Let's celebrate
10 years since the inauguration of the C3
Centro de Ciencias de la Complejidad at the
4th *Semana de la Complejidad*
October 27-31, 2025

SYMPOSIUM
OCTOBER 27–29

UNAM

Coordinación de la Investigación Científica UNAM

10 AÑOS C3 Centro de Ciencias de la Complejidad

UNAM Nuestra gran Universidad

More information:
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https://www.c3.unam.mx/semanadelacomplejidad.html

Monday 27
UNIVERSUM Theater

8:00-9:00
Registration

9:00-10:00
Inauguration

10:00-11:00
Plenary talk
"Towards a Science of Cities: A Complex Systems Approach"
Marta Gonzalez, UC Berkeley, USA

Marta Gonzalez is an Associate Professor of Civil and Environmental Engineering and City and Regional Planning at UC Berkeley, and also a Physics Research faculty in the Energy Technology Area (ETA) at the Lawrence Berkeley National Laboratory (Berkeley Lab). Gonzalez's research focuses on urban sciences, with a focus on the intersections of people with the built and the natural environment and their social networks. Her ultimate goal is to design urban solutions and enable caring development in the use of new technologies. Gonzalez has developed new tools that impact transportation research and discovered novel approaches to model human mobility and the adoption of energy technologies. She is a recipient of the prestigious Joseph M Sussman Prize for Frontiers in Built Environment best article award in 2021, the UN Foundation award in support of her research studying the consumption patterns of women in the developing world in 2016, and the Bill and Melinda Gates Foundation award to study access to financial services in the developing world in 2016. In 2023, she was named fellow of the Network Science Society for her seminal contributions to our understanding of human mobility and transportation networks, and for applying network modeling to solve societal problems in urban systems, and in 2024 she received the Lagrange-CRT Foundation Prize for her scientific research in the field of complexity sciences, its applications and dissemination.

11:00-11:30

Coffee

11:30-12:00
Invited talk
"Los cuidados para la vida digna y el bien común: pilar de la complejidad social"
Estela Roselló, Instituto de Investigaciones Históricas and C3, UNAM

Estela Roselló is a historian and professor at UNAM's Faculty of Philosophy and Letters. She holds a Ph.D. in History from El Colegio de México and is a full-time researcher at UNAM's Institute of Historical Research and an associate researcher at the Center for Complexity Sciences (C3). Her research focuses on cultural history, including women's history, the body, emotions, and alterity. She is the coordinator of the "Care for Life and the Common Good" project at C3. Committed to historical dissemination, she has authored several secondary level history textbooks, a collection of everyday life history for children, and historical novels for children. She received the "Sor Juana Inés de la Cruz" distinction in 2021 and has been President of the Ibero-American Society for the History of Emotions and Experience since 2022.

12:00-13:00
Roundtable 1: **Urban planning, poverty, inequality**
Panelists:
Ali Ruíz Coronel, Instituto de Investigaciones Sociales and C3, UNAM
Marta Gonzalez, UC Berkeley
Aracelí Damián González, Secretaría de Bienestar e Igualdad Social de la Ciudad de México and El Colegio de México
Gonzalo Castañeda Ramos, CIDE
Moderator: **José Luis Mateos**, Instituto de Física and C3, UNAM

• Alí Ruiz Coronel holds a Ph.D. in Anthropology from UNAM, with a specialization in Latin American Studies from UCLA. She is also a certified

expert in anthropology by the National Institute of Anthropology and History (INAH). Her extensive research and teaching experience centers on applied anthropology for public policy design and civil society interventions targeting vulnerable populations from a complexity perspective. She served as a researcher at UNAM's Center for Complexity Sciences (C3) and held a CONACYT chair at the National Cancer Institute (INCan). She has taught at various institutions, including the National School of Anthropology and History and UNAM. Her interests include complex systems, medical anthropology, public policies, and vulnerable populations, and she is part of an interdisciplinary research group on Social Complexity at UNAM.

• Araceli Damián González is a research professor at El Colegio de México and the current head of the Secretariat of Social Welfare and Equality (SEBIEN). She holds a B.A. in urban settlement design from UAM, an M.A. in urban development from El Colegio de México, and a Ph.D. in planning with a specialization in urban economics from the University of London. She is a level III member of the National System of Researchers. Dr. Damián served as a federal deputy from 2015 to 2018 and as General Director of the Evaluation Council for Social Development (Evalúa) of Mexico City from 2018 to 2021. Since 1997, she has been a professor-researcher focusing on poverty and social policy at El Colegio de México. She has also taught at institutions such as the Dr. José María Luis Mora Research Institute and the University of Bristol.

• Gonzalo Castañeda Ramos holds a B.A. in Applied Mathematics from ITAM, and an M.A. and Ph.D. in Economics from Cornell University. He has a distinguished career as a professor and researcher at numerous universities, including El Colegio de México (COLMEX), Universidad de las Américas-Puebla, ITAM, Texas Christian University, and Cornell University. He also contributed to the Graduate Studies Program at the Bank of Guatemala. Dr. Castañeda served on various consultative and editorial boards, including CIDE and El Trimestre Económico. He acted as a consultant for Bancomer on banking system perspectives and interest rate policies, and was involved in designing the Development Plan for the Sierra Norte region of Puebla. He is an author of several articles and books, and was a columnist for the newspaper El Financiero (1989-1993).

• José Luis Mateos, Ph.D. in Physics, is a professor and researcher at UNAM's Institute of Physics and Center for Complexity Sciences (C3). A member of the Mexican Academy of Sciences since 1998, he is the sole Latin American member of the C3 Statistical Physics commission of the International Union of Pure and Applied Physics (IUPAP). His research encompasses seismology, quantum physics, statistical physics, stochastic dynamics, nonlinear dynamics, chaos theory, complex systems, mathematical ecology, and network theory. He focuses on transport in nonlinear chaotic systems (ratchets) and Brownian motors, as well as anomalous diffusion and Lévy flights in physics and biology. More recently, he has researched Lévy random walks in networks. He received the Jorge Lomnitz Award in 2002 and the Alexander von Humboldt Fellowship in 2003.

13:00-14:00

Plenary talk (on-line)

" The Anthropocene: A history of the simple and the complex"

Pablo Marquet, Universidad Católica, Chile and SFI, USA

Professor of Ecology, Pontificia Universidad Católica de Chile, External Professor, Science Steering Committee, Santa Fe Institute

Pablo Marquet is a Chilean Ecologist, recognized for his contributions in the fields of macroecology, theoretical ecology, conservation, and global change. He is known for his work on the scaling of abundance in communities, the evolution of body size on landmasses; connecting body size to area, evolution, and fitness, the development of metapopulation models in dynamic landscapes, the emergence of power laws in ecology and, the emergence of social complexity, and the impact of climate change upon biodiversity. Marquet was born in Santiago (Chile), received a Bachelor in Biology from the Universidad de Concepción in 1987 and a Ph.D. from the University of New Mexico, in 1993. He was a postdoctoral fellow at the Pontificia Universidad Católica de Chile and joined the faculty in 1994. He is Fellow of the Ecological Society of America (ESA), a member of the Chilean

Academy of Science, The National Academy of Sciences (NAS), The American Academy of Arts and Sciences (AmAcad), and The World Academy of Sciences (TWAS).

14:00-15:00

Invited talks

"Complexity and Multi-scale phenomena in Systems Biology"
Enrique Hernández-Lemus, Instituto Nacional de Medicina Genómica and C3, UNAM

"Integrating multiomic single cell data from leukemia samples"
Adam Olshen, UC San Francisco

• Enrique Hernández Lemus holds a B.S. in Chemical Engineering and a Ph.D. in Physical Chemistry from UNAM. He is currently a Medical Sciences Researcher F in Computational Genomics at INMEGEN and a Level III member of the National System of Researchers (SNI). He served as Deputy Director of Population Genomics at INMEGEN from 2015 to 2019. Since 2006, his research in Systems Biology and Computational Genomics focuses on understanding systemic regulation of transcription and signaling in cancer. His contributions include predicting drug resistance mechanisms for breast cancer and revealing global mechanisms of microRNAs in cancer. He has published over 170 research articles and authored four books. He is also an associate researcher at UNAM's Center for Complexity Sciences (C3), where he coordinated the Computational Intelligence area (2012-2022).

• Adam Olshen is a Professor in the Department of Epidemiology and Biostatistics at the University of California, San Francisco (UCSF). He also serves as the Director of the Computational Biology and Informatics Core at the UCSF Helen Diller Family Comprehensive Cancer Center. His research has significantly contributed to the fields of Medicine and Biology. Dr. Olshen has co-authored 154 publications and has an h-index of 58. Prior to his current role, his affiliations included the Memorial Sloan Kettering Cancer Center and Kettering University.

15:00-16:15

Lunch -C3

16:15-17:15

Plenary talk

"The complexity of biological regulation"
Peter Stadler, University Leipzig, Germany and SFI, USA

Director of the Interdisciplinary Centre for Bioinformatics, University of Leipzig, Germany and External Professor, Santa Fe Institute

Peter F Stadler, born in 1965, is full professor for bioinformatics at the University Leipzig since 2002. He did a doctorate in 1990 in Chemistry at the University of Vienna. After a postdoctorate with Prof. Manfred Eigen at the department for biochemical kinetics in the Max-Planck's institute of biophysical chemistry in Göttingen he went back to Vienna in 1991 and qualified as a professor in 1994 in Theoretical Chemistry. Since 1994 he is also member of the external faculty of the Santa Fe institute in New Mexico. Since 2009 he works as a foreign scientific member at the Max-Planck's Institute of Mathematics in the Sciences. Peter F Stadler is corresponding member of the Austrian Academy of Sciences since 2010 and Profesor Honoria at the Facultad de Ciencias in Bogota since 2018. Since 2023 he is the director of the Interdisciplinary Center for Bioinformatics (IZBI) at Leipzig University.

17:15-18:15

Roundtable 2: **Bioinformatics and Systems Biology**
Panelists:
Adam Olshen, UC San Francisco
Peter Stadler, University of Leipzig
Maribel Hernández Rosales, Laboratorio de Bioinformática y Redes Complejas, CINVESTAV
Javier Torres López, Unidad de Investigación Médica en Enfermedades Infecciosas y Parasitarias, IMSS Moderator: **Enrique Hernández-Lemus**, INMEGEN and C3,UNAM

• Maribel Hernández Rosales holds a B.S. in Computer Science from UNAM and a Ph.D. in Sciences from Leipzig University, Germany. She held a CONACYT Chair position at UNAM's Institute of Mathematics, Juriquilla, from 2014 to 2020 and was Secretary of the Mexican Bioinformatics Network from 2018 to 2022. Dr. Hernández has served as a mentor for the Global STEM Alliance's 1000 girls – 1000 futures program and has been a member of the Board of Editors for the Journal of the Royal Society Interface since 2018. She is currently a Cinvestav Researcher 3B in the Bioinformatics and Complex Networks Laboratory at Cinvestav Irapuato.

• Javier Torres López completed his B.S. in Bacteriological Parasitological Chemistry, an M.S. at the National School of Biological Sciences of the National Polytechnic Institute, and a Ph.D. at the University of Gothenburg, Sweden. His postdoctoral work (1993-1994) at OraVax, Inc. and Harvard Medical School resulted in a patented vaccine candidate in the U.S. He has directed the IMSS Infectious Diseases Research Unit for over 20 years. Dr. Torres has supervised 20 theses and published 112 high-impact, indexed articles, accumulating approximately 800 citations. He has received 24 national and international awards and holds two patents: one for a vaccine against C. difficile colitis and another for a drug to treat multi-drug resistant M. Tuberculosis.

18.15-20.00pm

Social event - C3

Tuesday 28
C3 Auditorium

8:00-9:00
Registration

9:00-10:00
Plenary talk (on-line)
"Positive tipping points to avoid climate tipping points"
Tim Lenton, University of Exeter, UK

Director of the Global Systems Institute and the Chair in climate change and Earth system science at the University of Exeter.

Tim Lenton has more than 20 years of research experience in studying the Earth as a system, and developing and using models to understand its behavior. He is particularly interested in how life has reshaped the planet in the past, and what lessons we can draw from this as we proceed to reshape the planet now. His accolades include being recognised on the Clarivate Web of Science 2020 list of Highly Cited Researchers, the Royal Society Wolfson Research Merit Award in 2013, the Times Higher Education Award for Research Project of the Year 2008, and the Royal Society of London William Smith Fund in 2008. He is a Turing Fellow; a Fellow of the Linnean Society, the Geological Society, and the Society of Biology; and Earth Commissioner for the Earth Commission: Global Commons Alliance.

10:00-11:00
Roundtable 3: **Climate change and sustainability** Panelists:
Tim Lenton, University of Exeter, UK
Antonio del Río(on-line), Instituto de Energías Renovables and C3,UNAM
Patricia Balnavera, Instituto de Investigaciones en Ecosistemas y Sustentabilidad, UNAM
Francisco Estrada Porrúa, Programa de Investigación en Cambio Climático, UNAM
Moderadora: **Julia Tagüeña**, Instituto de Energías Renovables and C3,UNAM

• Antonio del Río is a tenured researcher at UNAM's Institute of Renewable Energies. He is a member of the Mexican Academies of Sciences and Engineering, among others, and a distinguished Level III member of the National System of Researchers. He has received numerous awards, including the Gabino Barreda Medal, the Weizmann Award (1991), and the National University Award (2023). His main research areas are renewable energies, thermodynamics of irreversible processes, complex systems, and photonics.

• Patricia Balvanera, trained in biology, ethnobotany, and ecology, is a researcher at UNAM's Institute of Ecosystem Research. Her work analyzes the links between nature and human well-being at global and local scales. She has co-coordinated the Socio-ecosystems and Sustainability Thematic Network and the scientific committee for the Programme on Ecosystem Change and Society (PECS). She co-chaired the assessment on nature's values for the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). She is the Editor-in-Chief of the journal Ecology and Society. Her primary research interests include the dynamics of socio-ecological systems, the values of nature and sustainability, and the co-construction of fairer and more sustainable food systems.

• Francisco Estrada Porrúa holds a B.A. in Economics from Universidad Iberoamericana, an M.A. in Risk Management from ITAM, and a Ph.D. in Environmental Economics from Vrije Universiteit Amsterdam. He is a tenured researcher at UNAM's Institute of Atmospheric Sciences and Climate Change (ICAyCC) and a visiting researcher at Vrije Universiteit Amsterdam. He is a National Researcher Level II. He previously headed the Department of Atmospheric Sciences and promoted the formation of the Climate and Society group, which he led. He is currently the Coordinator of UNAM's Climate Change Research Program (PINCC). His research focuses on the economic causes and consequences of climate change, combining aspects of atmospheric sciences, economics, and statistical modeling.

• Julia Tagüeña is a Mexican physicist, researcher, and professor at UNAM's Institute of Renewable Energies. She holds a B.S. in Physics from UNAM and a Ph.D. in Sciences from the University of Oxford. Her research primarily focuses on solid-state physics, particularly disordered systems, amorphous solids, and nanostructured porous materials, and its intersection with renewable energies. She is a distinguished science communicator and has held key administrative roles, including Director General of Science Outreach for UNAM and Deputy Director of Scientific Development at CONACYT. Dr. Tagüeña has been recognized for her extensive academic and outreach work, including the National Prize for Science Dissemination Alejandra Jaidar (2020) and the Public Understanding and Popularization of Science Award (2021) from The World Academy of Sciences (TWAS). She is a Level III National Researcher and was named UNAM Emerita Researcher in 2024.

11:00-11:30

Coffee

11:30-12:00

Invited talk

"Mezcal boom and extinction debts: a proposal for sustainable development"

Alfonso Valiente, Instituto de Ecología and C3, UNAM

Alfonso Valiente Banuet is a researcher at UNAM's Institute of Ecology, specializing in the diversity of arid and semi-arid ecosystems. He holds B.S., M.S., and Ph.D. degrees in Ecology from UNAM. He conducted postdoctoral research on desert community dynamics in Phoenix, Arizona (1991-1992). Since 1992, he has been a researcher at UNAM's Institute of Ecology, achieving the highest ranks. His research focuses on the mechanisms driving diversity in Mexican arid and semi-arid ecosystems, considering historical biogeographical, phylogenetic factors, and ecological interactions. He has coordinated international research networks, published over 110 ISI articles, co-edited two international books, and has been cited over 7,000 times. He has received multiple honors, including the Gabino Barreda Medal and the SEMARNAT Ecological Merit Award (2007).

12.00-13:00

Plenary talk (on-line)

"Universality and unreachability in physics and beyond"

Gemma de les Coves, University Pompeu Fabra, Spain

Gemma de les Coves studied Physics in Barcelona and moved to Tyrol in 2007 for her PhD with Hans Briegel, working on quantum information and statistical mechanics. In 2011 she joined Ignacio Cirac's group in Munich to study quantum many-body systems using tensor networks and the universality of spin systems. She returned to Innsbruck in 2016 to build her own group, consolidated in 2020 with the START Prize.

Collaborating with researchers across Europe, she has explored mathematical quantum physics, universality, and computational limits. Recently, she has turned to philosophy and linguistics to address questions close to her heart. In 2024 she returned to Catalonia as an ICREA Professor.

The 4th Complexity Week celebrates the 10th Anniversary of the C3 – Centro de Ciencias de la Complejidad – gathering national and international experts to discuss global challenges such as climate change, inequality, and health. Through plenaries and round tables, we will reflect on why current approaches fall short and what must change.

13:00-14:00

Roundtable 4: **Computer science, Artificial Intelligence and Data Science Inteligencia**

Panelists:

Gemma de les Coves, University Pompeu Fabra, Spain
Carlos Gershenson, University of Binghampton, USA and C3, UNAM
Paul Schrater, Department of Computer Science, University of Minnesota, USA
Boris Escalante, CECAV, UNAM
Moderator: **Humberto Carrillo** Facultad de Ciencias and C3, UNAM

• Carlos Gershenson is a tenured full professor at SUNY Binghamton. He holds broad academic interests, including complexity, artificial intelligence, artificial life, healthcare, self-organizing systems, information, urbanism, evolution, cognition, and philosophy of science. He is the current President of the Complex Systems Society (2024-2027), Editor-in-Chief of Complexity Digest (2007-), and a member of the Board of Advisors for Scientific American (2018-). He was previously a research professor at UNAM's Institute of Applied Mathematics and Systems, where he led the Self-organizing Systems Laboratory. He is also an associate researcher at UNAM's Center for Complexity Sciences.

• Boris Escalante earned a B.S. in Electrical Mechanical Engineering from UNAM (1985), an M.S. in Electronic Engineering from the Philips International Institute of Technological Studies (1987), and a Ph.D. from Technische Universiteit Eindhoven (1992). Since 1992, he has been a full-time career professor at UNAM's Faculty of Engineering, currently holding the rank of Full Professor "C." He teaches Digital Image Processing and Digital Signal Processing at the undergraduate and graduate levels, as well as Computer Vision. His research interests focus on bioinspired models for computer vision and image and signal processing.

• Humberto Carrillo Calvet is a mathematician, founder and director of the Nonlinear Dynamics Laboratory at the Faculty of Sciences, and Coordinator of Data Science at the Center for Complexity Sciences (C3) at UNAM. He is a multidisciplinary researcher with significant contributions to the qualitative theory of dynamic systems, mathematical biology modeling, bioinformatics, scientometrics, and the application of Artificial Intelligence to Data Science. His research has accumulated over a thousand citations, including 70 in specialized books, 58 doctoral theses, and 700 citations in patents.

14:00-15:00

Plenary talk

"To solve AI, all you need is [Big data, Reward, Attention, Base Models, One Simple Trick,...] to
Understand the core problems. A unifying tour of core open problems in AI using category theory."
Paul Schrater, University of Minnesota, USA

Paul Schrater's research centers on developing predictive models of human behavior, emphasizing perception, action, decision-making, learning, and motivation. His work is grounded in the idea that human behavior represents a rational, adaptive response to survival and reproduction challenges under conditions of limited information.

To explore these mechanisms, he employs probabilistic approaches such as hierarchical probabilistic models, Bayesian reinforcement learning, and Bayesian decision theory, which help define optimal solutions to the perceptual, cognitive, and learning problems humans face.

Schrater's lab rigorously tests these theoretical frameworks through behavioral experiments conducted in specialized environments, including a video game laboratory. Additionally, his team collaborates closely with the Multi-Sensory Perception Lab to deepen the understanding of how humans integrate sensory information and make adaptive decisions in complex environments.

15:00-16:15

Lunch

16:15-17:15

Plenary talk

"Pensar la Complejidad en salud: entre la fragmentación y la conciencia."
Rafael Lozano, University of Washington and Facultad de Medicina, UNAM

Rafael Lozano Ascencio is an Emeritus Professor at the University of Washington's Department of Health Metrics Sciences and a half-time Professor at UNAM's Faculty of Medicine, with nearly forty years dedicated to public health research.

A founding member of Mexico's National Institute of Public Health, he has played a key role in the Global Burden of Disease Study and in shaping Mexico's national health information systems. With over 240 peer-reviewed

publications and more than 160,000 citations, he is one of the most cited researchers in his field.

Now focused on teaching first-year medical students, he promotes analytical thinking and a population-level view of medicine. Lozano emphasizes rigorous preparation, data literacy, and patience for those entering public health. Deeply committed to Mexico, he continues leading projects on mortality data quality and disease burden studies, integrating them into medical education to address pressing health challenges such as diabetes and renal failure.

17:15-6:15

Roundtable 5: **Health and Medicine**
Panelists:
Martha Kaufer, INNCMSZ
Tonatiuh Barrientos, INSP
Miguel Ángel Díaz Aguilera, CENAPRECE
Rafael Lozano, University of Washington y FM UNAM Moderator: Raúl **Sampieri,** Facultad de Medicina and C3, UNAM

• Martha Kaufer, Ph.D. in Sciences and certified Nutritionist, is a Medical Sciences Researcher at the Obesity and Eating Disorders Clinic of the National Institute of Medical Sciences and Nutrition, Salvador Zubirán (INCMNSZ). She is an associate professor for the High Specialty Course in Obesity at INCMNSZ and the Department of Health at Universidad Iberoamericana. She has served as a consultant for institutionalization projects for the FAO and the Mexican Health Foundation. She was honored for 25 years of contributions to Nutrition in Mexico by the Mexican College of Nutritionists.

• Tonatiuh Barrientos is a Surgeon and holds an M.S. in Occupational Health from UAM and a Ph.D. in Epidemiology from the University of Texas at Houston. He is a researcher at the National Institute of Public Health, where he currently directs the Center for Research in Population Health. He is a Level III member of the National System of Researchers and the National Academy of Medicine. His work spans public health areas, including research on adolescent pregnancy, substance use, hepatitis, and COVID-19, and projects on obesity and diabetes focusing on associated social and structural factors. He is part of the urban health research network for Latin America and the Caribbean. His main research areas are epidemiology and public health, cardiometabolic diseases, urban health, and reproductive health.

Dr. Ángel Díaz Aguilera is a notable figure in Preventive Medicine and Public Health in Mexico, currently associated with the National Center for Preventive Programs and Disease Control (CENAPRECE), where he has held significant roles such as Director of the Program for Adult and Elderly Health. His academic and professional trajectory focuses on the design and implementation of national health strategies and programs. Dr. Díaz Aguilera's expertise includes the management of non-communicable diseases, such as obesity and diabetes mellitus, which is reflected in his published research and involvement in health policy. His work contributes to the integration of medical approaches and public health initiatives to improve the Mexican population's well-being.

• Raúl Sampieri Cabrera is a Professor at the Department of Physiology of the Faculty of Medicine at UNAM, where he also directs the Learning Sciences Laboratory. He holds two bachelor's degrees (Nutrition and Pharmacy), a Master of Science, and a Ph.D., all specializing in Pharmacology. Dr. Sampieri's research is dedicated to transdisciplinary inquiry in learning sciences and health. He is known for his work in medical education, particularly in human physiology, where he develops teaching-learning models, including hybrid approaches. He has been honored with the "Dr. Aniceto Orantes Suárez" Special Chair by the Technical Council of the Faculty of Medicine for two consecutive periods. He is a member of the National System of Researchers.

6.15-8.00pm

Poster session and snacks

Wednesday 29
C3 Auditorium

8:00-9:00
Registration

9:00-10:00
Plenary talk (on-line)
"AI, cognition and society"
Christopher Summerfield, University of Oxford, UK

"Professor of Cognitive Neuroscience at the University of Oxford and Research Scientist at Deepmind UK.

Christopher Summerfield's work focusses on the neural and computational mechanisms by which humans make decisions. He was trained in psychology and neuroscience at University College London, Columbia University (New York), and the École normale supérieure (Paris). He is Professor of Cognitive Neuroscience in the department of Experimental Psychology, where he heads a lab focussed on understanding the computational mechanisms by which humans make decisions, and how these processes are implemented in the brain. His work, which involves a combination of computer simulations, behavioural testing, and functional brain imaging, is funded by a grants from the European Research Council, the Wellcome Trust, and the National Institute of Health."

10:00-11:00
Roundtable 6: **Neuroscience, psychology and Decision Science**
Panelists:
Christopher Summerfield, University of Oxford, UK
Carlos Brody, Princeton University
Enrique Cáceres, Instituto de Investigaciones Jurídicas and C3, UNAM
Mario Buenrostro, Universidad Iberoamericana
Moderator: **Gabriela Navarro**, University of Guanajuato

• Enrique Cáceres is a tenured researcher at UNAM's Institute for Legal Research (IIJ). He holds a Ph.D. in Law and specializes in the intersection of Law, Logic, and Complex Systems. His work addresses the theoretical and methodological challenges of applying complexity theory to legal and social phenomena, including legal informatics and the formalization of legal arguments. He is a recognized authority in legal philosophy, especially in the areas of normative systems and judicial reasoning. Dr. Cáceres actively contributes to the development of legal knowledge by integrating computational and formal methods.

• Mario Humberto Buenrostro Jáuregui is a full-time professor in the Department of Psychology at Universidad Iberoamericana (IBERO) and the Coordinator of the Ph.D. in Psychological Research. He holds a B.S. in Psychology and an M.S. and Ph.D. in Behavioral Sciences (Neuroscience orientation) from the Institute of Neurosciences at the University of Guadalajara. He completed a postdoctoral fellowship at the University of Barcelona. Dr. Buenrostro is the head of the Neurosciences Laboratory at IBERO, where his research focuses on Neurophysiology and Behavior. His work investigates complex relationships, such as the effect of chronic sexual and social activity on cognitive function, neurogenesis, and protein expression in the hippocampus of aged rats. He is a member of the National System of Researchers and an author of scientific and outreach publications on neurosciences.

11:00-11:30
Coffee

11:30-12:00
Invited talk
"A Comprehensive look at the complexity of body weight"
Rolando Díaz-Loving, Facultad de Psicologia, UNAM

Rolando Díaz-Loving is a prominent researcher and professor at UNAM's Faculty of Psychology. He holds a B.A. in Psychology from UNAM and completed his graduate studies at the University of Texas at Austin, where he earned his Ph.D. His work is recognized for pioneering the application of

psychological research methodologies to social and cultural phenomena in Mexico and Latin America. His primary lines of investigation center on Social and Cultural Psychology, focusing on interpersonal relationships, gender, couple dynamics, and the construction of self and identity within Mexican cultural contexts. Dr. Díaz-Loving has extensive publications in his field and is known for his dedication to teaching and training specialized human resources, making significant contributions to the understanding of Mexican behavior and social structures.

12:00-13:00

Plenary talk

"Neuroscience, psychology and Decision ScienceTowards using large-scale, cross-brain neuronal recordings to identify the brain's internal signals"
Carlos Brody, Princeton University, USA

Carlos Brody is a Professor of Neuroscience and Molecular Biology at Princeton University and an Investigator at the Howard Hughes Medical Institute. He earned his Ph.D. in Computation and Neural Systems at the California Institute of Technology in 1997, under the supervision of John Hopfield. In 2001, he joined Cold Spring Harbor Laboratory, where he led a computational neuroscience group and, inspired by the experimental innovations of Zachary Mainen and Anthony Zador, began integrating behavioral experiments into his research.

Brody's work focuses on understanding high-level cognitive processes in rats through precisely controlled, quantitative behaviors. His lab combines computational modeling, electrophysiology, pharmacology, and optogenetics to study the neural mechanisms underlying decision-making, working memory, and executive control. Since moving to Princeton University in 2006, Brody has continued advancing experimental and theoretical approaches to cognition and has been a Howard Hughes Medical Institute Investigator since 2008.

13:00-14:00

Invited talks

"Criticality in Biology: Revisited with a Physics Flavour"
Gustavo Martínez-Mekler, Instituto de Ciencias Físicas and C3, UNAM

"Big data and Machine Learning Analysis of the Sustainable Development Goals (SDG)"
Rafael Barrio, Instituto de Física, UNAM

• Gustavo Martínez-Mekler holds a degree in Physics from the Faculty of Sciences at UNAM, a Master of Science (MSc) in Mathematics from the University of Warwick, and a Doctor of Philosophy (PhD) in Physics from the University of Manchester, England. He also completed his first year of Chemical Engineering at the Universidad Iberoamericana (UIA), Mexico City. He is currently a Researcher at the Institute of Physical Sciences, UNAM, and a founding member of the Academic Council of the Center for Complexity Sciences (C3). Previously, he was a visiting researcher at the University of Florence, the National Institute for Nuclear Physics (INFN) in Italy, and the Department of Physics and the Beckman Institute for Advanced Science and Technology at the University of Illinois at Urbana-Champaign. He has been a Fulbright, British Council, and UNAM fellow. He is the founder and former head of the Department of Complex Systems at the Institute of Physics, UNAM, and served as Director of the International Center for Sciences.

His areas of research include Statistical Physics (Critical Phenomena, Condensed Matter, Polymers), Dynamical Systems (Nonlinear, Discrete, Continuous, and Stochastic Dynamics, Synchronization, and Chaos), and Complex Systems (Pattern Formation in Chemical Reactions, Earthquakes, Volcanology, and Systems Biology: Immunology, Origin of Life, Ecological Evolution, Developmental Biology, Fertilization, and HIV).

14:00-15:00

Plenary talk

"Quantifying Emergence: tools from statistical mechanics and information theory"
Henrik Jensen, Imperial College, UK

Director of the Centre for Complexity Science, Imperial College, London

Henrik Jeldtoft Jensen is Professor of Mathematical Physics at Imperial College London and leads the Centre for Complexity Science. He is a prominent expert in complexity science and is involved in a variety of high-profile research projects including the application of co-evolutionary dynamics to the modelling of socio-economical sustainability, finance, cultural evolution, innovation, and cell diversity in cancer tumour growth, and has also worked with the Guildhall School of Music and Drama to identify differences in the neuronal response of audience and performers depending on the mode of performance. He has published two books on self-organized criticality and complex systems.

15:00-16:15

Lunch

16:15-17:15

Roundtable 7: **Complexity Science**
Panelists:
Henrik Jensen, Imperial College, UK
Maximino Aldana, Instituto de Ciencias Físicas and C3, UNAM
Andrea Sáenz-Arroyo, Colegio de Frontera Sur and C3, UNAM
Jesús Mario Siqueiros, Instituto de Investigaciones en Matemáticas Aplicadas y en Sistemas, UNAM
Moderator: **Juan Claudio Toledo**, Instituto de Ciencias Nucleares and C3, UNAM

• Maximino Aldana González holds B.S., M.S., and Ph.D. degrees in Physics from UNAM. He is a Career Researcher, Full Professor C, at UNAM's Institute of Physical Sciences in Cuernavaca. Dr. Aldana has extensive experience in the study of complex systems, having completed postdoctoral research at the James Franck Institute at the University of Chicago and the Santa Fe Institute for Complex Systems. He has held significant administrative positions within UNAM, including Academic Secretary of the Institute of Physical Sciences (2013-2015) and Academic Coordinator of the Center for Complexity Sciences (C3) (2016-2018). His research focuses on theoretical and computational physics applied to complex phenomena.

• Andrea Sáenz-Arroyo is an interdisciplinary researcher focusing on conservation science and socio-environmental systems. Her work analyzes the feedback loops between social and ecological systems, particularly concerning biodiversity conservation, fisheries management, and climate change adaptation in coastal regions. She employs a transdisciplinary approach, integrating local ecological knowledge and scientific data to co-design sustainable management strategies. Dr. Sáenz-Arroyo is known for bridging the gap between scientific research and public policy, working closely with local communities and government agencies to promote equitable and effective environmental stewardship.

• Jesús Mario Siqueiros is a Mexican academic with a diverse background in the social sciences and philosophy of science. He holds a B.A. in Ethnology, an M.A. in Anthropology (UNAM), and a Ph.D. in Philosophy and History of Science and Technology from the University of the Basque Country. Dr. Siqueiros is an Academic Researcher at UNAM's Institute for Applied Mathematics and Systems (IIMAS), based at its Mérida campus. His research interests include the social and ethical implications of artificial life and the link between sociocultural context and cognitive sciences. He is valued as a "technosocial translator," building bridges between disciplines such as mathematics, physics, anthropology, and philosophy in various interdisciplinary research projects.

• Juan Claudio Toledo-Roy holds a Ph.D. in Computational Astrophysics from UNAM's Institute of Nuclear Sciences. His research focuses on applied complexity science, specializing in time-series analysis and high-performance computer simulation. He has extensive academic experience in computational physics, including the simulation of fluid dynamics for astrophysical applications, and the simulation of dynamic systems using cellular automata and agent-based models. Dr. Toledo-Roy worked for three years at UNAM's Center for Complexity Sciences (C3) on various interdisciplinary research topics. He also has expertise in high-performance software development, data analysis, and administering computing servers for UNAM research groups.

17:15- 17:30

Conference summary

Santiago Herce Castañon, C3 UNAM

Santiago Herce Castañón is a computational neuroscientist. He holds a B.S. in Biology from UNAM and an M.S. and Ph.D. in Neurosciences. His academic trajectory is distinguished by a multidisciplinary approach to understanding intelligence. His early work focused on neuronal codes using macaque somatosensory systems. His doctoral research, conducted at the Neurosciences Institute in Spain, investigated perceptual decision-making in humans, particularly how information from various sources is integrated to reduce sensory uncertainty. Currently, his research focuses on modeling human learning and generalization, aiming to use human intelligence as inspiration for developing artificial intelligence tools and refining scientific models of reality.

17:30-19:30

Roundtable 8: **"Quo vadis" C3 and Complexity Science?**

Panelists:

Alejandro Frank, Instituto de Ciencias Nucleares and C3, UNAM

Xavier Soberón, Instituto de Biotecnología and C3, UNAM

Carlos Arámburo, Instituto de Neurobiología, UNAM

Moderator: **Christopher Stephens** Instituto de Ciencias Nucleares and C3, UNAM

• Alejandro Frank Hoeflich is a distinguished Mexican physicist, academic, and full professor at UNAM. He holds a Ph.D. in Nuclear Physics from UNAM and specializes in nuclear and molecular physics, with significant contributions to the theory of nuclear supersymmetry. He is the Founder and General Coordinator of UNAM's Center for Complexity Sciences (C3), a key figure in promoting transdisciplinary science in Mexico. Dr. Frank is also the founder of the "Adopte un Talento" (PAUTA) program, which supports scientific education. He is a member of El Colegio Nacional, the highest academic institution in Mexico, and has received numerous honors, including the National Prize for Sciences and Arts (2004) and the UNAM National Award (2001).

• Francisco Xavier Soberón Mainero is a Mexican scientist and academic. He holds a B.S. in Chemistry and a Ph.D. in Basic Biomedical Research from UNAM. A pioneer in Genetic Engineering and Biotechnology in Mexico, he helped establish UNAM's Research Center on Genetic Engineering and Biotechnology (CIIGB). His research focuses on DNA synthesis, protein engineering, and directed evolution in biocatalysis, leading to international patents. He was the Director of UNAM's Institute of Biotechnology and later served as the Director General of the National Institute of Genomic Medicine (INMEGEN) from 2009 to 2019. He is a Level III National Researcher and has received the Gabino Barreda Medal and the National Chemistry Award Andrés Manuel del Río.

• Carlos Arámburo de la Hoz is a renowned researcher in natural sciences. He holds a B.S. in Biology and a Ph.D. in Basic Biomedical Research from UNAM. He is an Emeritus Researcher at the Institute of Neurobiology (Juriquilla), which he was instrumental in creating. His research has made significant contributions to neuroendocrinology, particularly the molecular and functional characterization of peptidic hormones and their relationship with the neuroendocrine system. His work suggests that growth hormone (GH) may have potential as a coadjuvant therapeutic agent for various nervous system diseases and neural injuries. Dr. Arámburo received the UNAM National Award for Research in Natural Sciences (2022) and was appointed Emeritus Researcher by UNAM in 2024.

• Christopher Stephens is currently the Research Coordinator at the Center for Complexity Sciences (C3-UNAM). His work focuses on Statistical Physics, Complex Systems, Evolutionary Computation, and Data Mining, with applications in health, chronic and emerging diseases, and biodiversity. He collaborates with institutions such as CONACYT, the Carlos Slim Foundation, and CONABIO, contributing to projects on data analysis and the development of spatial data mining platforms like SPECIES.