

# The need for an integrated approach to physics/science capacity building in South Africa, SADC region, and Africa

Azwinndini Muronga

Nelson Mandela University, Gqeberha, EC, South Africa

**67<sup>th</sup> Annual Conference**  
of the South African Institute of Physics

**Date:** 03 -07 July 2023 | **Venue:** University of Zululand, Richards Bay Campus

 **UNIVERSITY OF ZULULAND**  
A NODE FOR AFRICAN THOUGHT

 **SOUTH AFRICAN INSTITUTE OF PHYSICS**  
THE VOICE OF PHYSICS IN SOUTH AFRICA

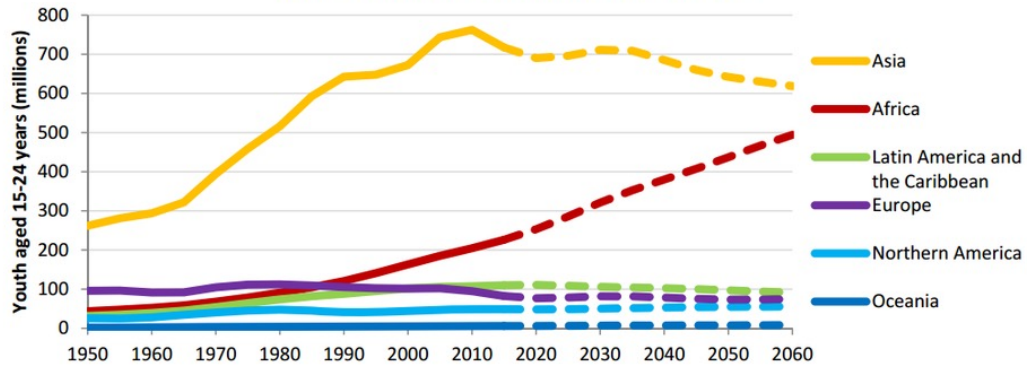
# Highlights of my talk

- Why should we invest in physics and science capacity building in Africa?
- What should we do to achieve our aspirations?
- There is a growing movement of physics capacity building in Africa.

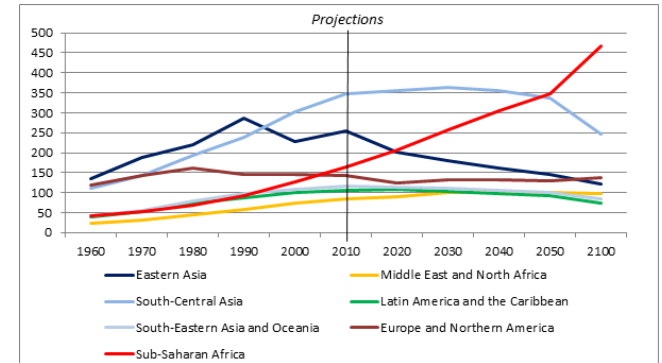
Why should we care about physics/science capacity building in Africa?

# The rise of Africa's Youth population

Figure 1. Youth aged 15-24 years, by region, 1950-2060



Data source: United Nations (2013) *World Population Prospects: The 2012 Revision*.





# UNESCO: Priority Africa Flagship Programmes and Actions

- Strengthening education systems for sustainable development in Africa
  - Fostering science for the sustainable management of Africa's natural resources and disaster risk reduction
  - Harnessing STI and Knowledge for the Sustainable Socio-Economic Development in Africa
- 
- Africa is positively changing at an extraordinary speed.
  - But with change also comes risk.
  - Rapid urbanization, growing population, youth unemployment, inequality and social exclusion, new natural resource finds and a changing climate as well as peacebuilding processes, all have the potential to place African societies under considerable strain.

<https://en.unesco.org/priorityafrica/flagshipprogrammes>

# UNESCO: Priority Africa Flagship Programmes and Actions

- Stability and prosperity start in schools, with quality education, to teach skills for jobs, and skills for peace to all African youth. In a continent where more than 60% of the population is under 25 - empowering people means educating youth, especially girls.
- The cradle of humanity is a powerhouse of cultural diversity and the “big origin” story.
- Education is moreover about learning values for citizenship, stability, and security.
- It is about teaching the history of Africa that has shaped the world.
- It is about living together, and teaching media including ICT, STI and social networks to respond to socio-economic challenges

<https://en.unesco.org/priorityafrica/flagshipprogrammes>

# We have challenges

- Fewer students taking mathematics and science subjects at school and university
- Fewer students who take mathematics and science subjects are succeeding
- Poor standard of teaching mathematics and science at schools
- Africanization/Decolonization of the science curriculum

# Africa and the UN SDGs



Africa is expected to play a significant role in achieving the sustainable development goals.

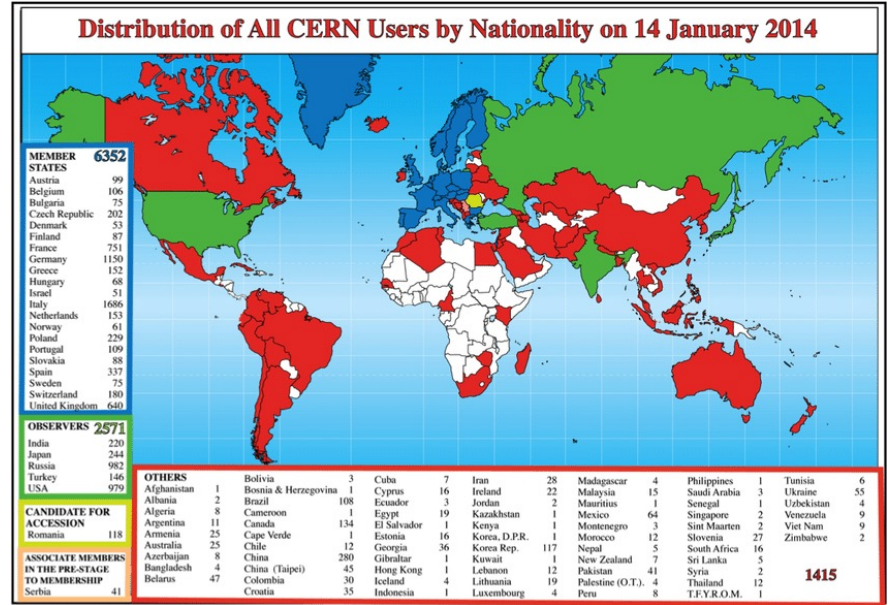
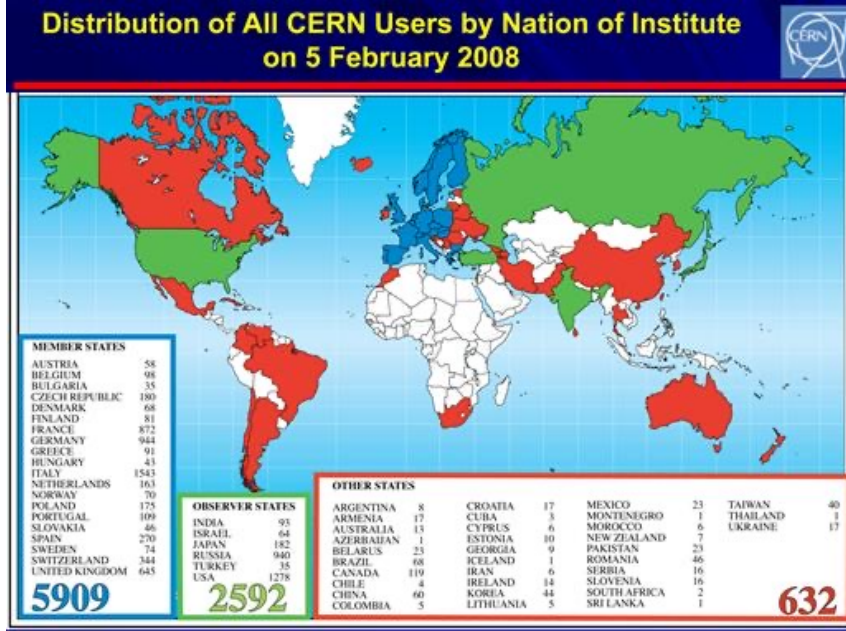
**AGENDA 2063**  
The Africa We Want

- Aspiration 1**  
A prosperous Africa based on inclusive growth and sustainable development
- Aspiration 2**  
An integrated continent, politically united and based on the ideals of Pan Africanism and the vision of Africa's Renaissance
- Aspiration 3**  
An Africa of good governance, democracy, respect for human rights, justice and the rule of law
- Aspiration 4**  
A peaceful and secure Africa
- Aspiration 5**  
An Africa with a strong cultural identity, common heritage, values and ethics
- Aspiration 6**  
An Africa where development is people-driven, unleashing the potential of its women and youth
- Aspiration 7**  
Africa as a strong, united and influential global player and partner



Africa will have continental events on IYBSSD and IUPAP Centenary celebrations

# High Energy Physics in Africa

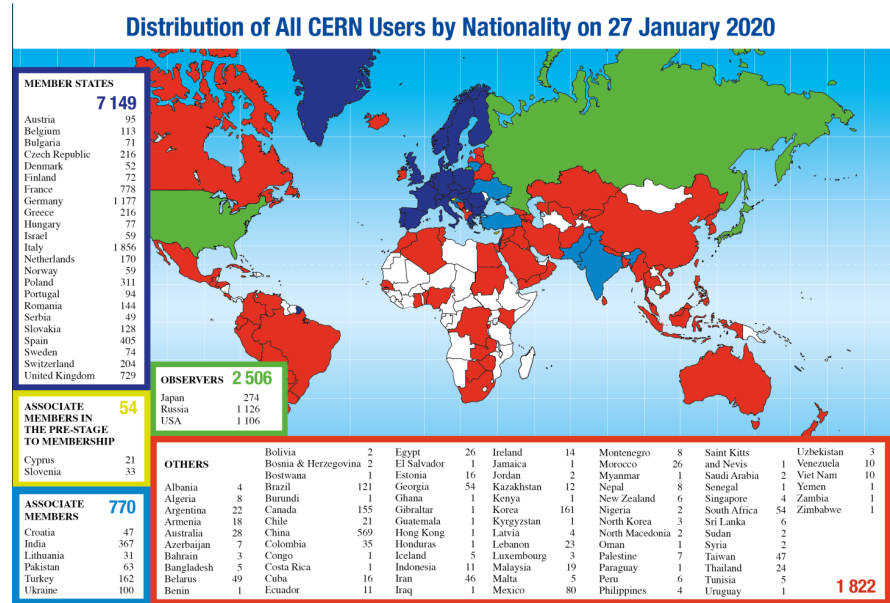


# Africa's participation in international HEP

- Africa's participation in international HEP facilities remains extremely low.

About 1.1% of CERN users are African Nationals

Not limited to CERN, a broader issue



# Africa's participation in international HEP

- About 43 countries with one African country
- About 178 institutes of which 2 are from South Africa
- Over 1900 members of which 5 are from South Africa



**South Africa**  
**SA-CERN programme**  
**ATLAS, ALICE, ISOLDE, CERN, Theory**



Participating institutions : 1 National Facility (iThemba LABS) and 10 Universities

	ATLAS	ALICE	ISOLDE	Theory	Total
PhD	6	5	6	8	25
MSc	19	2	7	15	43
Accad Staff	7	6	6	7	26
Tech Staff	3				3
Post Docs	5	2	2	2	8

2017 numbers, increasing trajectory

- SA has a long history in High Energy Physics, eg : 1<sup>st</sup> neutrino discovered and studied in nature 1965
  - Long history at CERN, BNL, JLAB, JINR, others
  - Also a long history of theoretical contributions
- **SA-CERN Co-operation Agreement 1992**
- Now formal participation at CERN and JINR

- Most HEP now in the SA-CERN and JINR Programmes
- ALICE since 2001
  - ATLAS since 2010
  - ISOLDE since 2017
  - Theory
  - JINR since 2005

*Decades of  
 "ad hoc"  
 participation*

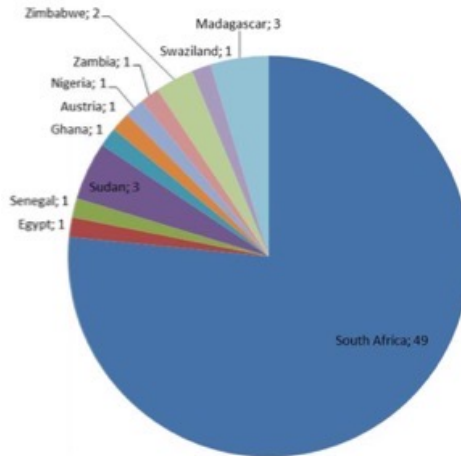
**ALICE nowadays**

42 countries, 174 institutes, 1800 members

**ALICE COLLABORATION**  
 AS NOVEMBER 2016

□ A world-wide Collaboration  
 □ Goal → exploit the unique physics potential of nucleus-nucleus interactions at LHC energies

E. Scapparini, Overview of recent ALICE results, Kruger, December 2016



Courtesy of Simon Connell

**Change the World**



# Africa participation at ICHEP

## Summary and Outlook



ICHEP 2018, Seoul (7/11/18)

- Introduction
- Happy 50<sup>th</sup> birthday Standard Model!
- ICHEP 2018
- Thoughts for the future

Paul Langacker (IAS)

- **Broad and exciting conference**
  - Experiment, phenomenology, theory, astro-particle, accelerator, detector, computing, education, diversity, applications
  - 1119 participants (213 women, 906 men)
  - 835 parallel talks in 16 sections
  - 41 plenary talks
  - 2 award lectures
  - 6 satellite meetings
  - 2 public lectures
  - 226 posters (3 award talks)
  - Director's panel
- **Not a detailed/complete summary**

ICHEP 2018, Seoul (7/11/18)

- Asia/Pacific: 560
- Europe: 414
- N/S America: 137
- Africa: 8
- Antarctica: 0



Paul Langacker (IAS)

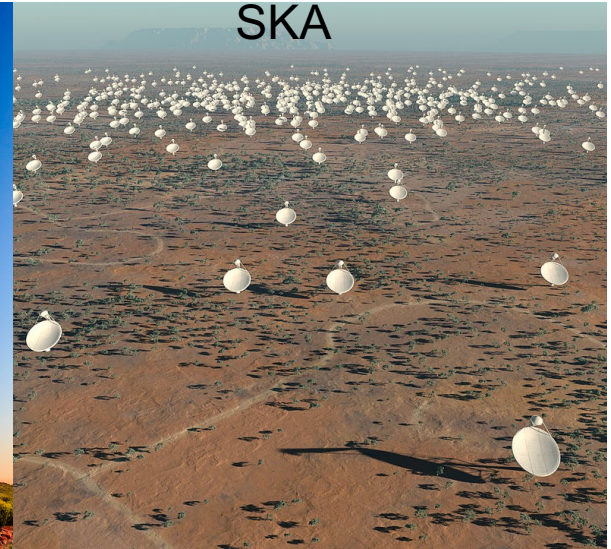
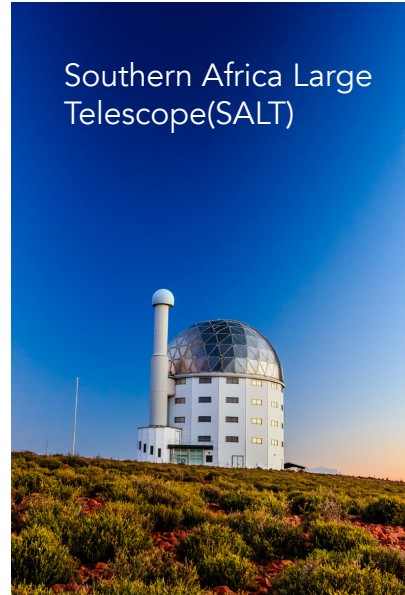


# Africa is fertile with possibilities

# Why is physics/science capacity building in Africa important?

- Major research research facilities coming to Africa
- SKA - The largest radio astronomy observatory to be (co-) hosted by South Africa (70%) and Australia (30%) : meaning that two Global/Geographical South nations will be at the heart of managing and driving the project; and this will need a large African STEM workforce
- Africa and in particular Southern Africa has geographic advantage in astronomy research (besides point of human origins)
- In Africa the diversity challenge is both local and global.

## Multi-messenger Astronomy



# SKA science and the birth of multi-messenger astronomy

THE ASTROPHYSICAL JOURNAL LETTERS, 848:L12 (59pp), 2017 October 20

© 2017. The American Astronomical Society. All rights reserved.

**OPEN ACCESS**

<https://doi.org/10.3847/2041-8213/aa91c9>



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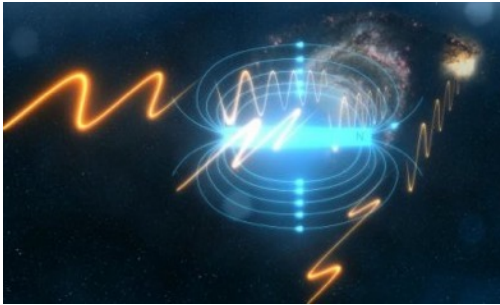
## Multi-messenger Observations of a Binary Neutron Star Merger

LIGO Scientific Collaboration and Virgo Collaboration, Fermi GBM, INTEGRAL, IceCube Collaboration, AstroSat Cadmium Zinc Telluride Imager Team, INiC Collaboration, The High Energy Gamma-Ray Initiative, ANTARES Collaboration, The GEM Collaboration, AGILE

A comparison between SALT/SAAO observations and  
kilonova models for AT 2017gfo: the first electromagnetic  
counterpart of a gravitational wave transient – GW170817

Buckley et al.

McCully et al.



# Physics capacity building in South Africa

- Public Engagement with Science
- Learners and educators support programmes
  - SAIP Outreach activities for learners and Teacher Development programs
  - SAPHO
- Student support programmes
  - Hot and Dense Matter School & Workshop
  - NITheCS Summer Study & Research Programme – aka “NITheCS Internship”



# Rural capacity building

- Science engagement in primary and secondary schooling education system
- Going from province to province visiting schools and HEIs
- Talking about wonders of nuclear physics, particle physics, astrophysics, and cosmology
- Science Centres in SA have transformed into training Centres for STEM learners and educators



# ...has challenges in Africa

- Science engagement in rural schools, in open spaces and under trees
- These challenges require local solutions that are implemented globally
- No time to wait for luxury infrastructure





# Capacity building through educator training

- Programmes for STEM educators
- Training teachers has ripple
- Effects – as evidenced by schools which improved their results
- SAIP has an educators development programme which has been very successful
- The programme is now rolled to the provinces and neighbouring African countries



# Physics for Africa *SAPhO*

- Excellence through South African Physics Olympiad
- Establishing and nurturing talent





# Physics for Africa SAPhO

- Excellence through South African Physics Olympiad
- SAIP's Physics Olympiad produced some of the top matric learners in SA



Don't prepare students  
for something. Prepare  
them for anything.  
@E\_Sheninger



# Capacity building at universities

- Annual Hot and Dense Matter in Heavy Ion Collisions and Astrophysics (HDM) school and workshop
- The school curriculum covers introductory topics including mathematical physics, computational physics, nuclear physics, particle physics, astrophysics and cosmology
- The HEPP Workshop series - The topics to be covered will be high-energy theory and phenomenology (heavy ions, pp, ep, ee collisions), ATLAS physics and ALICE physics.
- National Institute for Theoretical and Computational Sciences (NITheCS) Internship Programme. The NMU-NITheCS internship programme is a 4 weeks+ programme in topics spanning nuclear and particle physics, astrophysics and cosmology





# NMU-NITheCS Internship 2022

A special year – 12 years on

NELSON MANDELA UNIVERSITY NMU-NITheCS Internship 2022/2023 NITheCS

"Connecting Quarks with the Cosmos, Connecting people with the Universe"

**RESEARCH TOPICS:**

- Theory and Phenomenology of Relativistic Heavy-Ion Collisions
- Relativistic Fluid Dynamics in Heavy-Ion Collisions and Particle & Nuclear Astrophysics
- Statistical and Thermal Physics in Heavy-Ion Collisions and Particle & Nuclear Astrophysics
- Relativistic Kinetic Theory in Heavy-Ion Collisions and Particle & Nuclear Astrophysics
- Theoretical and Computational Biophysics
- Compact Stars as Laboratories for Matter at Extreme and Fundamental Physics
- Theoretical and Computational Space Physics
- Physics of Core-Collapse Supernovae
- Physics and Evolution of the Early Universe
- The IYSSD and IUPAP Centenary - 100 Years of Physics in Africa (The Past, Present, and Future)

**ACTIVITIES:**

- 28 November - 23 December 2022: Interns will spend four weeks of interactive sessions at Nelson Mandela University.
- Mid-January - End-April 2023: The interns will continue the internship programme online. Each intern is expected to submit a final research report.
- June & July 2023: Interns will present their findings at conferences, webinars and seminars under the banner of NMU-NITheCS 2022/2023 Internship programme.
- 28 November - 09 December 2022: There will be a parallel event hosted by NMU, i.e. The African School of Fundamental Physics and Applications (ASP 2022).

The ASP 2022 program can be found here <https://www.africanschoolofphysics.org/asp2022/> where you will also find the poster outlining the scientific topics here <https://www.africanschoolofphysics.org/wp-content/uploads/2022/05/ASP2022-Poster.png>

Do you want to boldly go where no one has been before? Apply now for the NMU-NITheCS 2022/2023 Internship programme under the Quarks to Cosmos Africa programme at Mandela University. At the Q2C Africa programme we address Big Questions and Explore the Unknown.

The interdisciplinary and transdisciplinary subject and the theme of the NMU-NITheCS Internship program brings together South African final year BSc, BSc(Honours), MSc, and PhD students from mathematics, physics, statistics, and computing to learn and to find solutions to interdisciplinary and transdisciplinary scientific questions. The objectives of multiple disciplinary approaches are to resolve real world or complex problems, to provide different perspectives on problems, to create comprehensive research questions and to provide comprehensive solutions to the problems.

**FACILITATING TEAM:**

- A. Guga (UCT)
- T. C. Khumalo (WITS)
- T. M. Ledwaba (UL)
- V. Matlabane (UES)
- D. Mathebula (UNISA)
- M. M. Mollo (UL)
- S. H. Mthembu (UWC)
- T. E. Nematshani (UJ)
- R. Ntshikwato (UNIVEN)
- M. Parakeza (CPUT)
- M. K. Seabi (UWC)
- D. Worku (CPUT)



Applicants must be university students; final year BSc, BSc(Honours), MSc and first year of PhD, with majors in Mathematics, Physics, Statistics, or Computing. To Apply for the NMU-NITheCS Internship Program Please visit the NITheCS websites (<https://nithecs.ac.za/>) OR email Mrs René Kotze at [rene.kotze@nithecs.ac.za](mailto:rene.kotze@nithecs.ac.za) for more info closing date 10 August 2022



NELSON MANDELA UNIVERSITY  
The 7th Biennial African School of Fundamental Physics and Applications



28 November - 9 December 2022

**Scientific Program**

**Topics**

- Space Physics, Astrophysics & Cosmology
- Nuclear and Particle Physics
- Medical and Radiation Physics
- Biophysics
- Physics Education, Outreach, & Communication
- Diversity Equity & Inclusion-in-Physics
- Condensed and Material Physics
- Photonics
- Applied and Industrial Physics
- Theoretical and Computational Physics
- Physics for Sustainable Development
- 100 Years of Physics in Africa and the Future

**Activities**

- Workshops for High School Teachers
- Outreach for Secondary Schools
- Physics Lectures and Tutorials for Students
- Forums to Discuss Capacity Development & Retention

100 years of Physics in Africa Past, Present, and Future

Gqeberha (Formerly Port Elizabeth)



# It is always intensive!

Introductory lectures, group discussions, calculating, computing, presenting, scientific report/paper writing





# 2022 NMU-NITheCS Internship Programme was unique

- Activity Report on the Seventh African School of Fundamental Physics and Applications (ASP2022)
- [Kétévi A. Assamagan](#), [Bobby Acharya](#), [Kenneth Cecire](#), [Christine Darve](#), [Fernando Ferroni](#), [Julia Ann Gray](#), [Azwinndini Muronqa](#) – <https://arxiv.org/pdf/2302.13940.pdf>



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The 7th Biennial African School of  
Fundamental Physics and Applications  
28 November - 9 December 2022



## University World News

Africa Edition



al Edition Africa Edition Asia Hub SDGs Hub Transformative Leadership Special Reports Partner

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SOUTH AFRICA

### Institute focuses on training high-level problem solvers

Heather Dugmore 13 June 2023

[LinkedIn](#) [Tweet](#) [Share](#)

A total of 36 interns, the largest-ever number of final-year BSc, honours and masters students from South Africa's rural areas and historically disadvantaged universities, have submitted projects for



# 2023/2024 Programme

**NELSON MANDELA UNIVERSITY**

**The 3rd African Conference on Fundamental and Applied Physics**  
25-29 September 2023

**100 years of Physics in Africa**  
Past, Present, and Future

**Scientific Program**

**Topics**

- Space Physics, Astrophysics & Cosmology
- Nuclear and Particle Physics
- Medical and Radiation Physics
- Biophysics
- Physics Education, Outreach, & Communication
- Diversity Equity & Inclusion in Physics
- Condensed and Material Physics
- Photonics
- Applied and Industrial Physics
- "Theoretical and Computational" Physics
- Physics for Sustainable Development
- 100 Years of Physics in Africa and the Future

Nelson Mandela University (George Campus)

Logos at the bottom include: U.S. DEPARTMENT OF ENERGY, PAUL SCHERRER CENTER, IEEE NPSS, UNIVERSITY OF TEXAS AT DALLAS, SOUTH AFRICAN INSTITUTE OF PHYSICS, NITheCS, UNIVERSITY OF BIRMINGHAM, SAPS physica, CERN, INFN, ICFP, INTERNATIONAL CENTRE FOR THEORETICAL PHYSICS, G S, STANFORD UNIVERSITY, NRF, RISAT, US ATLAS, and NELSON MANDELA UNIVERSITY.

Lookout for:

1. NITheCS Internship call
2. NMU-NITheCS Summer Study & Research Programme call – applied through NITheCS call
3. SA-JINR Theory Workshop call – integration with the summer study & research programme in Gqeberha, Nov/Dec 2023

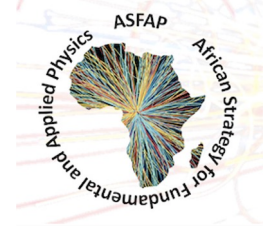
# Physics capacity building in Africa

- The African School of Fundamental Physics and Applications (ASP)
- The African Conference on Fundamental Physics and Applications (ACP)
- The African Strategy on Fundamental & Applied Physics (ASFAP)





# The African School of Fundamental Physics and Applications a.k.a. the African School of Physics (ASP)



## Assessment of impact

<https://www.africanschoolofphysics.org/>

Dr. Kétévi A. Assamagan  
on behalf of the ASP-IOC , IAC and LOC

[ketevi@bnl.gov](mailto:ketevi@bnl.gov)

Physicist at  
Brookhaven National Laboratory (USA)



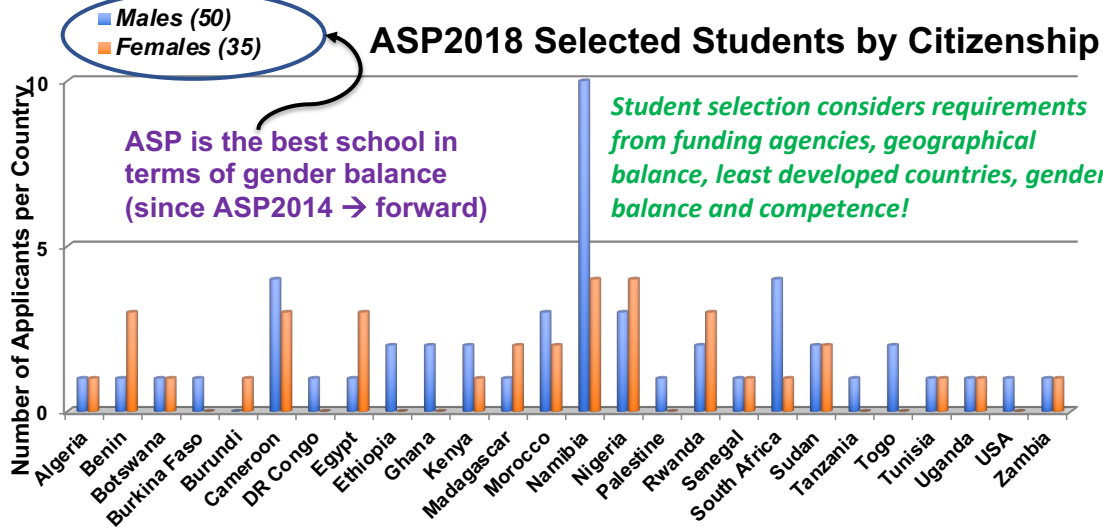


# African School of Fundamental Physics and Applications

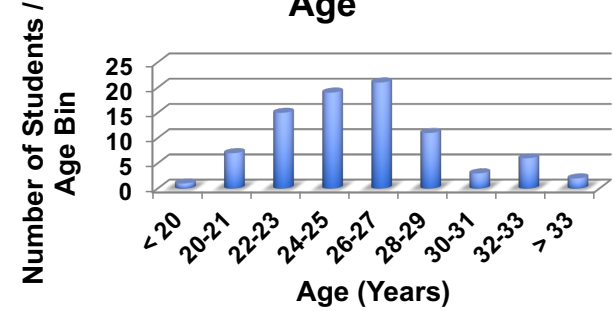
- Also known as “The African School of Physics”
- Acronym: ASP; Logo: as above
- <https://www.africanschoolofphysics.org>
- Organized biennially in different African countries since 2010 by an International Organizing Committee (IOC), [ASP-IOC@CERN.CH](mailto:ASP-IOC@CERN.CH)

ASP	Host Country	Applicants	Students	Mentorship	Teachers	Pupils	Conference
2010	South Africa	125	65	Continuously, even when there is no formal school			
2012	Ghana	138	50				
2014	Senegal	330	70				
2016	Rwanda	429	75	Program formalized in 2016. Runs continuously	20	150	
2018	Namibia	523	85		63	> 1200	+60
2020	Morocco						
2021	Online	N/A	94				

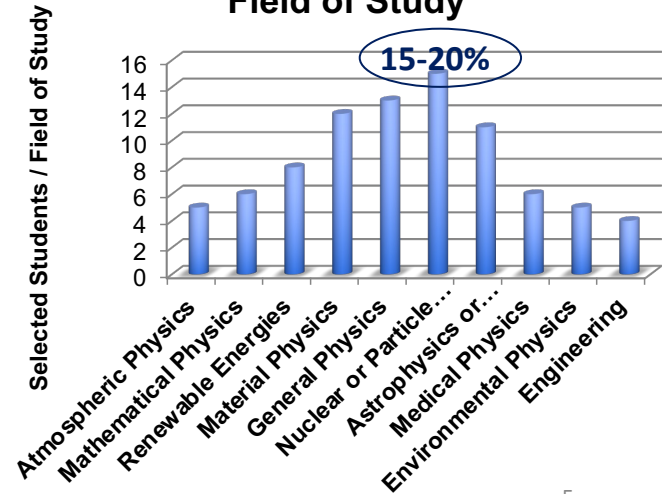
# ASP2018 Students Profile



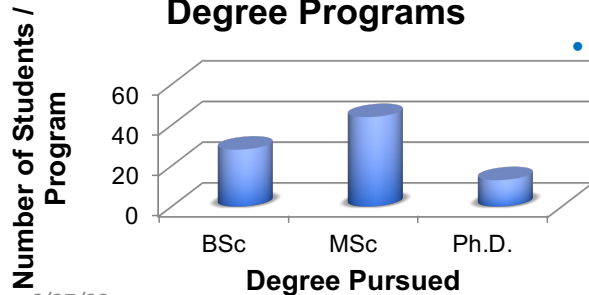
## ASP2018 Selected Students by Age



## ASP2018 Selected Students by Field of Study



## ASP2018 Selected Student Degree Programs

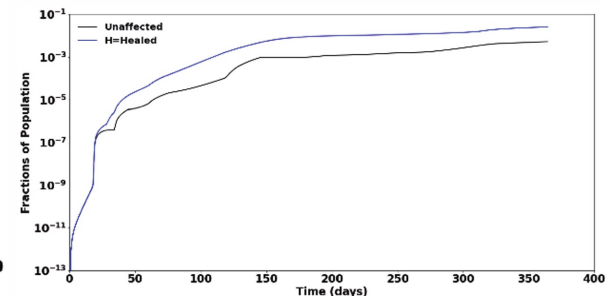
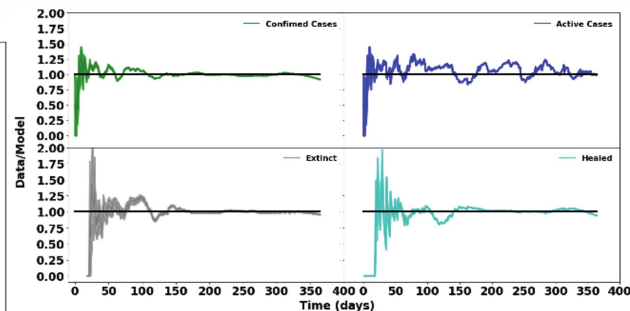
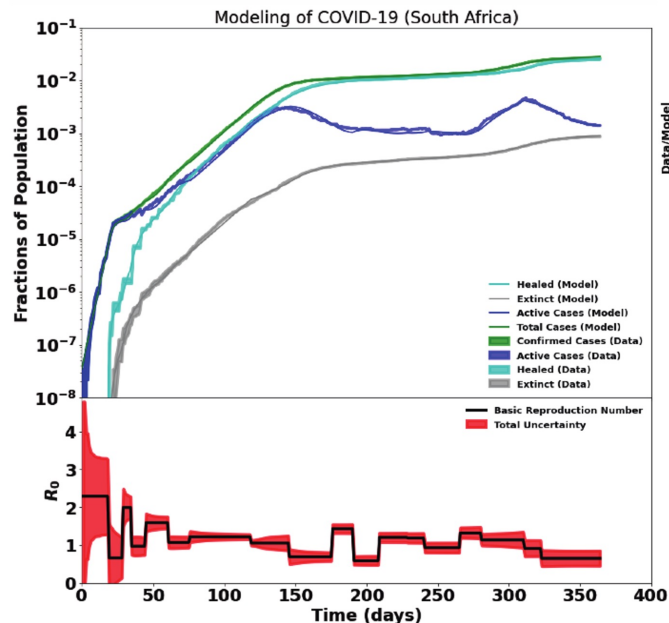


- **523 Applications**
- **Total Selected: 85**
- **There were 30 good students on the waiting list**
- **Selections constrained by budget and logistics**
- **Replace early declinations**

# ASP Mentorship during COVID-19 Pandemic

APS alumni learned about

- ❖ Analysis tools in C++ and Python
- ❖ Understanding their data
- ❖ Modeling, goodness of fit
- ❖ Statistical analysis
- ❖ Uncertainties (statistical, systematic)
- ❖ Estimation of basic reproduction number  $R_0$
- ❖ Giving scientific talks
- ❖ Writing a paper and responding referees comments



First 12 months of COVID-19 data of 10 countries analyzed  
> 50% of all COVID-19 cases in Africa were analyzed by 13 African students

Study published in the Scientific African  
<https://doi.org/10.1016/j.sciaf.2021.e00987>

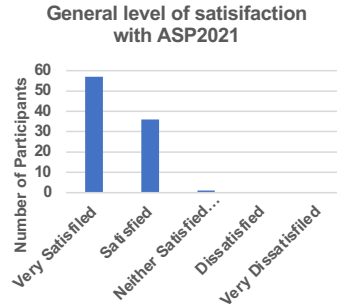
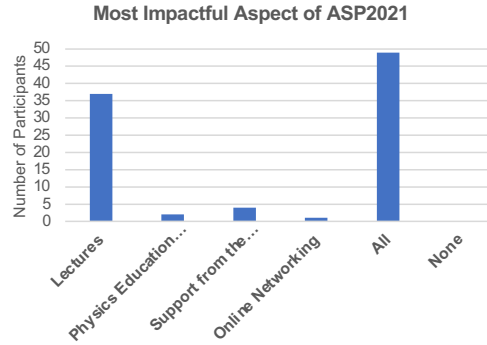
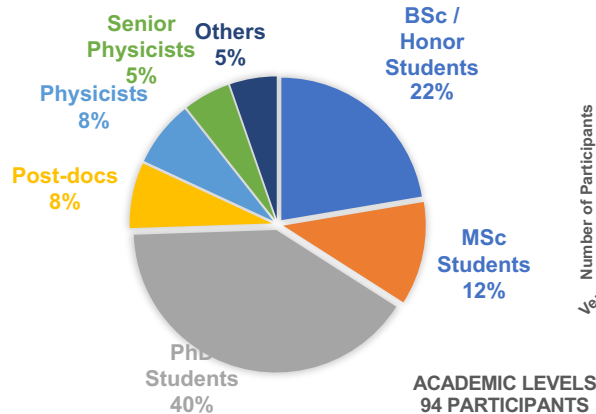
6/27/22

See the talk by Toivo S. Mabote (Mozambique, ASP2020 alumnus)  
On Friday, March 11, 2022

Dr. Kétévi A. Assamagan (BNL)

# ASP2021, July 19-30, 2021; online school

- **ASP2020-Morocco**
  - Cancelled because of COVID-19
  - A 2-week online version organized as ASP2021



## THE SIXTH BIENNIAL

 African School of Fundamental Physics and Applications  
July 19-30, 2021

Virtual Edition



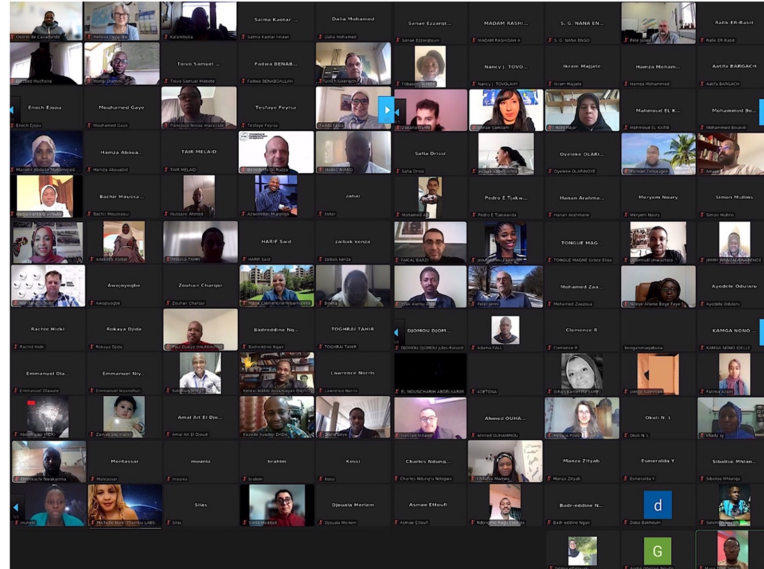
[www.africanschoolofphysics.org](http://www.africanschoolofphysics.org)



# Participant group photo, March 11, 2022

## The Second Biennial African Conference on Fundamental Physics and Applications

March 7-11, 2022





# The international HEP community is welcome to participate and co-create the future of Africa's HEPA community



**NELSON MANDELA**  
UNIVERSITY

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Fundamental Physics and Applications**

**28 November - 9 December 2022**



**Scientific Program**

**Topics**

- Space Physics, Astrophysics & Cosmology
- Nuclear and Particle Physics
- Medical and Radiation Physics
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- Workshops for High School Teachers
- Outreach for Secondary Schools
- Physics Lectures and Tutorials for Students
- Forums to Discuss Capacity Development & Retention



100 years of Physics in Africa  
Past, Present, And Future

Gqeberha (Formerly Port Elizabeth)
















**International Organising Committee (IOC)**

B. Acharya (ICTP and King's College London)

K. Assamagan (BNL)

A. Dabrowski (CERN)

C. Darve (ESS)

J. Ellis (King's College London)

F. Ferroni (GSSI-INFN)

S. Muanza (CNRS-IN2P3)

**Regional Organising Committee**

S. Connell (University of Johannesburg)

M. Diale (University of Pretoria)

E. Maluta (University of Venda)

B. Mellado (University of the Witwatersrand) (iThemba LABS)

I. Gledhill (University of the Witwatersrand)

E. Kasai (University of Namibia)

RE. Simon (University of Botswana)

JM. Tshitenge (University of Kinshasa)

TD. Bucher (Cape Peninsula University of Technology)

Z. Katamzi - Joseph (South African National Space Agency)

JB. Habarulema (South African National Space Agency)

R. Maphanga (Council for Scientific and Industrial Research)

S. Mullins (Botswana International University of Science and Technology)

**Local Organising Committee (LOC)**

V. Bongela (Nelson Mandela University)

N. Hashe (Nelson Mandela University)

A. Muronga (Nelson Mandela University)

R. Mosia (Nelson Mandela University)

S. Ngesi (Nelson Mandela University)

A. Tabalaza (Nelson Mandela University)

S. Thwala (Nelson Mandela University)


T. Trantaal (Nelson Mandela University)

EE. van Dyk (Nelson Mandela University)

A. Venter (Nelson Mandela University)


B. Masara (South African Institute of Physics)

N. Mahani (South African Institute of Physics)



**NELSON MANDELA**  
UNIVERSITY



**100 years of Physics in Africa**  
Past, Present and Future

**Date:**  
**4-8 July 2022**

**Gqeberha**  
formerly Port Elizabeth

**ANNUAL CONFERENCE OF THE SOUTH AFRICAN INSTITUTE OF PHYSICS (SAIP 2022)**

**Virtual Conference**

Heather Dugmore and Gillian McAinsh, Shaping the Future of Science for Soci-ety — supplement with articles on ASP2022, <https://news.mandela.ac.za/news/media/Store/documents/2023/Science%20Supplement/Shaping-the-Future-of-Science-for-Society.pdf>

Activity Report on the Seventh African School of Fundamental Physics and Applications (ASP2022)

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**Abstract**

The African School of Fundamental Physics and Applications, also known as the African School of Physics (ASP), was initiated in 2010, as a three-week biennial event with additional training in fundamental and applied physics to Africa of three-year university education. Since its inception, ASP has become an engine for development in Africa. We report on Physics, ASP2022, organized at Nelson Mandela University, on 2022. ASP2022 included programs for university students, high school pupils.

**Keywords:** The African School of Physics, ASP, ASP2022

**1. Introduction**

The African School of Physics is a collection of activities to African students. One activity is a three-week biennial African countries—this event consists of a 2-week intensive science one-week African Conference on Fundamental and Applied Physics host country of the next biennial event is selected two and has a bidding process. In December 2019, South Africa was selected to host the seventh edition of ASP at Nelson Mandela University. ASP2022 was originally planned in July 2022, for with the South African Institute of Physics annual meeting; how to travel restrictions and uncertainties resulting from the COVID-



Figure 3: Engagement with high school pupils during ASP2022.



Figure 4: ASP forum for discussion with policymakers on capacity development and retention in Africa.



Figure 2: High school teachers during ASP2022.

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The 3rd African Conference on  
Fundamental and Applied Physics  
25-29 September 2023

**Scientific Program**

**Topics**

- Space Physics, Astrophysics & Cosmology
- Nuclear and Particle Physics
- Medical and Radiation Physics
- Biophysics
- Physics Education, Outreach, & Communication
- Diversity Equity & Inclusion in Physics
- Condensed and Material Physics
- Photonics
- Applied and Industrial Physics
- Theoretical and Computational Physics.
- Physics for Sustainable-Development
- 100 Years of Physics in Africa and the Future

100 years of  
Physics in Africa  
Past, Present, And  
Future

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What should we do to build physics/science capacity in Africa?

# Lessons from Snowmass 2021

- These Snowmass contributed papers are of particular interest in today's talk
- I strongly recommend anyone interested in the topics of Diversity & Inclusion, Public Engagement and Public Education, and Physics Education, to study these white papers and their recommendations.
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- Why should the U.S. care about high energy physics in Africa and Latin America? [arXiv:2203.10060](https://arxiv.org/abs/2203.10060)
- The Necessity of International Particle Physics Opportunities for American Education [arXiv:2203.09336](https://arxiv.org/abs/2203.09336)
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- The need for structural changes to create impactful public engagement in US particle physics [arXiv:2203.08916](https://arxiv.org/abs/2203.08916)
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- Building a Culture of Equitable Access and Success for Marginalized Members in Today's Particle Physics Community [arXiv:2206.01849](https://arxiv.org/abs/2206.01849)

Cultural and structural change at all levels within the international HEP community and its stakeholders is necessary for an equitable access and success of Africa's HEP community.

# Cultural and Structural Changes needed within our community

- Engage with other African communities in a mutual beneficial way,
- Measure the impact by the success of African scholars and students,
- Measure the success by the return of African scholars and students to develop programs in Africa,
- Science Engagement should be treated in the same footing as Teaching and Research
- Physics/Science Education Scholarship should be recognized just like any other physics/science research
- We need a clear collective dream
- We need to look beyond SA borders
- We need to strengthen the SADC and Sub-Sahara region to contribute to the continental efforts.
- SAIP Office is coordinating the efforts already – they need the support of the community
- See Brian Masara's talk