University of Amsterdam
Institute for Advanced Study

Annual Report 2019

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UvA Institute for Advanced Study

From the Scientific Director

The University of Amsterdam is the first university in the Netherlands to have established an Institute for Advanced Study (IAS). We started our endeavour in the summer of 2016 with the ambition to become a leading international institute, where existing paradigms and traditional boundaries between academic disciplines are transcended, in order to create new knowledge for complex scientific and societal challenges.[1]

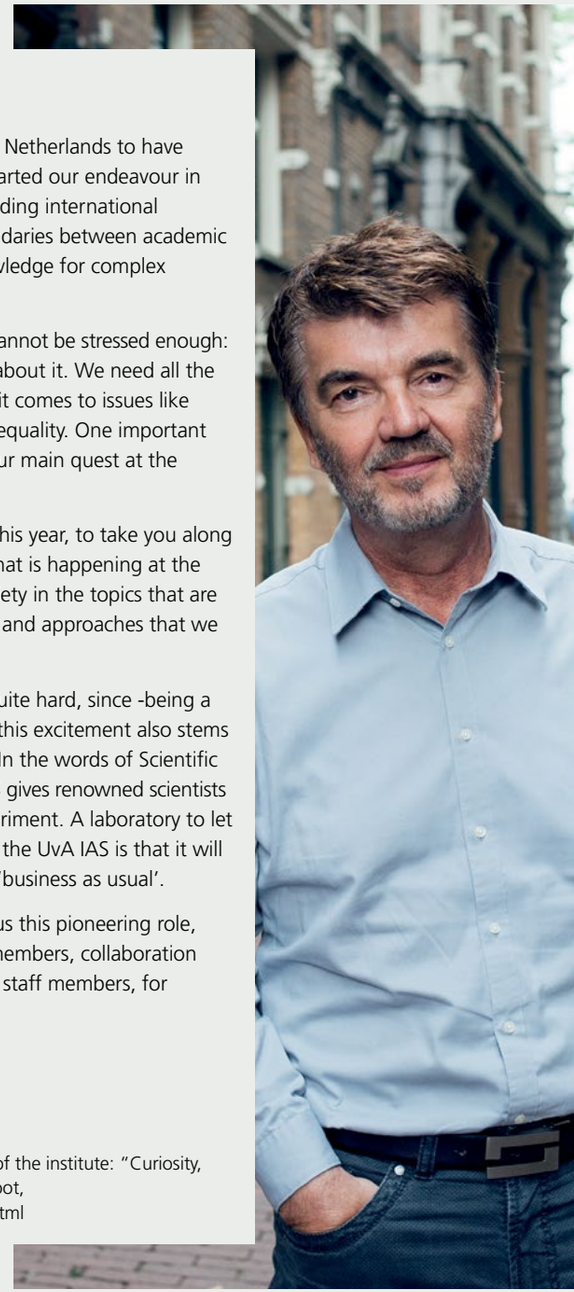
The importance of this type of interdisciplinary research cannot be stressed enough: the world is changing much faster than we can reason about it. We need all the academic disciplines to create actionable insights when it comes to issues like climate change, pandemics, economic crises or social inequality. One important question remains: how to make it really work? That is our main quest at the UvA IAS.

We decided to publish an open annual report, starting this year, to take you along on our journey and give you a general impression on what is happening at the institute. As you will notice, there is not only a large variety in the topics that are being addressed at the institute, but also in the formats and approaches that we use to address them.

Selecting some personal highlights for this report was quite hard, since -being a young institute- many steps are novel and exciting. But this excitement also stems from the pioneering role that we have in the university. In the words of Scientific Advisory Board member Robbert Dijkgraaf: "The UvA IAS gives renowned scientists and young talents a place and time to interact and experiment. A laboratory to let new ideas grow and then escape". My sincere hope for the UvA IAS is that it will remain faithful to that role and never reach the level of 'business as usual'.

I would like to thank the UvA leadership for entrusting us this pioneering role, but also our advisory board members, external faculty members, collaboration partners, all IAS-affiliated researchers and students, and staff members, for supporting our mission.

Peter Sloot
Scientific Director



[1] If you want to learn more about the origin and philosophy of the institute: "Curiosity, Serendipity and Complexity" - a short essay written by Peter Sloot, https://ias.uva.nl/about-the-institute/reflections-by-peter-sloot.html

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UBIAS

The UvA Institute for Advanced Study is member of the international network of University-Based Institutes for Advanced Study (UBIAS). UBIAS institutes bring together outstanding researchers from different disciplines, nationalities and academic backgrounds, creating a productive environment for innovative research. The network was established in 2010 to enable structured forms of exchange between partner institutes. Today, it has 44 members spread across the globe.

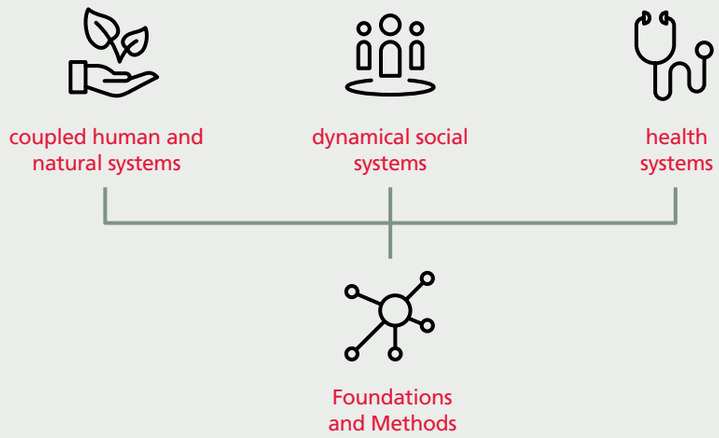
www.ubias.net

Research

Many breakthroughs in modern science happen at the interface of previously unconnected fields of insight. At the UvA Institute for Advanced Study we bring together outstanding researchers from all disciplines to collectively unravel wicked problems. We use system's thinking and complexity science methods as our common language to bridge disciplines, scales and paradigms.

The IAS aims to create a vibrant and inspiring environment for interdisciplinary and cross-faculty collaboration. We host and organise events to facilitate networking and knowledge exchange, spark ideas, and create new research partnerships. We offer multidisciplinary research teams a physical home base where they can work together and utilise the synergy potential with other research activities at the institute.

The IAS also adds a new dimension to the university landscape by creating a place for 'slow science', where outstanding researchers and out-of-the box thinkers can escape the academic rat race for a while and hit upon new ideas in a serendipitous way. Through the IAS fellowship programme, they have time to focus on a specific scientific question in interaction with other bright and creative minds. The number of events, IAS-affiliated researchers, theme groups is steadily growing.



Research themes

We live in an increasingly interconnected and rapidly changing world. A world where everything is interwoven with everything else, and where cause and effect are hard to unravel. As our challenges evolve and become more complex, we must resist the temptation to reduce large wicked problems into isolated issues, and avoid piecemeal 'solutions' to individual issues that lead to a worsening of others. We cannot afford such mistakes in combating problems like climate change, pandemics, economic crises, social inequality. To get a grip on the scientific, technological and societal challenges that we are facing, we need to understand what kind of interventions will produce what type of outcomes in such complex adaptive systems. This requires a true game-changer, a new disruptive way of doing science that cuts across the alfa, beta and gamma sciences. That is exactly what the IAS aims for.

We have organised our research activities in three broad application-oriented domains. Each domain contains several research projects and theme groups. Additionally, we focus on the development of foundations and methods to bridge disciplines, scales and paradigms.

Fellowship programme

UvA researchers and external researchers can apply for a fellowship at the IAS. Fellowships are awarded to renowned researchers as well as to talented early- career scholars. We can accommodate approximately 10-15 fellows per year. Fellows are selected by the IAS Board of Associates.
In 2019 we welcomed 14 research fellows in total. Their stay resulted in various papers, new research projects, outreach activities and sustainable collaborations with UvA researchers. For the first time, the selection included an Artist in Residence.

Fellows

Albert Feilzer

Professor of Comprehensive Dentistry at ACTA Former Dean of ACTA (Jun 2009 - Jun 2019)

Research question

Caries prevention the last mile
Adverse reactions of medical devices

As Past-dean, I received a sabbatical for six months, which I partly fulfilled at the IAS. Afterwards I will remain connected to the IAS as a fellow. On one hand, I am involved in setting up research on how we can make the world's most common non communicable disease 'caries' to disappear While on the other hand I execute research on adverse reactions of medical devices. During the last fifty years, the oral health of the Dutch population has improved enormously. However, caries has not completely disappeared and the 'last mile' requires the development of new strategies for prevention of the complex disease caries. I hope to realize a project subsidy for this within IAS for developing a biomedical model of this disease.

James P. Crutchfield

Professor of Physics and Director of the Complexity Sciences Center at the University of California at Davis.

Research question

What are patterns and how do we discover them?

My time at IAS was particularly productive, partly due to the wonderful hospitality, partly since I was on sabbatical. One key new work completed was analyzing how the act of quantum measurement itself makes quantum systems appear more or less random and more or less complex.

Luc Coffeng

Assistant Professor at the Department of Public Health, Erasmus MC, University Medical Centre Rotterdam

Research question

How can approximate Bayesian computation (ABC) based on sequential Monte Carlo (SMC) be optimised, automated, and its performance visualised for the quantification of complex stochastic transmission models?

I briefly worked on ABC-SMC, as it turned out that this project progressed faster than expected. I therefore spent most of my time interacting with other Fellows and learning about network sciences and network modelling. As a result, I started implementing networks into my transmission models to capture local patchiness of environmental reservoirs for intestinal worm infection. My stay at IAS further inspired me to write an ERC Starting Grant about the interconnected dynamics of health-related behaviour and infectious diseases in social networks.

Mehmet Itik

Associate Professor, Department of Mechanical Engineering, Karadeniz Technical University, Trabzon, Turkey

Research question

How does treatment affect the spread of antibiotic resistant Neisseria Gonorrhoeae in a sexually active population?

At the IAS, I worked on developing a mathematical model to understand the main drivers and dynamics of the spread of antibiotic resistant strains of Neisseria Gonorrhoeae. The model aims to develop efficient antibiotic management strategies to reduce the spread of resistance from country to global level.
I was closely collaborating with the researchers from the AIGHD at the IAS on my work. Moreover, I established many contacts at the IAS who shared different views with me on my research. It was a great experience to be a part of IAS.

Sharon Wohl

Assistant Professor, Architecture and Urban Design, Iowa State University

Research question

To disambiguate how urban research streams engage complexity, identifying the complexity features explored within each stream, and how such features are more generally understood within complexity science

Time at the IAS provided the focused environment in which to research and write text/content for a website that addresses the question above. In addition, time was spent coordinating the design of the website flow, ensuring that the content is easy to navigate. Discussions at the IAS with researchers contributed to development of the website content.

Maarten Marsman

Assistant professor in Psychological Methods at the University of Amsterdam

Research question

How to build formal psychometric models for psychological constructs such as intelligence that are consistent with established cross-sectional phenomena using idiographic network models?

The main challenge in the development of psychometric theory is to unite well-established phenomena from psychometric research with models for the individual in a formal framework. To address this challenge, I will build upon the random-cluster model from statistical physics that can be used to model individuals by their personal network of relations (edges) that are formed between cognitive skills or knowledge (nodes), say. During my fellowship I hope to connect with researchers from different disciplines — such as physics and informatics — as my research builds upon ideas from dis¬ciplines that are not my own.

Antonio Cappuccio

Computational biologist and data scientist at Mount Sinai Hospital, New York, USA

Research question

What biological and socio-economic mechanisms drive AMR at different levels (global, national, regional)?

Antimicrobial resistance (AMR) is increasing morbidity, mortality, and health-care expenditures worldwide . AMR surveillance has a key role in informing antibiotic therapies and policies to contain AMR. However, setting up and maintaining surveillance is expensive in terms of direct costs, human resources, and infrastructure. As a consequence, the status of clinical AMR in low and middle-income countries is still largely unknown. At the IAS, I have been working on a new machine learning framework to predict AMR levels in low and middle-income countries, where data is currently missing. The strategy takes advantage of the World Bank Database, and quantitatively links high-dimensional socio-economic and demographic profiles of individual countries with antibiograms for all relevant combinations of priority pathogen and antibiotic class.

Paul van Zuijlen

Plastic Surgeon, Medical Director of the Burn Center of the Red Cross Hospital, Beverwijk, and Endowed Professor for Burn Injury Management at the Amsterdam UMC.

Research question

Can integration of system dynamics and immune system models of processes that take place after a severe burn injury lead to new insights to improve the outcome of burn treatment?

The main purpose of this fellowship is to better understand the impact of a serious burn injury on the human body thanks to the different expertise and new perspectives available through IAS and its network. Thanks to the IAS network, interesting connections could be made outside the usual medical scientific network that are of great added value for this project specifically on system dynamics and immune system models. Through this new insight we hope to be able to improve the outcome of burn treatment in the long term.

Andrea Ravignani

Pegasus 2 Marie-Curie fellow at Artificial Intelligence Lab, Vrije Universiteit Brussel & Research Department, Seal Centre Pieterburen

Research question

Why are we musical animals? In particular, why do humans have rhythm, and which similar traits can be found in other species?

While at IAS, I collaborated with Prof. Henkjan Honing to tackle the biology-culture interplay in musical rhythm. In particular, I will (1) finalize the analyses and write a paper reporting human experiments on the cultural transmission of rhythm; (2) design a rhythm experiment in seals, which I will be running in Pieterburen (northern Netherlands), with an agent-based model of rhythmic interaction to complement the experiment; (3) work on a special journal issue on 'Synchrony and interactive rhythms from neurons to ecology", collecting contributions from many disciplines.

René Melis

Principal Investigator at the Department of Geriatric Medicine of the Radboud University Medical Center, Nijmegen, the Netherlands.

Research question

How are processes across multiple spatial and temporal scales involved in the emergence of resilience of aging humans against health stressors?

Successful and healthy aging is not just about the avoidance or elimination of health risks and treatment of disease. Equally important, but much less appreciated, is the capacity to resist, recover from and cope with risks to health and life as they come along. Clinicians currently lack valid tools to manage their patients' resilience and results in avoidable disease burden, delayed recovery, and healthy life years lost in the increasing group of older persons and persons with multimorbidity. This calls for a better understanding of the underlying mechanisms. I hope to involve a mixture of methods and disciplines to increase our understanding of how resilience comes about in aging humans.

Claudi Bockting

Professor of Clinical Psychology in Psychiatry at Amsterdam UMC (location AMC)

Research question

How can complexity modelling tools successfully be applied and explored to understand the onset and maintenance of common mental health disorders like depression in order to explore new targets for prevention and treatment?

As a fellow at the Institute for Advanced Study (UvA-IAS) I studied the use of complexity models in order to explore new targets for prevention, treatment and relapse prevention of mental disorders.

Paul Duijn

Strategic Intelligence Analyst, Fiscal Intelligence and Investigations Service (FIOD)

Research question

What is the complex adaptive reality behind organised crime networks and how can we anticipate to detect and disrupt them effectively?

I worked on obtaining a grant of EUR 1.2 million from the RIEC Amsterdam for setting up a research project HYPERION LAB on the adaptation of criminal networks to interventions. The aim is to hire two Phd's and a scientific programmer to work on two topics: 1.) adaptation processes of criminal networks (dynamics of networks) and 2.) the complexity of flows of information and money through criminal networks (dynamics on networks). So far we managed to hire one Phd and we reopen the second vacancy soon. The goal of the project HYPERION LAB is publication of several papers in high impact journals and more popular criminological journals and delivering a analysis tool for the RIEC analyst's to simulate the outcome of scenario's for interventions. For this project I organized several meetings with stakeholders at IAS. Besides these organizational efforts I am working on two papers: a) the strength of weak ties in criminal networks and b) the emergence of crime-as-a-service money laundering networks in organized crime.

Iman van Lelyveld

Professor of Banking and Financial Markets at VU Amsterdam and Senior Policy Advisor at De Nederlandsche Bank

Research question

A sabbatical – creating room for new cooperation outside of the well-trodden path

Time was too short, with just a day a week at IAS. It is an inspiring environment that I should have explored much further. I have mainly worked on my new course on Machine Learning in Finance. In addition, I participated in a high level expert meeting on Complexity Economics. I have had very preliminary contact with the Crime Group which will surely lead into further interaction in the future.

Artist in Residence

As part of our ArtScience theme, we host an artist at the institute aiming to integrate thinking and practice at the possible intersections of complexity and arts.

Orion Maxted

Theatre and performance maker. DAS Graduate School of Performance (formally DasArts), Amsterdam; supported maker at Frascati Theater, Amsterdam; and artist-researcher in the ArtScience group of the Center Leo Apostel, VUB, Brussels.

Research question

What systems, made of interacting people (and in some cases objects and machines), can we imagine which collectively show emergence, whereby the whole has properties that the individuals do not?

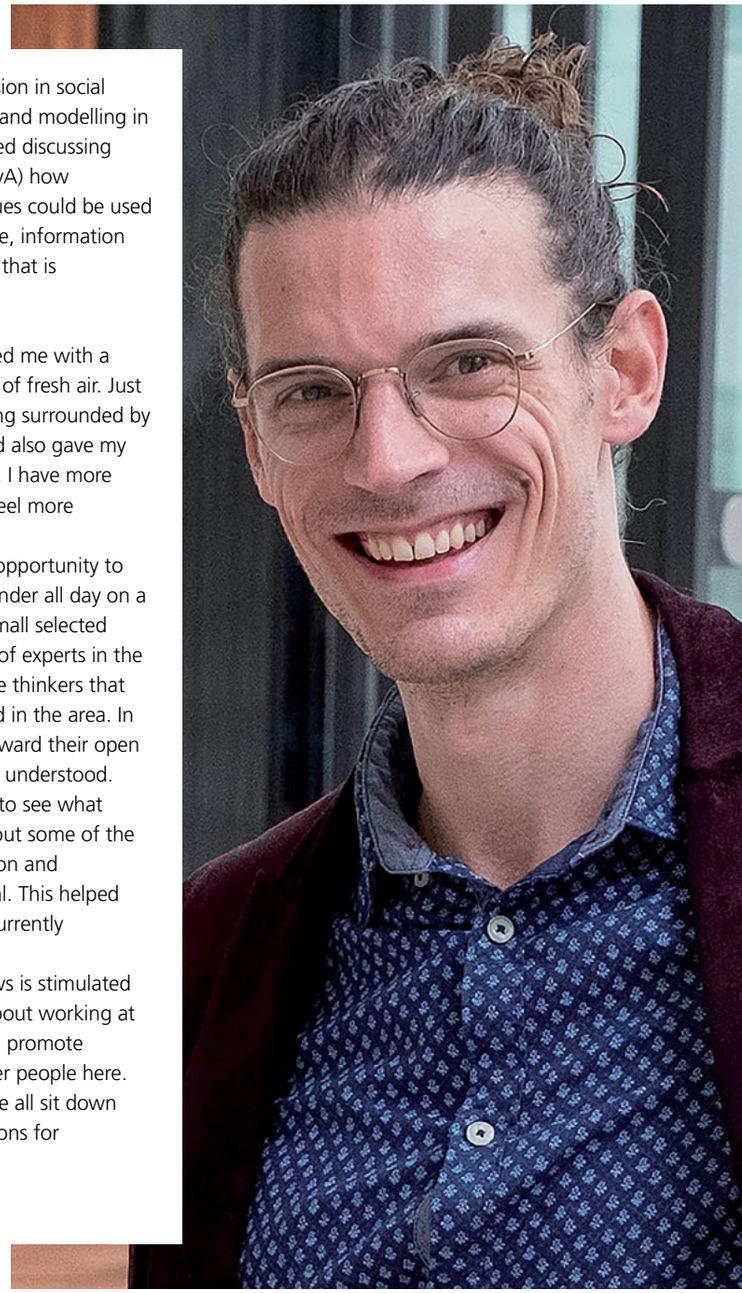
Orion aimed to deepen the ArtScience theme at the IAS inviting artists, scientists and academics from Amsterdam and beyond in order to learn, discuss and experiment together. He initiated an experimental laboratory for thinking together, through which he aimed to build a lexicon of transferable concepts between theatre and complexity, to imagine, and engineer experiments in complexity theatre, that lead participatory and non-participatory performances.

Luc Coffeng about his IAS Fellowship

IAS visiting fellow Luc Coffeng about his experience at the UvA Institute for Advanced Study, and how his fellowship inspired him to start exploring new research fields.

Luc Coffeng has a background in medicine and currently works as epidemiologist and mathematical modeller at the Department of Public Health of the Erasmus MC, where he uses computational models to predict the impact of public policy on infectious disease transmission. Currently, Luc is mainly working on exit-strategies for COVID-19. "My passion for the work I do is largely driven by interest and creativity. I'm eager to find solutions to problems, and then create techniques and methodologies to actually address them".

Luc's fellowship at the IAS started with a proposal on model quantification and calibration, but his questions were answered quicker than expected. "It turned out that within a few months the work had already progressed quite far. In the meantime I had met some very interesting researchers here from other fields. We got along very well and talked about completely different topics. It inspired me to start something new." Luc is now exploring two different



domains: infectious disease transmission in social networks, and quantitative methods and modelling in psychology. About the latter: "I started discussing with co-fellow Maarten Marsman (UvA) how infectious disease modelling techniques could be used to study learning processes. In a sense, information can also be considered as something that is transmitted."

Coffeng: "The fellowship has provided me with a couple of things. First of all, a breath of fresh air. Just being in a new environment and being surrounded by new people was really energizing and also gave my regular work at Erasmus MC a boost. I have more pleasure in my work in general and feel more inspired."
Each fellow at the IAS is offered the opportunity to organize a "Slow Science day" to ponder all day on a topic of the fellow's interest with a small selected group of researchers: a combination of experts in the field and some open-minded, creative thinkers that do not necessarily have a background in the area. In these days, fellows typically bring forward their open questions; the things that are not yet understood.
Coffeng: "For me, it was very useful to see what people from different fields think about some of the concepts around learning, transmission and interactions, and modelling in general. This helped me formulate a new idea that I am currently translating into a research proposal."
At the IAS interaction between fellows is stimulated in various ways. "What I really like about working at the IAS, is the way they organize and promote interaction between fellows and other people here. Lunch is provided and this is when we all sit down together, which creates good conditions for unexpected new ideas to arise."

Events IAS 2019

In 2019 we hosted and organised 45 events, using various formats: think-tanks, lectures, colloquia, network events, and slow science days. Most events at the IAS are typically small-scale and flexible, offering researchers a haven to ponder, debate and reflect in an almost 'homely' ambiance.

Kick off meeting IAS excellence students

21 January | Community Building
Scientific Lead: NA

Nine Master's students are selected to write their final thesis at the IAS. In this kick-off meeting the students presented their topics.

The Road to Reality

22 January | Symposium
Scientific Lead: Peter Sloot

The Dutch translation of Sir Roger Penrose's monumental book "The Road to Reality: A Complete Guide to the Laws of the Universe" had been published. On this occasion, we organized a symposium with the author, followed by the book presentation.

Barlaeus Dinner 'complexity' (together with IXA)

28 January | Network Event
Scientific Lead: Peter Sloot

The Barlaeus dinners, aim to create dialogues and establish new collaborations between academia, business and government. Each dinner is focused on a central theme. The central theme for this discussion was complexity.

Visiting researcher Rudolf Hanel: On Driven Systems, Crystal Balls, and Combinatorial Evolution

5 February | Lecture
Scientific Lead: Rudolf Hanel

Rudolf Hanel is with the Complex Systems Research Group at the Medical University of Vienna since 2007. He is working on a diverse set of topics ranging from Statistical Physics over Robotics to Medical Imaging, Complex Systems and Evolution.

Alternative facts and fighting the merchants of fear: vaccine hesitancy

14 February | Colloquium
Scientific Lead: Roland Pierik

Colloquium organised by the Paul Scholten Center for Jurisprudence and the UVA Institute for Advanced Study (IAS). What exactly is that misinformation about vaccination, how can misconceptions be combated and what is the role of the government here?

Slow Science Day: Contagion and network modelling for humanities

14 March | Slow Science
Scientific Lead: Luc Coffeng

During this day, twelve scientists with various background (infectious disease modelling, computational psychology, social and behavioural sciences, computer science, network sciences, information technology) explored how human learning and behaviour might be considered a contagious process and how that process might be modelled using (combined) methods from different disciplines.

Stakeholder meeting: "Policy to prevent and combat terrorist financing"

4 April | Network Event *(hosted event)*
Scientific Lead: Marieke de Goede

In this stakeholder meeting policy makers, researchers and practitioners were brought together to share and discuss the findings of the WODC report "Policy to prevent and combat terrorist financing".

Academic Discussion on Interdisciplinarity

12 April | Excellence Lounge
Scientific Lead: Michiel Mandjes and Karien Stronks

This year, IAS Associates Michel Mandjes and Karien Stronks led the discussion. The students were challenged to think across disciplinary borders by

reflecting on the relevance of the scientific questions presented to their own academic discipline, and vice versa.

Demonology - The Curious Role of Intelligence in Physics & Biology

15 April | Lecture

Scientific Lead: James Crutchfield

Lecture on the new physics of information that will transform bad "demonology" to a constructive, perhaps even an engineering, paradigm that explains information processing embedded in the natural world.

Lecture by James P. Crutchfield: Demonology - The Curious Role of Intelligence in Physics & Biology

15 April | Lecture and Think Tank

Scientific Lead: James Crutchfield, Peter Sloot and Rick Quax

In this 3-day expert workshop we aimed to go beyond Shannon communication theory, reaching out to experts from a range of disciplines to come together to take stock of the challenges and to innovate new approaches.

Interdisciplinary Think Tank 'How Nature Learns'

3 May | Think Tank

Scientific Lead: Esther Quaedackers

In this think thank we brought together researchers from various academic disciplines to generate novel ideas for research and the further development of the Big History courses that the UvA has been pioneering since 1994.

Beyond Shannon: the structure and meaning of information

6-8 May | Think Tank

Scientific Lead: James Crutchfield, Peter Sloot and Rick Quax

We aimed to go beyond Shannon communication theory, reaching out to experts from different disciplines to take stock of the challenges and innovate new approaches.

Case studies of the ODYCCEUS project (H2020)

16-17 May | Workshop *(hosted event)*

Scientific Lead: Justus Uitermark

We hosted the case studies sessions of a 3-day workshop of the ODYCCEUS project; an international research collaboration funded by Horizon 2020. ODYCCEUS stands for Opinion Dynamics and Cultural Conflict in European Spaces.

Complexity and Public Policy

22 May | Think Tank

Scientific Lead: Roland Kupers

In the context of various research themes that are being studied at the IAS (e.g. public health, crime, segregation, the energy transition), policy and governance are an inescapable and vital component. Therefore, we are currently exploring how we may contribute to furthering our understanding of the connection between Complexity and Public Policy/ Governance.

Crime in the City

4 June | Lecture

Scientific Lead: Paul Duijn

The meeting was organized for professionals from local governments and regional expert working groups on fighting organized crime. I taught them about the complexity of criminal networks and we discussed its implications. The meeting contributed to convincing the RIEC Amsterdam to provide us with a 1 million grant for research on the adaptability of criminal networks.

Slow science with Andrea Ravignani

18 June | Slow Science

Scientific Lead: Andrea Ravignani

Why are we musical animals? In particular, why do humans have rhythm, and which similar traits can be found in other species? Across disciplines, research on musical rhythm has historically been split into two macro-fields. A brief presentation of some of Andrea's ongoing experiments provided further ground for discussion and input.

Biomineralisation

3 July | Think Tank

Scientific Lead: Jaap Kaandorp

In this expert meeting the growth of biominerals in both abiotic and living systems were explored. We brought together researchers from different disciplines using a variety of methods to study biomineralisation. The focus will be on biomineralisation in marine organisms ranging from foraminifers, scleractinian corals to shelled pteropods.

Computational Social Science

12 July | Meeting

Scientific Lead: Mike Lees and Eelke Heemskerk

This was the first meeting of the computational social science group at IAS. The meeting brought together people from informatics, political science, social science to explore possibilities of collaboration in the area of social complexity. These ideas are currently being developed further into the themes of IAS.

Lecture by Karoline Wiesner: Complexity and climate: from foundations to interventions

15 July | Lecture

Scientific Lead: Karoline Wiesner

In recent work for the Green Climate Fund, Karoline had taken her work on the conceptual foundations of complexity science to address the dynamics of climate change mitigation and adaptation interventions. She presented aspects of this ongoing project and the group discussed some of the open questions.

IC2S2 Datathon

17 July | Datathon *(hosted event)*

Scientific Lead: Javier Garcia

IC2S2 and CSS Amsterdam organized a Datathon on Wednesday July 17th at the Institute for Advanced Study in the city center of Amsterdam. The objective of the Datathon was to meet like-minded people and foster future collaborations, learn new methods and algorithms, and have fun answering some of the research questions below, using the data provided by the datathon.

Visit of the Mayor of Amsterdam

30 August | High Level Visit

Scientific Lead: Peter Sloot

On 30 August 2019 we were honoured by a visit from Femke Halsema, Mayor of Amsterdam and member of our Board of Trustees. After an introductory presentation about the IAS and its mission by Scientific Director professor Peter Sloot, four examples were presented of research that is conducted in close collaboration with the city of Amsterdam.

Comenius: Leadership and Complexity

18-20 September | Network Event

Scientific Lead: Sander Bais

We co-organised the 3-day predeparture meeting of the Complexity and Leadership Course of Comenius. After the introduction, the participants traveled to the Centre for Complex Systems in Transitions at the Stellenbosch University, South Africa.

Lecture by Sharon Wohl: Thinking the City as Information Processor

19 September | Lecture

Scientific Lead: Sharon Wohl

In this lecture Dr. Sharon Wohl, positioned urban elements as physically situated computational devices capable of processing information regarding their own fitness. Here, components of the urban fabric

are treated as entities that receive inputs regarding their behavior and are designed so as to be able to adjust their outputs. These output regimes generate novel and emergent urban configurations. Dr. Wohl discussed a number of thought experiments that exemplify how such urban strategies could be implemented, and also discussed her research work at the IAS – developing a website that introduces core principles of Complex Adaptive Systems and relates these to various streams of urban research.

Lecture by Renske Vroomans: Evolving multicellularity: from single cells to colonies and beyond

27 September | Lecture
Scientific Lead: Renske Vroomans

It's the first lecture organised by the Simulation-based Science Club in the new academic year. Future research directions on the early evolution of animal development with the current model and others were discussed.

Lecture by Keywan Riahi (IIASA): Advancements in Energy and Climate Scenario Research

18 October | Lecture
Scientific Lead: Bob van der Zwaan

In order to reach the 2˚C target of the Paris Agreement unprecedented levels of sustainable energy technology deployment are required. In this lecture an overview was given of some of the latest insights in energy and climate scenario science, with a special focus on feasibility, lifestyle changes, energy demand reduction, and investment needs.

The future of energy

18 October | Expert Meeting
Scientific Lead: Bob van der Zwaan

Academic discussion with IAS External Faculty Member professor Keywan Riahi, Director of the Energy programme at IIASA.

Complexity, Power and Change

21 October | Course
Scientific Lead: Peter Sloot

Short intensive course for PhD students of the Amsterdam Institute for Social Science Research (AISSR). Opening session by Peter Sloot, Professor of Complex Adaptive Systems and IAS Scientific Director.

IDA Introduction meeting

21 October | Network Event
Scientific Lead: NA

Eleven PhD students have been selected to work on an interdisciplinary research topic as a result of the Interdisciplinary Doctorate Agreement (IDA) that was launched by the UvA in 2017. In this meeting the PhD students presented their topics and discussed ideas for further exchange and networking.

The university of the future

23 October | Discussion
Scientific Lead: Frank Zuijdam and Niek Brunsveld

Kick off session of a series of discussions around the main question: given the fundamental changes – technological, political, economic, and cultural – what will the university of the future be for?"

Innovative Health Research : in silico modelling

29 October | Network event
Scientific Lead: Anje te Velde

After that two speakers, Alfons Hoekstra and Anje te Velde, inspired us to think about the state of affairs of computational science applied to in silico models and how to tackle this complexity by looking again from a complex system perspective "It became more clear that the interdisciplinary approach and the system biological perspective: as holistic perspective is actually a perfect setting for TPI."

Complexity economics

5 November | Brainstorm + BoT
Scientific Lead: Cars Hommes

An expert meeting on Complexity Economics with leading international experts took place at IAS. Doyne Farmer (University of Oxford) presented recent work on the Economics of Climate Change. Stefan Thurner and Drona Kandhai presented recent work on financial stability and the key role of financial networks. These themes were further discussed among a small group of experts including Tjark Tjin-a-Tsoi (CBS), Frank Pijpers (CBS), Iman van Lelyveld (DNB, VU), Cees Diks (UvA) and Cars Hommes (UvA). The role of big data in both climate change and financial stability research and the need for concrete case-studies was stressed.

Evolution of viruses

7 November | Think Tank *(hosted event)*
Scientific Lead: Colin Russel

I organized a one day meeting of my research group and the group of Menno de Jong, along with various other faculty members from across the University of Amsterdam to discuss the intersection of our computational and clinical research interests in influenza viruses. The meeting featured 12 short talks with discussions with topics including mathematical modelling of immune responses, analyses of transcriptomic data, and wet lab virology experiments. The IAS offered us an ideal setting to come together and share ideas and several new research ideas and collaborations emerged from the meeting.

Thesis Fair MSc Computational Science

7 November | Thesis Fair *(hosted event)*
Scientific Lead: Mike Lees

Network event aimed at matching students Computational Science with potential thesis supervisors. The fair included amongst other things poster presentations of master students who are currently working on their thesis projects, representatives of research groups and potential supervisors.

Origins of Musicality

11 November | Slow Science
Scientific Lead: Henkjan Honing

While musicality is seen by some as being an epiphenomenon of language, the current research program aims to provide further support for an alternative hypothesis that suggests musicality to be a preverbal and prelinguistic phenomenon from which both language and music evolved.
In a slow science meeting two leading neuroscientists (prof. dr Robert Zatorre and prof. dr Virginia Penhune) presented their newest work in a setting moderated by members of the Music Cognition Group of the UvA (www.mcg.uva.nl).

Computational Phenotypes of Socio-emotional Function and Dysfunction

15 November | Academic Discussion
Scientific Lead: Casper Hesp

Towards realistic computational models of polarisation and social influence dynamics

14 November | Lecture
Scientific Lead: Andreas Flache

This talk presented the recently started ORA project ToRealSim that aims to tackle obstacles much of the current research faces. ToRealSim aims to 1) improve theoretical integration of the large variety of models that can be found in the literature and 2) to connect these models with empirical tests of model assumptions as well as model predictions.

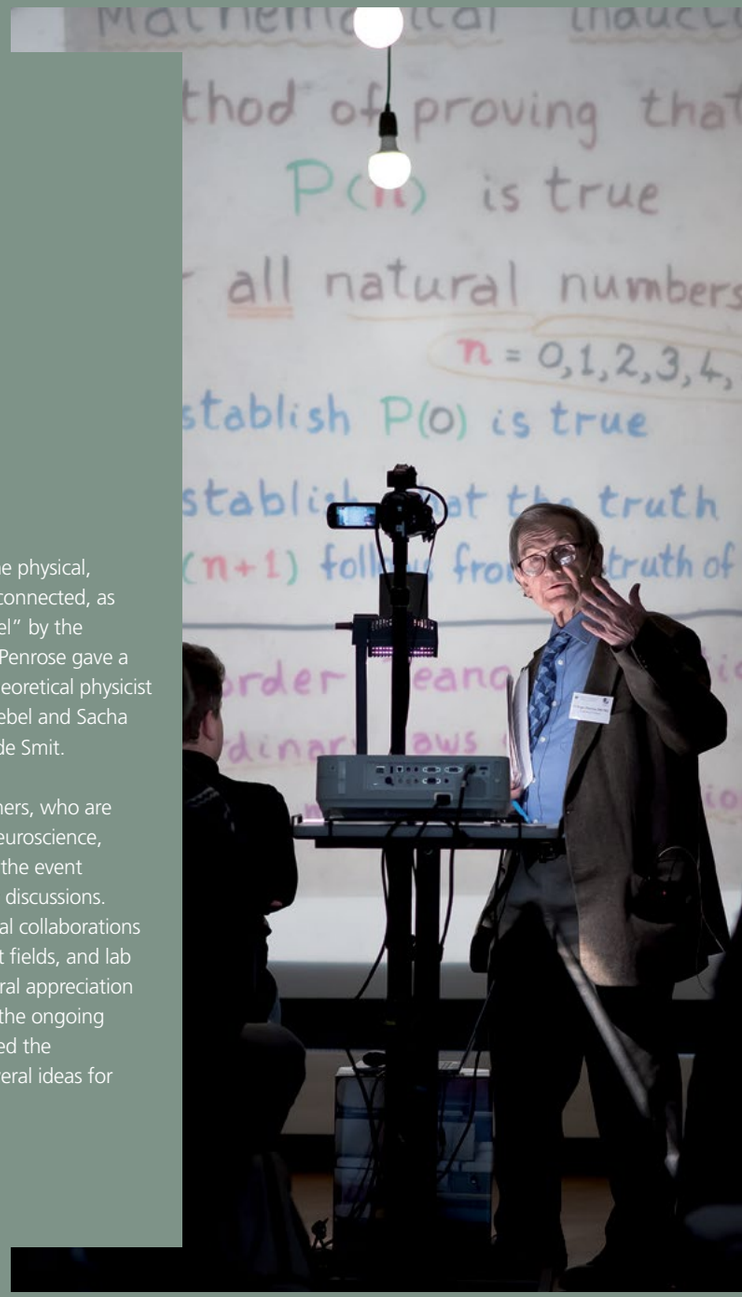
Laboratory for Theatre and Complexity

29 November
Scientific Lead: Orion Maxted

Orion Maxted, artist in residence at the IAS, organises regular sessions to experiment on new forms of synthetic thinking, i.e. new forms of collective thinking - by marrying together approaches from theatre and complexity.

The Dutch Road to Reality starts at the IAS

22 January 2019. On the occasion of the Dutch translation of Sir Roger Penrose's monumental book "The Road to Reality: A Complete Guide to the Laws of the Universe", the UvA Institute for Advanced Study (IAS) and Meromorf Press organised a symposium with the author, followed by the book presentation.



The main topic of the day was how the physical, mental and mathematical worlds are connected, as postulated in the "Three Worlds Model" by the renowned guest of honour. Sir Roger Penrose gave a memorable presentation, as well as theoretical physicist Renate Loll, neuroscientists Rainer Goebel and Sacha van Albada, and mathematician Bart de Smit.

By bringing together eminent researchers, who are key figures in the fields of cognitive neuroscience, mathematics, physics and complexity, the event resulted in high-level, multidisciplinary discussions. Initiatives were established for potential collaborations between researchers of these different fields, and lab invitations were exchanged. The general appreciation for the workshop was well shown by the ongoing enthusiastic discussions which extended the workshop duration and motivated several ideas for a follow-up event.

Talent development

We are committed to investing in the training and development of the next generation of interdisciplinary researchers. Talented Master's students who are interested in interdisciplinary research can join the IAS community as student assistant or to work on a thesis project.

IAS Excellence call

In 2019 we ran the first edition of the IAS excellence call for outstanding Master's students. Following a call for proposals nine students were selected to work at the institute on their final thesis, offering them a stimulating work environment alongside outstanding researchers. The students came from various programmes, ranging from Brain & Cognitive Sciences, Artificial Intelligence, Computational Science, to Cultural Sociology.

The selection committee awarded three students with a prize for the best and most original theses:

- Eva Abels received a 500 euro cash prize for her thesis "Effects of a 12-week aerobic exercise intervention on hippocampal neurometabolism in young healthy adults – A 7T MRS study." The selection committee praised Eva for the massive amount of work she had done and her excellent reporting
- Sofia Orellana was awarded the opportunity to present her work at the International Conference on Computational Science next year (ICCS 2020). The selection committee specifically praised the novelty of her thesis: "Detecting Cascading Network Failure in Glioma: Developing a novel metric for failure assessment".
- Fiona Lippert received a book for her rigorous work on "Information Dissipation in Criminal Networks".

Contribution to education programmes

Although the IAS is primarily focused on novel interdisciplinary research, we also contribute to several education programmes. In 2019 we were involved in the following:

- We organised an academic discussion on interdisciplinarity with the Amsterdam Excellence Students and the Amsterdam Science Talent Students as part of their extracurricular programme;
- Various IAS-affiliated researchers gave lectures in the interdisciplinary bachelor course 'Complexity can it be simplified?'. The course is developed by IAS Scientific Director;
- We contributed to the development of a new honours module: Information revolutions at the dawn of life, humanity & AI by organising a think tank to brainstorm on the content of the new programme.
- We hosted and gave several lectures in the Complexity and Leadership Course, an executive training course organised by Comenius.

Sofia Orellana about her time at IAS as Excellence student

Sofia Orellana, Master's student Brain and Cognitive Sciences at the UvA, participated in the 2018/2019 call for excellent students and won the prize for her thesis.

"Writing my thesis at the IAS was a wonderful experience! Perhaps my favourite aspect of it all was the continuous exposure to researchers in fields vastly different from mine (neuroscience), either through lectures, discussions, casual conversations over lunch or during a walk through the canals. Since we all "spoke" the common language of complexity, the general –and sometimes specific- intricacies of other's work remained accessible and understandable. The constant access to different intellectual perspectives turned out to be rather exciting. It helped me think of new approaches towards my own research questions, and more ideas than I can ever hope to execute!

My time at the institute was not exclusively about research. I found some wonderful friends in my fellow students – we enjoyed many dinners, coffees and procrastination sessions looking at obscure locations in google maps together (or the occasional drink) – as well as in the staff and fellows of the institute. Everyone was incredibly approachable and always open for a chat. The hallmark of a great scientific community. I believe my work greatly benefited from both the fun I experienced and knowledge I gained at the IAS.

I am very happy that, as a result of the thesis prize, I will have the opportunity to present at the International Conference on Computational Science the coming year. As I am just getting started with a scientific career, having the possibility of exposing my research through a conference presentation, so early on, is an exciting and rare opportunity."

Collaborations for societal impact

Femke Halsema, the Mayor of Amsterdam, visiting the IAS

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At the IAS, researchers from a wide range of disciplines work together on various complex societal challenges. To take our knowledge development one step further towards creating insights that are actionable for the world beyond academia, we closely involve stakeholders from the public and private sector.

A growing part of our research activities is policy-oriented; trying to understand what kind of interventions will produce what type of outcomes in complex systems. In co-creation with policy makers and other experts, we develop integrative methods and tools that help to explore new avenues of intervention.

The city of Amsterdam is an important collaboration partner, and we are proud to have the Mayor of Amsterdam, Femke Halsema on our Board of Trustees. In 2019, we had three research projects running with direct involvement of the city:

- Socio-economic inequalities in health
- School choice dynamics and segregation
- Computational modelling of criminal networks and value chains

On the national level we started a new research collaboration with the Ministry of Economic Affairs and Climate Policy of the Netherlands:

- Complexity research on the resilience of industry clusters

We expect that our research activities in the field of Complexity and Public Policy will further increase in the coming years. Our explorative collaboration with the Netherlands Organisation for applied scientific research (TNO) under the working title ‘Policy by Simulation’, that marked its one year celebration with a joint workshop in November 2019, also found a growing need for this type of research.

Barlaeus dinner on Complexity & Public Policy

On Monday January 28th 2019, Innovation Exchange Amsterdam (IXA office UvA-HvA) and the UvA Institute for Advanced Study (IAS) jointly organised the 6th Barlaeus dinner at the Allard Pierson museum. The central question of the evening was: how to navigate effectively and responsibly in an increasingly complex and rapidly changing world? Each table had a specific domain to focus on: the energy transition, public health, crime, financial market stability, and public sector governance in general.

Many of today's societal challenges are interconnected and interrelated in complex ways. The fact that systems are coupled together in poorly understood ways can make policy making overwhelmingly complicated. Complexity permeates all aspects of the modern world, where seemingly small innocuous changes can have global effects. The system-level response of human behaviour, for example, is particularly hard to predict, but extremely relevant for policy making. It was agreed that novel decision-support methods are needed to predict the outcome of possible strategic interventions (e.g. simulation of 'what-if' scenarios). Another conclusion of the evening was that many potential threats are and will remain beyond our direct influence, which calls for better detection of early warning signals and improving the resilience of systems in general.

By organising the Barlaeus dinner, we have broadened and strengthened our network in a highly relevant and promising field of study. It has sparked several new activities:

- The collaboration with Statistics Netherlands is being intensified, aimed at applying complexity theory in official statistics to provide policymakers more insight into the causal relations between different indicators in the socio-economic domain;
- Intensified dialogue with various partners on Complexity and Public Policy, which has led to a network of involved researchers at the University of Amsterdam and beyond, and new research projects in collaboration with and funded by stakeholders from the public sector.

With its Barlaeus dinners the UvA brings together researchers with representatives of government and industry to discuss topics of mutual interest, strengthen network relations and establish new collaborations. The Barlaeus dinner is named after Caspar Barlaeus, one of the founders of the Athenaeum Illustre, which is commonly regarded as the predecessor of the University of Amsterdam.

IAS Boards 2019

Associates are researchers at the University of Amsterdam (UvA) who have expertise in various academic disciplines and believe in interdisciplinary, collaborative research. They are involved in developing our research portfolio, increasing our visibility and liaising between the IAS and the UvA's faculties.

Board Of Associates

University of Amsterdam	Dymph van den Boom	Educational Theory	
Faculty of Social and Behavioural Sciences	Han van der Maas	Psychological Methods	
Faculty of Social and Behavioural Sciences	Eelke Heemskerk	Political science	Started 1 March
Faculty of Social and Behavioural Sciences	Anna Keuchenius	Social science / PhD ambassador	Started 1 June
Faculty of Science	Michel Mandjes	Mathematics	
Faculty of Science	Peter Bolhuis	Computational Chemistry	
Faculty of Science	Willem Bouten	Computational Geo-Ecology	
Faculty of Humanities/Faculty of Science	Henkjan Honing	Music Cognition	
Faculty of Humanities	Esther Peeren	Media & Film Studies	Started 1 December
Faculty of Humanities	Jelle Bruineberg	Philosphy	Until September
Faculty of Law	Miranda de Meijer	Public Prosecution	
Faculty of Law	Natali Helberger	Law and Digital Technology	
Faculty of Economics and Business	Cees Diks	Data Analysis and Economic Statistics	
Amsterdam Academic Medical Centre	Menno de Jong	Clinical Virology	
Amsterdam Academic Medical Cenre	Karien Stronks	Public Health	
Academic Centre for Dentistry Amsterdam	vacant		

We are supported by two external boards: the Scientific Advisory Board and the Board of Trustees. They serve as sounding boards for the IAS management.

Scientific Advisory Board

Bertil Andersson	Former President at the Nanyang Technological University in Singapore / Former Chief Executive of the European Science Foundation in Strasbourg
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Ben Feringa	Full Professor and Jacobus van't Hoff Distinguished Professor of Molecular Science at the University of Groningen / Winner of Nobel Prize in Chemistry (2016)
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Helga Nowotny	Professor Emerita Social Studies of Science at ETH Zurich / Former President of the European Research Council / Chair of the ERA Council Forum Austria

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Tjark Tjin-A-Tsoi	Director-General of Statistics Netherlands (CBS)

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