Meeting the Future

12 Interdisciplinary Research Platforms
University of Copenhagen
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Research across Boundaries

One of the most significant effects of globalisation has been the breakdown of boundaries. Today, an increasing number of social issues transcend not only national borders but also traditional divisions between scientific disciplines. Research into climate change, for instance, needs to embrace disciplines as diverse as meteorology, analyses of the inland ice on Greenland, safety issues related to energy supply and critical assessment of Al Gore’s political rhetoric.

The merger between The University of Copenhagen, The Royal Veterinary and Agricultural University, and The Danish University of Pharmaceutical Sciences has increased the scope for multidisciplinary research considerably. The University of Copenhagen is now Denmark’s largest knowledge institution, with eight faculties, 5500 researchers, almost 40,000 students – and, according to international ratings, a prestigious score as 8th on the list of Europe’s best universities.

The University’s strategy document, ‘Destination 2012’ states that the University has significant scientific diversity within education and research – a capacity that has only been further strengthened by the merger.

During 2007, 700 researchers made dedicated efforts to present their suggestions to how the University might take advantage of its scientific diversity in ways that are both visible and valuable. Their efforts resulted in the definition of 12 interdisciplinary research platforms, all of which address central current and future challenges facing our society.

This booklet presents the outcome of the researchers’ collective process from ideas to finished research proposals. Each platform introduces the motivation, the ambition and the sub-themes that structure the work under each research topic.

The unique process towards these platforms – and not least its immediate result – suggest a promising future for the University of Copenhagen and bode well for the University’s role in Danish society. The 12 platforms also reflect the University’s distinct potential to contribute positively to the international community – which Denmark is becoming a still more integrated part of.

Chancellor, Ralf Hemmingsen & Vice Chancellor, Lykke Friis, University of Copenhagen
Meeting the Future
Living Conditions, Environment and Health in Developing Countries

Motivation
More than one billion people live below the international poverty line of one dollar a day. They fight for their existence in a society frayed by inequality, environmental problems and unacceptable health conditions. At the same time, historical and political factors stand in the way of national and international efforts to implement effective, future-orientated development policies.

However, developing countries are not only home to poor, passive citizens. At a local as well as national level – in state as well as civil sectors of developing societies – there is a great determination to face up to and try to resolve existing challenges. Research-based knowledge can support such determination and contribute positively to development possibilities.

Ambition
The better we understand the causes and characteristics of the various problems facing developing countries, the closer we are to finding ways of removing the barriers to progress. This research platform will help to develop knowledge and build capacities to promote development programmes in Third World countries that are both socially and environmentally sustainable.

In order to build long-term capacities and know-how, the platform is premised on the interdisciplinary collaboration with researchers and professionals in developing countries, allowing them to be actively involved in defining and finding solutions to the problems facing their countries.

Structure
The University of Copenhagen is home to a number of internationally renowned researchers and units within the field of development studies. Areas of expertise extend from global health, agriculture and environmental issues to broader interdisciplinary development research that integrates perspectives from Social Sciences, Law and the Humanities. The University has also been actively involved in the implementation of a number of development, research and education programmes in Africa, Asia and Latin America.

The research activities in this platform have been divided into four sub-themes that are mutually supportive:

Global health
The global health theme analyses the most serious challenges within the area of public health. Among the topics explored are: Inequality, ‘the double burden of disease’, social, physical and demographic changes, food and nutrition, cultural perceptions and practices, health systems, policies and technologies.

Ecosystems and livelihoods
Researchers working in this area integrate natural and social science approaches to explore the following issues:
- The relation between ecosystem services and living conditions
- Climatic changes and human acclimatisation strategies
- Natural resources and human health.
**Agricultural production systems, food security, food safety and rural livelihood**

This theme focuses on the entire food chain, including local living conditions. Issues such as agricultural production systems, food safety, and conditions of life in rural districts in developing countries are given specific attention.

**Development: Conditions and policies**

This theme analyses relevant issues relating to:

- Institutions, governance and development policies
- Growth, international resources and the development of markets
- Households, business and local communities in the development process.

The platform draws upon research strategies and methods from the entire scientific spectrum; all eight faculties of the University are involved in the study of living conditions, environment and health in developing countries.

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IBM introduced the personal computer in 1981. Ever since, computer-based technologies have become more and more sophisticated and have had a huge impact on almost all aspects of modern society.

The ‘e’ prefix has not only given new meaning to concepts such as ‘mail’, ‘business’, ‘commerce’, ‘government’ and ‘learning’. Computer technology has also influenced our behaviour and culture. Now an integral part of everyday life, we expect more and more of computers and keep finding new ways of allowing computer-based technology to make life easier for us.

This development is a huge challenge for the public sector. Particularly within health and education, there is a need for more intelligent and user-friendly systems based on the requirements of the individual citizen, patient or student. These systems should allow people to become active users, able and willing to obtain knowledge themselves and contribute with their own knowledge and experience.
Ambition

Communication – between people and between people and computers – is the central concern linking the research activities in the eResearch platform. The various sub-themes will look into how information is exchanged, and how we can ensure a positive dialogue between people and systems in a virtual and global world – a world where the participants in dialogues typically belong to different cultures and have entirely different professional backgrounds.

The University of Copenhagen has unique capacities within the field of eResearch. This provides plenty of opportunities to produce new interdisciplinary studies that inspire students at all levels and make a difference to the way in which computer-based technologies are utilised in society in general.

The eResearch platform has defined a number of specific targets:

- To contribute to the development of advanced and user-friendly communication technology that supports active participation and the exchange of experiences among citizens and patients, specifically on health-related issues.
- To develop methods for translating evidence-based knowledge into information which health professionals, patients and relatives can use in their daily lives.
- To connect linguistic and cognitive disciplines with disciplines from the natural sciences, paving the way for new types of analyses and innovation within scientific as well as other types of computer-based interaction.
- To change universities’ traditional way of teaching and planning by using new media to develop their educational programmes, learning processes and organization.

Structure

The eResearch research platform is organized into three sub-themes:

**eHealth**

This theme focuses on advanced communication technology in medical treatment, health care and health sector usage. Scientific enquiries assume the perspectives of a) the individual citizen b) the various institutions in the health sector and c) society in general.

**Language, cognition and natural science**

This topic examines specific areas within modern technology where language, cognitive processes and natural science interact in new ways.

**eEducation**

eEducation research involves case-based studies of the way in which advanced communication technology can help improve learning at all levels of the education system.

The eResearch platform draws on expert capacities from six different faculties at the University of Copenhagen.

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Natural Resources and the Environment

Motivation

The world’s current development is not sustainable – neither globally nor locally. Our global supply of food and natural ecosystems are threatened by rapid climatic, social and economic changes, by explosive population growth, and by an imbalance between rich and poor countries and cities and rural areas. By 2025, more than 2 billion people will be affected by water scarcity. In addition, current climate changes are so dramatic that we need to significantly reorganize our existing energy supply systems.

Contemporary concerns about climate change, pollution and global environmental changes call for new sustainable development strategies and practices. They also identify the need for new directions in research that can address the human impact on, and interactions with, the natural environment from a far more holistic and systemic perspective.

Ambition

During the latter part of the 20th century, our knowledge of natural resources and the environment has increased substantially. However, this knowledge has not yet been transformed into coherent solutions that can solve imminent environmental problems. Sustainability Science presents an approach that paves the way for solutions that are not only sustainable, but also far more comprehensive in scope.

Sustainability Science is a new multidisciplinary approach that seeks to understand the complex interactions between nature and society, and the way in which global processes interact with the ecological and social structure of particular places and sectors.

Following this approach, the Natural Resources and the Environment platform aims to provide the necessary evidence-based knowledge that will increase society’s capacity to approach environmental challenges in a proactive way.

Among the important issues on the research agenda are:

- Understanding how ecological, social, political, legal and economic resources can interact to ensure sustainable agriculture and management of natural ecosystems. The aim is to achieve a stable food supply without causing irreparable damage to ecosystems.
- Finding useful answers to the complex problems relating to sustainable water supply, sustainable production in agriculture and aquaculture and to those ecosystem functions that are threatened by lack of water and/or future climate changes.
- Enhancing our understanding of the preconditions for – and barriers to – an effective prevention of future climate changes, including strategies of adjustment to those that have already happened.
- Modelling the effect of polluting substances on the environment and on human beings in order to make more precise risk assessments of these substances before allowing their use.
Structure

The study of human-environment interaction calls for interdisciplinary approaches involving Natural Sciences and Life Sciences as well as, for instance, Social Sciences, Law and the Humanities. The Natural Resources and the Environment platform provides an ideal scientific basis for the cooperation between faculties.

By facilitating interdisciplinary collaboration, this platform hopes to spearhead the effort to position the University of Copenhagen at the forefront of international research within Sustainability Science.

The platform is organized into four subthemes, all of which draw upon research strategies and methods from the entire scientific spectrum:

- The terrestrial environment: Land-use and ecosystem services in a changing world
- The aquatic environment: Water scarcity and ecosystem functions
- Energy, environment and climate change
- Man, pollution and health

All eight faculties of the University of Copenhagen are involved in the Natural Resources and the Environment platform.

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Meeting the Future

Science, Ethics and Communication

Motivation

During the past 50 years, the role of Life Sciences has become increasingly important. These disciplines have provided an understanding of basic mechanisms of biological life, offered new diagnostic tools and ways of treatment, along with advanced ways of producing biological material. Life Sciences have fundamentally reshaped the way we perceive ourselves and our role in nature.

At the same time, Life Science has undergone radical transformation. Scientific enquiries have become organized, funded, communicated and embedded in society in new ways. Strategic research has a more central position, typically organized in larger groups and in collaboration with external commercial partners. Scientific environments have also become more dependent on public approval. This means that they need to be able to deal with public concern, communicating theories, methods and results meaningfully in a context largely determined by modern media.

Last but not least, scientific research has gone global. Science is part of an international community where the public’s insecurity, fear, trust and perception of risks cut across regional and national boundaries. What happens in scientific communities in Korea or Scotland may have a profound impact on public opinion and political decision-makers in other parts of the world.
Ambition

These global changes in the way Life Science is organized and embedded in society at large demand that the norms of scientific research are reconsidered and the relation between Life Sciences and society in general is redrawn. This is the premise for the Science, Ethics and Communication platform.

Scientific enquiry into the organization and social relations of Life Sciences is important, not only to secure the continued social acceptance of Life Sciences as scientific disciplines, but also to ensure the ethical approval of their scientific enquiries. This platform hopes to contribute to this process by:

- Qualifying the scientific and public debate
- Realizing the University of Copenhagen’s commitment to communicate its research and reflect on its relations with society
- Strengthening the University’s teaching and post-graduate education programmes within Life Sciences, scientific theory and research ethics.

Due to its size and tradition for interdisciplinary collaboration, the University of Copenhagen is in a unique position to realize these ambitions. If successful, this platform will be the first of its nature in the world.

Structure

The platform is subdivided into six themes that each seek to address a number of challenging questions:

**Research ethics under new conditions**

Which new challenges arise when research is funded by large strategic grants and depends on the collaboration with commercial partners?

**Rethinking the contract between science and society**

How should scientific enquiry be organised if we are to preserve the virtues of scientific enquiry and meet society’s legitimate demand for effective resource utilisation, political management and democratic participation?

**The social life of proteomics**

How is the emerging field of proteomics constituted? Which ethical, legal and social issues does proteomic research give rise to?

**Conditions for public engagement with Life Science and biotechnology**

How do Life Sciences and biotechnology communicate their activities and findings? How does the integration of social and aesthetic disciplines increase the level of public engagement with Life Sciences?

**Rethinking the role of the expert: Public negotiation of the scientific ethos**

How do the scientist’s performance, negotiating skills and credibility influence his/her construction as an expert by the media and society in general?

**Global risk, national expertise, local trust**

How do culturally specific values and discourses interact with scientific facts? How do culturally specific discourses influence the conception of science, scientific expertise and risks in different countries?

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Motivation

Cells are the building blocks of life; in the communication between cells lies the key to understanding – and preventing – many serious diseases.

Unicellular organisms include pathogenic bacteria and organisms that in turn produce fuels and nutrients. In multicellular organisms – humans and animals, for instance – the interaction between cells and the tissue they compose is coordinated by signals. All cells in multicellular organisms produce signals. They communicate growth and death to other cells and receive signals from the acellular matrix that surrounds them.

Defects in the signalling between cells can be the cause of neurological illnesses, immune system diseases, diabetes, obesity and cancer. Recent studies have shown that cancer can be cured or controlled by therapies targeting deviant signalling pathways. In the treatment of breast cancer and leukaemia, remarkable results have been achieved by using certain forms of signal therapy.

Ambition

A number of sophisticated and very expensive techniques are needed to unravel the mechanisms behind normal and abnormal cell behaviour. These costly techniques are applicable to organisms as diverse as bacteria, plants and human and animal cells. The techniques in question are:

- Imaging of the life processes in situ, using whole organisms, organs, tissues or cells
- Robotics and cytomics, proteomics and metabolomics
- High throughput and high resolution characterisation of genomes
- Sophisticated studies of signalling regulation in health and disease
- Computer-based modelling of cellular behaviour based on data from different omics technologies (systems biology).

By bringing together scientists working in these different fields, the University of Copenhagen builds a unique and internationally competitive technological platform that can significantly further research into new biologically targeted therapies for cancer and other diseases, microbial adaptation, infectious diseases and vaccines, and the production of healthy foods and feeds.
Structure

The Universe of the Cell platform draws on researchers from four different faculties at the University of Copenhagen, as well as scientists from the Danish Biotech Research and Innovation Centre (BRIC).

This platform has been subdivided into seven themes that represent distinct, but interrelated research areas:

Adaptation in the microbial universe
Research projects on microbial adaptation - from specific molecular mechanisms in model organisms to multi-species interactions in complex environments. This sub-theme also assesses the role of Horizontal Gene Transfer (HGT) in genome evolution.

Omics and system biology
This theme combines omics technologies and systems biology to reveal the dynamic connections between genomes and proteomes, proteomes and metabolomes, and ultimately between the molecular information and phenotypes/function of the whole organism.

Epigenetics
Epigenetic regulation governs crucial processes such as proliferation, development, differentiation, stem cell renewal and genome integrity. Deregulation of epigenetic mechanisms is causally related to a number of human diseases. This sub-theme aims to unveil and understand the epigenetic gene-regulatory mechanisms that are so fundamental to health and disease.

Cell signalling and interactions
Normal cell interaction processes are mapped and compared to deviant signalling processes. On this basis, the specific biological questions relating to homeostasis, exemplified by tumour development and defence against infectious diseases, are addressed.

Infectious diseases and immune protection
The target for the research activities in this sub-theme is to understand host-pathogen interaction and present immunotherapeutic strategies for prevention of viral and non-viral infections and diseases. Vaccine projects are taken from fundamental immunology and microbiology through vaccine formulation and delivery to pre-clinical testing in appropriate animal models.

Novel validated targets for the development of new treatments for cancer
By using novel screening approaches and cellular and genetic systems, this sub-theme hopes to discover and understand fundamental molecular mechanisms underlying the development of cancer, and to translate this knowledge into clinical tools for diagnostics and treatment of cancer.

Plants taking on new tasks
Plant biotechnology and genomics can be used to pave the way for a bio-based economy. This theme has a number of different targets for its research activities:

- To secure a healthy and health-promoting high quality food supply
- To improve plant yield potential
- To improve the genetic diversity of crop plants
- To reduce the environmental impact of agriculture
- To develop renewable materials
- To develop more efficient biofuels.

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Identities

Motivation

The concept of identity is not only of central concern to a number of disciplines within the Humanities, Theology and Social Sciences. Visions of identity have also played – and continue to play - an important role in the historical constructions of national, religious and other types of collective identity. Collective identity has served as lever for the formation of states and the progress of civilization; however, it has also triggered wars and caused the repression of minorities.

In a period of economic, political and cultural globalisation, an understanding of the historical and contemporary role of ideas of identity seems to be of crucial significance – particularly in Europe.

Ambition

This research platform presents a number of critical enquiries into the notion of identity and how it is used – and misused – for scientific or political interpretation of historical and cultural phenomena.

The Identity research platform aims to:

- Present the historical background for the conceptions of identity that influence current debates in individual nation-states and in Europe in general.
- Enhance the level of research, education and public debate on national, religious and cultural communities – real or imagined – in a rapidly changing world.
- Analyse the historical background for identity issues related to the meeting between European culture and the Islamic world (including the growing Muslim minority in European societies), with a view to developing more precise concepts and theories for the identity-related aspects of this encounter.
- Create a better basis for the public debate – and for political decision-making – on how to handle our genetic identity legally, ethically, philosophically and medically.

Structure

The Identities research platform is organized into five sub-themes:

**The cultural history of European identities**

A study of the distinctly ‘European’ in a global context, focusing on some of the dichotomies that have crucially influenced Europe’s development and the visions of European identity (for example, secularisation versus religion, tradition versus modernity and inclusion versus exclusion).

**Identity, nationalism and cultural policy**

An analysis of the role cultural politics has played - and still plays - in Europe. Under scrutiny is the political, institutional, and ideological framework for cultural initiatives as well as the significance of national identity in a globalised world.

**Islam in European culture – Historical and contemporary perspectives**

An enquiry into Islam’s historical and current role in European culture. This sub-theme looks into the interaction between European self-perception and Islamic culture and politics through the ages, and studies current aesthetic expressions of migrant experience from writers and artists with Islamic backgrounds.
**Identities**
- The cultural history of European identities
- Identity, nationalism and cultural policy
- Islam in European culture
- Picturing Scandinavia
- Genetic identity

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**Picturing Scandinavia**
This sub-theme examines the formation of Scandinavian culture, values and experience from both a European and a global perspective. Specific attention will be given to the outsider’s view of Scandinavia – particularly the socio-political impression (e.g. the Welfare State) and the cultural image (e.g. design).

**Genetic identity**
An interdisciplinary enquiry into the concept of genetic identity, taking as its point of departure recent scientific acknowledgement of genetic individuality and what this means for our conception of individual and collective identity.

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In recent years, the world has witnessed the development of an obesity epidemic. Overweight and obesity not only reduce the quality of life for the individual; they also cause serious illnesses such as cardiovascular diseases, certain forms of cancer, metabolic and musculoskeletal disorders and, in particular, Type 2 Diabetes. Globally, the prevalence of these diseases has grown exponentially over the past decades. For this reason, obesity is at the top of WHO's chart listing the greatest health problems facing the world today.

In 2006, more than 30 per cent of the adult population in the United States was obese and 65 per cent were overweight. When examining the status of obesity in Europe, scientists estimate that Europe is only five years behind the US. Figures from various European countries support this estimation: In Great Britain, for example, the prevalence of overweight people tripled from 1980 to 2000.

But we are not only dealing with a Western phenomenon. In countries such as China and India, the proportion of obese children is increasing at a frightening rate. Among pre-school children in urban areas of China, the prevalence of obesity exploded from 1.5 per cent in 1989 to 12.6 per cent in 1997! Drastic development on a similar scale is seen elsewhere in Asia.

The radical increase in lifestyle-related diseases is the result of a complex interaction of genetic and lifestyle-related factors. Some factors are obvious: Changes in diet and advances in technology and transport, which reduce our daily level of physical activity. Others are far more complex, relating to metabolic abnormalities and intricate genetic dynamics.

Many questions concerning the correlation between genetic and environmental factors remain unanswered by modern science. What are the social, economic and cultural reasons why people react so differently to the self-evident appeal to put an end to unhealthy habits? Why are the drugs available for the treatment of diabetes and related cardiovascular diseases not as effective as we would wish them to be? To answer such questions, we need to approach the field from different angles, employing approaches that cut across traditional scientific disciplines.

Based on the existing collaboration between academia and industry, the Food, Fitness and Pharma platform aims at building an interdisciplinary powerhouse for research into, and prevention of lifestyle-related diseases. One of the ambitious goals of this research platform is to analyse the origins of lifestyle diseases and use this knowledge to develop effective medical remedies as well as recommended procedures that may affect behaviour among stakeholders (for example, patients, politicians, therapists, the food and medical industry, etc.).
Denmark already holds a strong position internationally within the field of lifestyle-related diseases. Based on this strong hold, the platform aims to make science on lifestyle-related issues a brand – not only for the University of Copenhagen but for Denmark as such.

The platform’s various projects and themes interact at many levels, forming an integrated matrix of approaches to understand, prevent and treat lifestyle-related diseases. It consists of two main ‘vertical’ themes and four ‘horizontal’ sub-themes:

**Main themes:**
- Lifestyle: Food / Nutrition / Exercise
- Pharmaceuticals / Medicines

**Sub-themes:**
- Genomics / Bioinformatics
- Translational sciences (for example, bio bank, epidemiology and biomedical research)
- In vivo models (such as animal testing, and clinical trial units to assess effects in humans)
- Sociological, legal, economic and ethical aspects

By providing a common platform for the collaboration between experts and institutions, the platform centralises activities within this area, allowing synergies between disciplines to develop into effective results that benefit professionals, the industry and not least patients suffering from lifestyle-related diseases.

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Migration – Movement of People and the Development of Societies

Motivation

New communication technologies and improvements in transportation systems have fundamentally challenged the idea of a global order based on separate and independent nation-states. The world is now conceived in terms of social, economic and cultural flows and networks, and the image of stable, grounded cultures and societies has given way to notions of mobile ethnosapes, creolisation and hybridity.

A central aspect of globalisation has been the escalation of voluntary and forced migration – particularly along a North-South axis. This calls for a total rethinking of migration processes and the conceptual framework within which they are examined. Migration needs to be seen as a fundamental characteristic of modern social and cultural processes - not as a parenthesis in the history of an otherwise stable and rooted civilization.
Ambition

This research platform focuses specifically on mobility, place-making and processes of identification and belonging within the context of globalisation.

The overall objectives of this platform are:

- To investigate the nature of migratory movements
- To study the impact of migratory movement on both sending and receiving societies, including places of transit
- To examine ways in which migrants manoeuvre as individuals, families and communities in relation to local, national and transnational contexts, and how these contexts become sources of identification.

Denmark will figure as a prominent, but not the only reference point for the research programme. Thus, one of the programme’s specific aims will be to understand how population movements in and out of Denmark in a historical and contemporary perspective have shaped the development of Danish society.

Structure

The research agenda is organized into three sub-themes:

**The global fields of mobility, flows and networks**
Exploring the migratory moves between the South and the North, this theme examines people’s motives for moving, the role of social networks as frameworks of movement, and the way in which the complexity of movements and links influence the character of sending as well as receiving societies.

**Belonging and cultural diversity**
This theme studies the nation-specific conditions for belonging, social inclusion and participation. Do these conditions suggest that human mobility relies on more universal constituents of identity formation? How are belonging and identity processes affected by the increasing ethnic and cultural diversity that characterises nation-states?

**Societal conditions and institutions in everyday life**
The third and final sub-theme presents an in-depth, cross-sectional study of everyday life in a local community. The study includes detailed analyses of the ways in which immigrants and their descendants interact with the local community and its key institutions (such as schools, day-care and health services, sports clubs and labour markets).

Reinterpreting societal development from the perspective of movement, networks and transnational flows involves the collaboration of researchers from a variety of disciplines and backgrounds. The Migration platform includes researchers from six different faculties at the University of Copenhagen as well as a wide range of collaborative partners outside the University.

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Motivation

New technologies emerge as a response to a specific need or challenge. History reflects how certain new technologies have had such a profound influence on human life that they have provoked the onset of a new era. The development of the steam engine sparked the industrial revolution. Information technology revolutionised worldwide communications, creating the information society.

The challenges of the 21st century are already many and various: Pollution is threatening the stability of our planet; quality of life and the standard of health in the world’s population could be far better; a wide range of diseases are still neither preventable nor curable with current forms of medicine. These are all challenges that call for new technologies to improve life – technologies that might in time define the era of globalisation.
Ambition

Three central questions constitute the basis for all research activities in the Future Technologies platform:

- How can we efficiently harvest the energy from the sun deposited in plants in ways that are environmentally friendly?
- How can we employ new technologies to enhance the quality of life through better food and health?
- Can we develop technologies for targeted delivery of drugs and early diagnostics?

Structure

To address these questions, this platform has been divided into seven sub-themes, all of which are interdisciplinary and contain visions for the development of new technologies in different fields. All seven themes represent areas of great scientific potential that have already attracted a lot of international attention.

Nanotechnology

How can we use atom and molecule manipulations to develop better food, materials and medicine? Finding the answer to this question is central to the Nanotechnology sub-theme.

Bioimaging

Bioimaging refers to the pictorial representation and the quantification of living organisms at work. This sub-theme seeks to find ways of tracing single molecules through living systems.

Metabolomics

Metabolomics is the systematic study of the unique chemical fingerprints that specific cellular processes leave behind. This sub-theme attempts to follow these transformations directly in living tissue.

Chemical biology

Can we tailor biomolecules with new properties? This sub-theme will attempt to find the answer to this question by studying applications of chemical synthesis in biology.

Biofuels

The sun deposits tremendous amounts of energy in plant fibres, but how do we harness and harvest this solar energy, and what are the consequences of this utilisation for our environment?

Modelling

Using mathematic modelling to describe complex data sets, this theme examines the possibility of acquiring a complete picture of a disease from, for instance, a blood sample analysis by instant data integration.

Risk assessment of nanotechnology

What happens to nanoparticles in living systems? This theme explores the risks associated with nanotechnology.

This platform draws on scientists from five different faculties at the University of Copenhagen.

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Global Challenges: Spaces, Powers and Cultures

Motivation

The study of globalisation is most often concerned with the effects of economic globalisation. However, globalisation brings more than larger markets, cheaper goods and new global production patterns. Images, religious perceptions and ideologies travel across the world, as do tourists, business travellers, migrant workers and refugees.

This flow of ideas and people creates significant transformations that call for a redefinition of the concepts of identity, community and legitimacy.

Ambition

The Global Challenges platform is organized around three core concepts: Power, space and culture. Earlier, these three concepts coincided almost completely with the framework of the nation-state. But that is no longer the case.

National authorities are challenged, as economic and social relations are being shaped and controlled by forces beyond their reach. Fixed space loses its significance in favour of space produced by relations between citizens, businesses, organizations, government bodies, etc. Culture, as a national mode of behaviour or way of thinking, is dissolving into a number of distinct and diverse cultures that traverse national borders.

Through the prism of power, space and culture, this research platform reflects the changes and challenges globalisation generates. Turning power, space and culture into plurals, as this platform does, is perhaps the first conceptual manifestation of globalisation.

Structure

Understanding globalisation demands a three-dimensional approach that cuts across traditional disciplines and perspectives. Research in this platform will involve the collaboration between researchers from different faculties and departments at the University of Copenhagen as well as the participation of other international scientific institutions.

The Global Challenges platform presents itself as The University of Copenhagen Centre for Globalisation Studies. The centre’s research activities fall into five interdisciplinary themes:

Urbanisation and territorialization

This theme studies the territorial impact of globalisation processes. Under scrutiny is the rise of mega-cities, particularly those in the Far East.

Community

The community theme explores the tensions and ambiguities that arise in the interface between traditional ways of constructing political identities, communities and ideologies and the emergence of new global forms of social and political affiliations.
Figures of authority
How is authority produced and legitimised in the era of globalisation? This theme looks into the coexistence of new and traditional forms of authority with a view to mapping the political, legal and cultural changes of authority.

Constitutionalization
This theme explores the implications of three dominant trends in the globalisation of law and politics: Legalisation and delegalisation, transnational regulation and ‘the effects of Europe’, also known as Europeanisation.

Global imaginaries
How do new communication media change our relationship with fellow citizens? How do traditional art forms help us understand a globalised world? This sub-theme examines the role played by cultural imagination in the construction of a globalised world.

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Motivation

In developed, democratic societies, issues relating to welfare and democracy have a natural place on the agenda in the political and the academic arenas.

The fact that the state is experiencing increasing difficulties in delivering welfare services that meet citizens’ expectations raises questions about the relationship between citizen and state in the 21st century. The democratic system faces a number of similar challenges: Globalisation has meant that transnational structures within the media and the labour market have significant influence upon some of the well-established domains of nation-state.

Current developments within nations affect welfare and democracy in different ways. At the same time, tendencies and structures are becoming increasingly related internationally. This is why issues pertaining to welfare and democracy need to be analysed from a European and a global perspective.
Ambition

The Welfare and Democracy platform addresses a number of central issues related to the area of welfare and democracy. Most importantly, the platform wishes to:

- Highlight the Europeanisation of Denmark and the Danish public sphere in areas that are crucial to a democratic welfare society in a globalised world.
- Present new theoretical and empirical knowledge on the role of citizens, their rights and not least their experience of a welfare society undergoing significant change.
- Provide new knowledge on flexicurity models, their strengths and weaknesses as well as their limitations and preconditions.
- Cover the relation between welfare and democratization globally, analysing the dilemmas that arise and present possible solutions to these.

Structure

The Welfare and Democracy platform represents interdisciplinary collaboration between researchers from six different faculties at the University of Copenhagen and a number of experts from other research institutions in Denmark and abroad. The platform covers 20 different research projects, all of which fall into four major themes:

**Europeanisation, welfare and democracy**

This sub-theme represents research into the Europeanisation of national democracies and public spheres, and enquires into the media’s role as an intermediary between the national and the transnational public sphere. The political process, democracy and the role of the media – at both a national and a European level – is analysed in relation to the huge social and cultural significance Europeanisation has had.

**Where citizens meet systems – New challenges in the welfare state**

This sub-theme presents analyses of different welfare systems, focusing on the meeting between clients/patients/users and the system. The theme takes, as its point of departure, the viability of the universal Danish welfare model in a time of globalisation, multiethnictiy, demographic changes and pervasive organizational and management changes in the public sector.

**Flexicurity – New balances in the regulation of work and welfare**

Based on critical analyses of the Danish flexicurity model, this theme focuses on:

- The model’s (social) economic effectiveness in relation to other regulatory models
- The possibility for mutual exchange of knowledge between the Danish and other flexicurity models
- Inclusion and exclusion in relation to the model
- The model’s regulatory basis.

**Welfare and democracy in a global perspective**

Under this heading, researchers will look at the paradoxes and dilemmas that welfare and democratization processes produce all over the world, and, through a more comprehensive understanding, seek to find possible solutions to these issues. Special emphasis is given to the transnational prevalence of norms, institutional responsibility and democratic processes, such as international support for democratization.

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Motivation

The human brain is unique and by far the most complex organ in nature. 100 billion nerve cells (neurons) form an intricate network of more than 7000 billion interactions (synapses). Such complexity is not only intriguing, but constitutes the basis for human intelligence, behaviour and physiology.

Malfunctions in the brain often result in serious diseases. The most well known of these are Alzheimer’s and Parkinson’s disease, schizophrenia, epilepsy, Huntington’s disease, stroke, depression and anxiety disorders.

Ambition

In addition to the trauma suffered by patients and their relatives, brain-related diseases inflict a huge economic burden on society as well. To reduce personal suffering and bring down societal costs, we need to increase brain research, expanding our knowledge of the well-functioning and the malfunctioning brain.

Given its strong research environments within neuroscience and its related disciplines, the University of Copenhagen has the expertise and vision necessary to create a centre of excellence within the field of brain research.
The Brain, Mind and Medicines research platform has been divided into eight sub-themes, each of which relies on interdisciplinary collaboration between researchers and units from six University faculties as well as a number of external partners.

**Molecular and cellular neuroscience**
This topic seeks to unravel intercellular and intracellular signalling in the brain. By understanding the complex communication patterns of nerve cells, researchers hope to identify new therapeutic strategies and medicines for a large group of diseases in the central nervous system.

**Neurogenomics**
The premise for the research in this sub-theme is to uncover the exact roles of all brain-related genes and map their interactions. This will provide a basis for the diagnosis and cure of brain diseases and support many areas of research that depend on a deeper understanding of the brain (for example psychology, computer design and robotics).

**Consciousness, cognition, sensation**
This group investigates sensation, cognition and subjective conscious experiences at psychological, cellular and biochemical levels – both in the normal brain as well as in brains affected by neurological and neuropsychiatric disorders.

**Learning, memory and plasticity**
Under scrutiny in this sub-theme are human learning, problem solving and memory as well as mental and neural plasticity. Advances in these areas are extremely important to a variety of applications, such as pedagogy, clinical treatment strategies, rehabilitation therapy, and the development of effective medicines.

**Movement and motor control**
This sub-theme studies movement and motor control from the molecular and cellular levels, over animal models to healthy humans, and finally to patients with debilitating movement disorders. Research is undertaken with a view to finding better treatments for debilitating movement disorders.

**Psychiatric diseases and drug abuse**
Research in this group is directed towards bridging the gap between basic neuroscience and psychiatric disorders. By enhancing our understanding of the biological, social and psychological mechanisms behind psychiatric diseases, this group hopes to pave the way for better treatment of these diseases.

**Headache, epilepsy and pain**
This sub-theme brings together leading experts within migraine, pain and epilepsy research to find sufficiently specific and effective medicines that may alleviate, if not cure, conditions of “disturbed neurological signalling”.

**Neurodegenerative diseases**
By studying the entire spectrum from molecular and cellular mechanisms to the diagnosis and treatment of neurodegenerative disorders, this research group provides essential insights into mechanisms behind neurodegeneration, regeneration, repair and plasticity.

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