

6TH AIP EARLY-CAREER CONFERENCE

for Historians of the
Physical Sciences



ABSTRACTS

August 4–9, 2025
Salvador, Bahia, Brazil.



The sixth international conference for graduate students and early-career scholars in the history of physical sciences is hosted by the American Institute of Physics and the Federal University of Bahia (UFBA) from August 4–9, 2025, at the Hotel Victoria Sol Marina in Salvador, Brazil.

This conference aims to provide a space for professional and creative communication and collaboration across national and disciplinary boundaries amongst junior scholars, and to provide a forum for exploring and reflecting on current issues in the historiography of the physical sciences. The “early career” category includes graduate students and recent PhDs, independent scholars, post-docs, and those in early-stage academic positions.

Remarkably, 2025 marks the centenary of quantum mechanics, or, closer to us, a decade from the discovery of gravitational waves. In this context, this conference aims to broaden the conversation, not only by celebrating significant milestones in the development of the physical sciences but also, for the first AIP early-career event in the global south, by acknowledging and addressing the need for greater diversity in the field and in its reflexive approach.

Organizing Committee:

Carla Rodrigues Almeida

Climério Silva Neto

Duim Huh

Elena Schaa

Jean-Philippe Martinez

Jinyan Liu

Rebecca Charbonneau

William Thomas

Monday, August 4

Session 1: Physics in Brazil

Commentator: Ivã Gurgel

Chair: Carla Rodrigues Almeida

Ricardo Ribeiro – Universidade Federal da Bahia

Title: First Phase of the Brazilian Nuclear Program (1946–1955)

Abstract: This paper aims to analyze the First Phase of the Brazilian Nuclear Program (1946-1955), examining its historical and political implications. The research is part of the field of History of Science and Transnational History. We made a specific selection considering the actions that Brazil sought to develop to produce nuclear energy. Above all, primary sources will be used as documentation, and the main challenge is to interpret and dialogue with the sources we will be dealing with. We hope that the analysis of the sources will provide a more comprehensive overview of the clashes between 1946 and 1955, from a historical and political perspective. We will analyze primary sources: Álvaro Alberto's personal collection. The aim is to understand how the United States limited Brazil's nuclear options and to highlight the importance of nuclear energy, its application possibilities, and to promote knowledge about the commitment of so many generations of scientists, engineers, politicians, civilians, and military personnel.

Victor Luiz China Gonçalves – University of São Paulo

Title: The Uses of Computers in Solid-State Physics Research at the University of São Paulo (ca. 1960–1969)

Abstract: The impact of physics on the development of computer hardware is well-researched by historians both of physics and computing, but the adoption of computers by physicists in their research practices remains less explored, despite Peter Galison's influential work on the subject. It is often assumed that physicists simply adopted computers early on, a notion that has rarely been questioned. This paper investigates computer use in solid-state Physics research at the University of São Paulo (USP) in the 1960s, a crucial time for the development of solid-state physics in Brazil. In this context, the IBM 1620 computer at USP played a crucial role in shaping computational practices in the field. The project seeks to understand who used computers, how they were used, for what purposes, and how the necessary skills were acquired. The research is based on oral histories, published papers, graduate theses, and administrative records. By examining these questions, the project not only sheds light on the adoption of computers by physicists but also contributes to the history of solid-state/condensed matter physics in Brazil, a subfield less studied than nuclear and particle physics.

Mylena Gaspar Amoedo – Federal University of Bahia

Title: The History of Decoherence from the Perspectives of the Theoretical Contributions of Brazilian Physicists Amir Caldeira and Luiz Davidovich

Abstract: Quantum decoherence has become one of the main research topics in the

foundations of quantum mechanics. It is deeply linked to the emergence of quantum information and quantum computing. Among the relevant scientific advances related to decoherence, the theoretical work of Anthony Leggett and his doctoral student Amir Caldeira and the kind of Schrodinger's Cat experiments conducted by Serge Haroche in contribution to the Brazilian theoretical group led by Luiz Davidovich stand out. Through the study of available historiographical literature on decoherence, interviews, consultations of university archives, and letters, this work seeks to understand the history of decoherence through the perspective of the academic contributions of the Brazilian physicists Caldeira and Davidovich on the subject. In this way, we seek to understand the contributions of both to the topic of decoherence, to highlight how the interactions between scientists of different nationalities and areas of physics, as well as the dynamics of the research groups and universities they attended, were crucial for the construction of the knowledge necessary for both to be able to contribute significantly to theoretical and experimental advances in the understanding of decoherence.

Session 2: Bringing Coherence to the Global

Commentator: William Thomas

Chair: Duim Huh

Sara Bassanelli – Università degli Studi di Pavia

Title: The Diplomacy of Standardization: Negotiating International Electrical Units from the 1930s to the 1960s

Abstract: Techno-scientific standardization emerged as a key endeavor of international scientific organizations during the interwar period, laying the groundwork for subsequent global agreements. However, the science diplomacy dimensions of these early negotiations--and their influence on the development of standards during the Cold War--remain an underexplored theme. The talk examines these dynamics through the case of international electrical units. Focusing on the 1930s, the analysis highlights the complex interactions between national laboratories and international bodies such as the International Union of Pure and Applied Physics (IUPAP), the International Bureau of Weights and Measures (BIPM), and the International Electrotechnical Commission (IEC). These discussions addressed the challenge of defining fundamental units amidst the complexities of the interwar period. The presentation then shifts to the post-World War II era, examining how global efforts in a transformed geopolitical, institutional, and technological landscape led to the adoption of the International System of Units (SI) in 1960. By tracing the continuity between interwar and postwar standardization processes, the presentation underscores how Cold War scientific agreements were connected to earlier data exchanges.

Michiel Bron – Maastricht University

Title: How to deal with a nuclear petro-state? Geopolitical consequences of an intertwined history of nuclear and oil.

Abstract: In 2023, the Saudi energy minister, Prince Abdulaziz bin Salman, claimed that his nation possesses almost seven percent of the global uranium reserves. Saudi Arabia, a country not only rich in oil, will almost definitely also play a crucial role in a potential

future worldwide transition to nuclear energy. In earlier work, I uncovered the shared geological history of both resources and showed how the oil industry was involved with uranium exploration and extraction since the early Twentieth Century by means of their shared geophysical knowledge, technologies, and practices based on the development of early quantum mechanics. In this presentation, I will delve into the geopolitical discussions and consequences that arose from these entanglements. By focusing on a case-study to oil and uranium deposits in various petro-states in the Middle East and Africa, I argue that oil actors served, and still serve in the case of Saudi Arabia, as active vehicles of science diplomacy regarding the development of nuclear energy. In this presentation I will make use of the research conducted for my PhD research, but also expand on this research with new questions about the geopolitical consequences of the strong entanglement between both the oil and nuclear industries.

Janna K. Mueller – University of Cambridge

Title: Early 19th Century Sunspot Observations and the Nature of the Sun

Abstract: In 1816, the “year without summer,” global temperatures plunged, leading to failed harvests and food shortages. This series of events is now attributed to the 1815 eruption of Mount Tambora, which disrupted global weather patterns. This episode has therefore primarily been studied within histories of meteorology and earth sciences. In 1816, there was, however, another possible explanation investigated. Some English and German astronomers sought the cause for low temperatures in the heavens: observing a slightly higher number of sunspots during the summer of 1816, they speculated about a potential link between solar activity and Earth’s cooling.

This paper examines these sunspot observations and theories on their impact on terrestrial phenomena. While sunspots had been observed for centuries, their interpretation varied. Analyzing the interpretations of the early 19th century reveals how astronomers of that time envisioned the Sun’s structure, composition, and the mechanisms of its heat and light. Furthermore, it highlights how pre-spectroscopic astronomy, traditionally focused on positional studies and celestial mechanics, began to adopt a more “physical” approach, delving into the nature of celestial bodies as well as applying contemporary physical knowledge to the heavens.

Keynote Lecture

Chair: Jean-Philippe Martinez

Gisela Mateos

Title: Physics on the Move: Technical Assistance for Development in Latin America

Abstract: The role of the International Atomic Energy Agency (IAEA) and its technical assistance programs set in place a machinery that mobilized experts in the nuclear fields and technologies. Established in 1957, it became an essential tool for the internationalization and standardization of atomic technologies and practices and for promoting geopolitical influence in the Third World. One of Latin America's first IAEA technical assistance activities was the Mobile Radioisotope Exhibition, which began in Mexico in 1959. It marks the beginning of a series of programs that mobilized people, knowledge, and materialities. This talk will delve into how the IAEA's resources were leveraged through technical assistance programs to support local scientific and

institutional goals during the 1960s and 1970s, embedded in the discourse of development, the intersection of international scientific collaboration, political interests, and technologies.

Tuesday, August 5

Session 3: Re-reading the History of Astrophysics from Marginalized Labor

Commentator: Rebecca Charbonneau

Chair: Climério Paulo da Silva Neto

Rebecka Mikaela Mähring – University of Cambridge

Title: Disciplining Photographs: Labor Organization and Photography at the Royal Greenwich Observatory

Abstract: Photography in the 19th century was highly dependent on trained labor and judgement, and was incorporated into pre-existing scientific regimes in complex ways. In my research, I investigated how photographs were produced, processed, and used at the Royal Greenwich Observatory in the 1890's. By focusing on the photographs' intertwinement with the human technician, I highlighted the roles of labor organization and site-specific approaches to science in shaping photography. Notably, I found that photography did not generate a regime of measurement and discipline at Greenwich, but rather was made to fit a pre-existing regime. Thereby, this work constitutes a revision of earlier scholarship on the history of photography and the labor history of astronomy, and stands in conversation with previous research on invisible technicians.

Eun-Joo Ahn – Yale University

Title: Invisible workers and invisible Place: making of a modern astronomical observatory in Southern California in the early twentieth century

Abstract: Mount Wilson Observatory, located in Southern California, was one of the most prominent astronomical observatories during the first half of the twentieth century. Founded by astrophysicist and science statesman George Ellery Hale, it is known for significant discoveries such as magnetic fields in sunspots and that our Universe is expanding. We remember prominent astronomers and powerful instruments such as Hale and his solar tower telescopes, and Edwin Hubble and the large reflector telescopes. By turning the spotlight--which usually focuses on scientific discoveries, prominent scientists, and large telescopes--into a floodlight that illuminates the often-overlooked places and workers, we can not only get a better understanding of scientific knowledge making process but examine how place and science shape each other. The observatory space went beyond the mountaintop and included the office in the valley and the road up the mountain. In these spaces, male astronomers with varying degrees of power interacted with subordinate women astronomers and male telescope operators, creating a gendered and classed workspace. Such workspace exacerbated the gendered and classed marginalization in astronomical work at Mount Wilson Observatory.

Poliana Martins – Federal University of Bahia

Title: Gendered Labor and Glass Plates: The Harvard Women Behind the H-R Diagram

Abstract: At the beginning of the 20th century, the Hertzsprung-Russell (H-R) Diagram revealed the relationship between the luminosity of stars and their spectral classes, as well as how stars are distributed in the universe, becoming an essential tool to astrophysics ever since. Developed independently by Ejnar Hertzsprung and Henry N. Russell, the diagram was based on data meticulously cataloged by a group of women at the Harvard College Observatory (the famous Harvard Computers) in the late 19th century. Among them were Williamina Fleming, Antonia Maury, and Annie Jump Cannon, who, in a male-dominated field and prohibited from operating telescopes, were limited to analyzing data to stars. Despite these constraints, they developed stellar classification systems based on spectra recorded on glass photographic plates. This study aims to present the classification systems developed by these women and demonstrate how these systems were essential to the construction of the H-R Diagram. The research relies on early published catalogs and astronomical glass plates to highlight how the work of these women went beyond mere computational tasks, analyzing and constructing data for the H-R Diagram despite the labor restrictions imposed by their gender.

Session 4: Materiality of Physics

Commentator: Gisela Mateos

Chair: William Thomas

Thiago Faustino – Universidade Federal da Bahia

Title: Before Charles Goodyear's vulcanization: South American indigenous material knowledge and the rise of early rubber research in France, 1743-1791

Abstract: This paper analyzes how Amazonian indigenous material culture contributed to the development of early rubber research in France. Natural rubber was widely used by Amazonian indigenous peoples in the form of various everyday objects, such as clothing, containers, ornaments and toys, which attracted the attention of European naturalists especially after the second half of the 18th century, when it was recognized as a material of relevance in fields such as physics and chemistry. Based on the Memoirs of the Royal Academy of Sciences in Paris and scientific journals published in France during this period, it is argued that the knowledge embodied in these objects and in the instruments and techniques used in their production laid the foundation for rubber research, which developed in an attempt to integrate the indigenous knowledge with the economic interests of the metropolis. The results show how a material culture approach can shed light on the knowledge of racialized peoples that might be omitted if only theoretical aspects of science are privileged, thus contributing to a historiography of science that is not limited to Western knowledge.

Anxo Vidal Nogueira – Universitat de València

Title: Diversity in uniform: A Tale of Two Astronomical Instruments in Santiago de Compostela across the Francoist regime.

Abstract: This paper presents a complex diversity of scientific practices converging in

two objects present in Santiago (Spain) during the collapse of democratic culture characterizing Franco's dictatorship. Autarchical government led to violent uniformization, but it might also have led, unexpectedly, to certain diversification, although of a nature akin to aberration. Within the material culture framework, I analyse two objects from the Santiago observatory. First, a graphic instrument, called orbigraph, designed by local scientists to calculate double-star orbits, made in 1956 by the Swiss company Coradi and funded by the Spanish state. It was crucial for the observatory's scientific production for several decades. Secondly, a telescope designed by a Law professor, made between 1962-1967 in a textile factory where uniforms for the Francoist troops were made. Funds for its installation were granted personally by the universities' general director. Never used, it was dismantled in the 1970s leading to a legal dispute. This peculiar crossbreeding of scholars with different academic backgrounds and status within the regime hierarchy, industrial practices, funding strategies, and autarkic techno-political discourses sheds light on the complex role of diversity in uniform scientific contexts.

Lingzhao Meng – Institute for the History of Natural Sciences, Chinese Academy of Sciences

Title: The Establishment of the Luoxueshan Laboratory and the Early Development of Cosmic-ray Research in China

Abstract: In the early 1950's, the first Five-Year Plan of the Institute of Modern Physics, Chinese Academy of Sciences, was formulated by Qian Sanqiang, Wang Ganchang, and Peng Huanwu, emphasizing the research in the interaction of cosmic-rays with matters and the establishment and consolidation of a high mountain cosmic-ray laboratory. In 1954, the laboratory was constructed in the Luoxueshan Mountain, Dongchuan, Yunnan Province, at an altitude of 3,200 meters. Under the overseeing of Professor Wang and Xiao Jian, a small magnetic cloud chamber and a small multi-panel cloud chamber started to operate successively, and more than 700 examples of strange particles were collected. The first results of experimental particle physics research in China were gained there, with the cloud chamber used to carry out the study of high-energy nuclear interactions, the generation of strange particles and their properties, and the strong and electromagnetic interaction of high-energy particles. This research mainly focuses on the whole history of the establishment of the laboratory and its extension project into the Yunnan High Mountain Cosmic Ray Observatory, revealing the efforts and contributions that Chinese particle physicists made in the development of cosmic-ray research.

Session 5: Physics and Physicists in Climate Science

Commentator: Richard Staley

Chair: Jinyan Liu

Madison Renner – Harvard University

Title: Big Island, small world: Maintaining atmospheric access on Hawai'i throughout the history of the Keeling curve

Abstract: This paper on the CO₂ measurements conducted since 1958 at the Mauna Loa Observatory (MLO) examines how local Hawaiian politics affected scientific

concepts by shaping practices in postwar geochemistry. Historiography today links 1950s decisions to initiate the Mauna Loa measurements with ideas about islands as ideal locations for generating globally meaningful observations, citing remoteness, isolation, and stability as critical qualities of monitoring sites. I argue instead that islands did not emerge as optimal sites for accessing global atmospheric information until around a decade after MLO CO₂ measurement began. In fact, given Hawaii's geophysical idiosyncrasies and dynamic social and political landscapes, maintaining MLO's (supposed) purity and stability took continual work. It was mainly through resisting changes on and to Hawaii, as while lobbying against roads and radio transmitters that might interfere with CO₂ analyses, that scientists began treating islands as uniquely suited to keeping a global geochemical watch. Following 1970s discourses devised to "preserve" MLO's immediate surroundings into 1980s debates over climate and energy, I show how maintaining Mauna Loa helped establish greenhouse warming as an irreducibly planetary event.

Robert Naylor – University of Manchester

Title: Rolando García: Refugee, Radical, Climate's Attorney at Law

Abstract: Having grown up in a poor household in Argentina, Rolando Victor García Boutigue (1919-2012) was thrown out of his undergraduate studies due to his student union activities in 1943. He then worked for Argentina's National Weather Service, through which he was able to study meteorology in the United States. He returned to Argentina to become a science administrator the University of Buenos Aires, but left again in 1966 after being physically attacked by police under orders of a right-wing military coup. Following a move to Geneva, he became the director of joint planning staff at the influential Global Atmospheric Research Programme. In 1976, he was appointed to head a large project investigating the impacts of early 1970s climate anomalies, leading to the publication of "Nature Pleads Not Guilty" (1981), which laid the blame for severe famines at the feet of US policy and the functioning of international food markets. However, this publication and its sequels were suppressed, despite the sizeable team that produced it from the Global South. Although the influence of García on climate discussion was dampened, his story is a precious example of how a scholar from the Global South responded to and helped shape the emergence of climate change discourse and research in the 1970s.

Barbara Mercier – Technische Universität Berlin

Title: A Numerical Experiment: From Weather Forecasting to Climate Modelling

Abstract: Atmospheric numerical modeling emerged in the United States at the end of World War II. In the early days of the Cold War, links between scientific research and the military were at their strongest. In this paper, I study atmosphere modeling to learn more about the aims and concerns of this nascent scientific community.

In the first part, I focus on the construction of the Geophysical Dynamics laboratory (GFDL), the first laboratory devoted entirely to the development of atmospheric general circulation models. I show that the GFDL has very strong links with the army, through its funding and its members' careers.

In the second part, I examine the first general circulation model of the atmosphere,

which prompted the construction GFDL. Despite its simplicity, this model by Norman Phillips, published in 1956, shows striking similarities with the major atmospheric movements observed near the ground. In analyzing his publication, I will highlight the continuity that exists with numerical weather prediction models. This large-scale atmospheric modeling work is presented as long-term weather forecasting. The aim of these general circulation models is not to shed light on the physics of the atmosphere, but to improve long- and medium-term weather forecasting.

Thursday, August 7

Session 6: Re-reading the History of the Physical Sciences from Women's History

Commentator: Joanna Behrman

Chair: Elena Schaa

Megan Briers – Max Planck Institute for the History of Science

Title: Gender and the Construction of nineteenth-century British eclipse expeditions

Abstract: In the nineteenth century, British astronomers frequently mounted expeditions to observe total solar eclipses. Women were regularly expedition members, but their positions fluctuated as the expeditions changed in character, size and ambition, and became further supported by institutional, military and colonial infrastructures. My paper will examine the gendered dimensions of fieldwork in astronomy, considering the expeditions as liminal enterprises that were constantly reshaped by actors and their investigations. Analyzing various conceptualizations of the fields/expeditions from the 1840s to the 1860s, I will explore how women were involved in establishing the practice of expeditions, and how they became restricted by later constructions. Focusing on two couples: Richarda and George Airy and Eliza and James David Forbes, I argue that initially a broader conceptualization of expeditions, emerging partially through existing Airy family practices, created space for women in the field. However, rhetorical devices used to discuss contributions, gendered associations of travel, and changing expectations for observers limited women's ability to gain recognition for their work and carve out their space in the field.

Charnell Chasten Long – North Carolina A&T State University

Title: Recovering Carolyn Parker's Contributions to Physics (1917-1966)

Abstract: Carolyn Beatrice Parker's (1917-1966) inspirational narrative as the first known African American woman to get a postgraduate degree in physics has been captured in numerous short, online biographies. Since Parker co-authored classified reports at Wright Field in Dayton, Ohio, her biographers have assumed that Parker worked on the Dayton Project, which was the division of the Manhattan Project that processed the polonium needed to make the first nuclear explosions. However, in this talk, I will discuss the importance of revisiting Black scientists' narratives, especially those involved in governmental research, to uncover the realities of their scientific contributions and reposition their stories within the broader history of physics to better understand how race, gender, and class impact historical memory. While Parker's contributions to physics were mostly practical, educational, and experimental,

it does not diminish her contributions to physics and the history of physics. Parker's story illuminates the intersectional barriers of a young Black woman who wanted to become a quantum physicist in the mid-20th century United States and illustrates how conventional notions of what counts as a scientific contribution curate the past.

Mar Rivera Colomer – Independent scholar - Societat Catalana d'Història de la Ciència i la Tècnica

Title: Revisiting the Foundations: Voices from the Margins

Abstract: In early 1960s, some historians of science recognized a unique moment in quantum physics, emphasizing the proximity of contemporary physicists as foundational figures. Kuhn and his team saw the opportunity to address this gap by directly questioning living key protagonists, leading Sources for the History of Quantum Physics (SHQP). SHQP aligned with the trend of elite interviews and perpetuated the silencing of marginalized voices. A quantitative analysis reveals a lack of representation of some group, such women and non-north/western culture. Reinforcing the history of physics centered on geniuses, neglecting contexts, ideas, and collaborations. Has this paradigm changed today? In this paper, I analyze the oral histories published to date in the AIP's oral history archive. Additionally, I briefly present the case of the oral history of Ana María Cetto Kramis, a Mexican physicist. Cetto has dedicated over half a decade to delving into the fundamentals of quantum physics, with a singular focus on the stochastic theory. In addition to founding Latindex and pursued a long career in international cooperation. Her professional and personal journey culminates with the dynamization of the IYQ 2025, aiming to shed light on her understanding of quantum science and science as a whole.

Session 7: Interpretations and Debates in Physics around the World

Commentator: Olival Freire Junior

Chair: William Thomas

S. Prashant Kumar – Department of History, University of Chicago

Title: The Symmetry Eaters: Group Theory and Intellectual Property in Relativistic Quantum Mechanics

Abstract: What kinds of collaboration did the introduction of group and representation theory bring about in physics? What was the global career of the notorious "Gruppenpest"? Using an episode from the papers of B.S. Madhava Rao (1900-1987), a mathematical physicist who taught at Central College, Bangalore, we explore these questions in the context of the Global South. Madhava Rao's early work concerned Max Born's attempts to remove the strange and unexpected infinite divergences that appeared in early attempts to reconcile relativity with classical electrodynamics. The emerging quest to unify physics led Madhava Rao to collaborate with Homi J. Bhabha on the algebra of wave equations that govern mesons. Madhava Rao possessed the knowledge of group theory and matrix representations key to the development of relativistic wave equations for arbitrary spin. But the collaboration was not equal, and the resulting equations bear only Bhabha's name. And many years after Bhabha's death, exactly who contributed what became an issue of controversy. Yet by examining the episode historically we can understand much about the relationship between

collaboration and credit in the mathematical sciences.

Emily Philippi – Humboldt University Berlin; Max Planck Institute for the History of Science, Berlin

Title: Philosophical Discussion and Interpretation of Quantum Physics in the GDR

Abstract: In my presentation, I will explore philosophical discussions of quantum physics in the German Democratic Republic (GDR), including a proposed modification of quantum theory by GDR physicist Frank Kaschluhn. First, I will highlight, among others, the philosophical contributions of Robert Havemann and Herbert Hörz, who discussed the interpretation of quantum mechanics by applying the concept of “dialectical determinism” and a dialectical understanding of causality in which one cause can lead to multiple effects. Next, I will discuss Kaschluhn’s work on a modified Quantum Scattering Theory, where particle interactions do not lead to a superposition of all possible outcomes, but instead are described by a statistical law for the single case, reducing the final state of the scattered system to alternative substates. I will show correspondences between Hörz’s philosophical arguments and Kaschluhn’s theoretical approach.

Beñat Monfort Urkizu – University of the Basque Country (EHU/UPV)

Title: A Posteriori Theory Adjustments in the Early Universe Cosmology. On the viability of Cosmic Inflation

Abstract: Meta-Empirical theory Assessment (MEA) posits that the way in which contemporary physical theories are evaluated has changed due to the progressive distancing of theory from observation. In the field of inflationary cosmology, Richard Dawid suggests that MEA has potential as a rationale for making the limited empirical evidence the central element in ensuring the viability of the theory. My research focuses on the “cosmic controversy” that emerged in 2013 due to differing interpretations of data from the Planck satellite. I argue that while MEA may serve a legitimate role in theory confirmation within the early universe scenario, it remains susceptible to the same methodological preconceptions that fueled the original debate. In this talk, I will focus on one such methodological preconception: the persistent disagreement between the two groups involved in the debate regarding the use of *a posteriori* reasoning in the context of inflation. I will present a historical narrative to support the role of *a posteriori* theory adjustments within eliminative reasoning, emphasizing the methodological continuity that has characterized the evolution of the cosmic inflation research program.

Session 8: Feminist Approaches to the History of Physics

Commentator: Daniela Mondaldi

Chair: Carla Rodrigues Almeida

Colleen Seidel – Bergische Universität Wuppertal

Title: “Frauen beobachten oft besser, Männer machen Theorien daraus.” (“Women often observe better, men theorize.”) – Representations of female scientists in school and university textbooks for physics in (West) Germany, ca. 1960-2020

Abstract: The content of textbooks is not merely a reflection of a society's knowledge; it also conveys the social ideas that permeate that society. These texts present a scientific image that influences societal perceptions. This analysis examines 82 textbooks published in West Germany between 1957 and 2023, focusing on the portrayal of female scientists. The study examines the evolving narratives surrounding prominent physicists such as Meitner and Curie, the various forms of collaboration between men and women, including scientific couples, how gender is mentioned, and the way women were rendered invisible. The study employs the Mathilda effect and agnotological approaches to investigate the lack of recognition for women physicists and the production of ignorance about them. It analyzes the relationship between the ongoing invisibilization of women in science and the increasing circulation of feminist studies of science and gender theories. Furthermore, it reflects on the potential effects of reproducing hegemonic and normative images of science, particularly how the representation of women scientists contributes to or combats social and epistemic injustices.

Lórien MacEnulty – Trinity College Dublin

Title: Are illustrations in physics androcentric? A historical and feminist analysis of visual representation of superexchange in materials

Abstract: In the 1950s, John Goodenough and Junjiro Kanamori developed their namesake rules to better visualize the theory of superexchange in crystals. Now a sidenote in physics history, their illustrations of overlapping electronic orbitals continue to influence how quantum phenomenon are formally represented. Meanwhile, feminist analyses and studies in physics pedagogy have highlighted how instruction methods reproduce gender norms and contribute to the field's systematic propensity to deter women+ from pursuing successful careers there. Such schemata are part of a web of microscopic barriers minorities may face when navigating quantum physics education. This paper discusses the androcentric ideologies embedded in visual representation of physical concepts. I highlight the historicity of superexchange schemata, paying attention to technological constraints for publication before showing how the resulting aesthetics perpetuate a distinct ideal of how knowledge in theoretical physics should be produced and communicated. I then discuss how current technologies (e.g., color) and pedagogic insight permit more accessible schemata. I ultimately argue that an ideology-critical analysis of the aesthetics of illustration in physics can deepen our understanding of the discipline's gendered nature.

Talks by IUPAP early career prize winners and presentation of the award

Chair: Rebecca Charbonneau

Joanna Behrman

Title: From Passion to Profession-Studying Women in the History of Physics

Abstract: How do you go from a personal passion to a professional career? For many historians, there is often a personal connection between the topic of their research and their lives outside their studies. Unfortunately, these two worlds are not always completely separate, and scholars can be open to criticism for "making research

personal” or failing to remain “objective”. In this talk I will discuss my strategies of pursuing gender histories in physics and how I have navigated various difficulties in making it my professional field.

Barbara Hof

Title: Fusion Incomplete? International Collaboration in Plasma Physics and Fusion Research, 1950s-1980s

Abstract: Often hailed as a triumph of global scientific exchange, the International Thermonuclear Experimental Reactor (ITER) represents not a beginning but the culmination of decades of uneven and politically fraught cooperation in fusion research. Shaped by military ambitions, early efforts to control nuclear fusion were tightly guarded. Only after key findings on magnetic confinement were declassified in the late 1950s did international exchange begin--tentatively and on highly unequal terms. In the years that followed, no joined initiative emerged in the civilian domain (let alone the military realm); instead, the international fusion effort was only loosely coordinated and remained constrained by political divides and strategic rivalries. Only in the 1970s did this begin to change. This talk draws on my new, soon-to-be-published research to uncover the contingent history of international collaboration in civilian fusion science and related plasma physics during the Cold War. It focuses on European actors (particularly at CERN, in the UK, and in Switzerland) who navigated a competitive landscape to position themselves as indispensable partners to both the United States and the Soviet Union. By tracing these dynamics, the talk ultimately highlights how physics, politics, power, and international order were deeply entangled.

Friday, August 8

Session 9: The Quantum Revolution: Roots

Commentator: Alexei Kojevnikov

Chair: Jinyan Liu

Siyuan Zhang – Institute for the History of Natural Sciences, Chinese Academy of Sciences

Title: The Evolution and Its Driving Factors of High-Resolution-Power Spectroscopes in Studying the Fine-Structure of Hydrogen Spectrum: 1920s-1930s

Abstract: Experiments in studying the fine-structure of hydrogen spectrum played an important role in physics development during 1920s-1930s. As core instruments, the evolution of high-resolution-power spectroscopes in use largely reflects how these experiments developed. Focusing on these experiments, we describes how spectroscopes evolved from old instruments to new ones. In the 1920s, new instruments were noticed that they could simplify error handling and thus were introduced into these experiments. In the 1930s, new instruments significantly improved their measurement accuracy with a better usage, winning the competition against old ones. Meanwhile, some research concerns for such experiments changed. Facing these concerns, old instruments were replaced without further competition, even though they were potentially as capable as the new ones. Previous narratives of this history mainly focused on the controversies between the results or conclusions of

concurrent experiments. As complementary perspectives, we take spectroscopy evolution as a clue to reveal the consistency and continuity of these experiments and analyze the driving factors behind the spectroscopy evolution by showing the effect of another kind of accumulative consensus different from experimental results or conclusions.

Sofia Guilhem Basilio – University of São Paulo

Title: Letters on Causality: Debates Between Erwin Schrödinger and Hans Reichenbach

Abstract: Quantum mechanics holds a unique position in the History of Science and collective imaginary. Due to its counterintuitive nature, it has sparked philosophical debate since its rise in the early 20th century. From Planck's concept of energy quanta to the thought experiment of Schrödinger's cat, it challenges classical determinism and questions traditional philosophical views on the predictability of natural phenomena and the role of causality in scientific laws. The physicist Erwin Schrödinger is an intriguing figure in the history of quantum physics, recognized for his vast knowledge in both physics and philosophy. In my talk, I will present key philosophical debates that emerged just before Schrödinger's wave theory. I will explore Schrödinger's relationship with the philosopher Hans Reichenbach, as their correspondence provides insight into Schrödinger's views on causality in the development of physics. I will analyze a series of 1924 letters, focusing on Reichenbach's manuscript "The Principle of Causality and the Possibility of Its Empirical Confirmation" and Schrödinger's thorough commentary. I argue that this exchange provides essential insights into Schrödinger's philosophy of science, revealing perspectives on causality that influenced the development of his wave theory.

Bernadette Lessel – Universität Bonn

Title: Quantum Pioneers and Classical Field Theorists: Revisiting their Interconnectedness

Abstract: The development of quantum mechanics is often portrayed as a revolution led by young, unconventional physicists who broke free from the old paradigm of classical (field) theory. This narrative typically casts those who pursued unified field theory in order to explain quantum phenomena as outdated and misguided, creating a perceived divide between two distinct groups of scientists. In my talk, I would like to challenge this view and discuss the significant overlap between quantum mechanics pioneers and unified field theorists. For many influential figures were not only well-versed in both domains but actively cross-pollinated ideas between them, fostering innovation in both fields. This overlap of communities contains of course Albert Einstein as the most prominent example, who was not only the first person to take seriously the concept of a quantum of light, but also continued to contribute groundbreakingly to the understanding of quantum mechanics in the 1920s, while at the same time advocating strongly for a field-theoretical methodology. But this overlap also contains other well-known names, such as Wolfgang Pauli, Hermann Weyl, Erwin Schrödinger, Max Born, Oskar Klein and others, as I want to argue in a case by case manner.

Session 10: The Quantum Revolution: Consequences

Commentator: *Thiago Hartz*

Chair: *Jean-Philippe Martinez*

Francisco Calderón – University of Michigan, Ann Arbor

Title: Inconsistencies in Quantum Field Theories: Replacement vs. Refinement?

Abstract: The history of QFT is one of inconsistencies and attempts at overcoming them. Specifically, Blum's history of QED (ms.) shows that it is one of inconsistencies in the UV. While it was known that QED also had divergences in the IR, IR problems are considered less pathological. Four decades after QED, it was discovered that soon-to-be QCD is asymptotically free. Although QCD also bore the worst of QED's inconsistencies, the Landau pole, asymptotic freedom put worries about the consistency of QFT to rest. The only difference between QED's and QCD's Landau poles was that the former lies in the UV and the latter in the IR. Is there a historical explanation for this double standard? A common reaction to QED's inconsistencies was to reject QFT altogether-call this attitude Replacement. A common reaction to QCD was that cleverer ways of looking at or extending RG techniques would prevent a catastrophe in the IR-call this attitude Refinement. One goal of my paper is to chart the history of asymptotic freedom, which is undertheorized from the point of view of QFTs (as opposed to a history of the discovery of quarks). Another goal is to compare my historical reconstruction of QCD with Blum's of QED and draw some philosophical morals about the differences between Replacement and Refinement.

Gautier Depambour – Université Paris-Cité

Title: From classical to quantum optics: New lights on light

Abstract: The current research fields of quantum cryptography, quantum simulation, quantum metrology, and quantum computing all exploit the quantum properties of light. However, the quantification of radiation in optics has not always been regarded as a natural or necessary step. Until the early 1960s, all research in optics was based on the classical theory of light established in the 19th century. The situation evolved in 1956 with the discovery of the Hanbury Brown and Twiss effect, which inaugurated experiments on photon statistics, and then in 1960 with the invention of the laser, which brought profound changes in the practice of optics. Firstly, I will show how these two events contributed to the emergence of a new field of research now called "quantum optics," notably by motivating Roy Glauber to build its theoretical foundations in 1963. Secondly, I will focus on several controversies that marked this transition from classical to quantum optics. Lastly, I will outline the three main directions of the development of quantum optics from the 1960s to the 1980s: Leonard Mandel's studies on free radiation in Rochester, Claude Cohen-Tannoudji's inquiries into light-matter interactions in Paris, and Alain Aspect's work on the foundations of quantum mechanics in Orsay.

Silvia Castillo – IHPST - University of Toronto

Title: Information, Computation, and the Foundations of Quantum Mechanics: John Wheeler's Influence at the Center for Theoretical Physics (1976-1987)

Abstract: At the 1989 International Symposium for the Foundations of Quantum Mechanics in Tokyo, John A. Wheeler delivered a paper titled “Information, Physics, Quantum: The Search for Links.” He proposed that every physical entity--every “it”--derives meaning from fundamental units of information, or “bits.” This ontological view, epitomized in the phrase “it from bit,” emerged out of a decade of research from Wheeler and his proteges. After a distinguished career at Princeton, Wheeler joined the University of Texas at Austin in 1976, where he established and directed until his retirement the Center for Theoretical Physics. Throughout this period, graduate students, postdoctoral fellows, and visiting researchers cycled through the group, many contributing to the exploration of information-theoretic principles in quantum mechanics. For them, computers served not only as pragmatic tools but also as conceptual models and heuristic devices. A study of the work and encounters at the Center for Theoretical Physics in Austin during this period will illuminate how cybernetic ideas, as well as developments in computer and information sciences, influenced the study of quantum mechanics and the emergence of fields such as quantum information and quantum computing.
