Introduction to the ICTP and HPC related activities

Mission - An institute run by scientists for scientists

- Foster the growth of advanced studies and research in physical and mathematical sciences, especially in support of excellence in developing countries.
- Develop high-level scientific programmes keeping in mind the needs of developing countries, and provide an international forum of scientific contact for scientists from all countries.
- Conduct research at the highest international standards and maintain a conducive environment of scientific inquiry for the entire ICTP community.
- Thanks to the generous funding from the Italian Government, UNESCO and the IAEA, ICTP has been able to initiate and implement various schemes of support and assistance to scientists from developing countries.

The Abdus Salam
International Centre
for Theoretical Physics

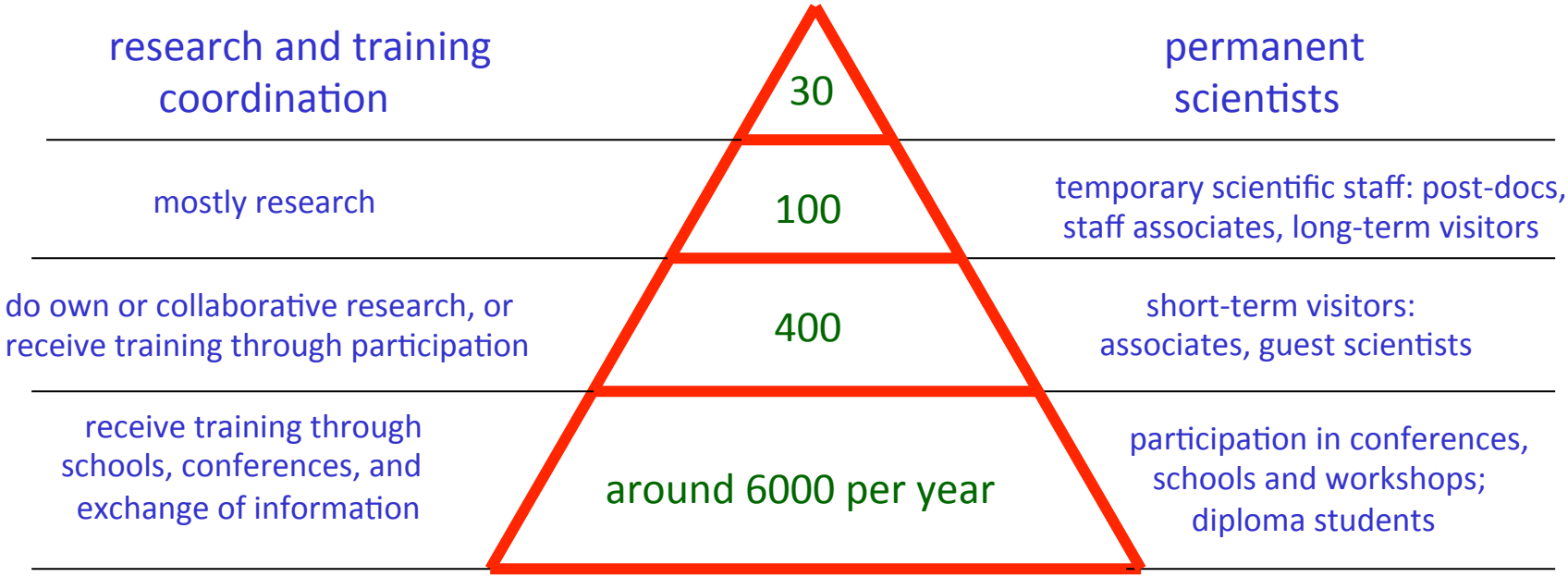
United Nations
Educational, Scientific and
Cultural Organization

IAEA
International Atomic Energy Agency

ICTP Partner Institutes

- Mesoamerican Centre for Theoretical Physics has been established in Mexico in collaboration with the Universidad Autónoma de Chiapas (UNACH).
- The ICTP Eurasian Centre for Advanced Research (ICTP – ECAR) is a new regional centre of ICTP, which is currently in the process of being established in Turkey based on the agreement between ICTP and İzmir Institute of Technology (IZTECH).
- The ICTP South American Institute for Fundamental Research, ICTP SAIFR, is a regional centre for theoretical physics created in collaboration with the State University of Sao Paulo (UNESP) and the Sao Paulo Research Funding Agency (FAPESP).
- Future centres are planned for Rwanda and China.

ICTP from Trieste to the World



ICTP in Numbers

https://www.ictp.it/media/1354002/ictpinnumbers16.pdf

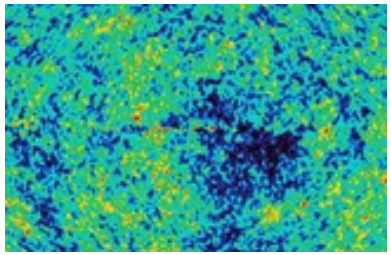
PRE-PHD PROGRAMMES	DEGREE PROGRAMMES	CAREER DEVELOPMENT	LABORATORY OPPORTUNITIES	SCIENTIFIC OUTREACH
ICTP Postgraduate Diploma Programme	Joint ICTP/SISSA PhD Programme in Physics and Mathematics	Conferences, workshops and schools	Training and Research in Italian Laboratories	Office of External Activities
ICTP/IAEA Sandwich Training Education Programme	Joint PhD Programme, Earth Science and Fluid Mechanics	Junior Associates	ICTP-ELETTRA Users Programme	ICTP Partner Institutes
	Physics PhD Program	Regular Associates	ICTP Laboratories	Science Dissemination Unit
	Joint Masters in Physics	Senior Associates		African Review of Physics
	Joint ICTP/Collegio Carlo Alberto Program in Economics	Federated Institutes		ICTP in East Africa
	International Master, Physics of Complex Systems	OFID Postgraduate Fellowship		Physics Without Frontiers
	Master of Advanced Studies in Medical Physics	The Kuwait Programme at ICTP		
	Masters in High Performance Computing			

ICTP Scientific Calendar

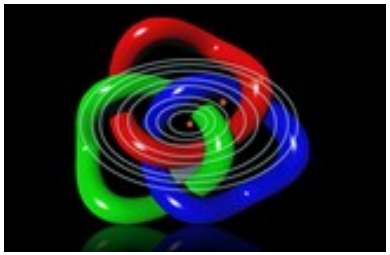
- Schools, Conferences, Workshops around the year
- Half of them on subjects related to main research areas (core)
- The rest on many subjects:
  medical physics, optics, nano physics, plasma physics, electronics, high performance computing, biophysics, satellite navigation, science dissemination and e-learning, m-science, entrepreneurship, nuclear physics (IAEA), teacher training, 3-D Printing, etc...
- http://www.ictp.it/scientific-calendar.aspx

Scientific Sections

High Energy Cosmology and Astroparticle Physics

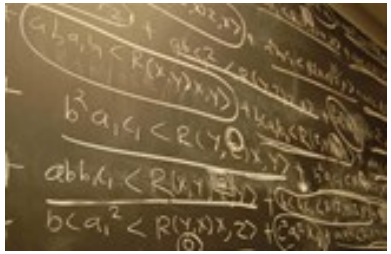


Condensed Matters and Statistical Physics



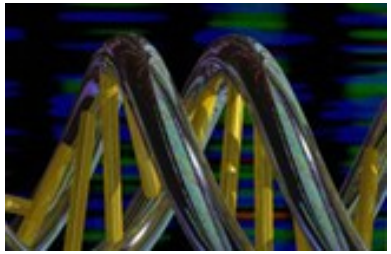
Earth System Physics

Mathematics



Applied Physics

New areas



HPC Staff and Collaborators

Dr. David Grellsheid
Herwig Software Manager
@ Durham University

Dr. Axel Kohlmeyer
Full Professor of Research
@ Temple University

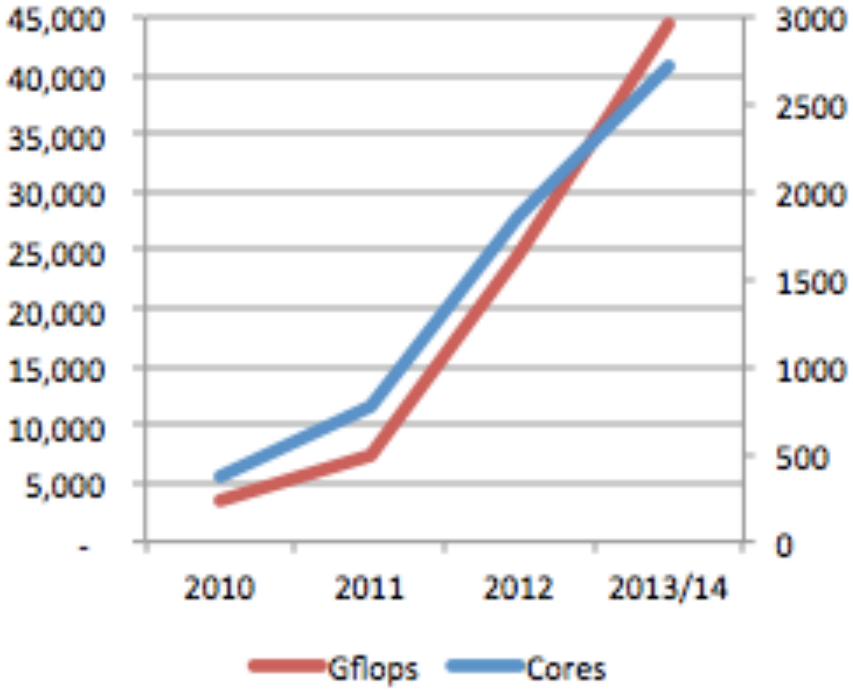
Dr. Clement Onime
Responsible IT/HPC Infrastructure
@ ICTP

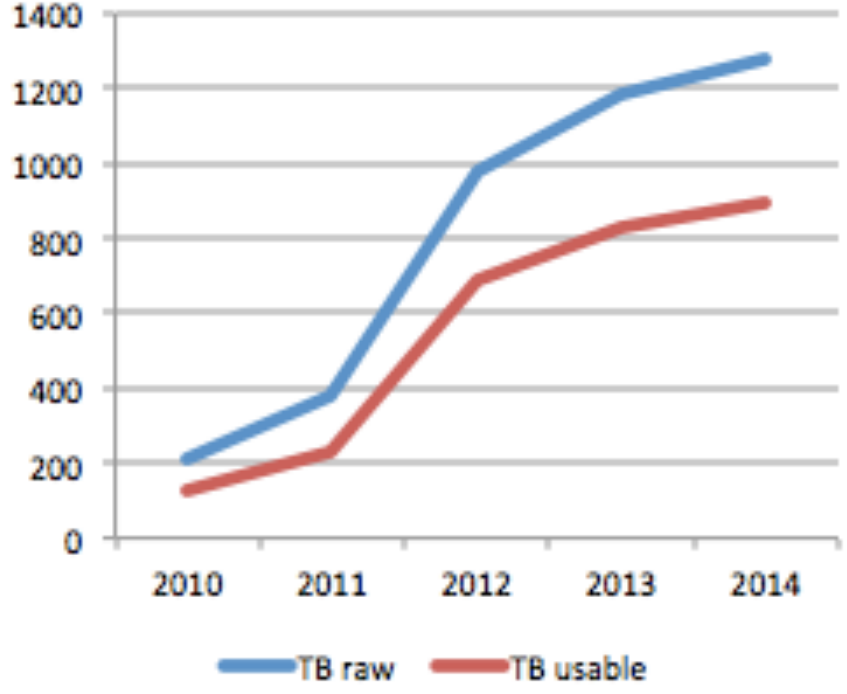
me
HPC Application Specialist
@ ICTP

High-Performance & Scientific Computing activities at the ICTP

- HPC service and HPC application consulting
  - in house HPC facility (Argo)
  - support for grant for computing resources on national service (CINECA) and EU infrastructure HPC service (PRACE)
  - research enablement on massively parallel systems for HPC
- Training on HPC and Scientific Programming (2018):
  - School of HPC and Parallel Programming @ Abacus/CINSTAV (MEX), Feb 2018
  - Advanced Workshop for Collaborative Development

ARGO & storage





CODATA-RDA School of Research Data Science

December 4 – 15, 2017

São Paulo, Brazil

ICTP-SAIFR/NCC-UNESP

Home | Lecturers | Registration | Preliminary Program | Photos | Additional Information

The ever-accelerating volume and variety of data being generated is having a huge impact on a wide variety of research disciplines, from the sciences to the humanities. The international, collective ability to create, share and analyse vast quantities of data is having a profound, transformative effect. This 'Data Revolution' offers great opportunities for students with modern data skills, both in conducting their research and in entering a jobs market where those skills are in demand.

Contemporary research – particularly when addressing the most significant, transdisciplinary research challenges – cannot be done effectively without a range of skills relating to data. This includes the principles and practice of Open Science and research data management and curation, the use of a range of data platforms and

MHPC in pills: www.mhpc.it

- high-level educational program: not an Ms.C. program!
- intensive training aimed to build knowledge in solving complex problems with an HPC approach
- Innovative, hands-on based training
- Aimed to people with strong interest in:
  - advanced programming for scientific computing
  - software optimization
  - management of computing platforms
  - data management and data analytics

Background Requirements

- Candidates must have some experience in programming and a competence in at least one of the languages between C, C++ and/or Fortran
  - Python knowledge is a plus
- A sound knowledge of Linux operating system
- Master level of a scientific degree is required
- No prior HPC knowledge is assumed
- Enthusiasm is a must

The Curricula

1 year program divided in 6-8 months courses and 6 month project (some overlap)

Mandatory

- Scientific Programming Environment
- Introduction to Computer Architectures for HPC
- Object Oriented Programming
- Parallel Programming
- Introduction to Numerical Analysis
- Advanced Computer Architectures and Optimizations
- Parallel Data Management and Data Exchange
- High Performance Computing Technology
- Best Practices in Scientific Computing

Optional Choice

- Data structures, sorting and searching algorithms in serial and parallel
- Lookup tables, cell lists and neighbor lists
- Domain decomposition techniques
- Parallel FFT techniques
- Parallel Linear Algebra
- Multipole expansion, multi-grid methods
- Adaptive Meshes
- Maximum likelihood techniques
- Cluster or network or graph analysis
- Monte Carlo methods
- Agent-based models
- Automatic differentiation
- DFT from source to code