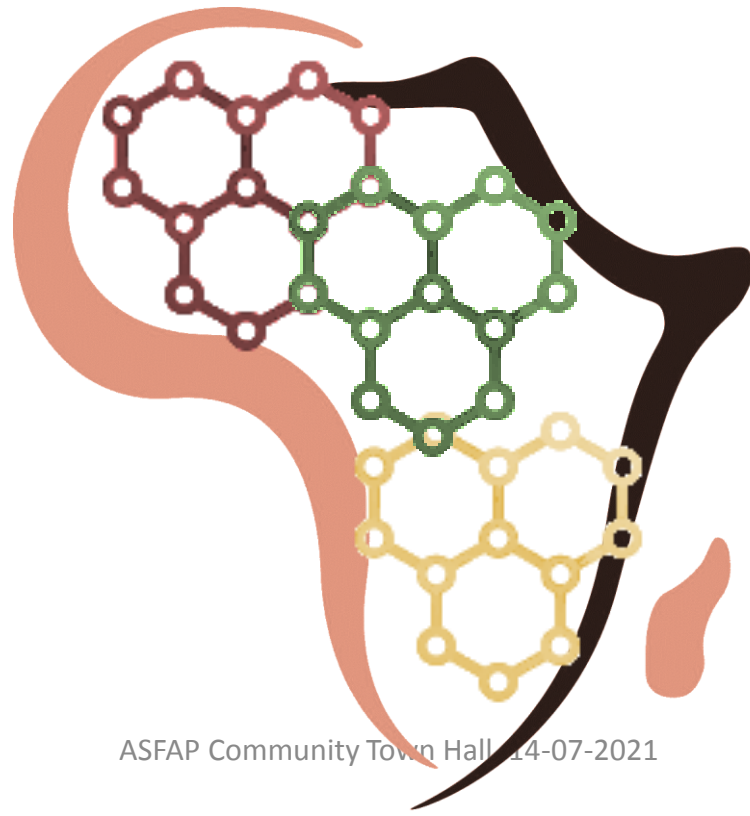


African Strategy for
Fundamental and Applied Physics



ASFAP Community Town Hall

Materials Physics WG





ASFAP Community Town Hall



Materials Physics WG

Sonia Haddad







Faculty of Sciences of Tunis Tunis
University of Tunis El Manar



Materials Physics WG

Co-conveners



NAME	AFFILIATION	African origin/Diaspora	
Balla Diop Ngom	Cheikh Anta Diop University, Dakar	Senegal	
David Dodoo-Arhin	University of Ghana	Ghana	
Samuel Chigome	Botswana Institute for Technology Research and Innovation	Botswana	
Sonia Haddad	University of Tunis El Manar	Algeria/Tunisia	

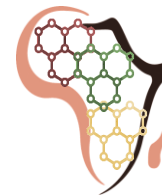


Materials Physics WG

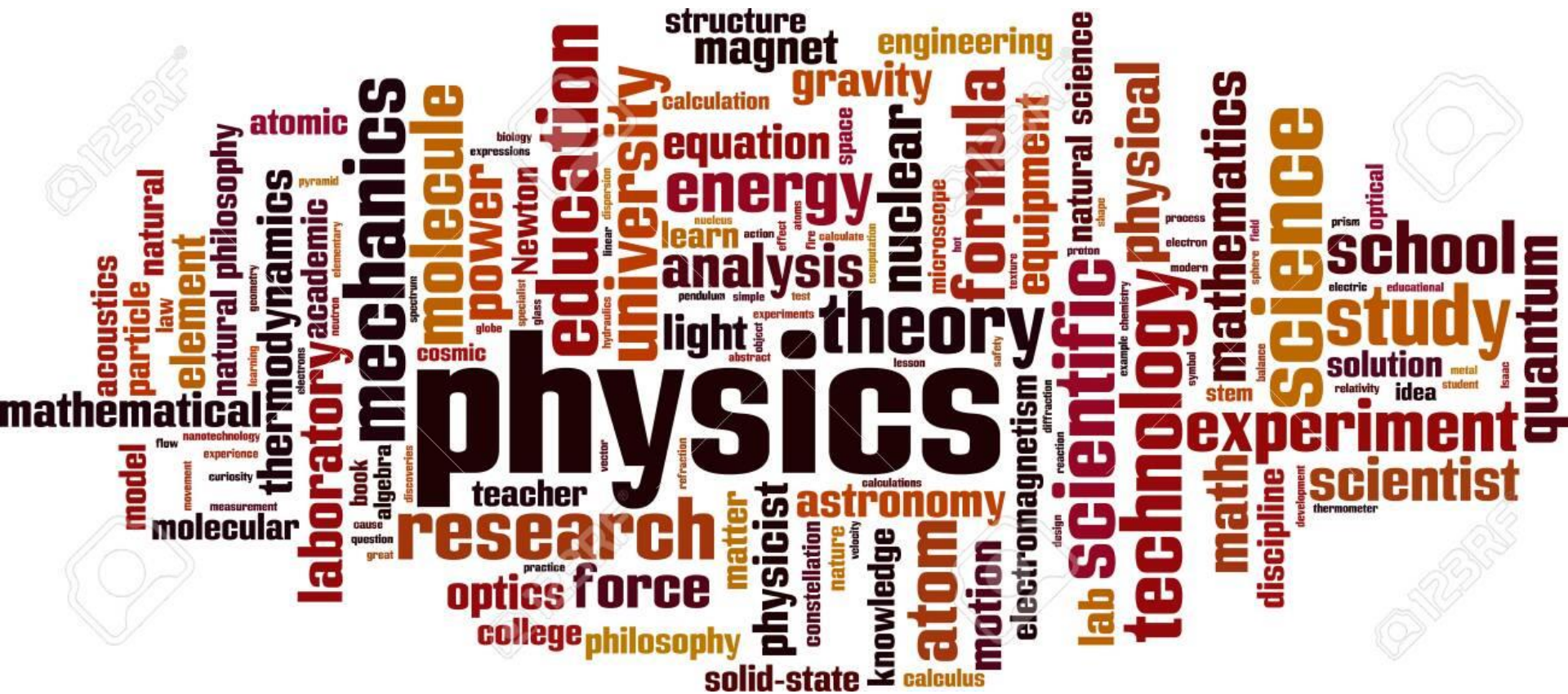


Observers Committee members

NAME	AFFILIATION	
Dr. Lawrence Norris	USA	
Prof. Oumar Ka	Cheikh Anta Diop University, Dakar, Senegal	



ASFAP ... thank you





ASFAP ... thank you

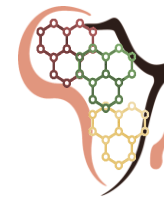


1927 Solvay Conference

**Here Are All The
People Who Made
Me Fail In Exams.**



ASFAP ... thank you



Meeting between Africans Physicists...

Egbe family...



H.E. Prof Sarah Anyang-Agbor



Prof. Daniel Ayuk Mbi Egbe



ASFAP ... thank you



Meeting between Africans...

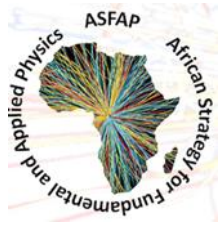
Haddad family...



Sonia Haddad, Tunisia



**Prof. Elias Sideras-Haddad,
South Africa**



Why Materials Physics?

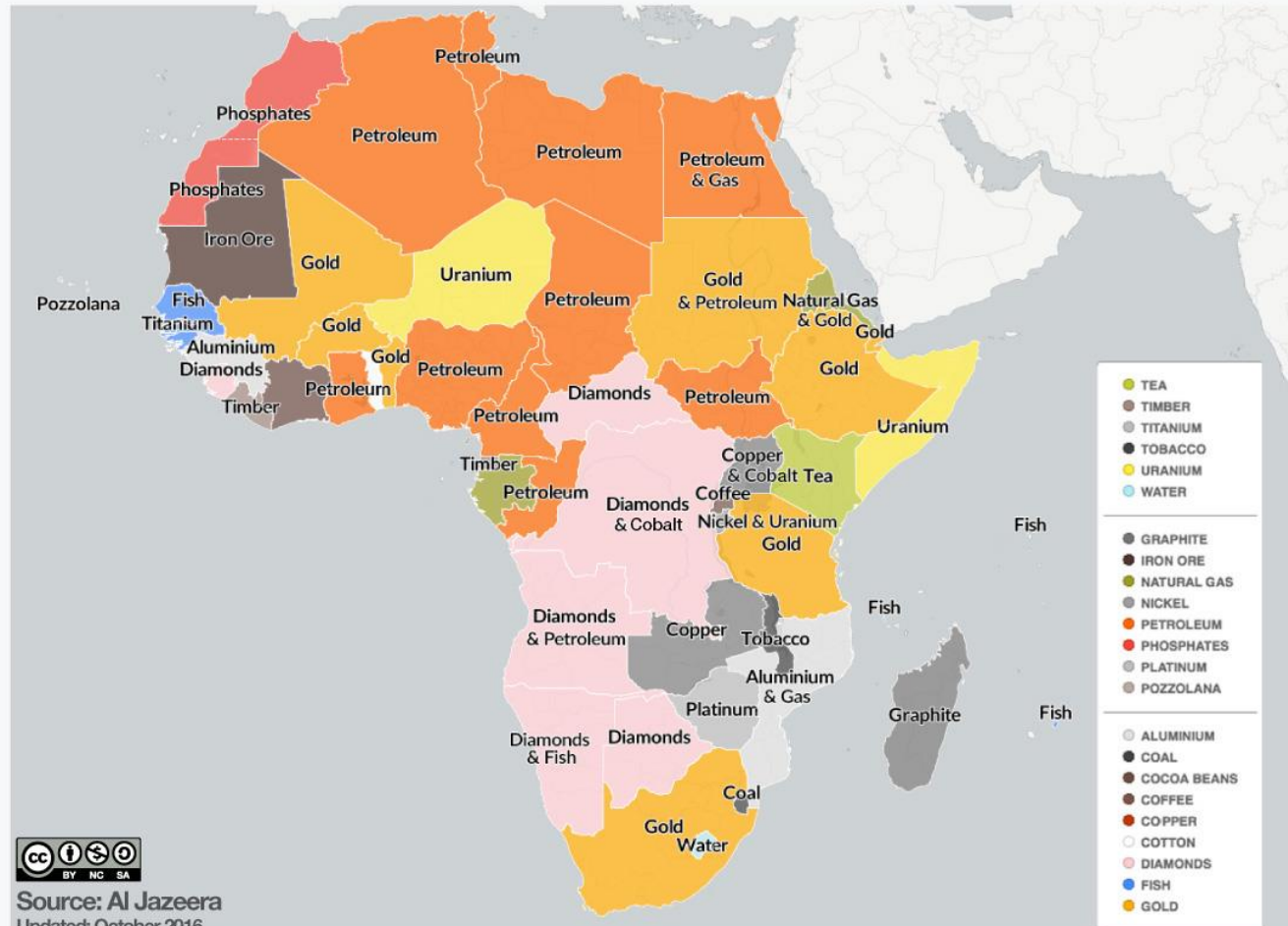


- Introduction: Scientific issues
- Organizational issues :
 - what is done ?
 - **What Should be done ?**



Why Materials Physics?

Mapping Africa's natural resources



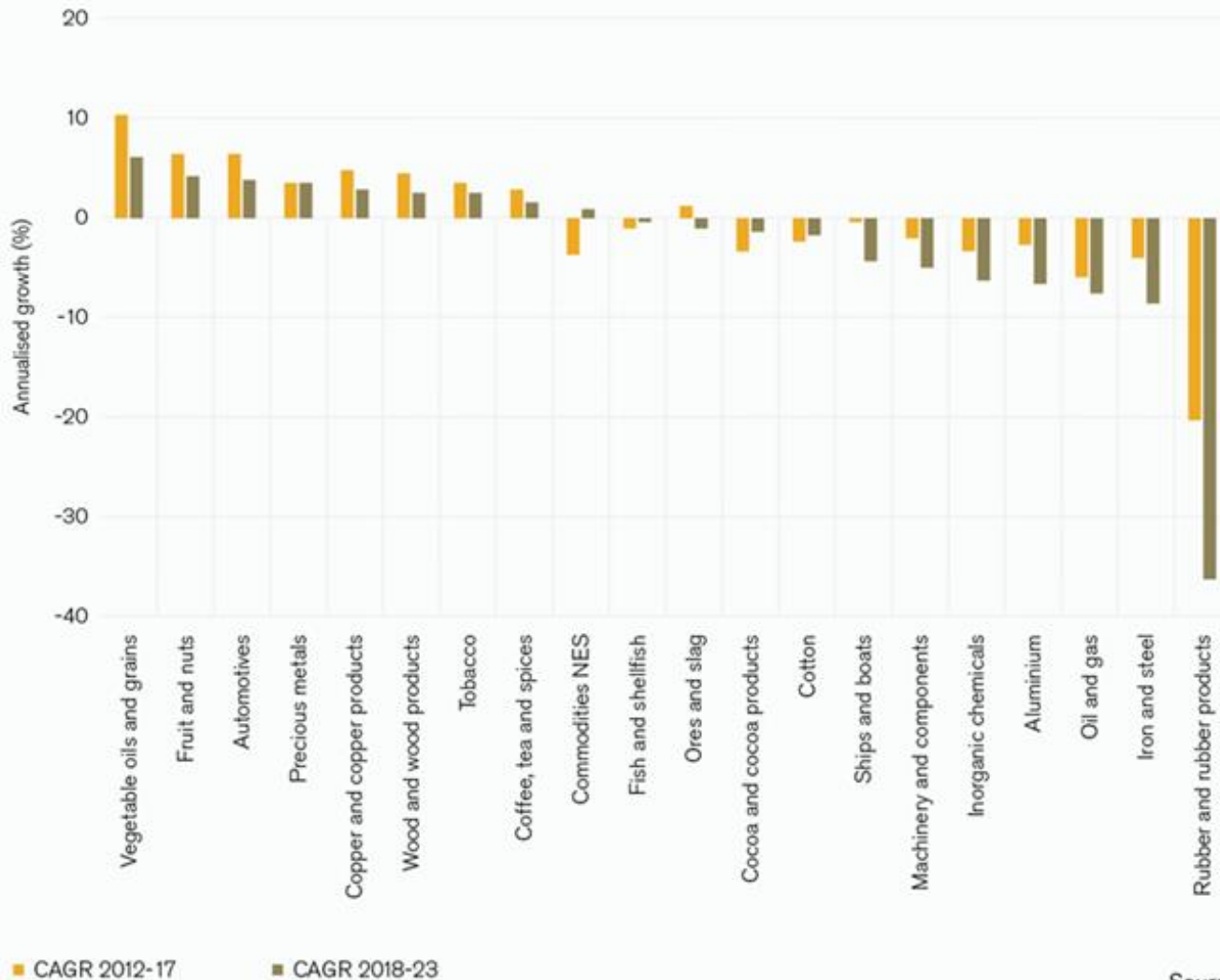
Source: Al Jazeera
 Updated: October 2016

Why Materials Physics?



Export

Top Sub-Saharan Africa export sectors, 2013-2017 and 2018-2023 (projected)

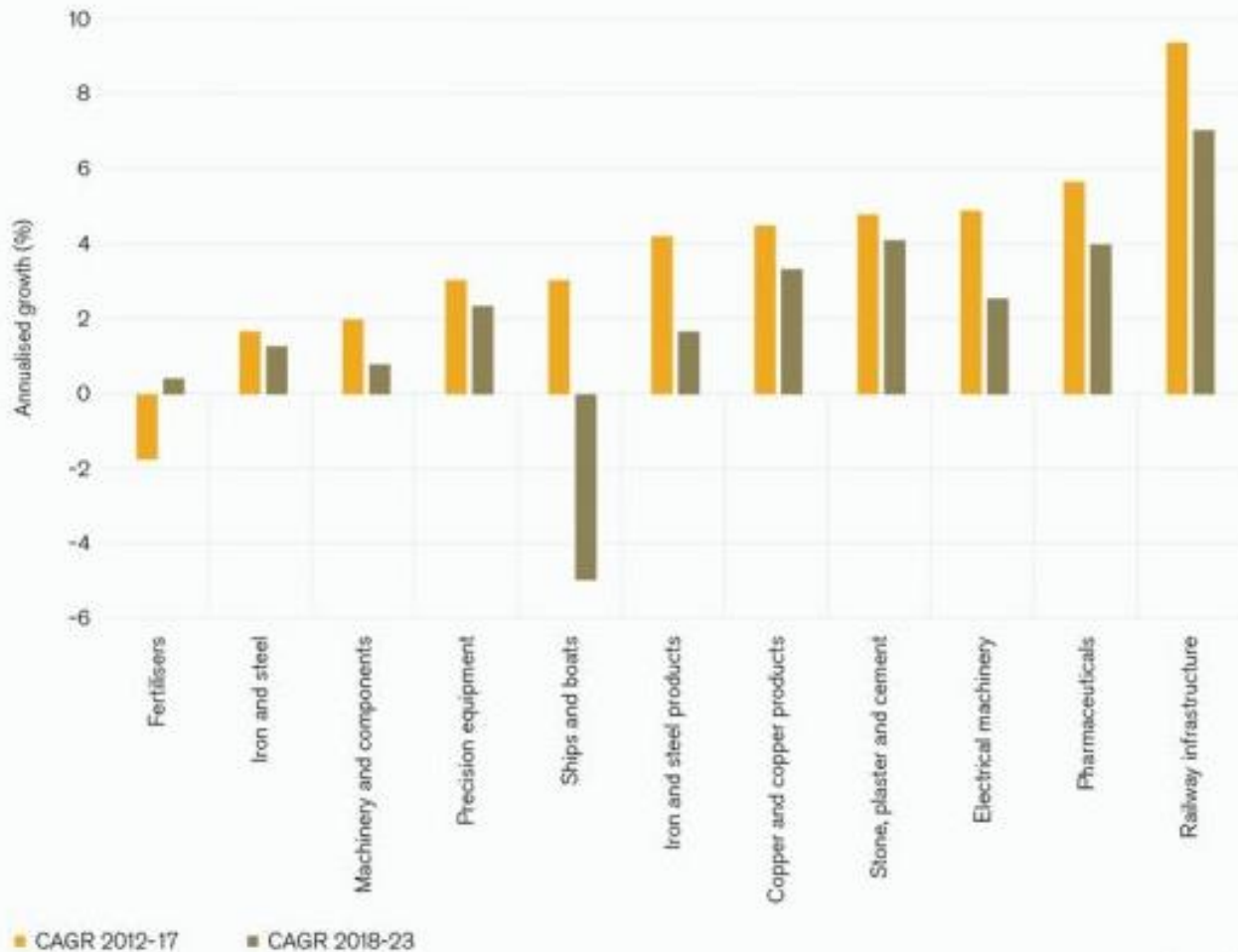


Why Materials Physics?



Import

Key infrastructure imports to Sub-Saharan Africa, 2012-2017 and 2018-2023 (projected)



Why Materials Physics?



Energy with peanuts (co-convener Dr. Balla Balla Diop Ngom)



GENIE D'AFRIQUE

www.Geniedafrique.com



Why Materials Physics?



Preserve Natural resources and sustainability

c&en
CHEMICAL & ENGINEERING NEWS

TOPICS ▾

MAGAZINE ▾

COLLECTIONS ▾

VIDEOS

JOBS



MATERIALS

Can synthetic horns and tusks offer hope against poachers?

Some researchers think lab-grown rhinoceros and elephant mimics could dampen illegal hunting, but conservationists disagree

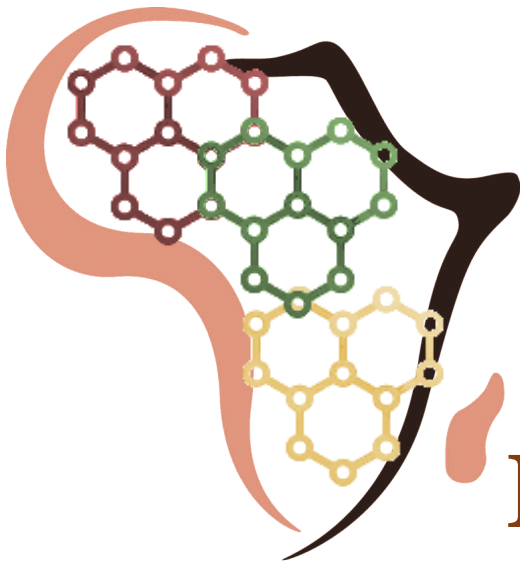
by *Melissa Pandika*, special to C&EN

January 22, 2018 | A version of this story appeared in **Volume 96, Issue 4**

New perspectives on emerging advanced materials for sustainability

APL Materials **8**, 070402 (2020); <https://doi.org/10.1063/5.0019300>

Judith L. MacManus-Driscoll¹, Ram Seshadri², and Anthony Cheetham¹



Materials Physics WG

Condensed Matter and Materials Physics WG

Materials physics is the use of [physics](#) to describe the physical properties of materials. It is a synthesis of [physical sciences](#) such as [chemistry](#), [solid mechanics](#), [solid state physics](#), and [materials science](#). Materials physics is considered a subset of [condensed matter physics](#) and applies fundamental condensed matter concepts to complex multiphase media, including materials of technological interest.



WIKIPEDIA



Materials Physics WG



Condensed Matter and Materials Physics WG

“It is obviously important that African countries prioritize education and support applied research. However, I argue that it would be a grave mistake to do that in the absence of an excellent fundamental research agenda”.

Nithaya Chetty, University of the Witwatersrand, Johannesburg, South Africa
Physics (2021)



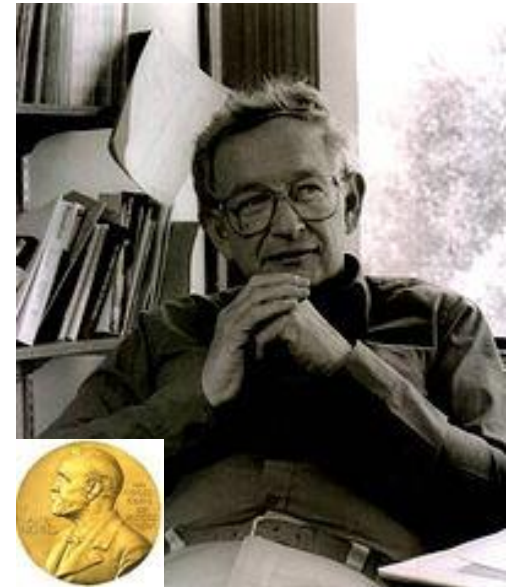
Why Condensed Matter and Materials Physics?



"More is different!"

P.W. Anderson

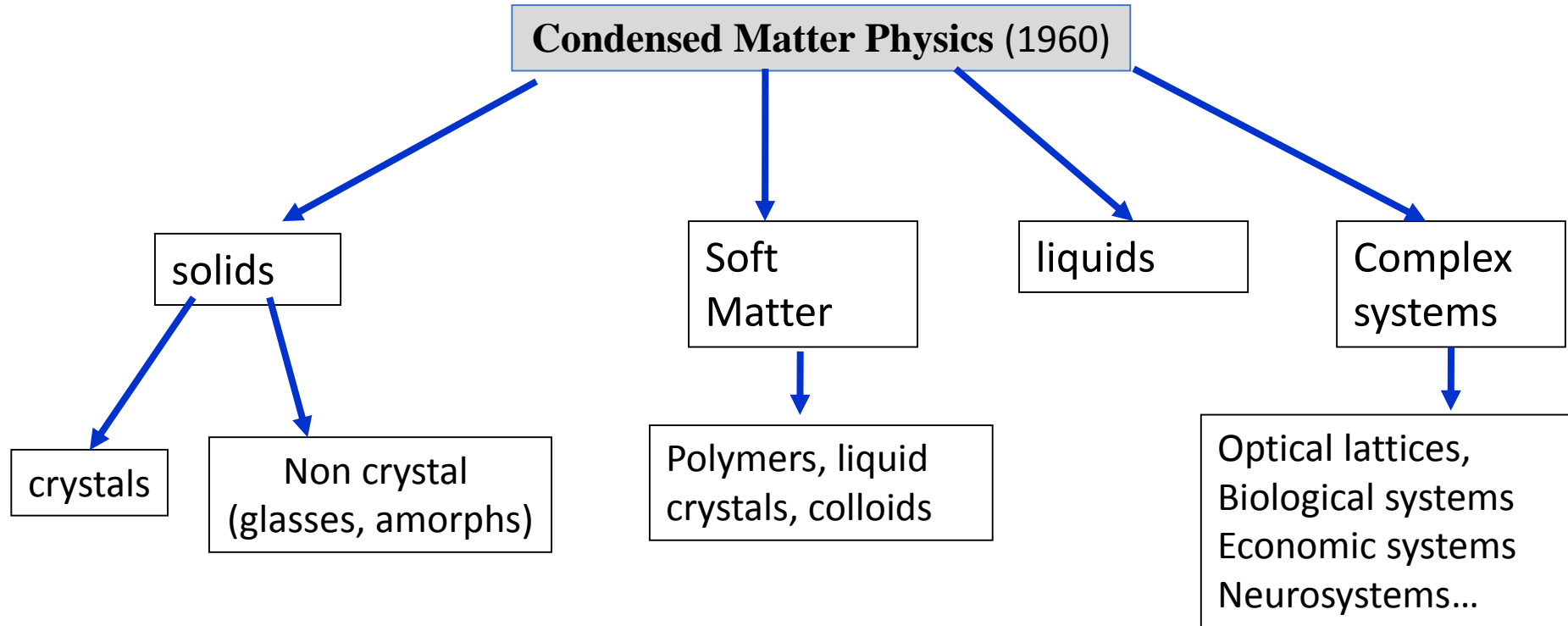
$$1+1 \neq 2$$



Why Condensed Matter and Materials Physics ?



Condensed matter physics deals with systems of great number of interacting particles (constituents)





Condensed matter physics

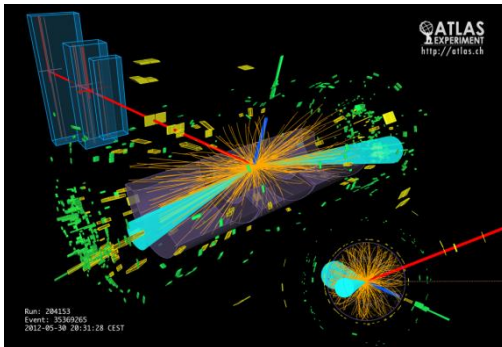
- fundamental science
- Understand the behavior of interacting systems
- foundations for technology developments (semiconductors, superconductors, NMR, Colliders, spintronics...)
- Prediction and realization of new materials and phenomena **topological states**, superconductivity, **Higgs mechanism**, **Majorana fermions...**)



Higgs mechanism :

key ideas first introduced by **Phil Anderson in 1963** in superconductors

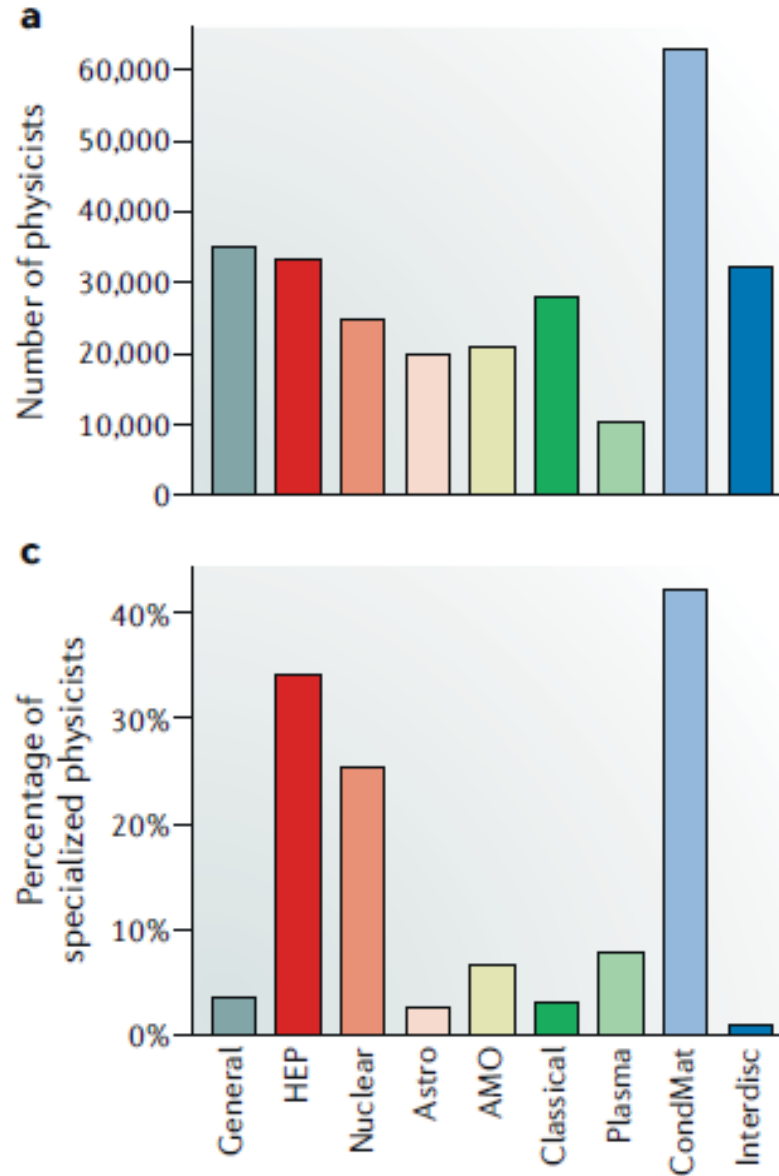
mimic Higgs field in graphene-like material



Condensed Matter and Materials Physics in the world



Condensed matter physics in the world

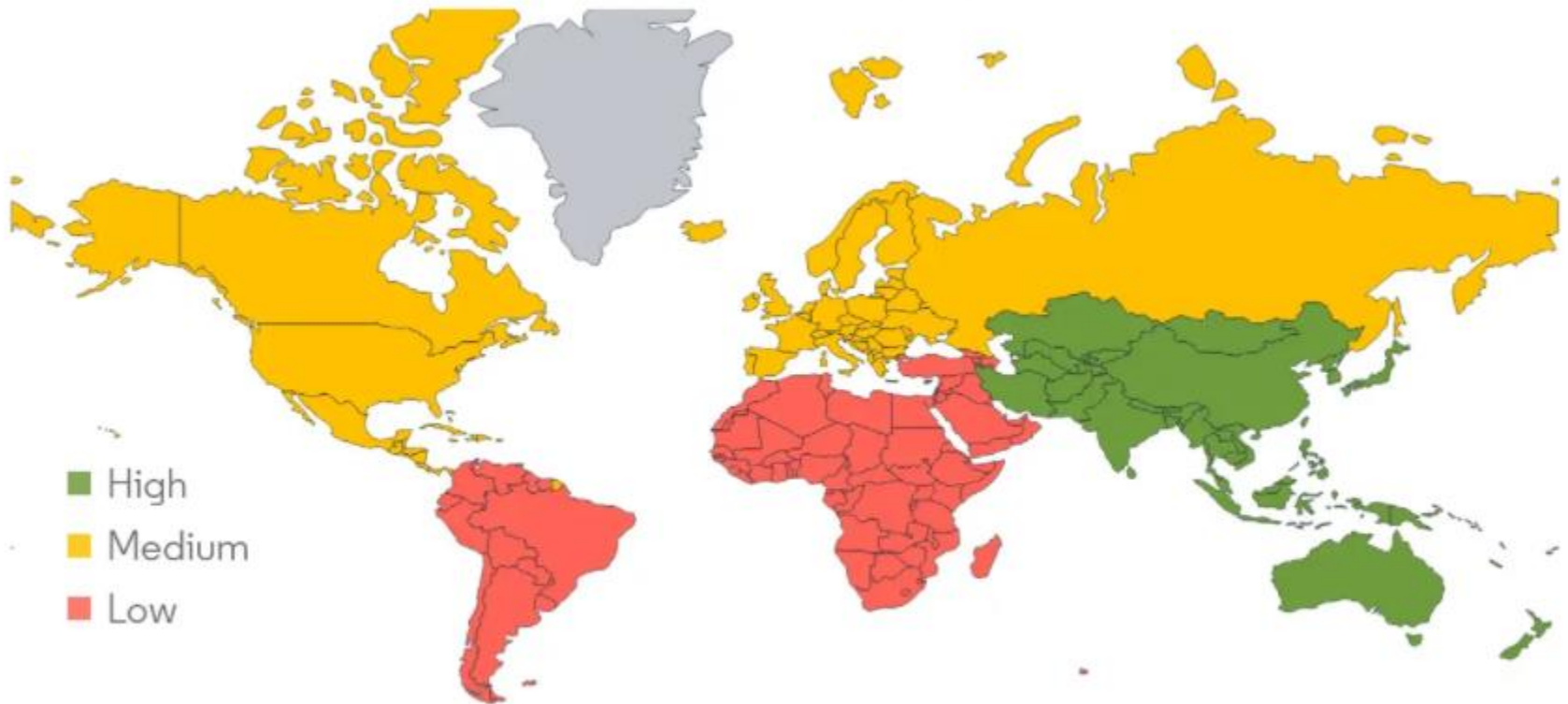


Nature Reviews Physics (2019)

Condensed Matter and Materials Physics in the world

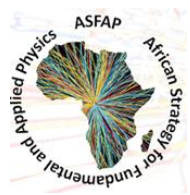


Graphene Market - Growth Rate by Region, 2021-2026



Source : Mordor Intelligence





Condensed Matter and Materials Physics in the world



Market Summary
CAGR 70 %



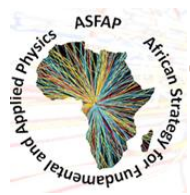
Study Period: 2016 - 2026

Base Year: 2020

Fastest Growing Market: Asia Pacific

Largest Market: Asia Pacific







CAGR: >70 %



VIEWPOINT

Nature (2020)

Physics in Africa

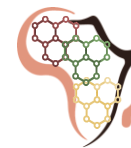
Rabia Salihu Sa'id , *Ibiyinka Fuwape*, *Alain Moise Dikandé* ,
Jamal Mimouni, *Francis Hasford* , *Delia Haynes* , *Igle Gledhill* ,
George Amolo , *Omololu Akin-Ojo* and *Nashwa Eassa*

Abstract | Africa tends to be isolated and sometimes forgotten when it comes to scientific research and in particular physics. But the region has great potential, being home to the youngest population in the world, and despite a variety of issues, there has been steady, albeit uneven progress towards establishing a scientific infrastructure. Ten African researchers discuss the diverse challenges and opportunities faced by physicists across the continent.

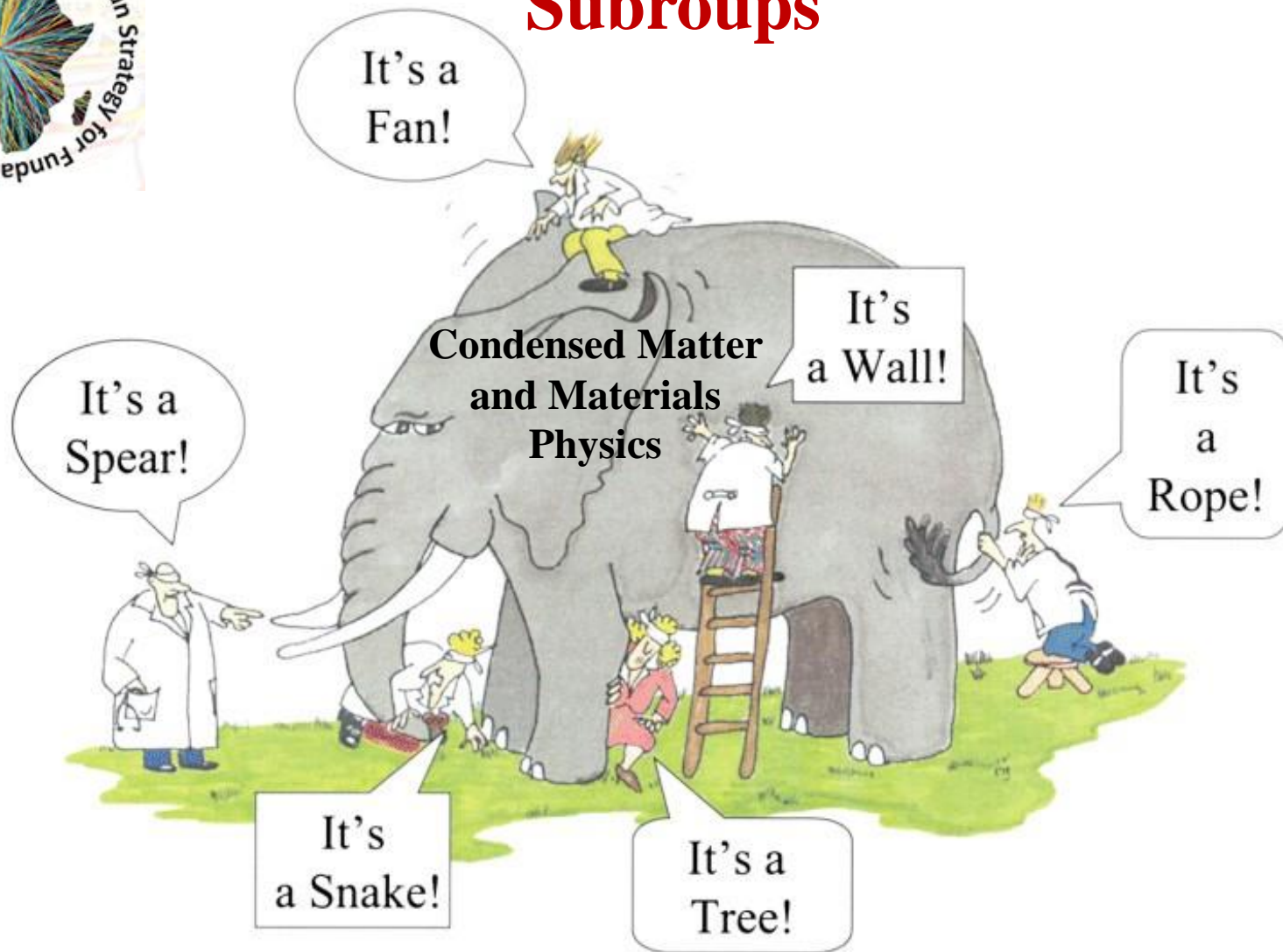


Condensed Matter and Materials Physics WG

- Introduction
- Scientific issues
- Organizational issues :
 - what is done ?
 - **What Should be done ?**



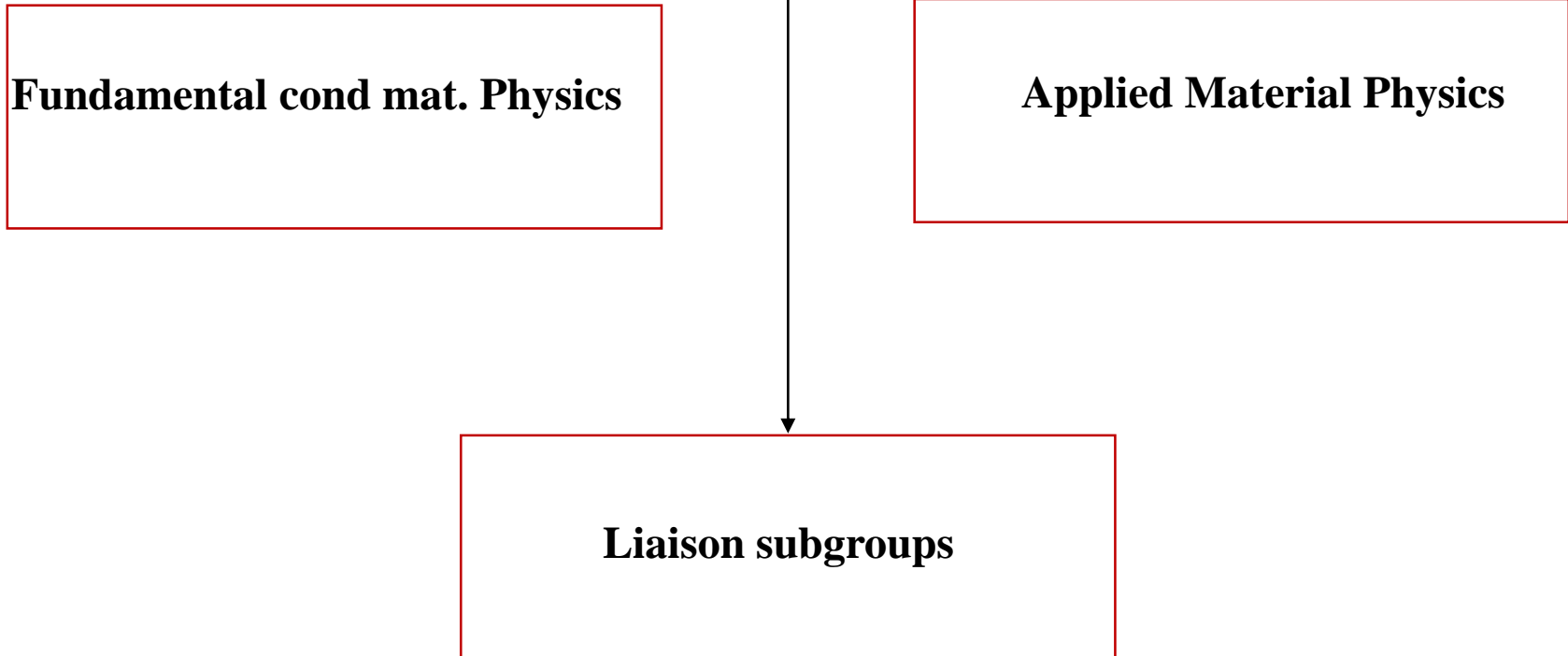
Subroups

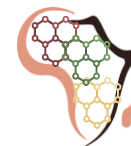
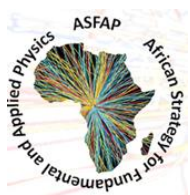




what is done?

Three main Subgroups





what is done?

Fundamental Physics Subgroups

Subgroup	Co-conveners	African origin/Diaspora
1. Theoretical and computational Condensed Matter Physics	Omololu Akin-Ojo Lalla Btissam Drissi	ICTP-EAIFR, Rwanda Univ. Mohammed V, Morocco
2. Quantum Matter and topological Materials	Sihem Jaziri Nedjma Bendiab	Univ. Carthage, Tunisia Neel Institute, (France)
3. Advanced 2D materials and heterostructures	Abdelkarim Ouerghi	Univ. Paris-Saclay
4. Quantum revolution	Inès Safi Hichem Eleuch	Univ. Paris-Saclay Univ Abou Dhabi (UAE)
5. Superconducting and magnetic materials	Samia Charfi Kaddour Nicola Spaldin	Univ Tunis El Manar ETH Zürich



Subgroup	Co-conveners	African origin/Diaspora
1. Soft matter	Raidh Neffati	Univ. Abha, KSA
2. Nanomaterials	Malek Maaza	South Africa
3. Materials for optics and quantum transport	Sihem Jaziri	Univ. Carthage, Tunisia
4. Materials for energy	Daniel Ayuk Mbi Egbe Elias Sideras-Haddad,	University Linz, Austria Univ. Witwatersrand, South Africa
5. Materials for water purification	Mohammed Khenfouch	Univ Mohammed V, Morocco
6. Materials for biology	Prof Raouf Medimagh	Université de Versailles (France)
7. Materials for Electronics	Faycal Djeflal	University of Batna, Algeria
8. Construction and manufacturing Materials		
9. Materials Physics and entrepreneurship	Timmo van der Beek	Tunisia



Liaison Subgroups

Subgroup	Co-conveners	African origin/Diaspora
1. Women in Cond mat and Material Physics	Sihem Jaziri	Univ. Carthage, Tunisia
2. Education and outreach in Cond mat and Material Physics		
3. Instrumentation		
4. Optics		
5. Energy		



what is done?

- **Call by email to join ASFAP groups (subscribe via CERN account)**
(only 15 persons !)
- **Ask for engagement of the Tunisian General Director of Research**
- **and Directors of Research Centers**

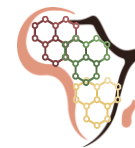


Condensed Matter and Materials Physics



what should be done?

- Call by email to join ASFAP groups (subscribe via CERN account, **google forms**)
- Engage African organizations to inform and attract members to ASFAP
- Engage universities, research institutions by MoU (call for LoI)
- Create African Platform to share Instrumentations and facilities
- Organize **Panel discussions sessions** on ASFAP during African Physics events



AFRICAN M·R·S

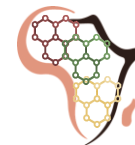
African Materials Research Society



African Physical Society



“SAVE THE DATE”



11th International Conference of the African Materials Research Society

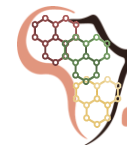


AMRS 2022

Preconference workshop 11-12 December 2022
Main conference 13 – 16 December 2022
Dakar - SENEGAL

Contact: Prof Balla Diop Ngom
Email: balla.ngom@ucad.edu.sn / **Website:** <https://africanmrs.net>

<https://africanmrs.net/senegal-2022/>



Nanotechnology Research and Innovation Bootcamp

Dates: 10 -13 August 2021

Venue: Virtual (AMRS Zoom)

Theme:

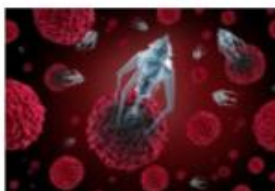
Harnessing Nanotechnology for Sustainable Development in Energy, Water, Health and Agriculture



TRANSFORMING
AGRICULTURE AND FOOD
SECURITY



PROVIDING CLEAN WATER



REVOLUTIONIZING
HEALTHCARE



PROVIDING SUSTAINABLE
ENERGY

Overview:

The African Materials Research Society (AMRS) in collaboration with the United Nations Economic Commission for Africa (UNECA) is organizing a Nanotechnology Research and Innovation Bootcamp. The Bootcamp is aimed at developing Undergraduate students, Graduate students, and Postdocs with an interest in using nanotechnology for the development of Africa. A total of 100 participants from the five regions of Africa will be selected upon evaluation of their applications. The evaluation aims at selecting a maximum of 20 participants from each of the five regions of Africa. Through interaction with mentors, discussions in focused ideation groups and attending lectures delivered by world experts over the duration of the bootcamp, talents will be nurtured. At the end of the bootcamp, 5 participants will be selected for further mentoring at an institution of a world expert in nanotechnology. The expectation is that at the end of the placement period, each of the mentees will either venture into nanotechnology entrepreneurship or nanotechnology research for the development of Africa. AMRS will facilitate the funding for the placement of the 5 mentees. It is the intention of AMRS to make the nanotechnology bootcamp an annual event with the hope that it will stimulate interest in nanotechnology for the development of Africa.

Click link to apply: <https://africanmrs.net/nanotechnology-bootcamp-2021/>

Important Dates:

- **Deadline for applications:** 20th July 2021
- **Notification of the outcome of applications:** 1st August 2021

Inquiries: Prof Dickson Andala at africanmrs.secretariat@gmail.com

Thank you for your attention

**Africa
tech.**

Silicon Valley