SDC

The university partnership
Denmark – China

Annual Report 2020

Sino-Danish Center for Education and Research

A report from the Danish partners

List of Abbreviations

SDC	Sino-Danish Center for Education and Research
CAS	Chinese Academy of Sciences
UCAS	University of Chinese Academy of Sciences

Sino-Danish Center for Education and Research
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Niels Jensens Vej 2, building 1190
DK-8000 Aarhus C, Denmark

Editors: Morten Laugesen, Lonnie Høgh and Michael Bihlet

Design and layout: Michael Bihlet and Lonnie Høgh

www.sdc.university
facebook.com/sinodanishcenter
instagram.com/sinodanishcenter
linkedin.com/school/sinodanishcenter

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The Director's report

Last year, in 2019, I opened my Director's report with the sentence: 'In many ways, 2019 was business as usual and busy as usual'. This year, we have also been busy, but nothing in 2020 has been business as usual. The year 2020 by far stands out as the most challenging year in SDC's history, and no part of the organisation has been unaffected by the Covid-19 pandemic.

In fact, SDC suffered two hits in the beginning of 2020. The first was when the initial outbreak of Covid-19 in Wuhan led to decisions by the Chinese government to close down research institutions and universities for staff and students and eventually also the Chinese borders for most foreigners. The second was when the Danish government in early March declared a comprehensive lockdown of Denmark and ordered most public employees, including university faculty, to work from home.

Within a few weeks, students, SDC teachers and staff members on both sides of the partnership were facing a new and unprecedented reality. Students suddenly found themselves physically isolated from classmates; teachers were forced to rethink and reorganise lecture plans and teaching activities; and researchers and PhD students had to cancel or postpone planned research stays in China. Despite the difficult circumstances everyone faced, and still are, due to the Covid-19 outbreak, SDC as a whole managed to handle the situation thanks to the tremendous effort of our dedicated faculty and staff members. Throughout the process our students have shown an impressive drive and patience in a situation where they have been met by uncertainty, new teaching methods and sudden changes.

However, 2020 was not only about changing plans and cancelling activities. In December, SDC celebrated its 10th anniversary with an online event, which also included the launch of the first edition of the 'SDC International Report 2020 – Cooperating for Energy Transition' and a subsequent panel discussion and symposium. The report, which contains 15 peer-reviewed articles co-authored by Danish and Chinese researchers, serves as a clear example of how well-established the collaboration between Danish and Chinese researchers has become.

2020 also saw the launch of a new Master's degree programme in International Food Quality and Health, making the total number of offered programmes eight.

This Annual Report 2020 is the report of the Danish SDC office, and it thus predominantly focusses on the achievements, accomplishments and contributions of the Danish side of the partnership.

Happy reading!

Morten Laugesen
Executive Director of SDC

SDC
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SDC 10-year anniversary

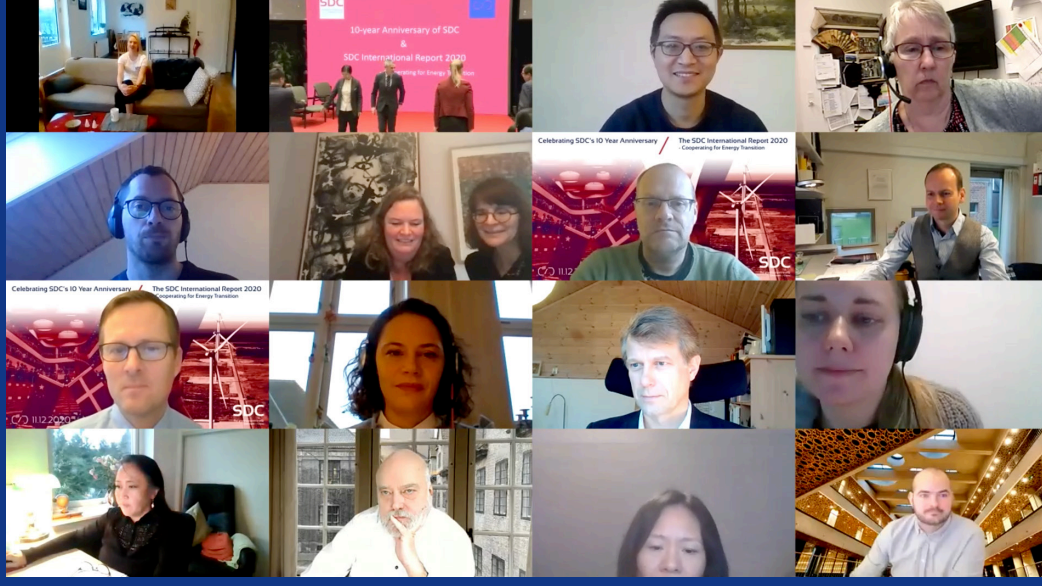
On 11 December, more than 200 people took part in the celebration of SDC's 10-year anniversary online and at SDC north of Beijing. The occasion was marked with the launch of the first SDC International Report 2020 – Cooperating for Energy Transition.

'The Sino-Danish relations revolve around shared interest, mutual respect and dialogue. And dialogue is the DNA of SDC. All of you Chinese and Danish students present here today, you sprout from different soil, providing us with your own distinctive characteristics, ideas and values. And this diversity is what makes SDC a fertile ground for learning and research'.

Thomas Østrup Møller, Danish Ambassador to China

'SDC has forged a strong partnership and made fruitful results in this first decade. I hope that in the coming one both sides will continue to remove to obstacles and maintain our responsibilities and dreams, respect and trust in each other. That we can deepen our cooperation and usher in the future where SDC makes every great contribution to the development of the two countries and progress of mankind'.

Wang Yanfen, Executive Vice President, UCAS



'As an international student, I can only say what SDC has meant for me and my career. I have got friends for life, both among our international students and the Chinese students from my cohort ... It is this access and the direct link between Danish and Chinese students that we should not underestimate ... Educating a generation of students between our two countries is immensely valuable in a world where the affairs of East and West become more and more intertwined'.
Mads Vesterager Nielsen, Alumni from the 2016 cohort

Launch of the SDC International Report 2020

The first SDC International Report – Cooperating for Energy Transition, which comprises contributions from nearly 50 Chinese and Danish researchers, was launched and marked with three parallel paper sessions on Technology Perspectives, Providing Clean Energy and Innovating the Future, respectively.

'This report shows the synergies between our countries and between research on sustainable energy and the social sciences'.
Stine Haakonsson, Principal Coordinator for SDC Social Sciences

'No country alone can combat climate change, and in 2015 the world agreed on the Paris Accord in order to keep the global temperature increase well below two degree Celsius. Also in 2015, Mission Innovation was launched to accelerate clean energy innovation with China and Denmark as the founding countries'.
Birte Holst Jørgensen, Principal Coordinator for SDC Sustainable Energy

Together with their Chinese counterparts, Zhao Hong and Chen Guangchao, Stine Haakonsson and Birte Holst Jørgensen have edited the report, which is the result of many years of collaboration across scientific disciplines and borders.

Teaching during the

The video platform Panopto, virtual group rooms and online lectures have been everyday life for students and teachers in 2020. Covid-19 forced the teachers to innovate online teaching and some of the students to move from one part of the world to another. Suddenly, the students were part of a study environment thousands of kilometres from their classmates and teachers. Common to all is that they have made an impressive effort.

Learning outcomes are related to a good study environment

2020 gave us time to re-think the concept for the intro days and social activities throughout the semester, and SDC's pedagogical unit, SMIL (Study Milieu and Intercultural Learning), was brought into play.

'Students' learning outcomes are closely related to how good a study environment they are a part of. A good study environment is an environment where students experience a sense of belonging and build safe relations to each other. Physical settings is an important factor for the environment, which made our job supporting the good study environment a challenge', says Associate Professor Jørgen Rafn, Roskilde University, from SMIL.

Four days of intro in September, which are usually organised in China, had to be converted to an online format and planned so students across time zones could attend.

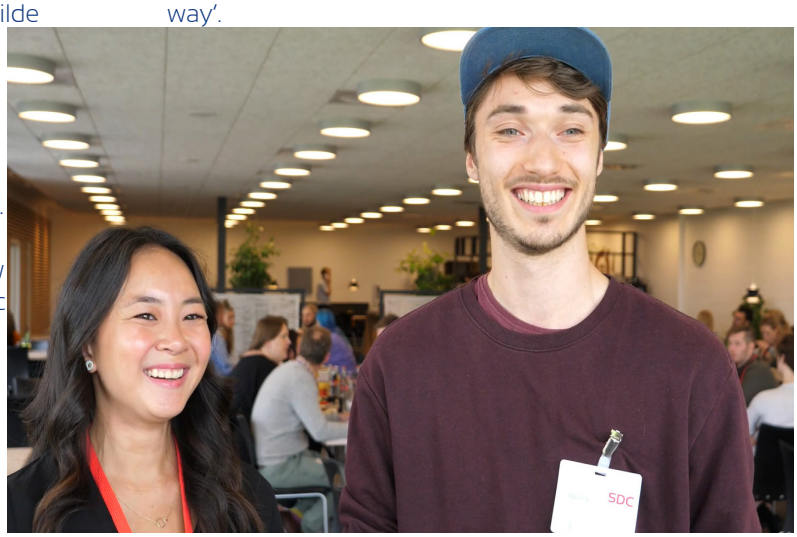
The fact that feeling safe among your fellow students has an influence on your academic output is something Rikke Mortensen, a student of Public Management and Social Development, can confirm.

'Building relations and the social aspects of the intro days were valuable. It has made us more comfortable with each other, so we feel safer speaking our minds during lectures', she says.

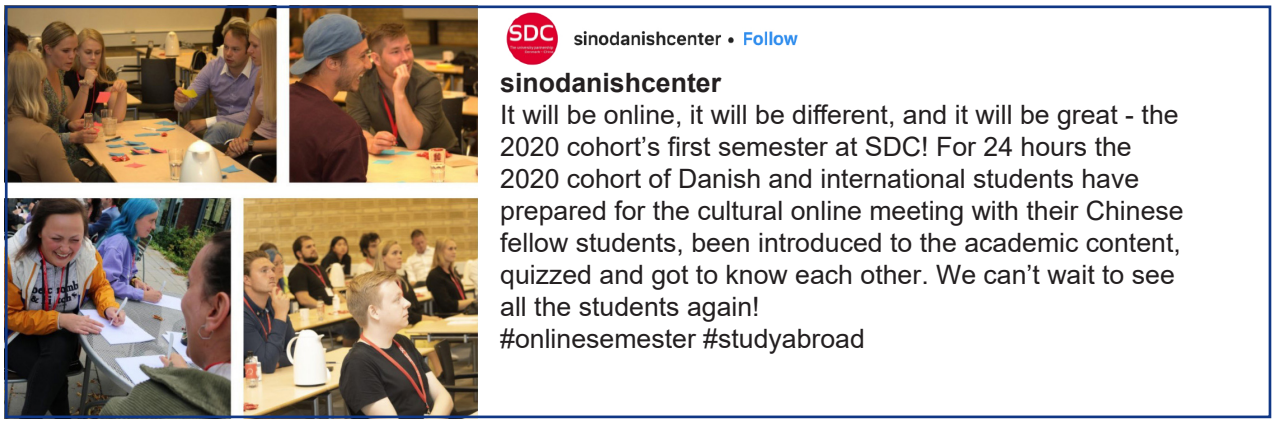
The first awkward online meeting

However, meeting each other for the first time in an online setting can add an extra awkward factor. Nikolaj Klahn, a student of Neuroscience and Neuroimaging, is glad that he got the chance to try the online platform Zoom and to organise group work and interact in groups before the lectures began:

'How do we make sure that everybody gets a chance to say something? How do we demonstrate what we mean? How does the platform even work? We also speak different languages and have different academic backgrounds, so it is easy to misunderstand each other. Being paired up in groups for the intro days and attending events together through Zoom has been really important for getting to know the tool, and it has prepared us for communicating in the best possible way'.



In order to involve and engage both the international and Chinese students, even though they cannot meet each other in person, SMIL has organised a range of online social activities throughout the semester, which have made it possible to exchange culture and personal lives in intercultural groups.



SDC Instagram post from 5 August 2020.

Covid-19 pandemic

Learning magnetoencephalography in a caravan

On the red driveway tiles leaning against a caravan, his current home, Andreas Baun is taking a break 7,000 kilometres from the classroom at SDC where he was supposed to be. He is on the outskirts of Silkeborg, and in a second, he will be back inside the caravan. His laptop, which is connected to his girlfriend's parents' Wi-Fi, is ready for him to resume his Neuroscience and Neuroimaging studies. Next up is an online lecture on Magnetoencephalography and Electroencephalography for which he will meet up with his classmates who are joining the session from various parts of the world due to the Covid-19 situation.

Andreas Baun had been travelling China and was visiting a classmate and her family in Changsha for Chinese New Year celebrations when news of Covid-19 broke. The following weeks in China, before he returned to Denmark, were characterised by uncertainty and confusion, so he is quite happy in the caravan, he explains.

'Under the circumstances, studying here is comfortable and the Wi-Fi connection is good, but it is kind of funny to be going to lectures in a caravan', says Andreas Baun, for whom it has been challenging to find accommodation in Denmark since his return.

Taking advantage of the possibilities

Lecturers teach live from their home offices in different ways. Some have handed out PowerPoint presentations along with voice recordings, some have used audience-interacting software in order to increase student activity in their lectures, and some have combined all of the above.

'Everything considered, the lectures have been really good, and it is clear that a lot of effort has been put into adjusting the teaching. I think the teachers who take advantage of the software possibilities, such as setting up virtual group rooms for discussions during lectures, tend to be most successful', Andreas Baun says.

Research / Education

Within the framework of SDC there are six research themes. Each theme has one or two affiliated Master's degree programmes.

Research themes	Master's degree programmes	
Social Sciences	Innovation Management	Public Management and Social Development
Water and Environment	Water and Environment	
Nanoscience	Nanoscience and Technology	
Life Sciences	Neuroscience and Neuroimaging	Life Science Engineering and Informatics
Sustainable Energy	Chemical and Biochemical Engineering	
Food and Health	International Food Quality and Health	

Social Sciences

Principal Coordinator's Report

In a sense,, Covid-19 has made us move closer together to find ways of dealing with the challenges. The Danish researchers from the Public Management group met in Denmark and their Chinese colleagues joined them online to discuss the development of the programme and possible PhD activities. Also, a special Covid-19 edition of the annual meeting across the Social Science research projects was set up.

The HEPs, teachers and students have been strongly affected by the pandemic. A lot of energy has been spent behind the lines to make the programmes run smoothly. In order to ward off the negative consequences, Professors Alan Irwin and Maja Horst created a very innovative course for the Public Management and Social Development programme. Likewise, a group of researchers set up a writing retreat to help the PhD students address the issues they faced after the Covid-19 lockdown. Unfortunately, the retreat was postponed due to the second lockdown.

The year was rounded off with the launch of the 'SDC International Report 2020', a joint scientific report on Energy Transition produced by the Social Science and Sustainable Energy research themes. Almost 50 Danish and Chinese researchers contributed to the report, and during the one-year process, the authors presented their draft papers at two online workshops.

It is my experience that our collaboration and results are being recognised, also outside Denmark and China, and in 2020 researchers have given speeches in Norway and Sweden on SDC-related research. Researchers from the Social Science group have been appointed Special Foreign Experts at UCAS, a special issue of the journal on Industrial and Corporate Change is now in press, and research has been published in Nature Energy.

Stine Haakonsson
Principal Coordinator

Danish companies' activities in China still crucial to performance

In June, the 'Survey of Danish Companies in China – Challenges and Opportunities' report was published by the Ministry of Foreign Affairs of Denmark.

The report, which is the outcome of a collaboration between the Royal Danish Embassy in China, the Danish Chamber of Commerce in China (DCCC) and SDC, presents the results of a survey carried out at the end of 2019 and a smaller follow-up survey conducted in May 2020. Then Danish Ambassador A. Carsten Damsgaard called it 'the most comprehensive and ambitious mapping of Danish companies' activities and challenges in China to date'.

In the original comprehensive survey four out of five companies indicate that their present activities in China are essential to the global performance of their Danish mother company, and that this is expected to increase. In the short term, plans to expand capacities in China are noticeably fewer now than prior to Covid-19, but in a five-year perspective the outlook of the Danish business community is still very positive in terms of expansion.

2020 PhDs

Anestis Keremis
PhD Student Anestis Keremis from the Department of Business and Politics, Copenhagen Business School, successfully defended his PhD thesis titled 'Anti-corruption in action: How is anti-corruption practiced in multinational companies'. Anestis Keremis did his PhD in cooperation with the School of Economics and Management, UCAS.

Birgitte Egeskov Jensen
PhD Student Birgitte Egeskov Jensen from the Department of Political Science, Aalborg University, successfully defended her PhD thesis titled 'Stemming the Tide of Ageing in China - The Role of Welfare Institutions in Alleviating Demographic Transition'. Birgitte Egeskov Jensen did her PhD in cooperation with the Center for Chinese Agricultural Policy, CAS.

Launch of the first SDC International Report

A full overview of existing SDC research collaborations between Denmark and China within the area of energy was published in the 'SDC International Report 2020 – Cooperating for Energy Transition'. The report has been one year underway and is the result of many years of collaboration across scientific disciplines and borders.

'This report shows the synergies between our countries and between research on sustainable energy and in social science', says Principal Coordinator for Social Sciences Stine Haakonsson, who is one of the editors.

She edited the report together with Principal Coordinator Birte Holst Jørgensen from Sustainable Energy and their Chinese counterparts, Zhao Hong and Chen Guangchao. It brings to the fore one of the most important global challenges facing the world today: the energy transition, and the editors emphasise that it will require international collaboration to address this challenge and achieve

A significant achievement

SDC's 10-year anniversary was an obvious opportunity to present some of the academic outcomes of the partnership, and in December the anniversary was marked with a symposium and launch of the first SDC International Report.

Morten Laugesen, Executive Director of SDC, says: 'I am delighted that this report on energy and policy has been published, because it is a vastly important topic on the global agenda which we need to deal with together. The fact that the report includes 14 peer-reviewed articles co-authored by Danish and Chinese researchers across different scientific fields is a significant achievement and a great example of how Danish and Chinese researchers benefit from working closer together'.

More than 200 people attended the event, which was held online and at SDC in Huairou.

21 scientific articles were published in 2020 by faculty in the Social Sciences theme.

Innovation Management

Head of Educational Programme's Report

2020 has shown that innovation is not only about producing technology, but also about how humans interact with each other and with technology, and this is one of the focal points covered on the Innovation Management programme, where engineering meets the social sciences.

A new initiative was taken to establish partnerships with companies for the benefit of students and research collaborations. There is a wide range of opportunities for collaboration, and through new information materials and a systematic effort we will make it easier for companies to explore the prospects of collaborating with SDC. One of the pilot projects was the semester projects that all of our first-semester students worked on. The projects were designed in collaboration with Danfoss, allowing the students to learn from 'real world' cases and professionals, who in return were inspired by the ideas that the students came up with in their projects.

In 2020, the results of a survey among Danish companies in China were published. The report was the result of a collaboration between the Royal Danish Embassy in China, the Danish Chamber of Commerce in China and SDC. A new collaboration initiative is emerging on the basis of this survey, just as we will continue to 'take the temperature' of the Danish business community in China. This time the Danish Chinese Business Forum will also be involved.

The students and teachers have handled the challenges of giving and receiving online teaching extremely well, and we have supplemented the online teaching with video links to the Chinese students who were able to meet at SDC in Beijing.

Dmitrij Slepniov
Head of Educational Programme

Go abroad for challenges and opportunities

'Working and studying abroad has been essential for me. You are challenged at another level, and you develop enormously. I think it is really healthy to go abroad at any stage of your career', says Mikkel Jordahn Kristiansen, who graduated from Innovation Management in 2018.

He sees the programme as a great adventure and a way to stand out professionally. At the end of 2020, Mikkel Jordahn Kristiansen landed a position as Transformation Partner at Ramboll after two years at Maersk Drilling.

Shortcut to the coolest internships

Mikkel Jordahn Kristiansen has learned that if you are bold enough to move abroad you get rewarded with opportunities. In China he did one part-time internship at Nordfrim (first semester) and full-time internships at the Danish Chamber of Commerce in Beijing and finally the Danish Trade Council in Shanghai, with whom he collaborated on his Master's thesis.

'In China, the coolest internships are more accessible, and when you do an internship abroad you constantly develop, because you have to think differently, even when it comes to simple tasks', says Mikkel

'The first three months I only allowed myself to apply for jobs I did not believe I could get'. That was the rule Mikkel Jordahn Kristiansen made for himself after he graduated. Just before the deadline, he signed a contract with Maersk Drilling. Today he works at Ramboll, and career development is a recurring topic when he meets with former fellow students from SDC. Here with Jeppe Andersen (to the left) from the same cohort.

Jordahn Kristiansen who also believes that studying in China gave him an extraordinary chance to train his networking skills due to the many social and professional events for expats.

During his time in China, Mikkel Jordahn Kristiansen served as a volunteer and eventually chairman of Danish Young Professionals – Beijing.

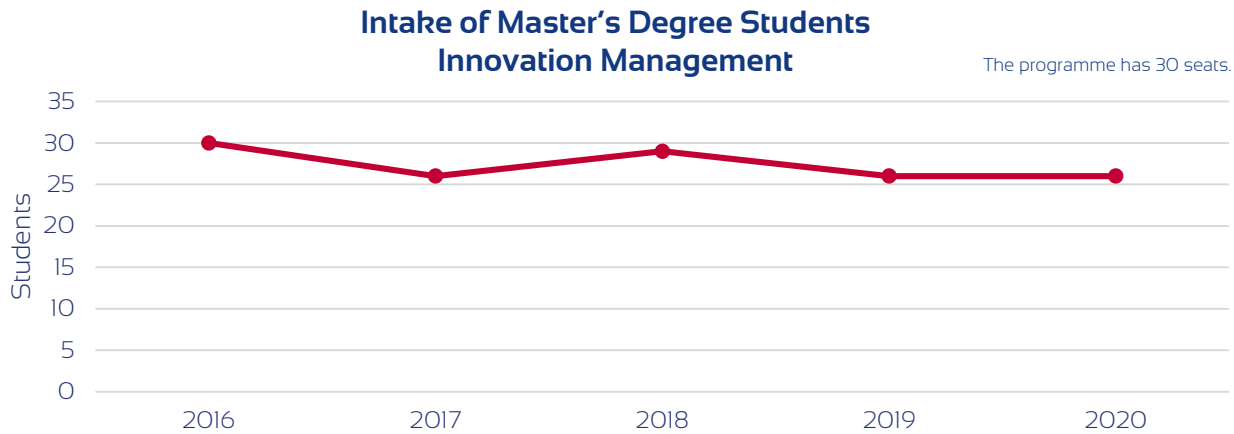
'As a student you are always told to network, network and network. But how do you do it? In China, I met with and learned how to interact with people at a business level I would never have reached in Denmark. Gradually I learned that networking is just talking to people, and the training in China has been a key experience for me. Today I am comfortable with people at all business levels', says Mikkel Jordahn Kristiansen.

The core of innovation

Many graduates from the Innovation Management programme end up in the consulting business or in other project-oriented positions. In his job, Mikkel Jordahn Kristiansen undertakes projects of varied sizes focussing on transformation and optimisation of organisational structures and processes, but innovation has been a main theme for him throughout his education, internships and jobs.

'When I do a process assessment, I look at the situation from a holistic perspective to identify potentials for improvement, and that is the core of innovation, in my opinion', he says.

SDC Instagram post from 15 June 2020. Students regularly share their experiences on the SDC profile.



Public Management and Social Development

Head of Educational Programme's Report

Public policy and management has never been as explicitly significant to the world as during the global financial crisis and now during the Covid-19 pandemic. The programme focusses on the management of grand societal challenges, including those posed by migration, welfare, environmental change, economic growth and international governmental cooperation. A core part of both the European and the Chinese strategies for solving and addressing the challenges is science and innovation policy. This year we introduced a new course, Science and Innovation Policy, in the first semester. The course harnesses resources at SDC and across our portfolio of programmes and empowers students to engage substantively with science and technology and host the policy issues these give rise to.

In August, we took the opportunity to gather all teachers, including PhD students, for a two-day seminar. This offered a basis for mutual learning and integration. At the top of the agenda was formulating a shared vision for programme rationale and synergies across courses. We hope this will become a recurring event and plan to bring together the whole SDC Social Sciences community to discuss research links and programme development.

Of course, the conversion to online teaching has been a central element this year. The technical infrastructure at SDC has been upgraded significantly. The big question is how we create commitment and momentum in an online environment. Perhaps, we have learned to do this with some success by providing variation in the teaching format and lots of space for the students to interact both with each other and the faculty. The students have become amazingly well integrated considering the fact that they have never met in person, and throughout the year they have impressed with their commitment and hard work. Together we have confronted challenging teaching and learning circumstances and done well. Our students should be congratulated.

Duncan Wigan
Head of Educational Programme

Learning to teach in new ways

Professor Morten Ougaard has decades of experience and know-how of educating students in classrooms, but the circumstances created by Covid-19 have prompted him to explore new teaching platforms and alter his pedagogy in order to give the students the best possible teaching.

'Providing students with a good education is always important, and in the current situation we have to ensure that they are not delayed in their studies and that their qualifications and exam results live up to normal standards', says Morten Ougaard from Copenhagen Business School.

Got ahead of the curve and landed the ideal job

Closed borders, daily restrictions and changed plans. For most people these are well-known consequences of Covid-19. Christian Jonstrup recognises them all. However, Covid-19 also gave him the inspiration to be one step ahead in the spring of 2020, when he applied for a job while being a student in the Public Management and Social Development programme.

'I thought it would be difficult for foreigners to enter and work in China, and since I was already in the country, I decided to go for a job that matched my interest in the interplay between Denmark and China on a commercial level', says Christian Jonstrup.

He activated his network of SDC students at the Danish Embassy in China, sent an application and landed a position as Junior Innovation Officer at the Innovation Centre Denmark – Shanghai (ICDK). Christian Jonstrup had his first day in the office in October, even before he had defended his Master's thesis.

Access, knowledge and market opportunities

'I get great insight into the Chinese market and China's socioeconomic structure. I focussed on this during my studies, and now I am adding the commercial sector to my expertise. We help Danish knowledge-intensive companies and institutions of higher learning gain access to networks, international knowledge and market opportunities in China', says Christian Jonstrup.

He draws on his experience from the Public Management and Social Development programme, but also to a great extent on his internship at the Danish Chamber of Commerce in China, where he worked with Danish companies ranging from small start-ups to multinational businesses. He emphasises that the internship gave him great experience and a valuable network of Danish companies and Chinese stakeholders, including local governments and innovation clusters.

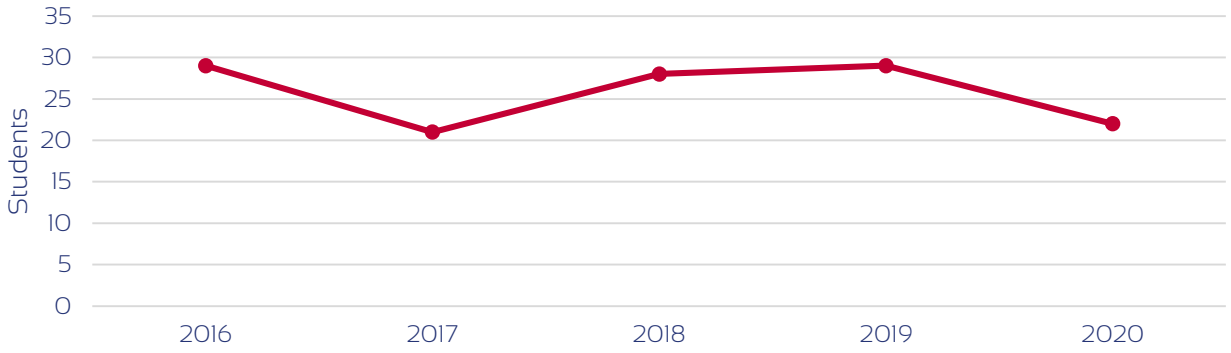
Christian Jonstrup has a strong interest in technology and development and supports ICDK's teams within a range of technology sectors such as AI, health tech and the green transition from the R&D stage to commercialisation and market entry. Here ICDK's teams focus on the newest technological development in Denmark and China.

Christian Jonstrup describes the employment with ICDK as a match made in heaven.

Christian Jonstrup presenting sustainable Danish design custom clothing during an 11/11 livestream with more than one million viewers at the Royal Danish Consulate General in Shanghai via the e-commerce platform Tmall.

Intake of Master's Degree Students
Public Management and Social Development

The programme has 30 seats.



Water and Environment

Principal Coordinator's Report

The innate commitment, long-term collaborations and strong personal relations of our researchers were key in keeping the research moving forward in spite of the challenges that came with Covid-19. In practice, this meant many online meetings and sending samples and test results back and forth between Denmark and China.

While existing projects moved forward, the fact that we were not able to meet new potential counterparts in person and build relations meant that establishing new connections and getting new projects up and running proved more of a challenge.

We continue to have clusters that deal with important issues. Professor Peter Bauer-Gottwein from the Technical University of Denmark and his group are using cutting-edge technology, such as satellites, drones and modelling, in order to gain a better understanding and prediction of how water moves and behaves in both European and Chinese contexts.

A field that is receiving much attention at the moment is biochar, and Professor Liu Fulai at the University of Copenhagen, along with several other researchers involved with SDC, are exploring its many potential positive attributes. Biochar is charcoal that is produced by pyrolysis of biomass in the absence of oxygen, and it may be helpful in for example soil improvement and pollution mitigation. This fits in very well with the Water and Environment research theme, which is centred around a holistic approach that takes the entire aquatic and terrestrial system into account.

Extensive research is being carried out within the field of antibiotic resistant bacteria, and at the forefront of that research is the impressive and long-standing collaboration between Professor and newly appointed Academician Zhu Yongguan from the Chinese Academy of Sciences and Head of the Water and Environment programme, Associate Professor Kristian Kofoed Brandt from the University of Copenhagen.

Peter Engelund Holm
Principal Coordinator

2020 PhDs

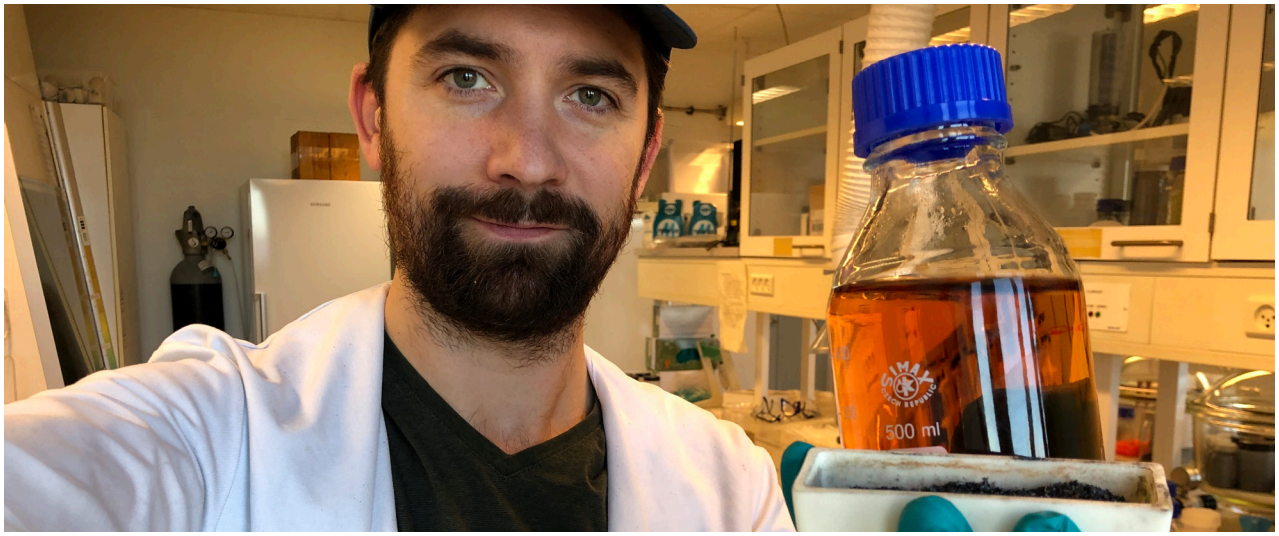
Lucien Stolze
PhD Student Lucien Stolze from the Department of Environmental Engineering, Technical University of Denmark, successfully defended his PhD thesis titled 'Arsenic mobility in multispecies flow-through systems: Model-based analysis of electrostatic and chemical interactions with mineral assemblages'. Lucien Stolze did his PhD in cooperation with the Center for Water System Security, College of Resources and Environment, UCAS.

Emil Jespersen
PhD Student Emil Jespersen from the Department of Bioscience, Aarhus University, successfully defended his PhD thesis titled 'Temperature effects on plant ecophysiology in salt marshes'. Emil Jespersen did his PhD in cooperation with the Institute of Botany, CAS.

Mark Taylor Randall
PhD Student Mark Taylor Randall from the Department of Geosciences and Natural Resource Management, University of Copenhagen, successfully defended his PhD thesis titled 'Sponge cities: Evaluating the hydrologic impacts through modelling at site and city scales'. Mark Taylor Randall did his PhD in cooperation with the Institute of Geographic Sciences and Natural Resources Research, CAS.

Gro Havskov Kirk
PhD Student Gro Havskov Kirk from the Department of Bioscience, Aarhus University, successfully defended her PhD thesis titled 'Comparisons of photosynthetic metabolism and salt tolerance in Phragmites australis and Spartina species and their significance for salt marsh response to climate change'. Gro Havskov Kirk did her PhD in cooperation with the Institute of Geographic Sciences and Natural Resources Research, CAS.

Biochar is the new black



PhD Student Jonathan Hessner Lindhardt investigates the properties and uses of biochar – a carbon-rich substance made from biowaste, which has huge potential for improving the environment.

For many years, manufacturing companies have used halogenated non-biodegradables for industrial purposes. These substances tend to end up in nature with great negative effect. However, remarkable advances have been made with the development of biochar, which may be very useful in neutralising halogenated substances.

'We know that biochar has many useful properties, and we believe biochar can be a catalyst for decomposing halogenated compounds, but we do not know exactly how it works, so that is what I am trying to find out', says Jonathan Hessner Lindhardt, who works at the Department of Plant and Environmental Sciences at the University of Copenhagen.

Biochar is charcoal produced by pyrolysis of biomass in the absence of oxygen, and it can be made from any biological product that has a high concentration of carbon. This makes it interesting in a global perspective, since residual biomass is ubiquitous, and pyrolysis is inexpensive.

Using biochar to purify groundwater

Jonathan Hessner Lindhardt experiments with biochar made from shrimp shells and its effect on brominated substances, which is one of four substances in the group of halogenated substances.

Biochar has numerous uses, but Jonathan Hessner Lindhardt's research group is looking into two specific ways of using it to purify groundwater. The first is to pump groundwater from a polluted aquifer through pipes into an above ground filter containing the biochar and reductant composite and then back into the aquifer. The second is to pump the composite directly into the polluted subsoil, which can be done safely due to the non-toxic properties of biochar.

'I know now that it works. The experiments show that biochar made from shrimp shells can work as a catalyst for decomposing brominated compounds. However, we still need to find out exactly how and why', says Jonathan Hessner Lindhardt, whose PhD thesis is due in 2022.

126 scientific articles were published in 2020 by faculty in the Water and Environment theme.

Water and Environment

Head of Educational Programme's Report

Covid-19 was undeniably the order of the year 2020, and our most important task was to adapt to online teaching formats and get the programme to run as well as possible. This new way of learning has been challenging for both students and teachers, but it has also provided us with new ideas for blended learning initiatives in the future. I wish to use this opportunity to thank all the involved teachers for their extra work and remarkable commitment throughout the year.

While all courses had to be modified for online teaching, we also used this opportunity to make some important adjustments to the progression of the courses with the aim to improve the teaching experience for both students and teachers. This has resulted in an improved and less stressful learning experience for the students.

The Covid-19 pandemic experience has highlighted the strength of SDC's Sino-Danish relations. Hence, the synergies between the Master's degree programme and ongoing research activities have been maintained, and in some cases even strengthened. Taking my own research group as an example, I have been able to intensify research and teaching collaborations with two CAS institutes (the Institute of Urban Environment in Xiamen and the Research Center for Eco-Environmental Sciences in Beijing) via exchange of students and postdocs. Our Master's degree students play an active role in this Sino-Danish collaboration as they frequently contribute to publications co-authored by both Chinese and Danish researchers, and in at least one Master's thesis project it was decided to expand a project on antibiotic resistance genes in wastewater to also monitor Covid-19.

In conclusion, 2020 has been a very special year with plenty of unforeseen challenges for all students and teachers involved in the Water and Environment programme. Nevertheless, our achievements document an indomitable will to continue working together in order to educate environmental science candidates that will play important roles in the future green transition of our respective economies.

Kristian Kofoed Brandt
Head of Educational Programme

Yu Lina detects Covid-19 in hospital wastewater

Yu Lina was inside a hospital in Shijiazhuang. Tears were streaming down her cheeks, and she swore that she would never do this dirty, smelly job again. The doctor examined her eyes and reassured her that everything was fine.

Two hours later she was back at the scene of the crime, where wastewater from the hospital had accidentally splashed in her face as she was collecting samples for her thesis project. But this time she was much better protected. 'If not me, then others will have to do this work', she thought to herself.

Before Covid-19, the focus of Yu Lina's thesis was antibiotics and antibiotic resistant genes (ARGs) in hospital wastewater, but as the pandemic developed, it also became part of her project.

'In addition to human SARS-COV-2 detection, studies have shown that the SARS-CoV-2 RNA will enter the sewage collection system with the patient's urination or defecation. It will eventually enter the municipal sewage treatment plant, making the detection of the virus in the sewage an epidemic monitoring method', she explains.

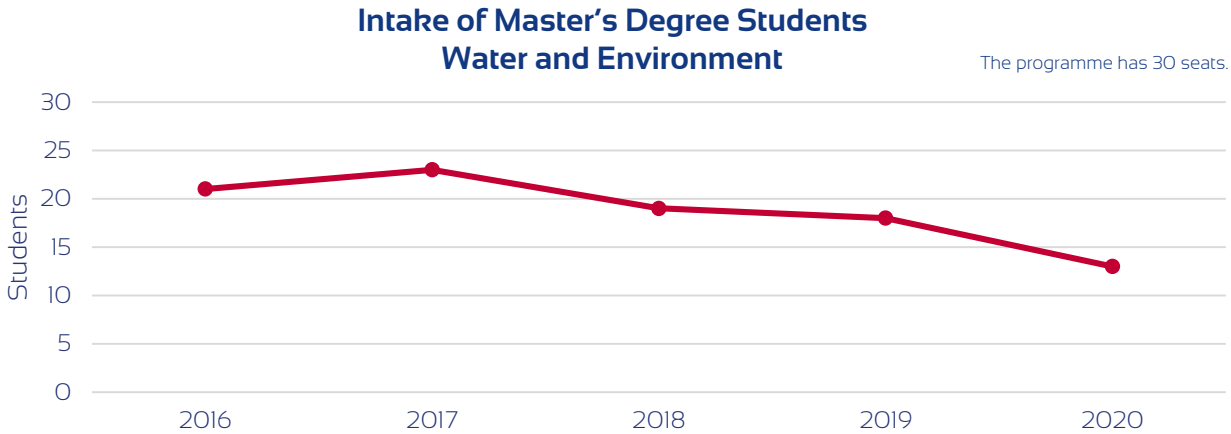
Concentrating SARS-COV-2

Yu Lina wants to help deal with the coronavirus, which is actually called SARS-CoV-2, by detecting it in hospital wastewater and potentially passing on early warnings to the authorities that a community is at risk. In that way they can take measures to deal with the situation, she explains. However, detecting SARS-CoV-2 and ARGs is difficult.

'Because the volume is huge, it is necessary to set up a useful method for concentrating the wastewater before testing in order to be able to detect SARS-CoV-2', Yu Lina says.

Yu Lina uses an aluminum hydroxide adsorption-precipitation method to concentrate water, because it can gather the virus with solid substances, and then she uses a grinding machine to disengage attached virus, which can then be analysed.

In the autumn, Yu Lina exchanged her Master's degree student status for an SDC PhD position, where she will carry on working on this topic for a few more years.



Nanoscience

Principal Coordinator's Report

Research activities and collaborations have inevitably been impacted by the Covid-19 situation. Thus, it has been a challenging year where we have had to shift our focus to other areas than originally planned.

Since exchange stays and access to lab facilities were put on hold, most of the PhD students had to adjust their project plans accordingly. Many used the opportunity to play a very important role in the teaching of the Master's degree students. They did a tremendous job in helping convert the courses to an online format. This included e.g. the use of tutorial videos.
The previously held nanoscience symposiums at SDC have been great successes, and we plan to launch a further development of the concept when it is possible again. We will base the concept on a traditional scientific conference, but every other year it will have a session of a more entrepreneurial nature with the participation of Danish and Chinese companies as well as researchers and students. There will be a strong focus on network and how skills within nanoscience as well as science-based innovation and entrepreneurship are applied in the industry.

Even though it has been a challenging year, research groups have continued their research, publications and collaborations. This year, an international research group with participants from iNANO, Aarhus University and the Institute of Urban Environment, CAS, among others, have succeeded in creating microbial energy cells of bacteria and demonstrated a method for improving the efficiency of bioelectrical systems by including carbon nanoparticles (dots). The results hold promise to contribute to new generations of energy systems. In 2020, the work resulted in a publication in Nature Communication.

Morten Foss
Principal Coordinator

2020 PhDs

Mikkel Christensen
PhD Student Mikkel Christensen from the Interdisciplinary Nanoscience Center (iNANO), Aarhus University, successfully defended his PhD thesis titled 'Simulations of the interactions between amylin and cell membranes – a mechanism in Type-II Diabetes'. Mikkel Christensen did his PhD in cooperation with the National Center for Nanoscience and Technology, CAS.

Sakse Emil Dalum
PhD Student Sakse Emil Dalum from the Niels Bohr Institute, University of Copenhagen, successfully defended his PhD thesis titled 'The CISS Effect'. Sakse Emil Dalum did his PhD in cooperation with the National Center for Nanoscience and Technology, CAS.

Steffan Møller Sønderskov
PhD Student Steffan Møller Sønderskov from the Interdisciplinary Nanoscience Center (iNANO), Aarhus University, successfully defended his PhD thesis titled 'Nanoscale surface charge density mapping of biomolecules'. Steffan Møller Sønderskov did his PhD in cooperation with the Institute of Biophysics, CAS.

Marina Fernández Medina
PhD Student Marina Fernández Medina from the Interdisciplinary Nanoscience Center (iNANO), Aarhus University, successfully defended her PhD thesis titled 'Surface-reactive micromotors –Autonomous mobility at the microscale'. Marina Fernández Medina did her PhD in cooperation with the National Center for Nanoscience and Technology, CAS.

Fighting bacterial infections

How can we be better positioned in the fight against infections caused by bacteria? This is one of the focal points for PhD Student Thorbjørn Vincent Sønderby's studies.

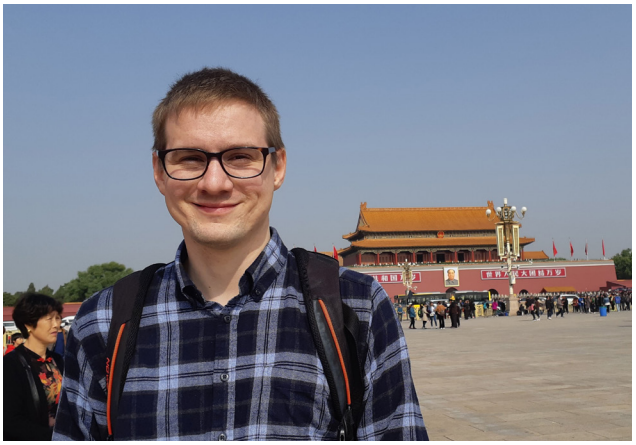
When proteins misfold, they often have a tendency to aggregate into large and very stable structures known as amyloids. This phenomenon is often related to human diseases such as Parkinson's disease. However, in recent years researchers have learned that many organisms can form amyloids 'deliberately' and use them for functional purposes.

Many bacteria can cluster in biofilm (bacterial communities), which stick to non-biological surfaces and over time can develop into an infection. Biofilm-related infection is a well-known complication when for example a hip implant or a pacemaker is implanted in the human body. The biofilm protects the bacteria, which are clustered in the so-called functional bacterial amyloids (FuBA). The high stability of FuBA increases the protective properties of the biofilm which can withstand harsh conditions like antibiotics.

'It is difficult to treat infections when bacteria have formed amyloid-protected biofilm. I am looking into how the amyloids are structured to find out how we can prevent them from developing. By targeting the amyloids in biofilms, we may be able to treat infections more efficiently', says Thorbjørn Vincent Sønderby.

Travelled to work with the best

Because of the clustering, it is difficult to determine the structure of the amyloids, since most techniques require proteins to be soluble in water. However, one specific technique, Scanning Tunnelling Microscopy, is ideal for this purpose, and some of the experts in the field are based at the National Center for Nanoscience and Technology in Beijing. Thorbjørn Vincent Sønderby's Chinese co-supervisor is one of them.



'My Chinese supervisor, Professor Chen Wang, has spent 20 years refining this technique, and the scientists at the centre in Beijing are among the best in the world. It was a great opportunity for me to spend time there, get assistance and discuss my results with my supervisor and the other students in his research group', says Thorbjørn Vincent Sønderby, who spent three months in China before his plans were impacted by Covid-19.

Discovering the world of nanoscience

Thorbjørn Vincent Sønderby will finish his PhD project in the spring of 2022, and back home at Aarhus University he continues his research into functional bacterial amyloids as a member of Professor Daniel Otzen's research group.

'It is like being an explorer in a modern age. We have explored most places on Earth, but when we look at things from a nanoperspective, many things are unexplored. The idea of being the first person in the whole world to learn how a certain protein is structured is super cool. That is what drives me', says Thorbjørn Vincent Sønderby.

42 scientific articles were published in 2020 by faculty in the Nanoscience theme.

Nanoscience and Technology

Head of Educational Programme's Report

In 2020, we faced a lot of challenges caused by the pandemic, but overall, the blended learning has been a successful solution. The teachers and students have done a great job together. However, the students have missed their social life in China and their classmates. Therefore, we organised social online activities, for instance during the online intro week, where all the students shared videos from their hometowns. That is an element we will continue to use in future cohorts, as it turned out to be a good way to get to know each other.

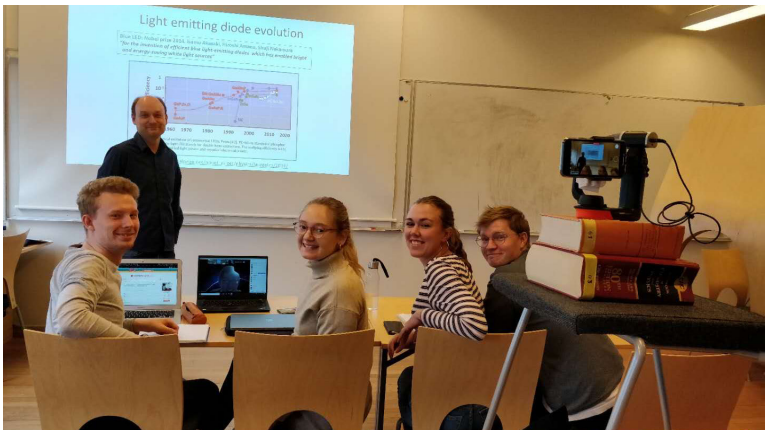
In October, the Master's thesis presentation seminar was held online, and while the second-year students got to practise and refine their thesis presentations, the first-year students used the opportunity to attend the presentations and get an idea about what is expected from them in a year.

In October, the first Danish-Chinese Quantum Frontier Seminar was held with more than 100 participants online. First- and second-year students joined the seminar, and Danish and Chinese researchers delivered the keynote reports focussing on the latest achievements, academic hotspots, development trends and major issues in the frontier fields of quantum science and technology. The conference was organised in collaboration with QDevil, the Niels Bohr Institute and the Innovation Centre Denmark in Shanghai.

Per Hedegård
Head of Educational Programme

The first online classes

In March 2020, Associate Professor Kasper Grove-Rasmussen taught nanoelectronics to second-semester students. This was in the beginning of the pandemic, and the Danish students had interrupted their stay in China and joined the teaching at the University of Copenhagen, while the Chinese students attended online. The technical solutions developed and were improved during the year concurrently with students and teachers increasing their experience with the new situation.



Driven by a passion for nanomedicine

The opportunity to study and work with bionanotechnology in an international environment left no doubt in Sun Qing's mind. After she finished her Bachelor's degree in Biomedical Engineering in the Jiangsu Province, she moved to Beijing to study at SDC.

'Nanoscience is my academic field of interest, but I also have a strong interest in cross-cultural communication, and the chance to get an international perspective and develop my global mindset made it an obvious decision to study Nanoscience and Technology', says Sun Qing.

She feels challenged by the whole situation with online teaching, restrictions etc., but her passion for learning more about nanomaterials for medical applications is driving her on.

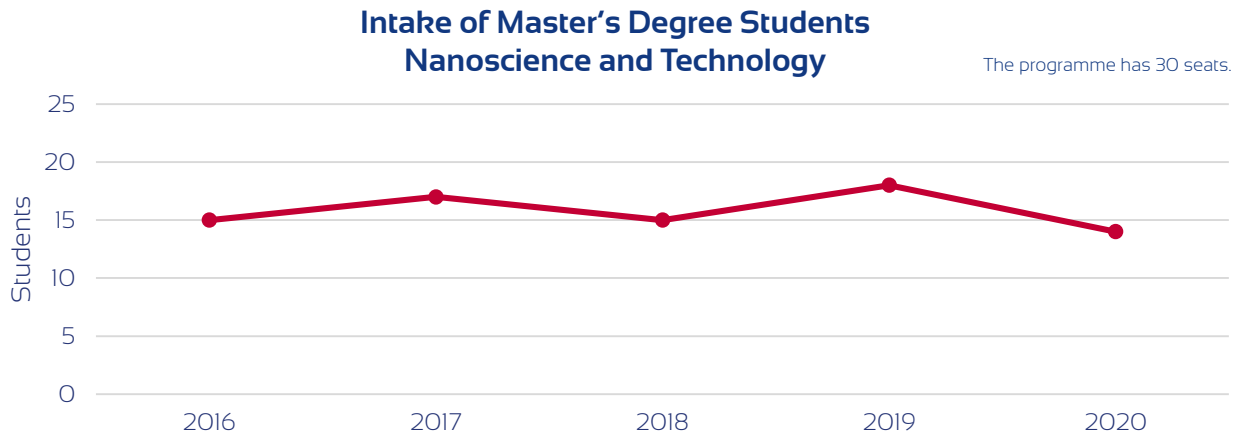
'My supervisor's work is centred around cancer treatment by the use of nanotechnology. Research-wise, I am motived to help develop new strategies for cancer treatment by taking advantage of the unique properties of nanomaterials to find novel strategies and smart nanomedicine to treat cancer diseases', she says.

Online teaching on campus

Sun Qing and her Chinese classmates attend the online teaching on UCAS' Yanqihu campus, while the international students are attending from their home countries. She appreciates the opportunity to be on campus and be able to turn off the screen and do group work, preparing presentations with her Chinese classmates. They communicate with the international students via social media and online meetings. The students also organise social online activities outside the classroom.

'We meet online, but I am looking forward to having classes together, putting our learning into practice in the laboratories and learning from each other without being distanced by a screen. And of course, experiencing the traditional Chinese culture together', she says.

Meanwhile Sun Qing uses every opportunity to dig into bionanotechnology, and she looks upon her education and the opportunities she is given through project work, collaboration with her supervisor etc. as preparation for the day when she will be working on her own research projects.



Life Sciences

Principal Coordinator's Report

Over time, the Life Sciences research theme has come to span a wide range of scientific fields from bioinformatics and the omics disciplines to cognitive science, neurobiology and imaging techniques. For aspiring researchers, joining the SDC family is an opportunity to become part of a resourceful network that they can tap into and find fellow researchers with shared interests.

A field of interest that is increasingly shared across the SDC Life Sciences theme is Covid-19. Here, geneticists, bioinformaticians, neuroscientists among others are looking into the disease and the impact on health. Especially the Beijing Institute of Genomics has allocated a lot of resources to increasing our understanding of the virus.

However, all SDC research activities were affected by Covid-19 to some extent due to lockdowns, not having access to laboratories or being prevented from carrying out exchange stays. Activities have been carried out to the extent possible, and many projects were adjusted along the way. Especially PhD students who had research stays planned in Denmark or China were forced to rethink their project timelines and explore new directions in order to replace parts of projects that could not be carried out. Projects where data had already been collected were affected to a lesser degree.

In addition, initiating new collaborations has been greatly impacted by Covid-19 closure of international travel, while planned meetings and symposia were either moved to an online platform, postponed or cancelled. Hopefully these events can take place in 2021 to deepen the bonds between Life Sciences researchers in both countries.

In spite of the challenges, several PhD students were able to conclude their PhD projects with excellent results and Danish-Chinese co-publications as the outcome.

Kim Ryun Drasbek
Principal Coordinator

2020 PhD

Rikke Linnemann Nielsen
PhD Student Rikke Linnemann Nielsen from the Department of Bio and Health Informatics, Technical University of Denmark, successfully defended her PhD thesis titled 'Big Data approaches for prediction of clinically relevant outcomes'. Rikke Linnemann Nielsen did her PhD in cooperation with the Institute of Genetics and Developmental Biology, CAS.

Investigating the mechanisms of antibiotic

As part of her PhD project, Sun Lang investigated colistin resistance in Klebsiella pneumoniae using multiple so-called omics techniques. One of her scientific articles was co-authored by the Danish PhD student Pernille Kronholm Rasmussen.

Sun Lang finished her PhD in June 2020, and as part of her journey as an SDC PhD, she spent six months at the University of Southern Denmark.

'When I was new to the lab and I could not find my way around, Pernille helped me a lot, and she also taught me most of the proteomic experiments I carried out. I appreciate that very much', Sun Lang says.

Pernille Kronholm Rasmussen knew Sun Lang from the Institute of Biophysics in Beijing, where she worked on her own Master's thesis in 2017. Afterwards, she took on an SDC PhD position herself at the University of Southern Denmark, and she was happy to get Sun Lang settled in Denmark and help her with the setup of proteomic experiments and data processing.

'I knew Sun Lang from my time in China, so it was super cool that she came to Denmark. I know what it is like to be in a totally different country, so being able to show her around and teach her how we do things was great', says Pernille Kronholm Rasmussen.

A big threat to public health

While she was in Denmark, Sun Lang carried out experiments for the research publication 'Proteomic Changes of Klebsiella Pneumoniae in Response to Colistin Treatment and crrB Mutation-Mediated Colistin Resistance'.

'Nowadays, most infections can be cured easily with antibiotics, but a growing number of infections such as pneumoniae are becoming harder to treat as first-line

antibiotics become less effective. Antibiotics resistance is a very serious problem and a big threat to public health', Sun Lang says.

In her research, she carried out proteomic analysis of pneumoniae strains cultured with different concentrations of the antibiotic colistin. The results demonstrated proteomic responses to colistin treatment and the mechanisms of colistin resistance, which offers information on the management of resistance.

'Maybe these insights can offer valuable information on the management of antibiotics resistance', says Sun Lang, who is now a research scientist at the Institute of Medicinal Biotechnology in Beijing.

42 scientific articles were published in 2020 by faculty in the Life Sciences theme.

Neuroscience and Neuroimaging

Head of Educational Programme's Report

Most of our resources were spent adapting to the circumstances caused by the Covid-19 outbreak and making the programme run as well as possible. We experienced great acceptance of the difficult situation and a willingness to adapt both from the students and our dedicated teachers.

It was definitely a spring semester where our teachers had to put in a lot of extra work and adapt to the new educational tools quickly to be able to deliver the best learning experience possible. In addition, assigning teaching assistants, usually PhD students, to all of the courses to help with the practicalities of running online teaching as well as being in close contact with the students sitting at home greatly contributed to the successful teaching last spring.

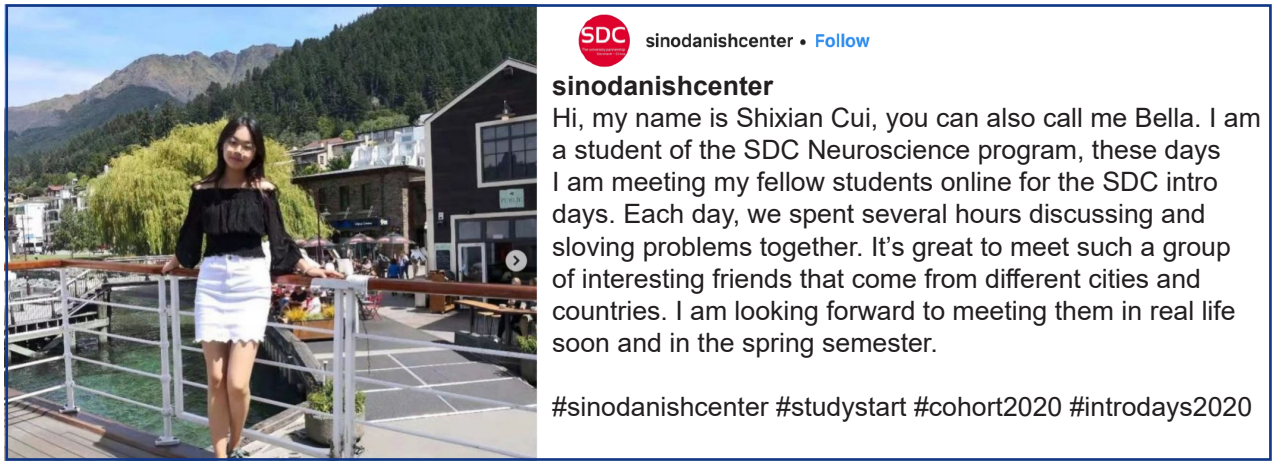
Due to the time difference, students and professors spent much less time together in class than usual, which is why we encouraged them to exploit the online teaching form and turn the course teaching towards what is termed 'flipped classroom teaching'. This method requires students to be responsible, to a higher degree, for acquiring the course content themselves. Professors will then make resources available to them in the form of video lectures, reading material, content-specific exercises, Questions and Answers sessions, etc.

All in all, we succeeded in adapting to the new situation, but the lack of face-to-face interaction that you have in the classroom is noticeable – both among the students and in the interaction with professors.

We have made a few adjustments to the progression of the first-semester courses by reducing the size of the Basic Neuroscience course. Some of its curriculum was included in the new Molecular Imaging of Brain Function and Structure course. Another new course was added, Methods in Preclinical Neuroscience, which includes learning about animal models and their use in neuroscience and neuroimaging research, and the course's final exam requires students to write an application for funding, which helps prepare them for a career in research.

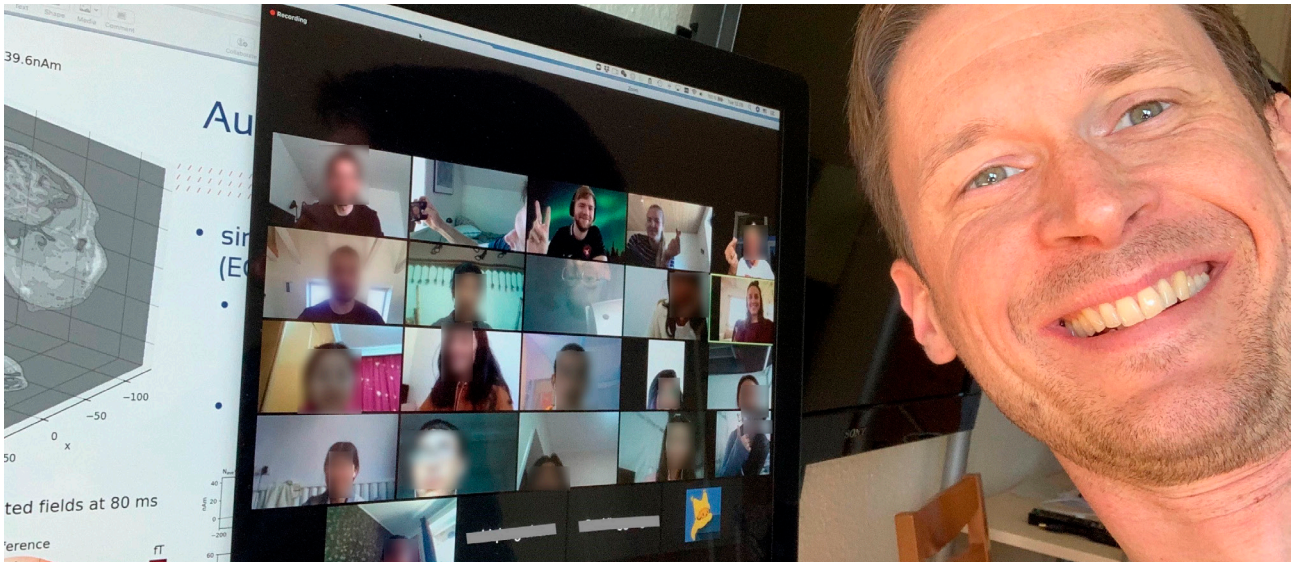
Finally, we carried out the annual Neuroscience Symposium in October using video connections between auditoriums in Denmark and the SDC Building, where all students were invited to take part and where the second-year students gave the opening speeches on their thesis projects.

Kim Ryun Drasbek
Head of Educational Programme



SDC Instagram post from 25 August 2020. Students regularly share their experiences on the SDC profile.

‘Forced to think differently’



Each year in April, Christopher Bailey teaches the Magneto and Electroencephalography course. Usually, he and his colleague, Liu Zuxiang, teach in a lecture room and supervise lab exercises, where students put electrodes on each other’s heads and measure electrical activity in the brain. However, this year the teaching has been different due to the coronavirus outbreak.

‘To do the lab exercises we all need to be in the same room. But because of the current situation we naturally cannot do that now. Instead, we work with data recorded in previous years, so the students still get the opportunity to relate theoretical concepts to real measured data’, Christopher Bailey says.

The corona situation has forced Christopher Bailey to re-think his methods and find new teaching platforms, such as the video conference software Zoom, the real-time feedback app Mentimeter and Panopto, which is used for recording and editing lectures.

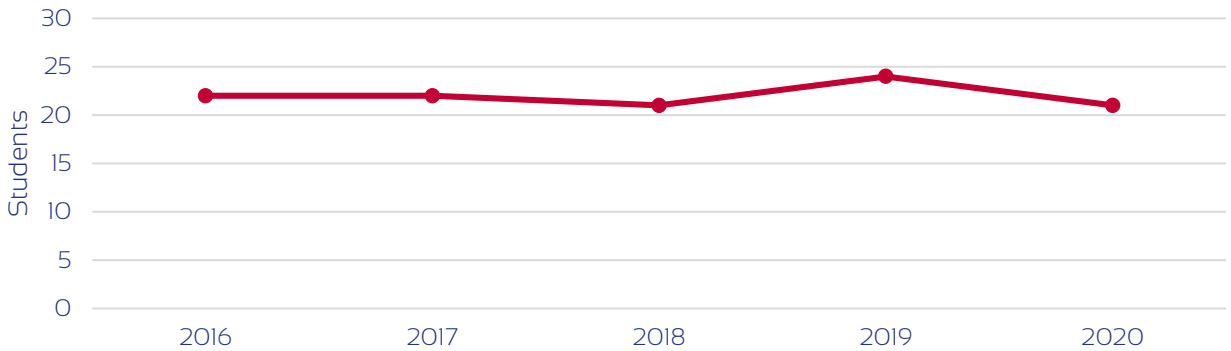
The corona situation boosts creativity

He was interested in digital teaching methods even before the corona situation forced him to change his teaching, and a few years back he began to produce videos as preparation for his lectures before he arrived in Beijing. Such experience is valuable, and he sees the situation as an obvious opportunity to produce some good material and go all in trying out new methods:

‘I have happily made the video materials during this corona time. However, you should not underestimate how long it takes to produce them. There is also a lot of learning in it for me, and by ensuring the materials are of a high quality, I am making an investment that I believe will benefit both my current and future students. I find it rewarding to be forced to think differently, and it is moving the course in the right direction’, Christopher Bailey says, but emphasises that he is looking forward to leaving online teaching behind and going to Beijing to teach his students face-to-face.

Intake of Master’s Degree Students Neuroscience and Neuroimaging

The programme has 30 seats.



Life Science Engineering and Informatics

Head of Educational Programme's Report

During 2020 we put a lot of resources into adapting to online teaching, and we were therefore unable to dedicate as much time to planning ahead as we would have liked. Our students and teachers have done their utmost, but of course the lack of interaction between people is a substantial miss.

We have noticed that students who can generate big data sets, but who are also able to analyse them are in demand both in academia and the industry. We continue to restructure the programme to accommodate those demands by emphasising the computational elements of the programme, such as programming, statistics, machine learning and artificial intelligence.

We have moved towards a less theoretical approach and a more task-driven way of teaching biological data science and bioinformatics by presenting students with real problems during courses and providing them with the tools to solve them. This has increased their motivation for learning specific skills and their appreciation for why they are important. This problem-based approach is helpful for learning, but it will also prove useful for the students after graduating.

We have started using a Jupyter cloud-based service for running computational exercises, which eliminates technical and security issues related to having to go through software installation. Working in an Internet browser is very convenient for students and teachers during courses, but also for researchers and industry representatives, who joined the webinars we organised during the year.

Starting in spring, we did three online webinars that revolved around data science, where quite a few people from Novozymes and Novo Nordisk in Beijing joined our students. We have also carried out company visits, when possible. We are pleased with the increasing interaction with the industry, and for the first time, we are seeing an interest from the students in engaging in company collaborations for their Master's thesis projects. We are pleased with this development and happy to facilitate the collaborations. However, we absolutely look forward to being able once again to bring students, researchers and the industry together physically in China.

Paolo Marcatili
Head of Educational Programme

Jonathan Rørth analyses the phenotype of eczema

In his thesis project, Jonathan Eggertsen Rørth seeks to enhance understanding of the skin disease atopic dermatitis by analysing data collected using the skin tape stripping method.

This project was a bit left field, but it gave me an opportunity to use a lot of what I learned in China. I get to work on the microbiome, transcriptomics and proteomics', says Jonathan Eggertsen Rørth.

The purpose of his thesis project is to get a better understanding of the composition of microbes inhabiting skin affected by atopic dermatitis, including bacteria and fungi, as well as to provide data that can help identify the factors which influence or even change the skin phenotype over time.

'There are many ways of treating atopic dermatitis according to the clinical manifestation of the disease. Hopefully, understanding these changes in the skin make-up can lead to understanding the mechanisms in the skin causing this disease and potentially pave the way for medicine that is more efficient and tailored towards the individual', he says.

A non-invasive method

The advantage of tape stripping is that it is non-invasive and very gentle for the patients. The method implicates placing and pulling off a number of commercially available tapes from the same spot on the skin of a patient one after the other, yielding insights into which viruses, fungi and bacteria are there.

Jonathan Eggertsen Rørth has frequent meetings with his Danish and Chinese supervisors to discuss the progress of the project, which is a collaboration between Leo Pharma A/S, Almirall Ltd., Hospital Clínic in Barcelona and the Technical University of Denmark.

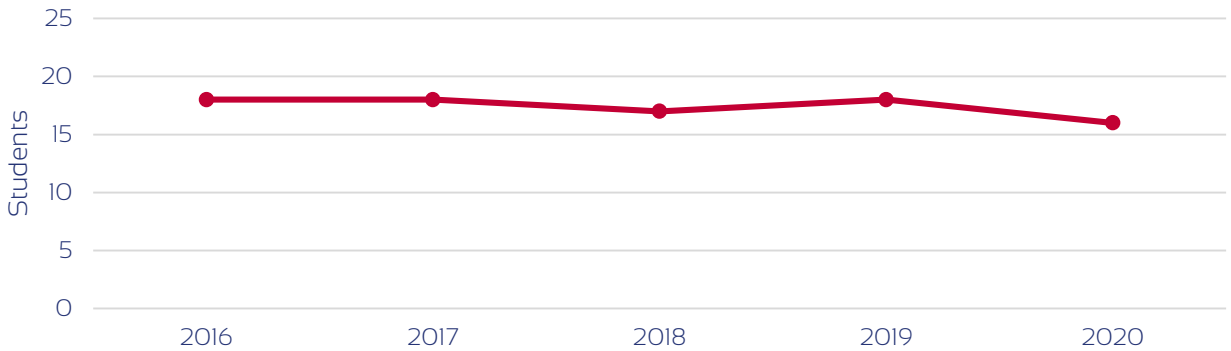
Introduction week with the Life Science Engineering and Informatics 2019 cohort. Here visiting the local theme park. Here with Lu Hao from my class

When he joined the project, he was provided a large amount of data from skin tape collected from children in Spain and generated using RNA sequencing at the Technical University of Denmark. He spends much of his time using the programming language 'R' to create graphs and visualisations in order to make sense of the large data set.

'Dealing with atopic dermatitis which affects 25 per cent of all children, I feel like I am living up to my slightly childish high school aspirations of being able to make the world a bit better through biotechnology', says Jonathan Eggertsen Rørth, who hopes his work can someday lead to better treatment.

Intake of Master's Degree Students
Life Science Engineering and Informatics

The programme has 30 seats.



Sustainable Energy

Principal Coordinator's Report

Throughout the years, dedicated researchers have produced tangible results within the framework of SDC.

Just before the pandemic broke out, the idea for the first 'SDC International Report 2020 – Cooperating for Energy Transition' emerged, and it took off shortly after the Chinese lockdown in January, rapidly developing over the following months. In December, the report was launched at a symposium marking SDC's 10-year anniversary. The articles are written by teams of researchers responsible for projects embedded in the research themes of Sustainable Energy and the Social Sciences. Nearly 50 researchers have contributed to the report that shows how the dual perspectives of technical and societal transformations complement each other in the transition of the two countries' energy systems.

No country alone can combat climate change, and in 2015 the world agreed on the Paris Accord in order to keep the global temperature increase well below two degrees Celsius. Also in 2015, the Mission Innovation was launched to accelerate clean energy innovation with China and Denmark among the founding countries. The report makes it clear how the collaboration between China and Denmark increases both the scope and the scale of the research.

In 2020, workshops, conferences and teaching moved online and PhD students and other researchers were deprived of the opportunity to work at partner institutions across our two countries. Nevertheless, we were able to publish a report that had been drafted, scrutinised and redrafted in accordance with academic norms of peer review and interaction.

Birte Holst Jørgensen
Principal Coordinator

Panel discussion on the green transition

The launch of the 'SDC International Report 2020 – Cooperating for Energy Transition' took place online and at SDC in Huairou. The programme included a panel discussion on energy research as the stepping stone in the green transition. Some of the panellists participated virtually: Pablo Hevia-Koch, Team Leader of the Centre for Global Cooperation at the Danish Energy Agency; Mette Fjord Sørensen, Head of Research, Higher Education and Diversity at the Confederation of Danish Industry; and Jørgen Delman, Professor of China Studies at the University of Copenhagen. Others joined the panel discussion physically: Hu Zhongbo, Vice Dean at the International College, UCAS; Chen Guangchao, Professor and Principal Coordinator at UCAS, SDC Sustainable Energy; and Mu Rongping, Professor and Dean at the School of Public Policy and Management, UCAS.

2020 PhDs

Kristian Barrett
PhD Student Kristian Barrett from the Department of Chemical and Biochemical Engineering, Technical University of Denmark, successfully defended his PhD thesis titled 'Peptide signature –Grouping of CAZymes – for sweet potato tuber sidestream processing'. Kristian Barrett did his PhD in cooperation with the Chengdu Institute of Biology, CAS.

Aslak Poulsen
PhD Student Aslak Poulsen from the Department of Physics, Technical University of Denmark, successfully defended his PhD thesis titled 'Turbulent transport in a multi-ion drift fluid model'. Aslak Poulsen did his PhD in cooperation with the Hefei Institutes of Physical Science, CAS.

Respecting the laws of nature

PhD Student Nicolas Fatras is preparing for a future where electricity production and consumption patterns will have to change due to man's inevitably increasing reliability on renewable energy sources.

Global energy consumption is changing, and the focus is no longer just on increasing production, but increasingly on using the energy available more efficiently.

'So far, with fossil fuels, we have been able to produce and consume electricity in which ever way we wanted to, but in the future, we will be totally reliant on renewables. That means that we have to adjust our consumption, because we cannot control when the wind blows and when the sun shines. I really like this idea of us going back to respecting the laws of nature', says Nicolas Fatras.

Switching from the Chinese to the Scandinavian system

One of the aims of his project is to model the Scandinavian and Chinese electricity market systems, respectively, and to figure out what the Chinese can learn from the Scandinavian system as they implement their own market liberalisation reform.

The Chinese electricity market and hence the price of electricity is decided centrally. The Scandinavian system is based on the balance of supply and demand, which works in favour of renewable energies and encourages more flexible consumption. This is where Nicolas Fatras sees an opportunity to positively impact carbon emissions and make electricity cheaper for consumers.

Building a digital twin for the smart electricity market

The aim of his research is essentially to develop a piece of software that can calculate and show consumers and policy makers the potential benefits of adjusting their electricity consumption. For this purpose, he will make a digital twin.

'For the industries, we need to find the right financial incentive. There have been quite a few attempts at doing so already, but it turned out that the prices were not attractive enough, because industries' priority is to produce goods with added value and not consume electricity. But the interesting news is that in the future prices are expected to be a lot peakier with renewables, which are much more variable. So, there will be a higher potential for industries to get some savings out of it', he says.

In 2020 Nicolas Fatras contributed to the SDC International Report – Cooperating for Energy Transition by co-authoring the chapter 'Digitalisation for energy efficiency and flexibility'.

49 scientific articles were published in 2020 by faculty in the Sustainable Energy theme.

Chemical and Biochemical Engineering

Head of Educational Programme's Report

Due to the influence of Covid-19, it has been a challenging year for the programme, both in terms of recruitment and in running the programme with lab courses, thesis projects etc. A significant effort was made by our teachers from the Technical University of Denmark and UCAS, and throughout the year the value of our collaboration has been emphasised by the way we have been able to support each other. For instance, Chinese teachers supported the Green Challenge and Research Immersion courses we normally run in Denmark, and we have even been able to run a joint laboratory course with students at different locations in the world.

This year, the Chinese students have carried on their great work with their Danish and Chinese supervisors, and a number of scientific articles based on Master's thesis projects have been published. Among them, four are joint Danish-Chinese publications.

We are happy with the career paths the graduates pursue, and several of them have taken up positions as PhD students in Sino-Danish environments, including SDC PhDs and China Scholarship Council PhDs in Denmark. Others have found employment in the industry, including GEA and Xellia Pharmaceuticals etc.

Many activities have moved online, whereas others have been postponed. For example, we were planning a China-based seminar in connection with an international conference organised by our Chinese partners, but we had to postpone the seminar about sustainable process engineering to utilise the benefits of combining an international conference with an SDC seminar.

Kim Dam-Johansen
Head of Educational Programme

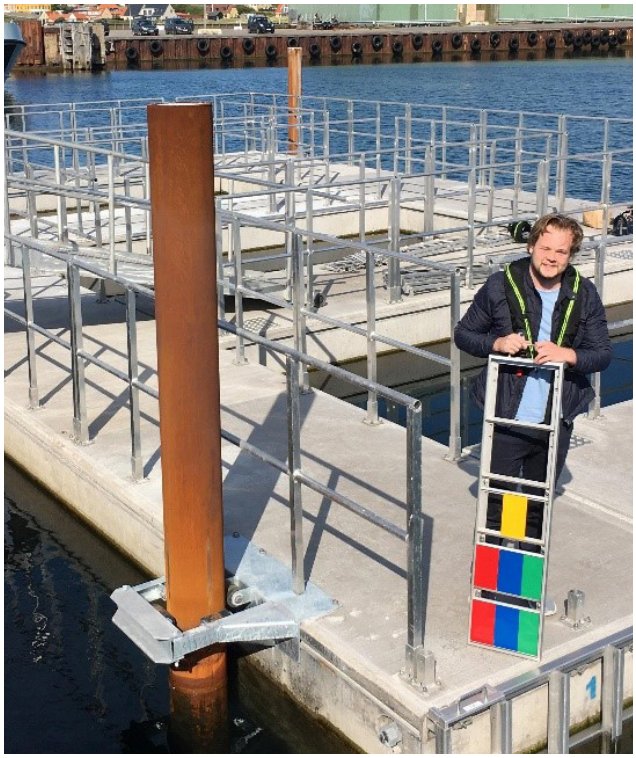
Environmentally friendly fouling control coatings

Marine biofouling is the focal point for PhD Student Morten Lysdahlgaard Pedersen. Marine biofouling affects a wide range of industries such as the shipping industry and other off-shore installations. For the shipping industry, biofouling causes increased weight and drag, which leads to speed reduction and loss of manoeuvrability.

'To compensate for the loss of speed, the fuel consumption is increased by up to 40 per cent, resulting in increased emissions of harmful compounds. This creates a high demand for improved fouling control coating which meets the requirements of government regulators, customers and NGOs', says SDC PhD Student Morten Lysdahlgaard Pedersen.

The focus of his PhD project is to develop new methods for the detection and evaluation of marine biofouling in order to provide quick and reliable information and thus develop new and environmentally friendly fouling control coatings.

Morten Lysdahlgaard Pedersen graduated from the Chemical and Biochemical programme in 2019, and he expects to finish his PhD in 2022.



Morten Lysdahlgaard Pedersen is ready to immerse test panels in the water at Hundested Marina.

From wheat straw to plastic

Wood, grain products and other organic leftovers from farming are usually not associated with chemical products like plastic and nylon. However, when you are a chemical engineer like Sejr Nielsen, the link between the organic and chemical fields is not unusual.

He holds a Master's degree in Chemical and Biochemical Engineering. In his thesis, he investigated the economic value of the production of succinic acid as a value-added co-product to xylitol, which is a widely used substitute for sweetener in food, for example in chewing gum. A value-added co-product can give a product with low or no value a higher value – in this case, xylitol produced from wheat straw. Succinic acid is also known as amber acid because it is extracted from amber.

'Succinic acid is a product that we can use as an intermediate for all sorts of other products. For example, as a substitute for the oil used in plastic and nylon', Sejr Nielsen explains.

A passion for process design

The current way of producing succinic acid is an expensive process. Therefore, Sejr Nielsen has cooperated with one of his supervisor's PhD students in investigating an alternative way of producing succinic acid by fermentation at a bio refinery, compared to the current method of producing succinic acid by butane or benzene. In his thesis, Sejr Nielsen focussed on the purification and recovery process of succinic acid after fermentation, because 60-80 % of the production cost is found in this process:

'The main point of investigating a process design is to determine whether it even pays off to produce a given product. I found that it pays off to produce succinic acid in a time span of 10 years, when you design the downstream process with an evaporation system,

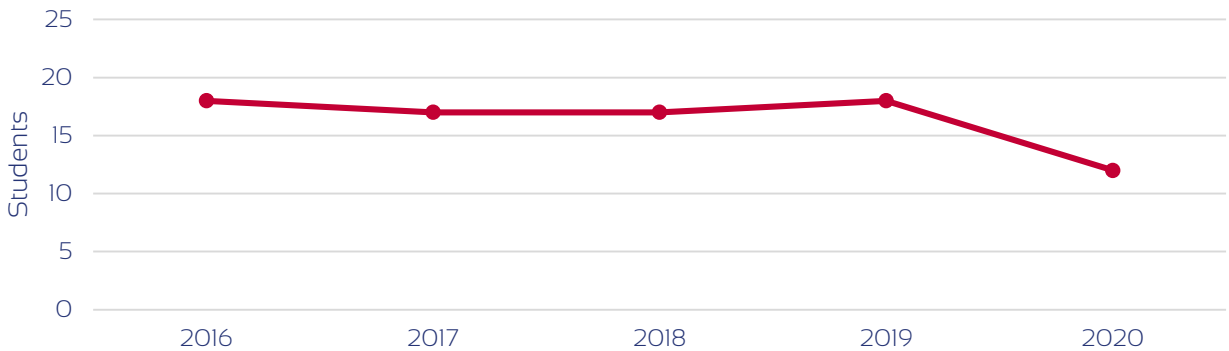
which means that steam is used as the energy source, and multiple evaporators are used in series that reduce the steam consumption', says Sejr Nielsen.

After five years as a student, Sejr Nielsen looks forward to getting experience in the real world:

'I am curious about using what I have learned. I believe the best way to start my career is in production, where I can get experience and move on from there. Production also fits my passion for process design', Sejr Nielsen says.

Intake of Master's Degree Students Chemical and Biochemical Engineering

The programme has 30 seats.



Food and Health

Principal Coordinator's Report

The research theme of Food and Health has been running since 2016, and it is progressing well in terms of establishing collaborations as exemplified by a total of some 10 jointly supervised PhDs so far.

In 2020, we have managed to continue our collaborations from a distance, but our annual Food and Health conference in China had to be postponed due to Covid-19 restrictions. We look forward to once again being able to build initiatives in person in China.

The research theme takes a chain approach, which means that the entire journey from farm to fork is included. All relevant topics across this chain are dealt with, which synergises well with the perspective taken on the Master's degree programme in International Food Quality and Health.

The theme of appetite and eating behaviour is one of the most evolved at present, illustrated by the collaboration between the team in Aarhus at AU FOOD, including Assistant Professor Barbara Vad Andersen and PhD Student Nikoline Bach Hyldelund, and Professor Chan Raymond from the CAS Institute of Psychology. At the heart of this collaboration is a cross-cultural approach, which is believed to lead to new insights into the factors that shape our eating behaviour and future food design.

We have also initiated interesting joint activities with the Life Sciences theme, where Associate Professor Thomas Alrik Sørensen from Aalborg University is leading the charge with PhD Student Aurore Zelazny on 'The Effect of Semantics on Perception: Synaesthesia, Multisensory perception and Food Experience'.

At the University of Copenhagen, Associate Professor Jørgen Leisner and PhD Student Kristian Key Milan Thamsborg also have a well-established collaboration with Professors Yin Li and Yu Bo at the Institute of Microbiology at CAS. They are focussing on ways to use microbiology as predictors of food shelf life, critical of course for contributing to the pressing need to reduce food waste globally.

PhD Student Anne Sjørup Bertelsen, Associate Professor Ulla Kidmose and Professor Derek V. Byrne from AU FOOD in collaboration with Professor Sun Yuanxia and her team at the Tianjin Institute of Biotechnology had a paper published in a special issue of the Foods journal. It focussing on 'Individual Differences in Sweetness Ratings and Cross-Modal Aroma-Taste Interactions'.

Derek V. Byrne
Principal Coordinator

2020 PhDs

Anne Sjørup Bertelsen
PhD student Anne Sjørup Bertelsen from the Department of Food Science, Aarhus University, successfully defended her PhD thesis titled 'Aroma-induced sweetness enhancement in beverages: The influence of intrinsic food factors and individual differences'. Anne Sjørup Bertelsen did her PhD in cooperation with the Tianjin Institute of Industrial Biotechnology, CAS.

Mette Duerlund Hansen
PhD student Mette Duerlund Hansen from the Department of Food Science, Aarhus University, successfully defended her PhD thesis titled 'Post-Ingestive Sensations in Healthy Eating Behavior - Clarifying and measuring post-ingestive sensations and studying their contribution to actual choice behaviour'. Mette Duerlund Hansen did her PhD in cooperation with the Institute of Psychology, CAS.

Viktorija Kulikovskaja
PhD student Viktorija Kulikovskaja from the Department of Management, Aarhus University, successfully defended her PhD thesis titled 'The role of customer engagement in marketing'. Viktorija Kulikovskaja did her PhD in cooperation with the School of Economics and Management, UCAS.

Pork chops and tuna steaks

Determining the shelf life of food products by investigating decay in meat and fish products is the objective of Kristian Key Milan Thamsborg's PhD project.

'The United Nations Development Goal number 2, Zero Hunger by 2030, does not just revolve around increasing food production. Using the food we have in a sensible way is also extremely important. If we are able to determine the shelf life of food products more precisely, then we can prevent non-spoiled food from being thrown away, and that is also great for the environment and the economy of food-producing companies', says Kristian Key Milan Thamsborg.

Currently, the food industry evaluates sell-by or best before dates of products by means of non-objective sensory methods and bacterial enumeration, which are not fitted to the precise conditions of storage or treatment of the producer. Moreover, these methods are expensive and time-consuming. However, over the last decade, the emergence of hand-held sensors that indirectly measure the bacterial concentration of food products has made evaluations cheaper, faster and potentially more accurate, explains Kristian Key Milan Thamsborg.

Kristian Key Milan Thamsborg spends much of his time in the lab linking the levels of the biogenic amine cadaverine in meat and fish products to spoilage. Cadaverine is produced by bacteria, and it has the potential to be a spoilage indicator in meats. An advantage to studying cadaverine is that it will mix with the air around the meat products, which means that measurements can be performed by simply holding the sensor above the product. This faster and cheaper way of measuring also means that food control can be performed on smaller quantities of products, which again means that products can be distributed more accurately.

China on hold

Kristian Key Milan Thamsborg initiated his PhD project in November 2019, where he joined a Food and Health conference at SDC in Huairou. Then Covid-19 broke out, and he has not been able to complete any of his planned research stays in China, which also means that he has been forced to alter his plans for the PhD project.

He planned to perform genome analyses and subsequently run them on products in China, and he was also supposed to compare similar products from Denmark and China, respectively, because of the differences in climate, handling and processing.

'My visit in 2019 really whetted my appetite for going to China. Joining the conference and being a part of SDC was very exciting, so it is a shame that that part of the project has been put on hold. I still hope to be able to go, and I want to make the most of it, but due to the changed timetable we will have to rethink what makes sense for me to do once I get there', says Kristian Key Milan Thamsborg.

9 scientific articles were published in 2020 by faculty in the Food and Health theme.

International Food Quality and Health

Head of Educational Programme's Report

This year we launched the programme on International Food Quality and Health, and most of our attention has been on establishing a solid foundation and getting the programme off to a good start. We are well underway and have 11 Chinese and two Danish students in the 2020 cohort. Due to Covid-19, teaching activities have been conducted online, though, which of course has been a challenge.

Prior to course start we engaged in an SDC task force focussing on creating guidelines for using technological tools such as Mentimeter, Panopto and Zoom to assist the online teaching. The guidelines were shared with all of the SDC Master's degree programmes.

We have experienced great commitment to the programme from Danish and Chinese teachers and feel that we have got off to a good start, despite the long-distance context.

We wondered how the students would cope with the online contact and physical distance to teachers and fellow students. It is our impression that they are very committed to the courses, although they would prefer to be together on campus.

We conducted detailed evaluations of each course as they were completed, with the aim of aligning course content and monitoring students' satisfaction with the teaching activities. The outcome was a set of recommendations and suggestions meant to give course leaders a solid basis for developing teaching content in the future.

Despite being apart, students were given various opportunities to exchange cultural experiences. This included several social online initiatives, for example an exchange of traditional recipes, very relevant for the programme content which focusses on food culture. Though our students would of course prefer to exchange culture first-hand, they expressed great interest in engaging with each other and their teachers via online tools.

The research theme and Master's degree programme are very much aligned in perspective and shape, and integrating the two has been a key focus. Bringing researchers together through educational activities is a great opportunity to strengthen the Master's degree programme as well as the research area of Food and Health.

Derek V. Byrne
Head of Educational Programme

Joining the first cohort

Huo Shiwei joined the first cohort of the International Food Quality and Health programme in the summer of 2020 with a passion for food science and a thirst for learning in a different environment.

When Huo Shiwei was on the lookout for the right Master's degree programme, she quickly turned her attention towards UCAS, which offered her an opportunity to acquire a double degree within her field of interest.

'UCAS is a well-respected and very wonderful university, and I really wanted to study there. I strongly believe that food is so close to everyday life that the attention to food science will only increase in the future, so I did not give the fact that it is a brand new programme much thought; I am just happy that I found it', she says.

Before joining SDC, Huo Shiwei studied Food Quality and Safety at Nanjing Agricultural University, where she learned a lot about technology and production, but at SDC she is learning about perceptions of food, food chains and the business side as well, she explains.

Helping each other through courses
The content of the International Food Quality and Health programme covers the entire process from farm to fork, which is also evident from the backgrounds of the students who have joined the programme. Some know a lot about technology, while others know a lot about biology or something else entirely, explains Huo Shiwei.

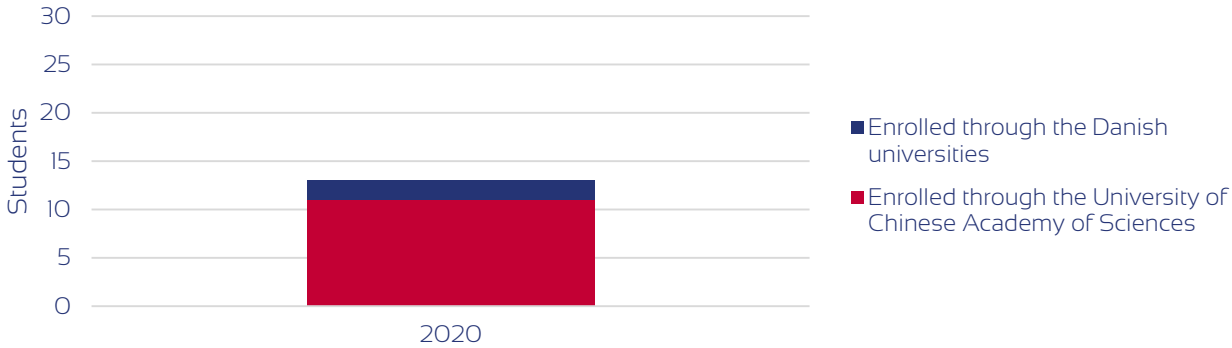
'For each course there are usually two or three students who are very knowledgeable about the topic in question. This is great, because it enables the students to help each other with different courses', Huo Shiwei says.

Separated by Covid-19
Since the summer, the Chinese students have been able to go to classes in the SDC building, although it has been conducted online. The Danish students, however, have taken the courses from Denmark, and that is too bad, according to Huo Shiwei.

'This is my first time studying alongside international students, and I like sharing stories and photos from everyday life with them on Zoom and WeChat, but I really look forward to meeting them in person', she says.

Intake of Master's Degree Students International Food Quality and Health

The programme has 30 seats.

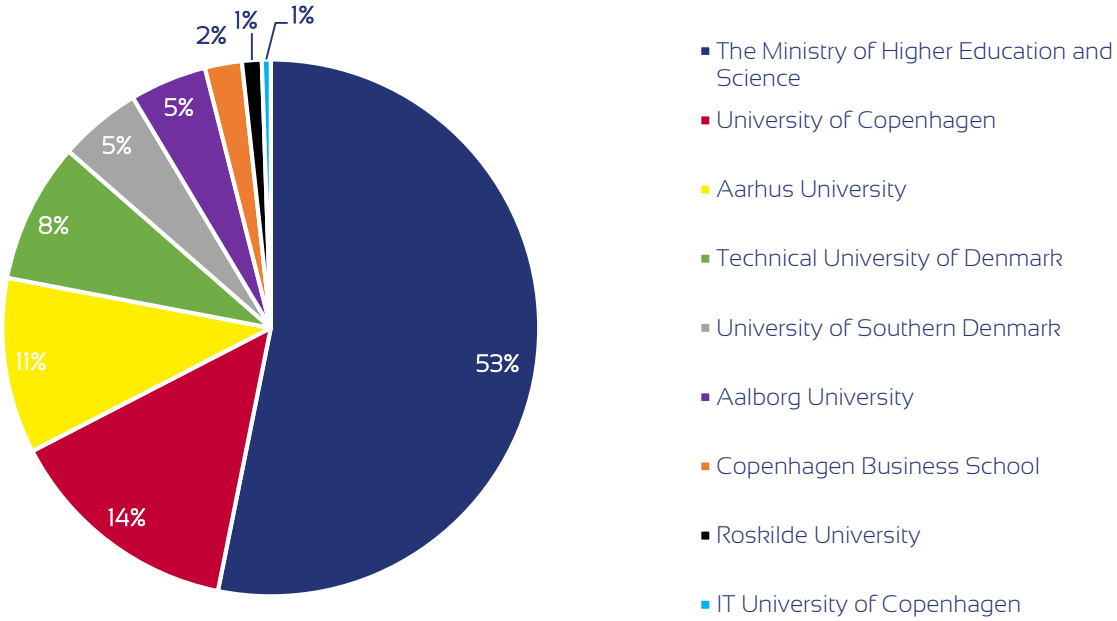


The Master's degree programme was launched in 2020

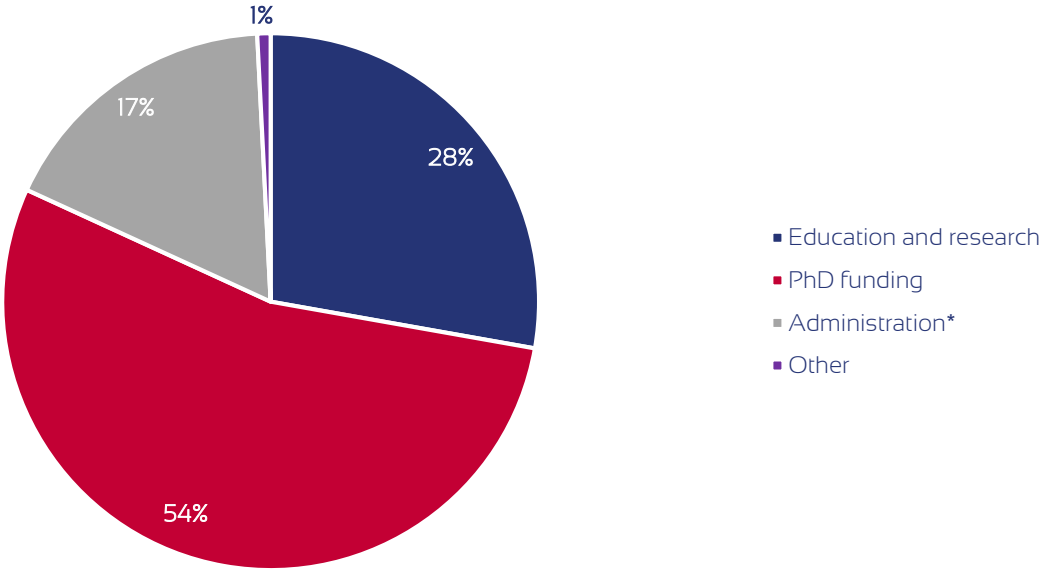
Finances

The Danish part of SDC is funded by the Ministry of Higher Education and Science and the Danish universities. The eight universities contribute financially to SDC based on their annual turnover.

Income 2020 - 65 DKK million



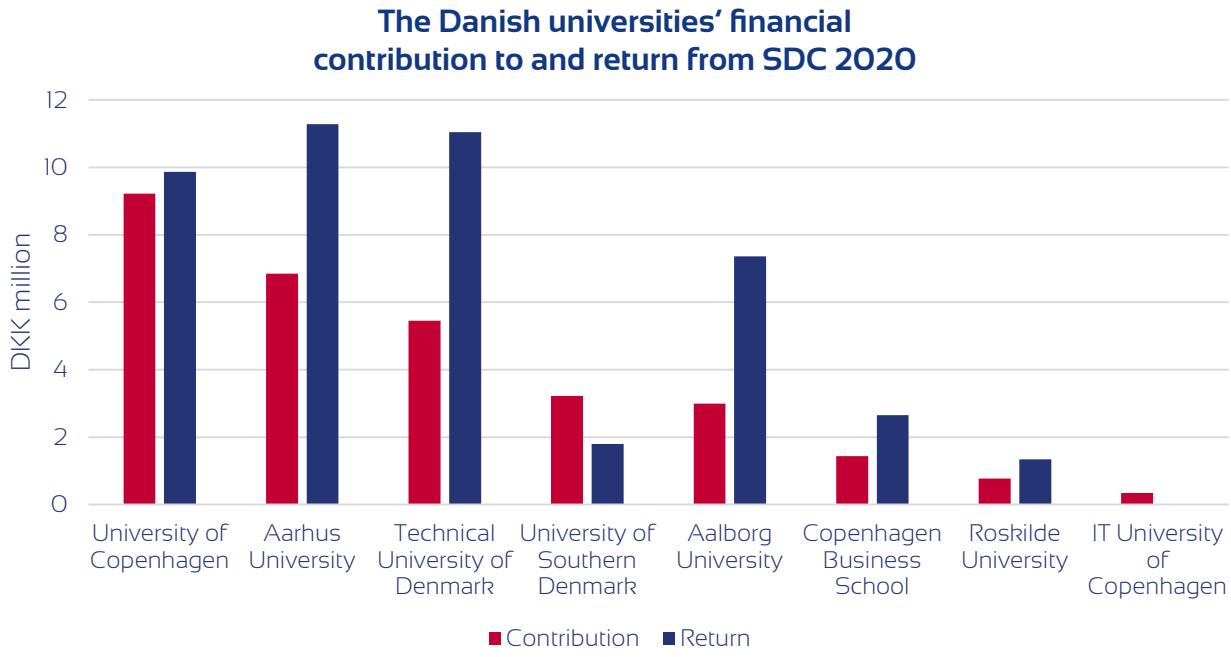
Expenses 2020 - 56 DKK million

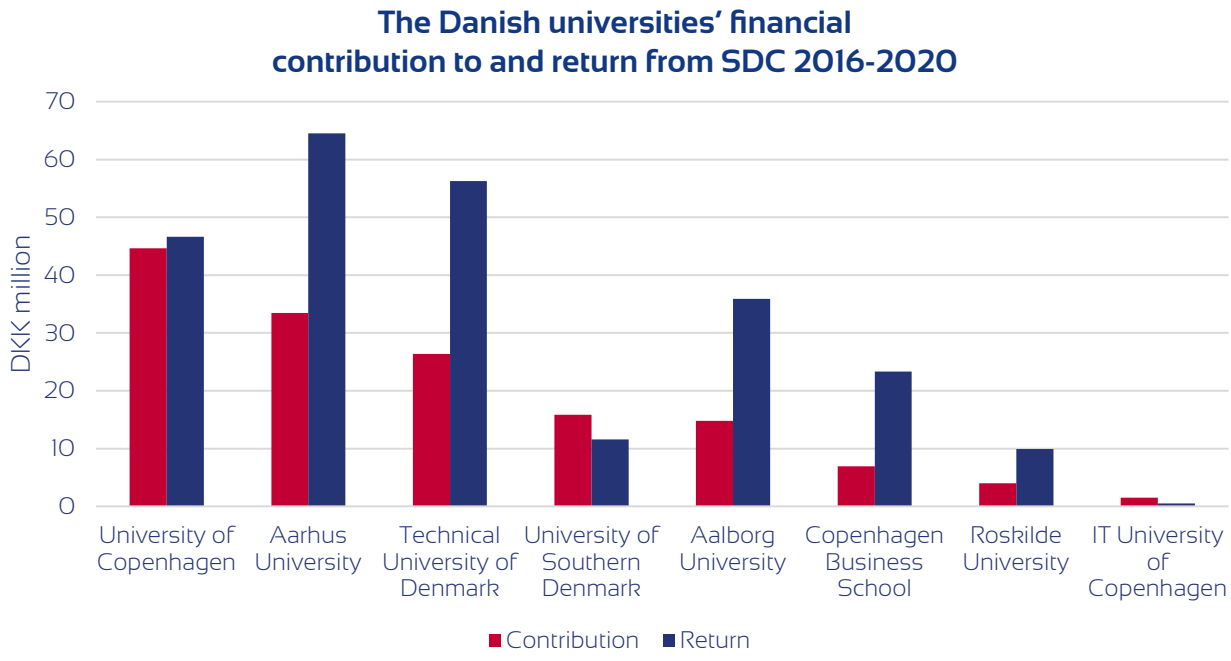


*Expenses related to the House of the Danish Industry Foundation are included in the category "administration".

Financial Flow

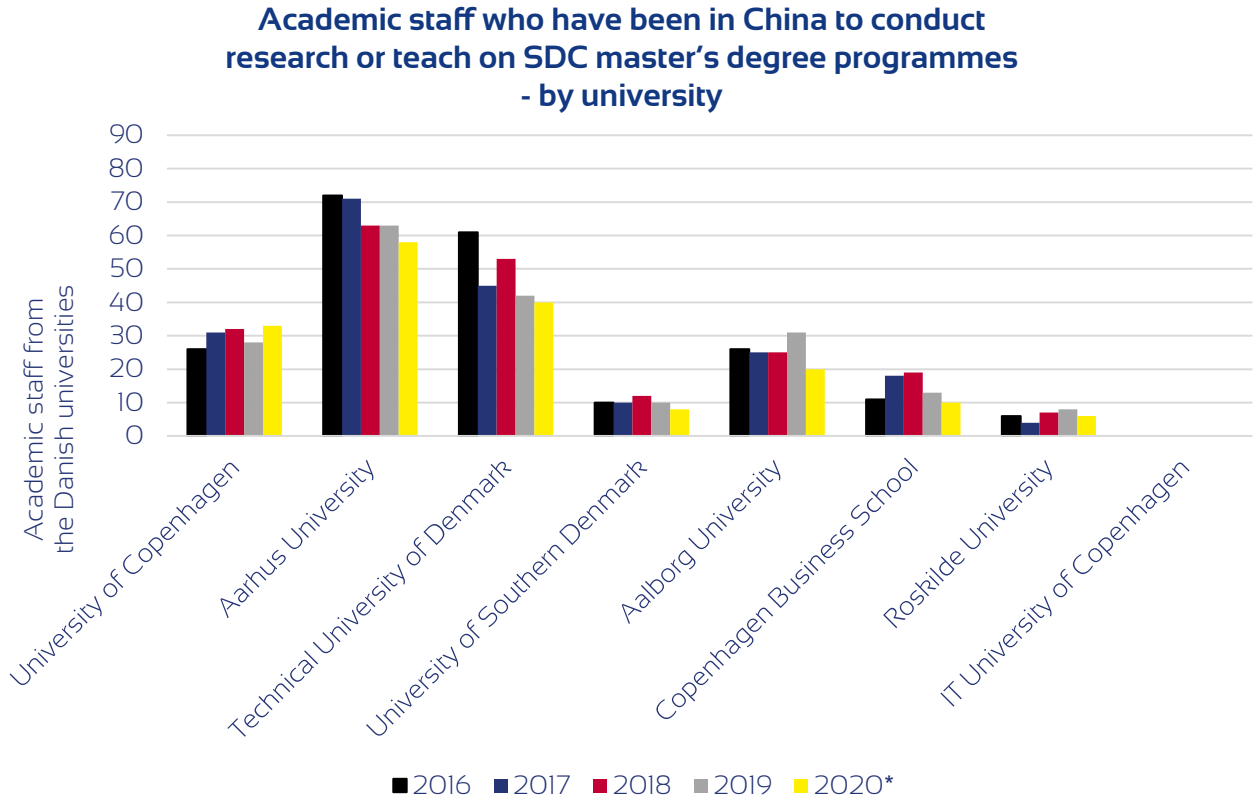
The Danish side of SDC compensates the universities for research and educational activities carried out in China and co-finance PhD projects and postdoc positions at the Danish universities.



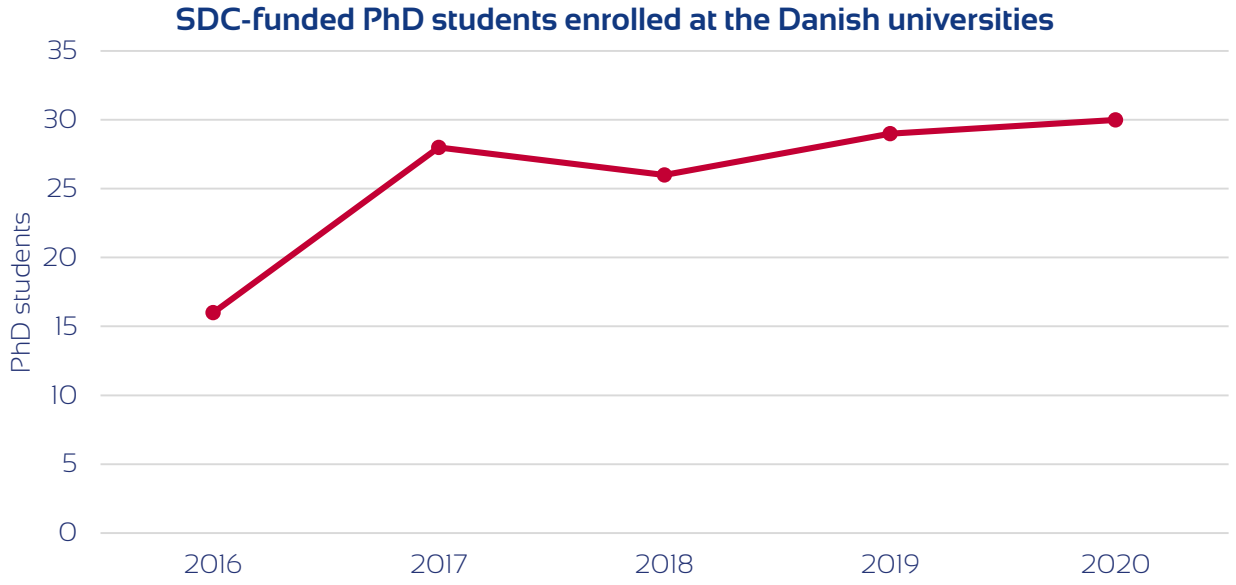


nano.ku.dk

Faculty



* Due to the lockdowns and closed borders, caused by Covid-19, it have not been possibly for Danish academic staff to go to China. The number for 2020 mainly cover the academic staff who has conducted online teaching.



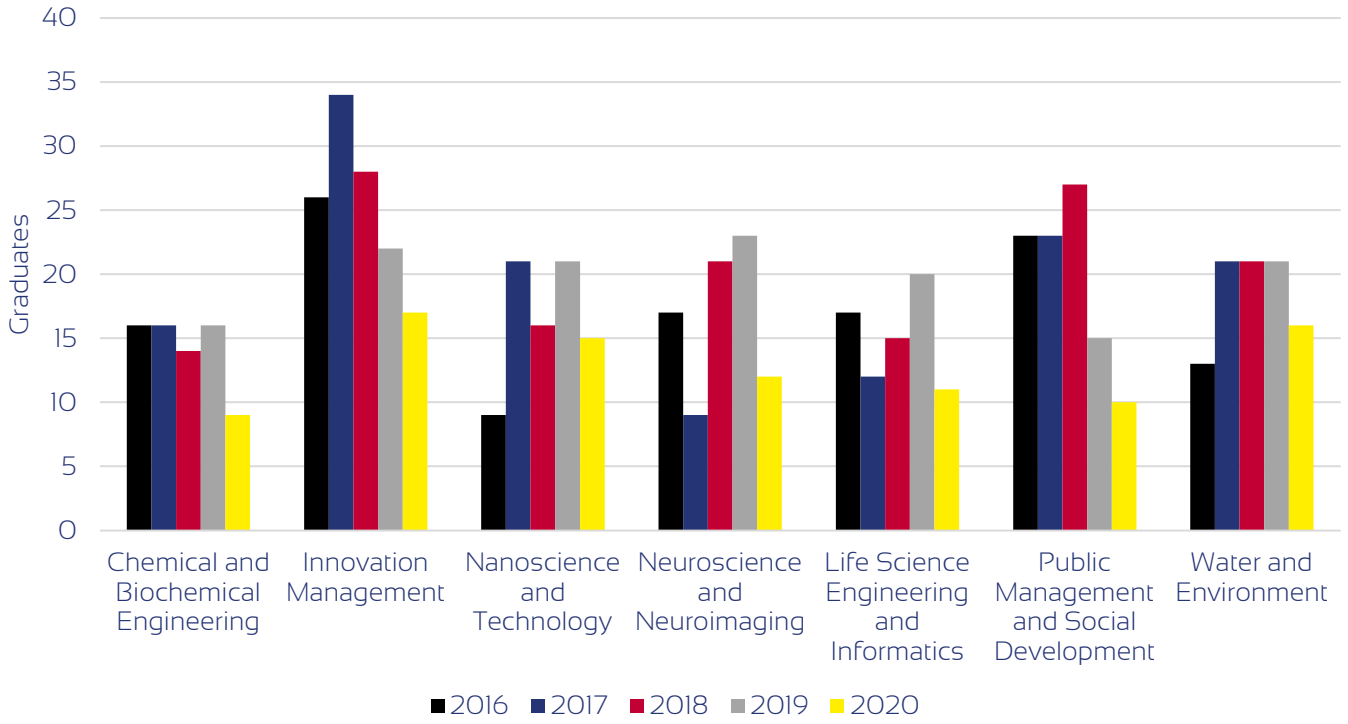
Since 2011 the Danish side of SDC has co-financed a number of PhD students each year at Danish universities. SDC PhD students have both a Danish supervisor and a Chinese supervisor, and the Danish SDC PhD students must spend a minimum of six months at a Chinese research institute during their studies. They have the opportunity to obtain a double PhD degree if they meet the requirements of both their Danish and Chinese host institutions.

Master's Degree Students and Graduates

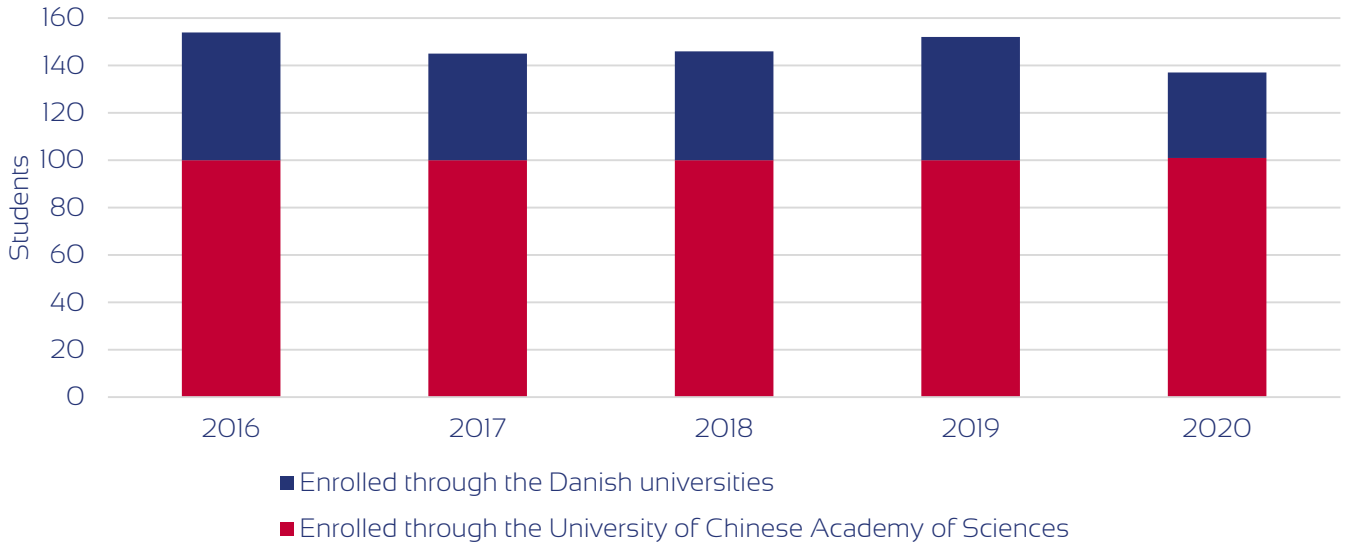
90

Master's degree students graduated from SDC in 2020

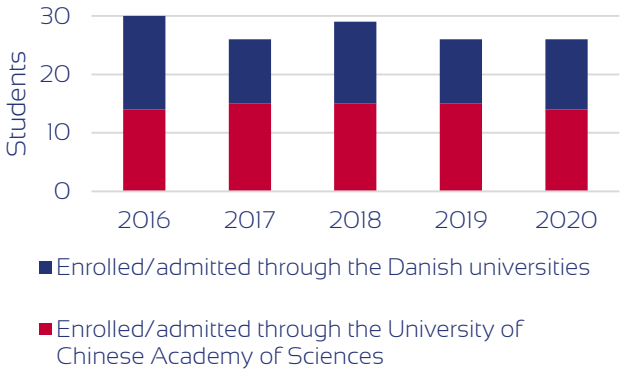
Graduates 2016-2020



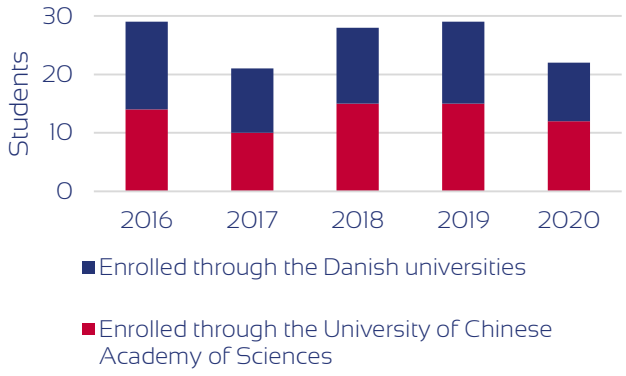
Intake of Master's degree students



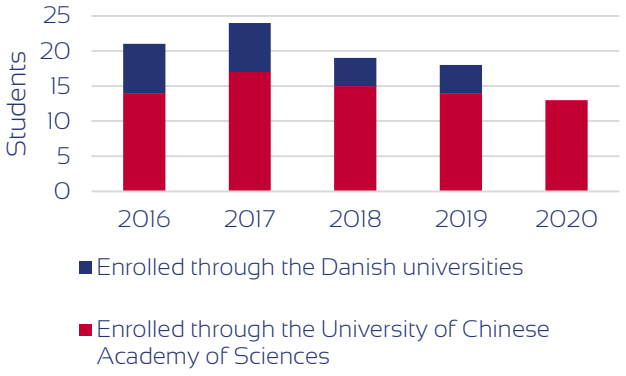
Intake of Master's degree students Innovation Management



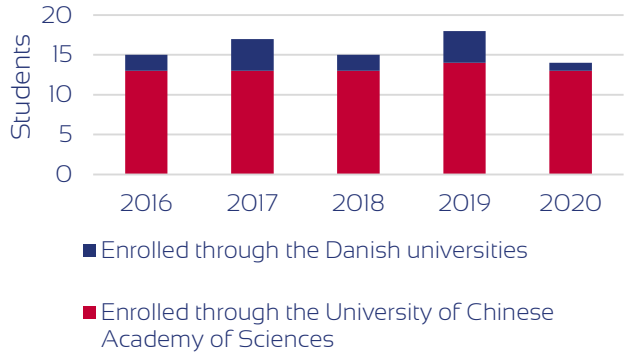
Intake of Master's degree students Public Management and Social Development



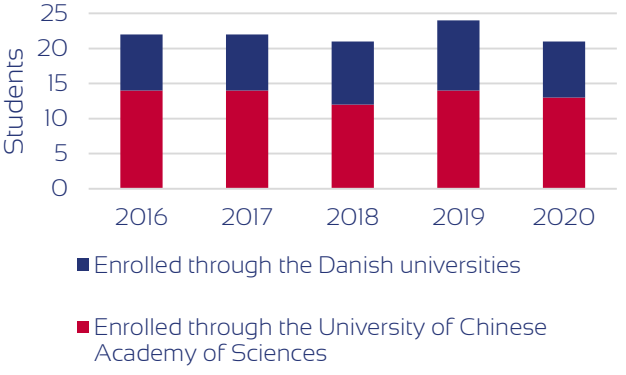
Intake of Master's degree students Water and Environment



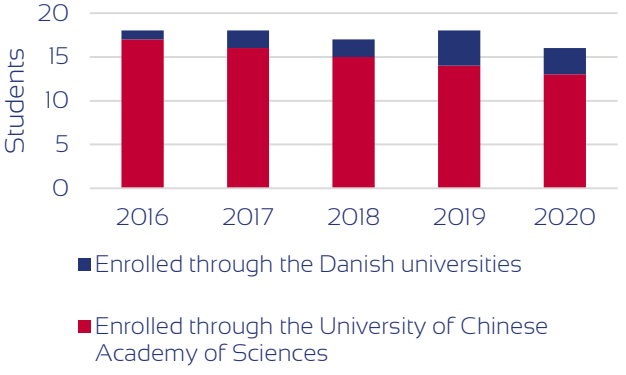
Intake of Master's degree students Nanoscience and Technology



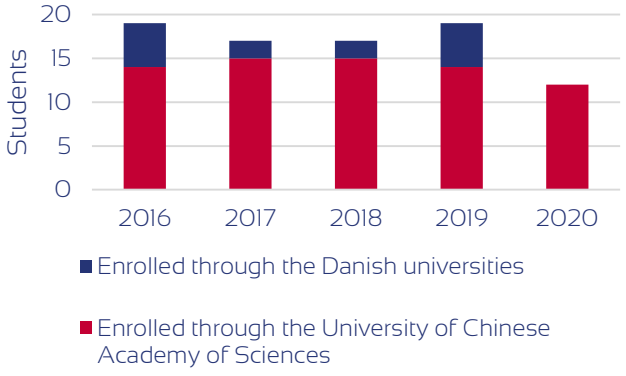
Intake of Master's degree students Neuroscience and Neuroimaging



Intake of Master's degree students Life Science Engineering and Informatics



Intake of Master's degree students Chemical and Biochemical Engineering

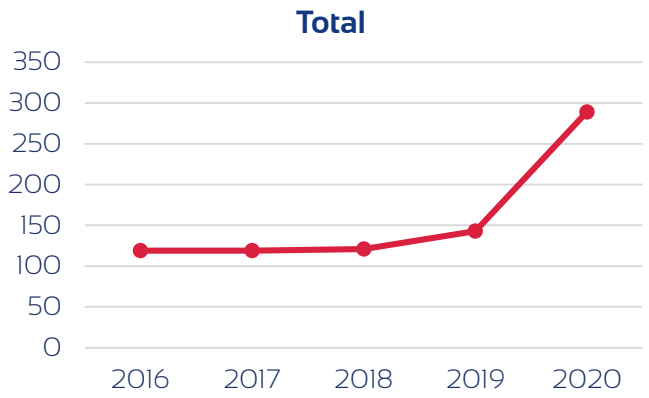


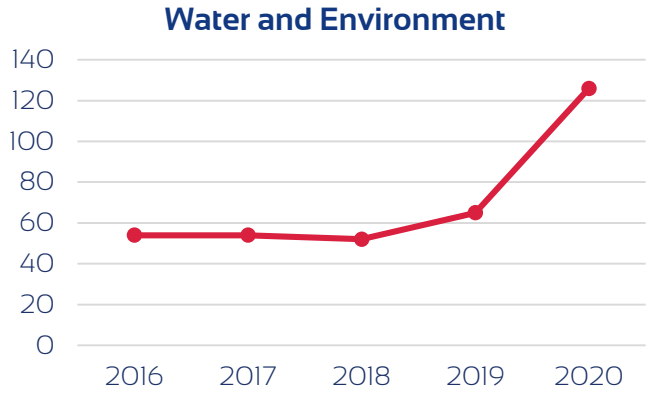
Intake of Master's degree students International Food Quality and Health

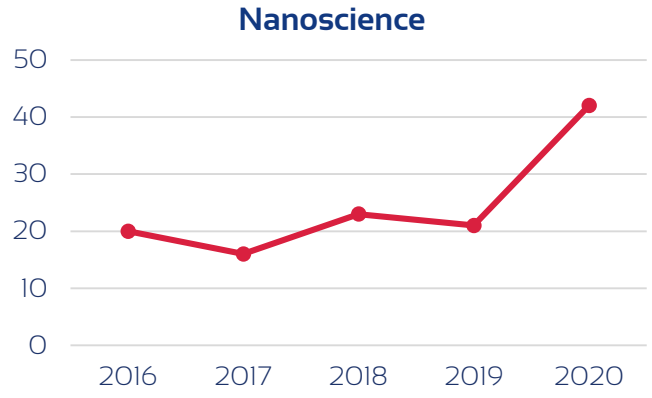
*The Master's degree programme was launched in 2020

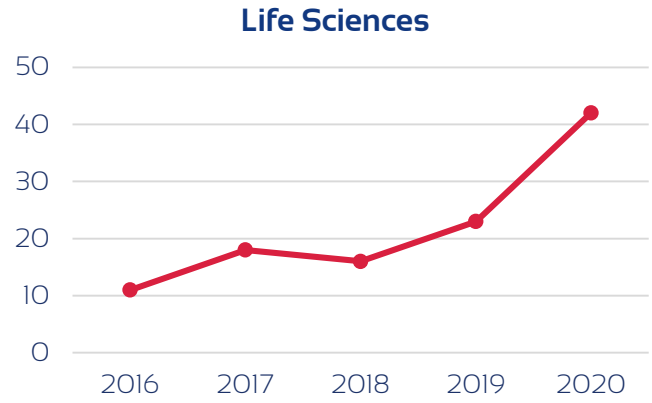
Publications

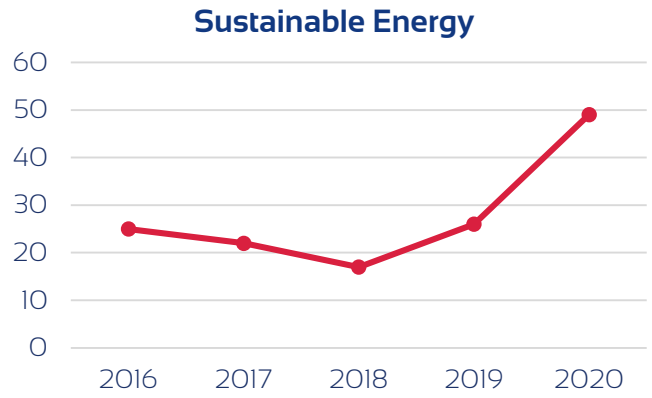
From 2016-2020, SDC faculty registered 791 scientific publications.

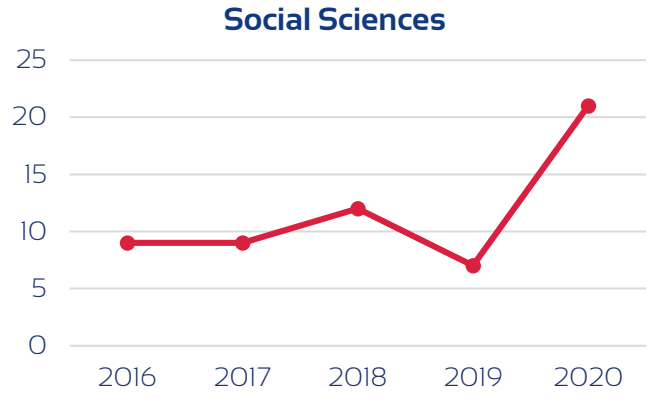


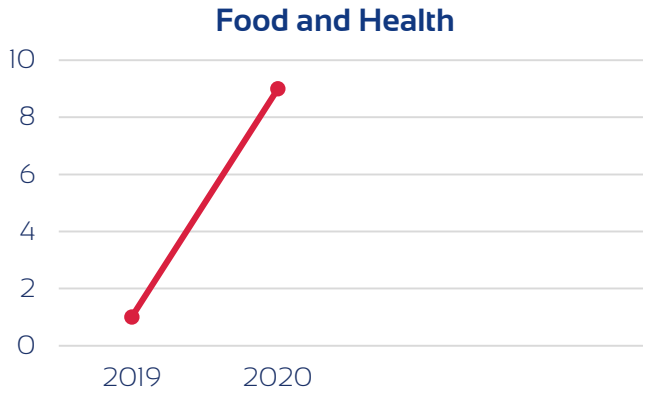












2020 Publications

The list of publications is compiled based on searches in Web of Science, Scopus and the Danish National Research Database. Only publications registered with affiliation to Sino-Danish Center for Education and Research are included.

Water and Environment

Xie S, Mo X, Hu S, Liu S / Contributions of climate change, elevated atmospheric CO2 and human activities to ET and GPP trends in the Three-North Region of China, Agric For Meteorol 295:108183

Ai Z, Wang Q, Yang Y, Manevski K, Yi S, Zhao X / Variation of gross primary production, evapotranspiration and water use efficiency for global croplands, Agric For Meteorol 287:107935

Jia X / Priming the pump of impact entrepreneurship and social finance in China, Agric Human Values 37:1293–1311
He R, Zeng J, Zhao D, Huang R, Yu Z, Wu QL / Contrasting patterns in diversity and community assembly of Phragmites australis root-associated bacterial communities from different seasons, Appl Environ Microbiol 86

Qin M, Xu H, Zeng J, Zhao D, Yu Z, Wu QL / Composition and assembly of bacterial communities in surface and deeper sediments from aquaculture-influenced sites in Eastern Lake Taihu, China, Aquat Sci 82:80

Li L, Ding M, Jeppesen E / Variation in growth, reproduction, and resource allocation in an aquatic plant, Vallisneria spinulosa: the influence of amplitude and frequency of water level fluctuations, Aquat Sci 82:81

Fu H, Yuan G, Ge D, Li W, Zou D, Huang Z, et al / Cascading effects of elevation, soil moisture and soil nutrients on plant traits and ecosystem multi-functioning in Poyang Lake wetland, China, Aquat Sci 82:34

Yu L, Zhang Y, Yang Y / Using High-Density Rain Gauges to Validate the Accuracy of Satellite Precipitation Products over Complex Terrains, Atmosphere (Basel) 11:633

Mormul RP, Thomaz SM, Jeppesen E / Do interactions between eutrophication and CO2 enrichment increase the potential of elodeid invasion in tropical lakes?, Biol Invasions 22:2787–2795

Zhou S, Zeng X, Xu Z, Bai Z, Xu S, Jiang C, et al / Paenibacillus polymyxa biofertilizer application in a tea plantation reduces soil N_2>O by changing denitrifier communities, Can J Microbiol 66:214–227

Bohara M, Acharya K, Perveen S, Manevski K, Hu C, Yadav RKP, et al / In situ litter decomposition and nutrient release from forest trees along an elevation gradient in Central Himalaya, CATENA 194:104698

Ding J, Liu J, Chang XB, Zhu D, Lassen SB / Exposure of CuO nanoparticles and their metal counterpart leads to change in the gut microbiota and resistome of collembolans, Chemosphere 258:127347

Wang G, Hu Z, Li S, Wang Y, Sun X, Zhang X, et al / Sulfur controlled cadmium dissolution in pore water of cadmium-contaminated soil as affected by DOC under waterlogging, Chemosphere 240:124846

Yu L, Li H, Yang Y, Shi S / Spatial and temporal precipitation patterns using the CMOPRH CRTproduct over the Taihang Mountains [基于CMORPH CRT产品的太行山区降水时空格局], Chinese J Eco-Agriculture 28:305–316

Zhang H, Li S, Liu Y, Yu J, Gao Y, Song J, et al / Advanced treatment of bio-treated coking wastewater by microwave-enhanced Fenton process [微波强化Fenton技术对焦化废水生化出水的深度处理], Chinese J Environ Eng 14:1495–1502

Li Z-Y, Li K-X, Liang T / Loss Characteristics of Rare Earth Elements in Urban Surface Road Dust under Different Rainfall Conditions [不同降雨条件下城市路尘中稀土元素流失特征], Chinese Rare Earths 41:1–14

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The annual report was approved by the Danish Board of SDC in April 2021.

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Bjarne Graabech Sørensen
Pro-Vice-Chancellor,
University of Southern Denmark