Workshop summary

CERN hosted its first workshop on high energy theory and gender from 26-28 September 2018. This workshop is the first activity of the Gen-HET working group, whose goals are to improve the visibility of women in high energy theory, increase awareness of gender issues in the scientific community, and provide networking, support and mentoring for early career researchers.

As in earlier meetings on string theory and gender, the workshop included physics presentations as well as talks and discussion sessions on gender issues. Early career researchers had the opportunity to present their work as short talks; we were impressed with how well they communicated deep ideas and complex computations in their 10 minute presentations!

The invited physics talks spanned the whole of high energy theory research; this was a great opportunity for participants to learn about exciting new results in neighbouring research areas. Agnese Bissi (Uppsala University, Sweden) began the physics programme by reviewing the AdS/CFT correspondence and discussing the use of conformal bootstrap methods in holography.

Korinna Zapp (LIP, Lisbon, Portugal and CERN) talked about three major discoveries in heavy ion physics over recent years: (i) the hydrodynamic behaviour of soft particles in heavy ion collisions; (ii) jet quenching and (iii) surprising similarities between soft particle production in high multiplicity proton-proton and heavy ion collisions.

JiJi Fan (Brown University, USA) gave an overview of beyond the Standard Model phenomenology, focussing in particular on topics related to the origin of the weak scale and Higgs physics. She discussed the possibility that the Higgs is meso-tuned but there are no other light scalars and how such scenarios may be probed in future experiments.

Elvira Gamiz (University of Granada, Spain) reviewed key features of lattice simulations for flavor physics. She discussed the significant tensions between some lattice and experimental results which are, for example, as high as 3σ in certain B decay channels. It will be interesting to see how these anomalies are resolved over the next few years.

Ana Achucarro (University of Leiden, Holland, and UPV-EHU Bilbao, Spain) gave the theory colloquium on the topic of inflation. She began by reviewing the successes and challenges of inflation and concluded with a discussion of the weak gravity conjecture, emphasising the subtleties of applying this conjecture to supergravity multifield models of inflation.

Maria Ubiali (University of Cambridge, UK) talked about parton distribution functions, emphasising their importance in an era of high precision physics. Maria explained the state of the art methods used for determining parton distribution functions and showed how much progress has been made over the last few decades.

Laura Covi (Georg-August-University Göttingen, Germany) reviewed key topics in cosmology and particle physics. Laura focussed on the heavy supersymmetry scenario, arguing that this has several advantages for cosmology. For example, in models with heavy SUSY, one can realise scenarios for baryogenesis and gravitino dark matter from R-parity violating supersymmetry.

Silvia Pascoli (Durham University, UK) began by reviewing the present status of neutrino physics, highlighting that neutrino masses are the first evidence of physics beyond the Standard Model. She discussed the ongoing research programme to determine precise information on masses, mixing angles and CPV phases, and concluded by explaining how complementary information from other searches will be required to fix the New Standard Model.

Tracy Slatyer (MIT, USA) gave an overview of models for dark matter, emphasising the huge diversity of reasonable models and the necessity for search strategies that test many possible models. Viable candidates for dark matter range from very low mass axions and axion-like particles to GeV scale WIMP like dark matter.

Alejandra Castro (University of Amsterdam, Holland) talked about black hole entropy, and its relation to holography and to number theory. Understanding the origin of black hole entropy for generic black holes is crucial in explaining quantum properties of black holes. In recent years very deep connections have emerged between black hole microstate counting and number theory.

The final physics talk of the workshop was delivered by Eleni Vyronidou (CERN) on the subject of Standard Model effective field theory (SMEFT). SMEFT provides a pathway to the discovery of new physics above the direct collider energy reach. The speaker discussed the state of the art in SMEFT and explained how SMEFT predictions can be systematically improved in the future.

The invited gender talks were delivered by recognised gender experts and by physicists who are active in diversity actions in their own institutions and in research projects on gender in physics. The CERN diversity office provided considerable support in preparing this meeting. Geneviève Guinot (CERN Diversity Programme Leader) delivered a talk about their wide portfolio of activities at CERN. We were honoured to have Sudeshna Datta Cockerill as a facilitator for one of discussion sessions. Sudeshna Datta Cockerill had a long career at CERN with 15 years of work in equal opportunity; she was the first leader of the CERN Diversity Programme. Her considerable experience of intersectional diversity was

interweaved into her discussion session.

Julie Moote (UCL Institute of Education, UK) [1] delivered a talk on behalf of the Aspires project in the UK. Aspires has been tracking career and science aspirations in a cohort of young people from 2009, when the cohort were 10. The Aspires project is exploring how social identities and inequalities affect students continuing in science. Julie gave a fascinating account of how girls' aspirations in physics changed from age 10 to 18 and how we, as a community, can engage optimally with young female students.

Marieke van den Brink (Faculty of Social Sciences, Radboud University Nijmegen, Netherlands) [2] talked about her group's studies of recruitment of professors and early career researchers. She has studied the records of around 1000 professorial appointments in the Netherlands and she described the systematic biases that were uncovered.

Meytal Eran-Jona (PhD. Sociology and Gender Studies, currently at the Department of Particle Physics and Astrophysics, Weizmann Institute of Science, Israel) [3] followed up on related themes. Based on two decades of experience working with organizations to promote gender equality and to create inclusive workplaces, Meytal reviewed the updated studies about unconscious bias and its implications for women in academia and described avenues to promote gender equality in the field.

The focus of the last day of the meeting was actions that physicists can take to improve diversity in their own departments. Jess Wade (Department of Physics, Imperial College London, UK) [4] began the day's talks with a discussion of UK initiatives such as the IOP Juno and Athena SWAN awards. Later in the day Yossi Nir (Department of Particle Physics and Astrophysics, Weizmann Institute of Science, Israel) [5] gave a moving account of his work on increasing female participation in physics in Israel. Yossi has research funding to study gender issues in physics - this is the first time in its history that the Physics Faculty at the Weizmann Institute has held a social sciences grant.

The presentation of Alessandro Strumia has attracted considerable attention. He registered for the meeting, requesting to give a talk on results related to his recent preprint 1803.10713 on bibliometric data in high energy physics. The organisers agreed to his request, as understanding possible biases in citation data was relevant to the meeting. There was no expectation that he (a professor, ERC laureate and long term CERN visitor) would not give a professional presentation.

The actual presentation was offensive, both in content and in delivery. The talk included personal attacks on named individuals, which violates CERN's code of conduct. The talk was unscientific; it was full of mis-statements; it included false facts and fake news. Many of the claims made, such as female students being given extra time for examinations at Oxford University and Italian women accessing STEM studies at university for free, can immediately be refuted. The scientific community has already come together to provide a

rebuttal to the arguments presented in his talk.

We are very grateful to many colleagues for their support in putting together this meeting. Core funding was provided by the CERN Theory Department. The organisers also obtained funding from the Mainz Cluster of Excellence PRISMA, INFN, the University of Milano-Bicocca and an ERC Consolidator Grant. The COST Network CA16201 ParticleFace – *Unraveling new physics at the LHC through the precision frontier* provided a special grant to support young researchers. This pooling of resources demonstrates the cooperative nature of the Gen-HET working group.

We appreciate the continued support of the CERN Director General, Fabiola Gianotti, and the Head of the CERN Theory Department, Gian Giudice. Their summary of this meeting can be found here.

The workshop combined great physics, mentoring and networking. We hope that the future activities of Gen-HET will go from strength to strength.

Valentini Forini (City University, London, United Kingdom), Alessandra Gnecchi (CERN), Mariana Grana (IPhT, CEA/Saclay, France), Pilar Hernández (Valencia University, Spain), Gabriele Honecker (formerly of Mainz University, Germany), Maria Lledo (Valencia University, Spain), Yolanda Lozano (University of Oviedo, Spain), Prado Martin Moruno (Complutense University of Madrid, Spain), Silvia Penati (University of Milano-Bicocca and INFN, Italy), Michela Petrini (LPTHE, Paris, France), Laura Reina (Florida State University, USA), Gavin Salam (University of Oxford, United Kingdom), Marika Taylor (University of Southampton, United Kingdom), Andrea Thamm (CERN), Malgorzata Worek (RWTH Aachen University, Germany).

References

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[2] https://www.ru.nl/english/people/brink-m-van-den/

[3] https://www.weizmann.ac.il/particle/nir/group-members

[4] https://en.wikipedia.org/wiki/Jess_Wade

[5] https://www.weizmann.ac.il/particle/nir/