihood for its driver.

We are in Frederikshavn in Denmark, where Mogens Lundholm, from the local branch of the DanAge Association, which is part of the 'Ageless Cycling' movement, is procuring rickshaw cycles for elderly care facilities in the municipalities of Frederikshavn and Læsø to give residents better opportunities for socialising in the open air and rediscovering the local community they were formerly an active part of. Mogens' first passenger is pleased enough. She'd happily take a trip again another day because it does after all get her further out into the blue beyond than her rollator. Not to mention the good company. Mogens may not be the fastest 'pilot', but she enjoys their chat in the open air, and the sights, sounds and scents of it all.

A PARTNERSHIP FOR NATURE APPRECIATION

Many senior citizens are keen country-goers. They get out into the countryside more often than other adults, not to mention more than children and young people, who are less in touch with the natural world than earlier generations. Many older people are very keen to share their appreciation of the countryside and great outdoors with other people. They often have the time and the mental energy to make a positive difference for the countryside, or arrange nature appreciation and outdoor recreation events for others. Equally, many older people in Denmark are very actively engaged in the nation's voluntary associations. Whether as members of a board, treasurers, instructors, tour guides, nature stewards or actively engaged senior members, they are all doing their bit for the appeal and diversity of the nation's voluntary associations.

In support of this vital contribution, VELUX FONDEN and the Danish Outdoor Council formed a partnership to grant DKK 2 million in 2015 to especially active senior citizens engaged in outdoor recreation and nature appreciation. The partnership is based on the positive experiences from the pilot period in 2014 during which time DKK 1 million was granted. The funding programme is aimed at non-working individuals aged 60 or over who are active members of an association. Funding applications are invited for non-profit activities benefitting the Danish countryside, or facilitating nature appreciation and outdoor recreation.

'ACTIVE BY NATURE' IS ENTHUSIASTICALLY RECEIVED

The interest in 'Active by Nature' has been immense. By the application deadline of 1 June, 100 applications had been submitted, of which half were granted. These applicants numbered active over-60s representing local councils, civic, pensioner and 'friends of' associations, local chapters of the Danish Outdoor Council's affiliated organisations and numerous other local associations. The geographical spread has been wide, with applications received from 56 municipalities. They reflect great diversity and creativity in the voluntary sector – all the way from 60-90-year-old 'village biddies', who meet on Tuesdays for communal activities; to the active senior rower who mounts summer activities for school children, or the 'grey panthers' who draw orienteering maps and mark waypoints on countryside routes.

Many of the funded activities are inter-generational with a particular focus on children and adolescents: Asserballe Youth Association's 50+ group is creating a village garden in which youngsters learn about growing and preparing vegetables.

Most of the activities are aimed at facilitating nature appreciation and outdoor recreation such as 'The Grassroots' in Hagested, who maintain nature trails; the senior members of Kalundborg Rowing Club, who, thanks to new equipment, can now offer

At Hagested, the retired volunteers known as 'The Grassroots' have for the last four years maintained nature trails and commons by their own manual labour. With a grant for a robotic lawn mower, they can keep up the initiative for the benefit of both themselves and the other villagers.

Photo: Jens-Knud Nielsen

Voluntary 'pilots' cruising the countryside with residents from Strandgården.

Photo: Charles Nielsen

young people exciting water pursuits; Faaborg Local Council's communal walks for mobility impaired persons or outdoor fitness training for senior citizens in the scenic surroundings of the tiny island of Drejø.

Other projects aim to make a positive difference to the countryside by putting up bird nesting boxes or bumblebee boxes, creating sheep pasture guilds, combating invasive species, cleaning village ponds or planting urban gardens.

The financial and moral support from 'Active by Nature' makes a considerable difference. It gives added impetus to many voluntary initiatives and activities. The benefit is not only to the active senior citizens themselves. The local communities also benefit from the older generation's initiatives. They boost quality of life and community spirit, prevent loneliness and promote health through physical activity in the open air. And requests have already been received for a new round of 'Active by Nature'.

RIKKE DAMM

Rikke Damm, MA (b.1972). Since 2010, Rikke has worked as a consultant in the Danish Outdoor Council's outdoor activities unit, where she primarily organises project support for outdoor recreation and open-air education. She was previously a programme coordinator with the Danish Ministry of Foreign Affairs.

Active workshop for senior citizens

BY MICHAEL BROSTRØM

RECIPIENT

Michael Brostrøm,
Ishøj Seniorværksted

PROJECT

Establishment of extraction system

GRANT

DKK 256,200
from VELUX FONDEN

Members working at a combination machine purchased with funds granted by VELUX FONDEN. You can see the wood waste extraction system in the corner.

Photo: Michael Brostrøm

Ishøj Seniorværksted houses just under 200 active senior members, who make the trip to the workshop from all over Zealand in Denmark. The workshop offers a wide array of activities ranging from woodworking, through glass working, to team cycling.

WOOD WASTE EXTRACTION SYSTEM

The latest installation at the seniors' workshop is a state-of-the-art extraction system that meets a number of practical requirements:

- To extract the dust suspended in the air after woodworking sessions. Every morning, we arrive to find the entire workshop floor, shelving etc. covered in settled dust. We all need to avoid inhaling these particles.
- To extract the wood shavings from all the tools we use such as lathes, circular saws, multi tools, band saws and more besides.
- To extract dust particles from the entire workshop.
- To be able to recycle the heat generated by the extraction system.

Apart from the above woodworking activities, we also have more social activities run mainly in our kitchen/common room. This is where all the crafting activities take place such as sewing, knitting, crochet, paper cutting, painting, silver jewellery making and much more. Several times a month, we also have communal cooking and dining events.

125 CULTURE & SOCIETY

VILLUM FONDEN and VELUX FONDEN make grants to projects related to culture and society.

The new story of Jelling

BY HANS OLE MATTHIESEN AND MORTEN TEILMANN-JØRGENSEN

RECIPIENT

Vejle Municipality

PROJECT

'Kongernes Jelling – Home of the Viking Kings'

GRANT

DKK 34,000,000 from VILLUM FONDEN and VELUX FONDEN

On the new roof terrace, visitors can use digital telescopes and turn back time to the era of Harold Bluetooth.

Photo: Jacob Nyborg Andreassen

The story is still being written. Outstanding new archaeological finds created a need to extend and upgrade the Kongernes Jelling – Home of the Viking Kings visitor and experience centre.

More than 1,000 years ago, the Viking kings Gorm the Old and his son Harold Bluetooth erected the monuments in Jelling, Southern Denmark. Two large barrows, two runestones and a gigantic stone ship. Around it all, they erected a 1.44 kilometre palisaded enclosure.

This powerful display of prowess would have been impressive at the time, and remains so today. In 1994, the Jelling monuments were inscribed on the UNESCO World Heritage List. The need for more extensive public outreach to communicate the value of this heritage site resulted in an exhibition centre and by 2000, the 'Royal Jelling' complex had been established. Remarkable new finds in 2006, including the world's largest stone ship and a vast palisade meant that the history of Jelling now had to be communicated in a new way. The architectural practice of Wohlert Arkitekter designed an extension and conversion and the new visitor centre and experience centre 'Kongernes Jelling – Home of the Viking Kings' was completed in June 2015.

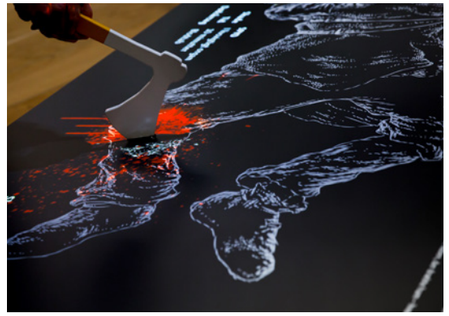
VISITOR INTERACTION

With this upgrade, the new visitor centre is now a whole complex, almost three times its original size. Together with new landscape architecture to offset the monuments, the Jelling heritage site today represents a premier national visitor attraction.

At the new Kongernes Jelling – Home of the Viking Kings centre, visitors engage actively in the experience. The combination of traditional visitor information and digital interactivity makes the centre dynamic in more than one sense. With its fascinating story, Kongernes Jelling – Home of the Viking Kings promises a fascinating experience against the backdrop of a crucial era in Denmark's history. Here all the family is invited to explore history at a level to suit all ages. Edutainment at the centre gives the public the chance to learn, experience, sense and touch, and get the Vikings and their world under their skin.

By the digital fireplace the visitors listen to stories about Jelling and the vikings. The illustrations in the fireplace make it a visual and auditive experience.

Photo: ART+COM



The dead warrior is seriously wounded. But which weapon is the most dangerous one? Visitors at Jelling learn about weapons and causes of death.

Photo: ART+COM

A TOUR OF THE VIKING WORLD

The experience centre is structured around a series of themed sections, each portraying the Viking Age as seen from the perspective of Jelling. As the visitor moves through the centre, the Vikings' everyday lives, religion, ideas and reality are not only communicated to an audience, but experienced interactively with the senses.

The visitor is immersed in diverse aspects of Viking life, from a visit to a fief's hall, to the mysterious burial chamber of the North Barrow, and follows the transition to the afterlife, explores the fabulous narratives of Nordic mythology and joins the Viking Age farmer as he tends his fields and harvests nature's resources.

The visitor is also a part of the scene when the Viking warrior battles to the last drop of blood and when the Viking merchant sails to the edge of the world. The experience not only stimulates the senses, but also tests visitors with mathematical puzzles concerning the monuments' construction and scientific aspects of the archaeologists' revelations of the secrets of the past.

EXPERIENCES BLEND INTO ONE

The roof terrace is a unique element in the new visitor experience. The top of the white building offers an outstanding view of the heritage site, with digital binoculars to turn back time to the reign of King Harold. In this way, impressions of the 1,000-year-old monuments and interactive dynamics at the contemporary visitor centre blend into an overall experience. Because history is still being written at Jelling.

THE PROJECT IS ALSO SUPPORTED BY:

The Labour Market Holiday Fund

A new national museum of natural history

BY RIKKE SANDERHOFF MØRCH

RECIPIENT
Natural History Museum of Denmark

PROJECT
A new national museum of natural history

GRANT
DKK 250m
from VILLUM FONDEN

The new museum will consist of a newbuild under ground and a number of fine, late-1880s buildings, which will be refurbished for the purpose. The new museum will cost a total of DKK 950 million and is scheduled to open to the public in 2020.

In addition to new exhibitions, the museum will also house research and teaching facilities together with storage for a substantial proportion of Denmark's 14 million natural history specimens.

The whale hall will be iconic for the new museum. This shows the entrance from Sølvtorvet.

Illustration: Lundgaard & Tranberg Arkitekter and architect Claus Pryds

The heart of the Natural History Museum of Denmark is made up of the great diversity of butterflies, minerals, rare fossils, skeletons of all kinds of mammals and millions of other specimens kept in storage.

Photo: Jens Astrup (left), Ole Johnsen (centre), René Riis (right)

THE NATION'S HISTORY

Denmark has one of the oldest natural history museums in the world. Since the 1650s, explorers, sailors and merchants have brought home spectacular finds from around the globe, amassing a large and diverse collection of 14 million natural history specimens. This treasure trove testifies not only to the evolution and diversity of life on Earth, it also tells the story of Denmark as a nation, of its history and development over the centuries. This story helps us to understand the world around us, and will enable present and future generations to relate, in an informed and critical manner, to common scientific concerns.

THE MUSEUM IN THE GARDEN

With its unique siting with the Botanical Garden in Copenhagen, the museum will benefit from unique opportunities for combining outdoor and indoor visitor experiences. The garden and buildings and outside and inside will merge as one to engage visitors in world-class experiences to inspire both mind and soul. The aim is for the museum to provide a setting for visits to take in not only the exhibits, but also a tour of the Botanical Garden and enjoy a lunch and the scenic surroundings.

A key element of the new museum will be to provide a new urban space for the benefit of not only visitors but passers-by too. From the Sølvtorvet side, a suspended glassed walkway will provide a peek into the whale hall, taking the casual passer-by through the great lobby and out into the Botanical Garden and on to Nørreport station. Passage through the complex requires no admission ticket, meaning that the public can appreciate the exhibits and enjoy a trip through the Botanical Garden en route to other destinations.

NEW EXHIBITIONS

The museum will be visitor-oriented. Mounting interesting exhibitions capable of attracting visitors from far and wide, being on hand to take questions

The new museum is to be a source of amazement, enlightenment, education and enjoyment. With its unique co-location with the Botanical Garden in Copenhagen, the museum will benefit from unique opportunities for combining outdoor and indoor and above-ground and underground visitor experiences.

Photo: Birgitte Rubæk

and talk to the general public constitute the whole raison d'être for a contemporary national museum. With this new institution, we gain the ideal physical setting for innovative exhibitions and public outreach to communicate the museum's research and natural history treasures. In the new exhibitions, natural science will be staged and communicated in thought-provoking and original ways engaging both children and adults and providing space for reflection and discussion.

The museum's iconic exhibition space will be the great whale hall, where a broad cross-section of the museum's comprehensive collections of whale skeletons will be on show. The working titles for new exhibitions include The Solar System, Dynamic Earth, Denmark's Natural World, Biodiversity, Evolution and Greenland. When the new museum opens, visitor figures are expected to increase from 180,000 in 2014 to more than 400,000 per annum. In addition, the tourist share over a 10-year period is expected to go up from 2% to 33%.

SCIENCE IN A NEW SETTING

In a number of fields, the museum's researchers are world leaders, and in fields such as geogenetics, the origin of life and biodiversity, rank among the absolute international elite. However, bright minds, creativity and curiosity do not do it alone. Facilities and equipment must also be first rate in order to deliver results. To that end, the museum will be equipped with state-of-the-art research and laboratory facilities. The storage facilities will be upgraded to the highest standard so that the collections that constitute the museum's research material can also be used by future generations.

A FOUNDATION FOR THE FUTURE

Letting your fingers skim the spines of a hedgehog or sensing the intense heat of a tropical climate. Or studying rare fossils under a microscope and being astonished by the skeleton of a ground sloth. Such experiences make an impression, and fuel the desire to enter the world of science. These are experiences

The museum's collection of whale skeletons is one of the largest worldwide and is the platform for mounting an amazing exhibition.

Illustration: Lundgaard & Tranberg Arkitekter and architect Claus Pryds

A museum is a knowledge bank of research materials available for use now and in the future. In 2013, PhD student Inger Winkelmann and Professor Thomas Gilbert used DNA sequencing to demonstrate that the legendary giant squid that inhabit the deep in both the northern and southern hemispheres all belong to one and the same species.

Photo: Anders Drud Jordan

not only to arouse curiosity, but may spur a lifelong appreciation of the natural world, and choice of educational and career path.

Thousands of schoolchildren visit the museum each year, and the exhibitions are used in their education. In recent years, the museum has extended its services to 6th-form colleges in the capital and the provinces, and is now Denmark's largest provider of upper secondary educational services. At the new natural history museum, pupils, students and teachers will gain even better opportunities for exploring the institution's research and scientific materials.

RIKKE SANDERHOFF MØRCH

Rikke Sanderhoff Mørch (b. 1969) is Chief Communications Officer at the Natural History Museum of Denmark. Before her appointment to the museum in 2009, she worked in communication and marketing at institutions such as the Royal Danish Theatre. In the period 2008-2012, she was also attached to Copenhagen Business School as an external associate professor in strategic communication.

THE PROJECT IS ALSO SUPPORTED BY:

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