

Report on the IAUS 356 in Ethiopia and related activities

Dear colleagues,

we would like to share with you a brief summary on the **IAUS 356 symposium on 'Nuclear Activity in Galaxies Across Cosmic Time'** that was held in Addis Ababa, **Ethiopia**, from **7 - 11 of October, 2019**. This was the **third symposium organised in Africa in the past 100 years since the establishment of the IAU**, and only the **first one organised in Ethiopia and East-Africa**. For benefiting the broader public, different activities have been carried out for graduate students, young researchers, teachers, teachers trainers, school children, and general public, before, after, and during the symposium.

IAUS 356 (7 - 11 Oct)
(<http://iau356.essti.gov.et>)

The aim of this symposium was: on one side to improve our understanding about nuclear activity in galaxies across cosmic time, and on the other to contribute to strengthen the development of science in Ethiopia and Africa for the benefit of all. We had a very productive scientific meeting that focused the discussion around 7 topics related with: S1. Multiwavelength AGN surveys, S2. AGN types and unification model, S3. Variability, S4. Properties of AGN host galaxies, S5. Triggering, feedback, and shutting off of AGN activity, S6. Jets and environment, and S7. The youngest AGN and AGN evolution.

Symposium was opened by the Minister of Innovation and Technology Dr. Getahun Mekuria, Former Deputy Prime Minister Mr. Tefera Waluwa, ESSTI General Director Dr. Solomon B. Tessema, African Astronomical Society Vice-President Dr. Lerothodi Leeuw, East-African ROAD Director Mr. Alemiye Mamo, and IAUS SOC and LOC chair Dr. Mirjana Pović. All of them recognised the IAUS 356 to be an important event for astronomy and science development in Ethiopia and Africa.

Independently on many challenges that were there in organising this symposium, we believe that we managed to have at the end very successful meeting and to achieve some of the main objectives, such as:

- revise the current status of physics behind AGN and still open questions,
- give more visibility to the ESSTI, and astronomy development in Ethiopia and Africa,
- inspire and motivate our first generation of MSc and PhD students in Ethiopia and Africa,
- bring for the very first time the international scientific community from the field to Africa and involve them in different activities for benefiting scientific and broader community (see below for more details on different activities),
- strengthen the current international collaborations and open a new space of possible collaborations between Africa and the rest of the world.

Basic statistics

- Number of participants: 164
- Number of represented countries: 30 (from 5 continents)
- Invited talks: 7 (4 males, 3 females; 7 countries, 5 continents)
- Contributed talks: 60 (53% male speakers, 47% female speakers)
- Poster presentations: AGN field - 33, non-AGN field - 17
- Number of discussion sessions: 8
- Discussion sessions chairs: 8 (5 males, 3 females)
- Session chairs: 12 (8 males, 4 females)

- SOC members: 17 (8 females; from 14 countries, 6 continents)
- LOC members: 25 (4 females)

In the following we provide description on different activities organised during the symposium. Pictures from all activities can be seen at:

https://drive.google.com/drive/folders/1TRHL-iKvUIE1B7S6nfgGro2_KsLDwrs1

We opened the page for uploading all presentations at:

<https://zenodo.org/communities/iau356/?page=1&size=20>. Finally, we are currently working on the book of proceedings to be published under the Cambridge University Press.



(Group photos from the opening session, National Museum visit, Entoto Observatory visit, and conference dinner. Credits. A. Solomon and V. Oknyansky)

Training for MSc/PhD students and young researchers (5 - 6 Oct)

This training was organised before the IAUS 356 started, in one of the halls of the Addis Ababa University, with aim to improve the skills of our MSc/PhD students and young researchers who are working already at different universities and research centres. We had **45 participants** in total, from different African countries, including **Ethiopia (great majority of participants from different parts of the country), Rwanda, Uganda, Tanzania, Kenya, Nigeria, and South Africa**. The training was planned not only for astronomy colleagues, but for benefiting the broader community.

Therefore, one part of training (10 hours) was focused on '**Introduction to python**' programming given by **Dr. Rubén García Benito** (IAA-CSIC, Spain), while the other (6 hours) was related with tips on '**CV, motivation letter, proposals, and research papers writing**' given by **Dr. Allison Man** (University of Toronto, Canada) and **Dr. Johan Knapen** (IAC, Spain). Colleagues from astronomy, space physics, physics in general, and engineering attended the training. We got very positive feedback from both participants and trainers. Our appreciation goes to all facilitators, without whom this training would not be possible. Attached are group pictures (*Credits. M. Pović*).



Public Lecture Event
 October 8, 2019
 Starting from 9:00 LT @ AAIT

Speaker: Prof. Chris Impey
 (University of Arizona, USA)

Talk title: Black Holes and Nuclear Activity in Galaxies

Short Bio:
 Chris Impey is a University Distinguished Professor of Astronomy and Associate Dean of the College of Science at the University of Arizona. He has over 180 refereed publications on observational cosmology, galaxies, and quasars, and his research has been supported by \$20 million in NASA and NSF grants. He has won eleven teaching awards and has taught two online classes with over 180,000 enrolled and 2 million minutes of video lectures watched. Chris Impey is a past Vice President of the American Astronomical Society and he has been an NSF Distinguished Teaching Scholar, the Carnegie Council's Arizona Professor of the Year, and most recently, a Howard Hughes Medical Institute Professor. He's written over 50 popular articles on cosmology and astrobology, two introductory textbooks, a novel called Shadow World, and eight popular science books: *The Living Cosmos*, *How It Ends*, *Talking About Life*, *How It Began*, *Dreams of Other Worlds*, *Humble Before the Void*, *Beyond: The Future of Space Travel*, and *Einstein's Monsters: The Life and Times of Black Holes*.

Speaker: Prof. Petri Vaisanen
 (South African Astronomical Observatory, South Africa)

Talk title: South African astronomy in the 2020s

Short Bio:
 Prof. Petri Vaisanen is the Director of the South African Astronomical Observatory (SAAO) in Cape Town. The SAAO operates an Observatory in the semi-arid Karoo region in Sutherland, with nearly two dozen telescopes, of which the 10m class Southern African Large Telescope (SALT) is the largest. Petri has been at the SAAO for 15 years, heading the SALT Astronomy Operations before taking up his current post in 2018. Before coming to South Africa he also worked in Chile and the U.S. - He is originally from Finland, where he obtained his PhD from the University of Helsinki. His own research is on colliding and interacting galaxies and violent star formation. SAAO believes in contributing to astronomy on the whole African continent. This can be done utilising collaborations, research with SALT, currently the largest single telescope in the Southern Hemisphere, networking smaller optical telescopes intelligently to be globally competitive in the exciting developments of astronomy coming in the 2020s, as well as focusing on multiwavelength astronomy together with MeerKAT/SKA.

Public talks and outreach activities at schools (8 Oct)

During one afternoon we organised in collaboration with the Ethiopian Space Science Society (ESSS) 2 **public talks** at the Addis Ababa University, given by **Prof. Christopher Impey** (University of Arizona, USA) about '*Black holes and nuclear activity in galaxies*' and **Prof. Petri Vaisanen** (SAAO, South Africa) about '*South African astronomy in 2020s*'.

In parallel, **outreach activities** were organised in **8 public schools** where **more than 40 IAUS participants** interacted with our primary and secondary school children and their teachers, and promoted during several hours astronomy and science.

In total, with all activities **we reached between 700 and 800 school children, students, and general public**. We are grateful to all facilitators for their volunteer

work done during all activities. Attached is the poster announcing the public talks event (*Credits.*

Sisay Fantahun) and few pictures (Credits: M. Pović, P. Shastri, S. Ridgway, C. Harrison, and Z. Beyoro-Amado).



Data lab training (10 Oct)

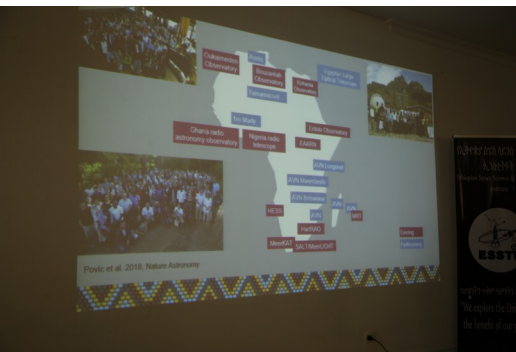
During the afternoon of 10 of October, after all talks, practical session was organised for our MSc/PhD students and other IAUS participants on '*The NOAO Data Lab - An Open-Data, Open-*

Access Science Platform' given by **Dr. Robert Nikutta** (NOAO, USA). We are very thankful to Robert for his support.



Lunch session on Astronomy in Africa (10 Oct)

In parallel with the IAUS 356, there was a 2 days scientific-business meeting of recently re-established African Astronomical Society (AfAS), 10-11 of Oct. We used this opportunity to organise a lunch session for presenting the AfAS to our participants and for discussing about the status of astronomy in Africa. We had a very fruitful discussion with approx. 70 participants attending the session. Few pictures are attached from this activity (*Credits. A. Solomon*).



Training in practical astronomy for teachers and teachers trainers (12 - 13 Oct)

This training was carried out after the symposium at the ESSTI for **44 participants**, who were public school teachers, teacher trainers, and ESSTI and ESSS staff members and volunteers actively involved in astronomy/science outreach activities in Ethiopia. We also had 2 colleagues from Tanzania and Zambia as participants. On Saturday morning the training was given by 4 **ESO** colleagues who developed and



brought different outreach materials that were used during the workshop. We are very much grateful to **Dr. Chris Harrison, Ms. Miranda Jarvis, Dr. Gabriela Calistro Rivera, and Dr. Chiara Circosta** for giving the training and for donating all their materials to the ESSTI. We are also grateful to **Prof. Prajval Shastri** who also spent Saturday morning with us and shared with teachers some of her experiences. Few pictures are attached from the training (*Credits: M. Pović*).



Saturday afternoon and Sunday the training was done in collaboration with the **Network for Astronomy School Education (NASE)**, where experiments have been constructed using recycled and easily accessible materials for showing different physical and astrophysical laws. Three workshops were given by **Dr. Mirjana Pović**, related with solar spectrum and light, stellar properties and stellar lives, and expansion of the universe. Introduction to Stellarium and stargazing was given by **Mr. Alemiye Mamo**. Few pictures are attached (*Credits: A. Mamo and M. Pović*).



Sponsors

This symposium and all organised activities would not be possible without support and help of the: International Astronomical Union (IAU), Ethiopian Space Science and Technology Institute (ESSTI), Entoto Observatory and Research Centre (EORC), Ministry of Innovation and Technology (MInT), International Science Programme (ISP), Development in Africa with Radio Astronomy (DARA), UK Science and Technology Facilities Council (STFC-UKRI), Instituto de Astrofísica de Andalucía (IAA-CSIC), Spanish Astronomical Society (SEA), Ethiopian Space Science Society (ESSS), East-African Regional Office of Astronomy for Development (EA-ROAD), Addis Ababa University (AAU), and Nature Astronomy. All received support is highly appreciated.

Acknowledgments

We highly appreciate the support of all institutions and people who in one way or another contributed to the realisation of this symposium, from the very initial stages of proposal writing and its acceptance, until the very final stage of all organisation. In particular, our gratitude goes to the IAU for giving us the opportunity and financial support to host for the very first time this symposium in Ethiopia and East-Africa. We also extend our thanks to the ESSTI and MInT for all the local support in terms of human and financial resources. In addition, this symposium would not be possible without huge support of SOC and LOC members, all our sponsors, invited speakers, all trainers and volunteers, and IAUS 356 participants. We hope that with all received support this

symposium will contribute significantly to development of astronomy and science in Ethiopia and Africa. Thank you all very much for everything!

