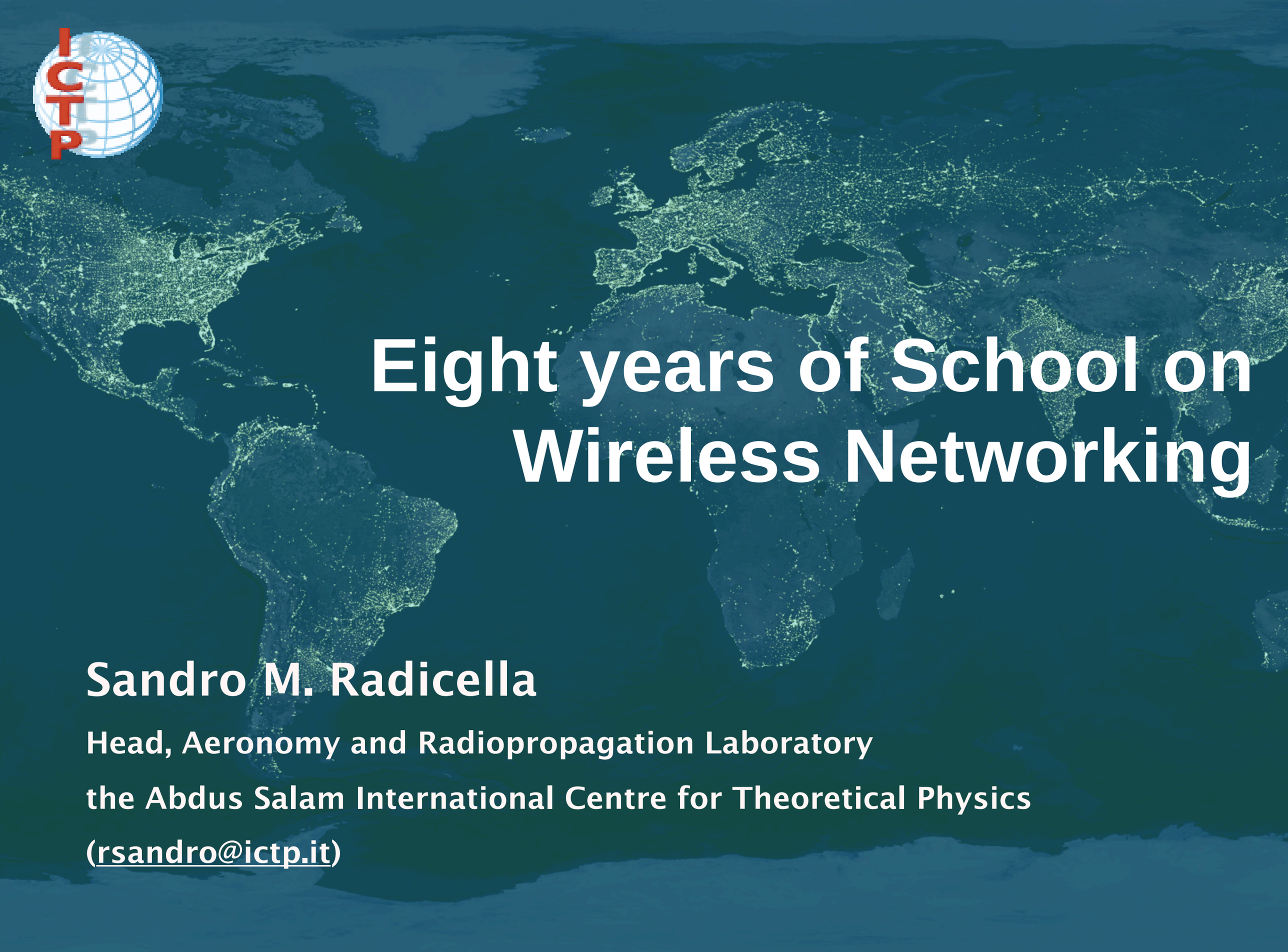


Eight years of School on Wireless Networking

Sandro M. Radicella

Head, Aeronomy and Radiopropagation Laboratory

the Abdus Salam International Centre for Theoretical Physics

(rsandro@ictp.it)

Introducing ICTP

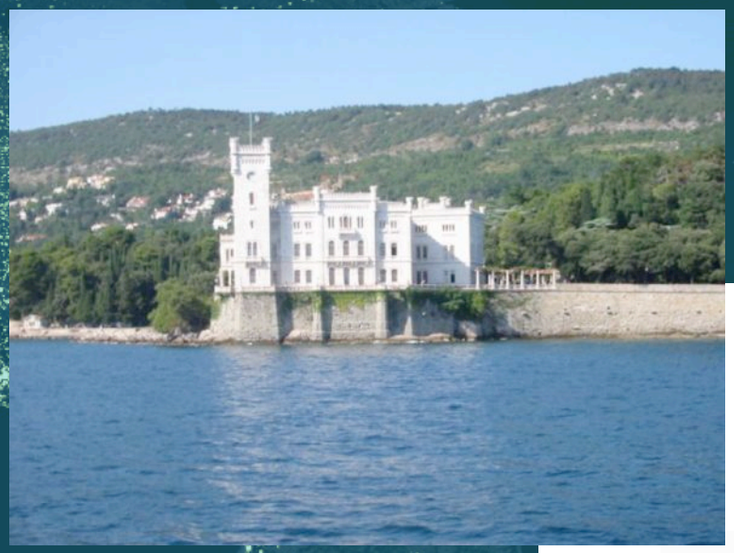
- Founded in 1964 by Abdus Salam, 1979 Nobel Laureate in Physics, ICTP operates under a tripartite agreement between two United Nations Agencies—UNESCO and IAEA—and the Government of Italy.

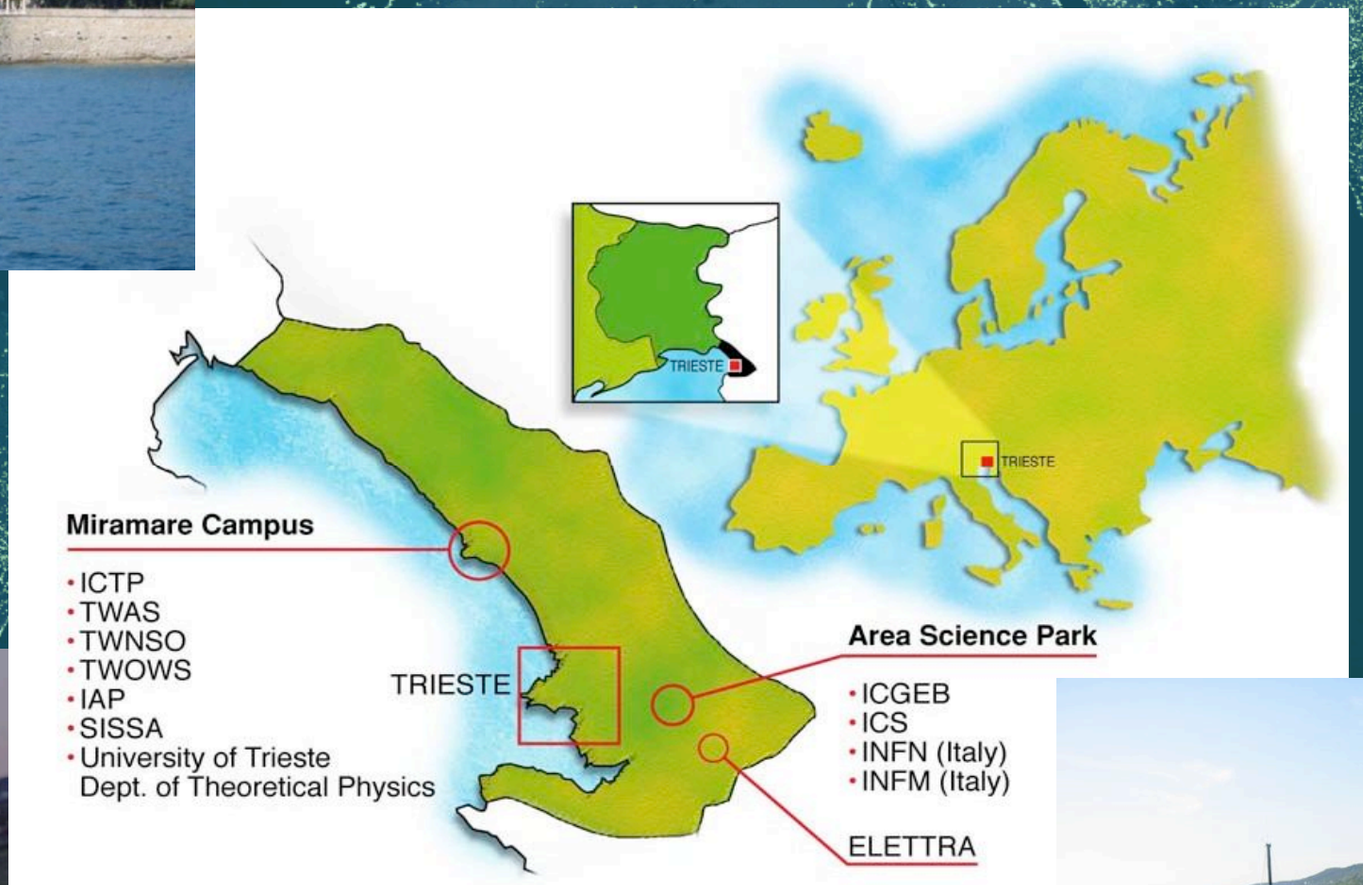
- ICTP's mission is to foster the growth of advanced studies and research in developing countries.

- Some base funding is provided by UNESCO and IAEA, some programmatic funding by SIDA, the Kuweit Foundation and others, but the largest (~82%) of the Center's budget comes from Italy.

- ICTP's working principle is that creating scientific knowledge is important and sharing it with others is at least as important

Where is located



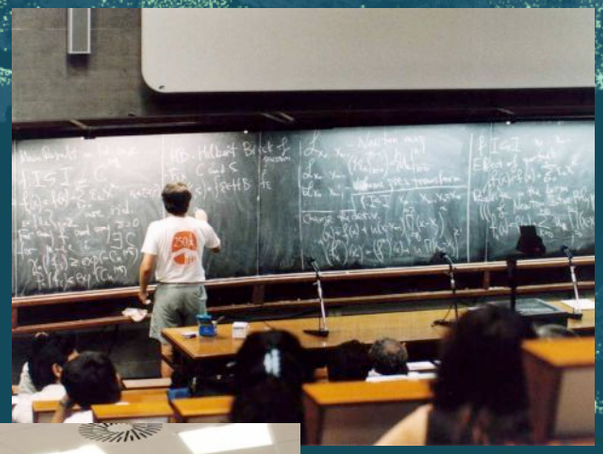


Training activities and people

- Today, the ICTP offers many courses, conferences and workshops in emerging physics and math-related fields.
- During 2005, 53 activities (including hosted activities) were carried out in Trieste and 9 outside Trieste.
- ICTP is an institution run by a few scientists for the benefit of many:

In house research

- Applied physics (AP)
- Condensed matter and statistical physics (CMSP)
- Earth system physics (ESP)
- High energy, cosmology and astroparticle physics (HECAP)
- Mathematics (Math)
- ICTP-INFN Laboratory (Mlab)

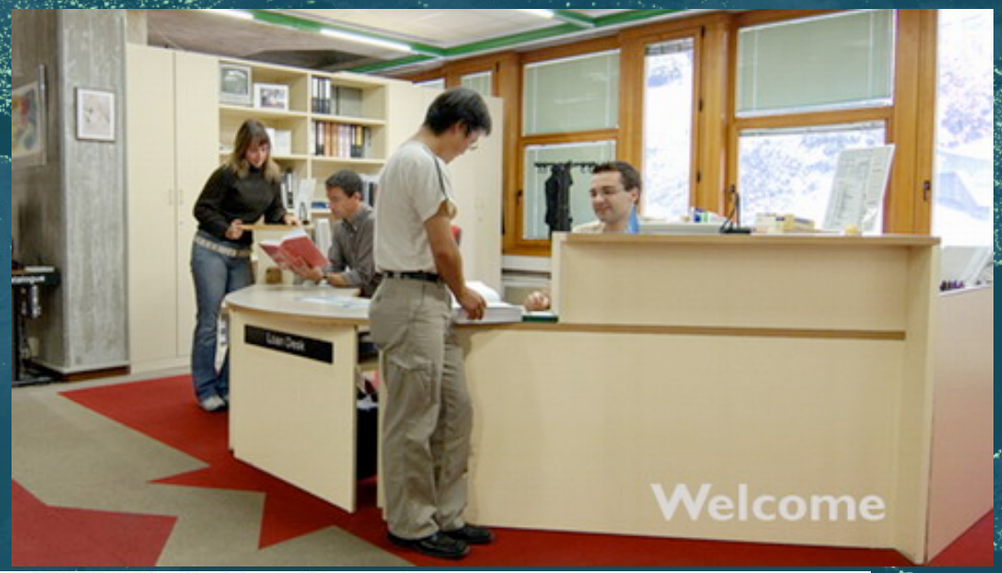


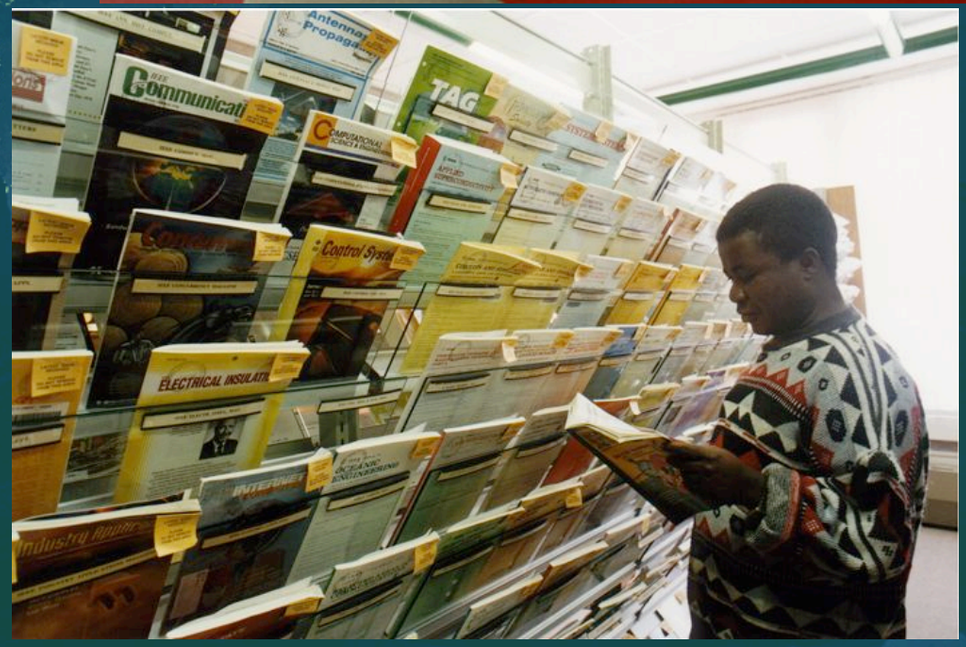
The ICTP Library

Books-print	63.000
Books-electronic	833
Journal subscriptions-print	466
Journal subscriptions-electronic	3,300
Periodical bound volumes	48,565

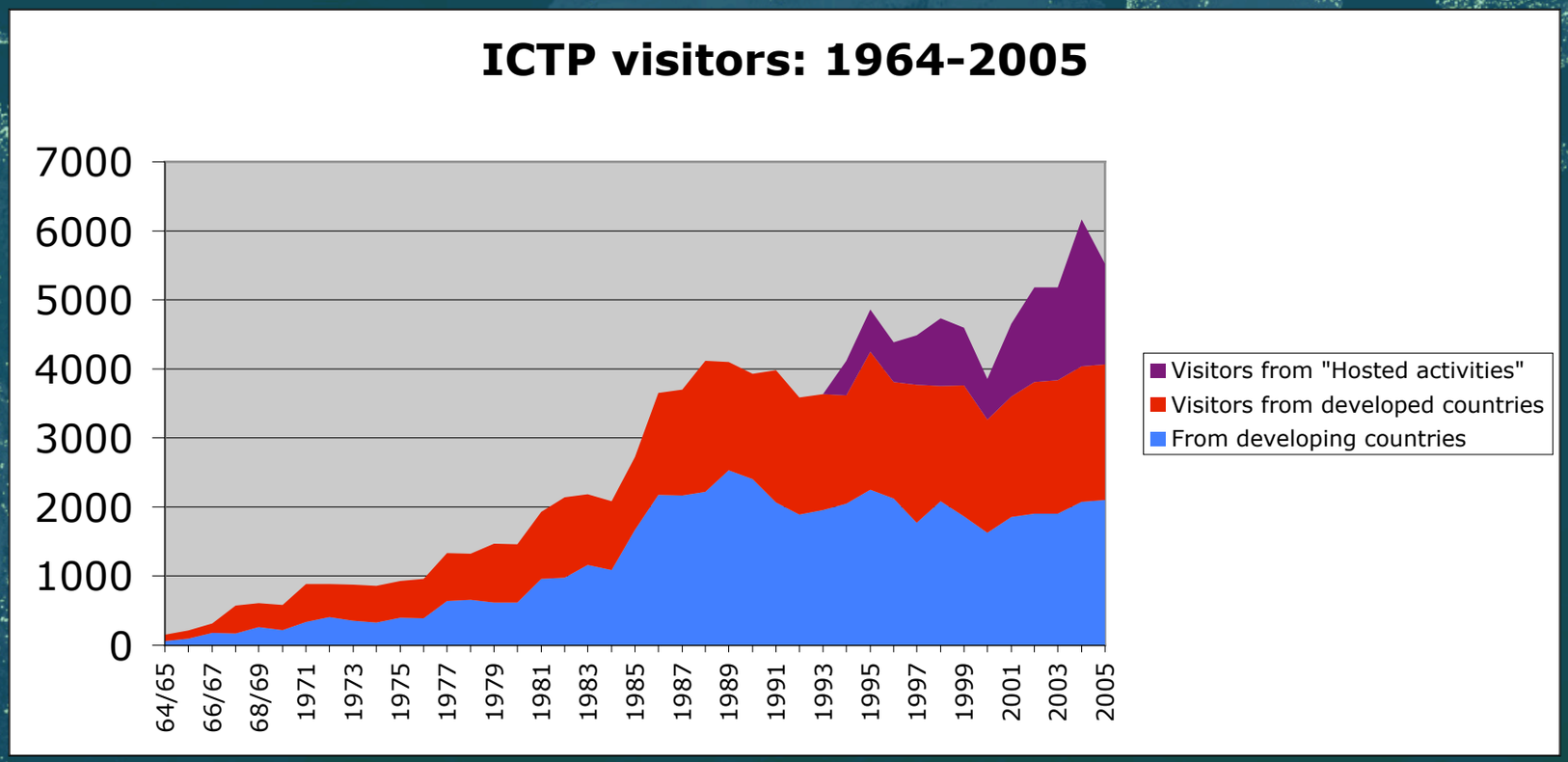
Access to repository archives

On-line databases	10
Theses	1,500





The growth of ICTP



The Aeronomy and Radiopropagation Laboratory

Aeronomy Section:
Research activities:
- Ionospheric data analysis,
- Ionospheric modeling,
- Data ingestion in models
- Ionospheric effects in satellite positioning

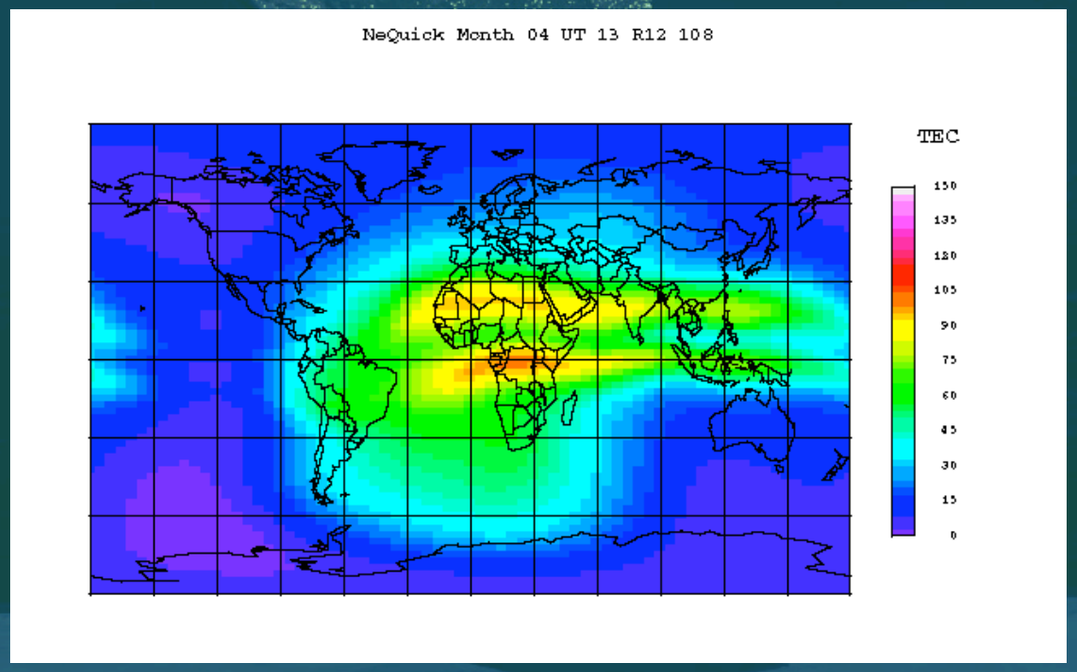
Radiocommunictions Unit:
technical support and training in the use of radio solutions for local area computer networking for academic and research institutions.

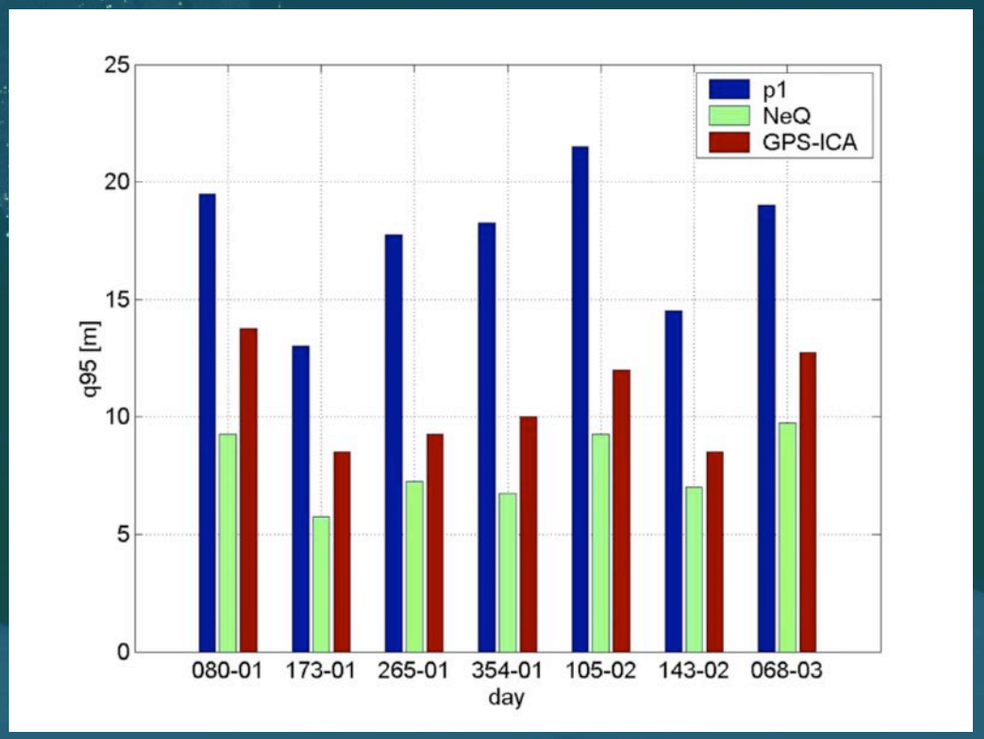
Achievements in Ionospheric research

- NeQuick electron density and TEC model developed for the EGNOS programme of ESA by the Laboratory and the University of Graz (Austria). It has been successfully used within the EGNOS End-to-End simulator and been adopted by ITU-R as one of the trans-ionospheric models in Recommendation P.531-7.

  The model will be used for GALILEO single frequency operation

- Evaluation of the effects of the ionosphere in satellite positioning on a global scale and comparison of the correction by different ionospheric models.





Radiocommunication Unit

Started its operations as result of the the signature of a Memorandum of Understanding by ICTP, ITU/BDT and URSI "*to collaborate for the advancement of human resources and [...] development capability in the field of telecommunication science and technology in developing countries*".

The unit looks for a way to bridge the Digital Divide!

The digital divide

2002 data:

Internet hosts per capita:

- 10 per cent of the world's population owns over 90 per cent of Internet hosts.

PCs per capita:

- Around 20 per cent of the world's population had access to 80 per cent of PCs.

Telephone mainlines per capita:

- 60 per cent of the world's telephone lines being available to 20 per cent of the total population.

ICT and science

Achieving scientific development depends on increased cooperation between scientists, including setting up networks of researchers and institutions.

Modern collaboration requires the use of the Internet. Network connection can be used for large-scale scientific data transfer, real-time collaboration, or access to scientific literature.

Premises

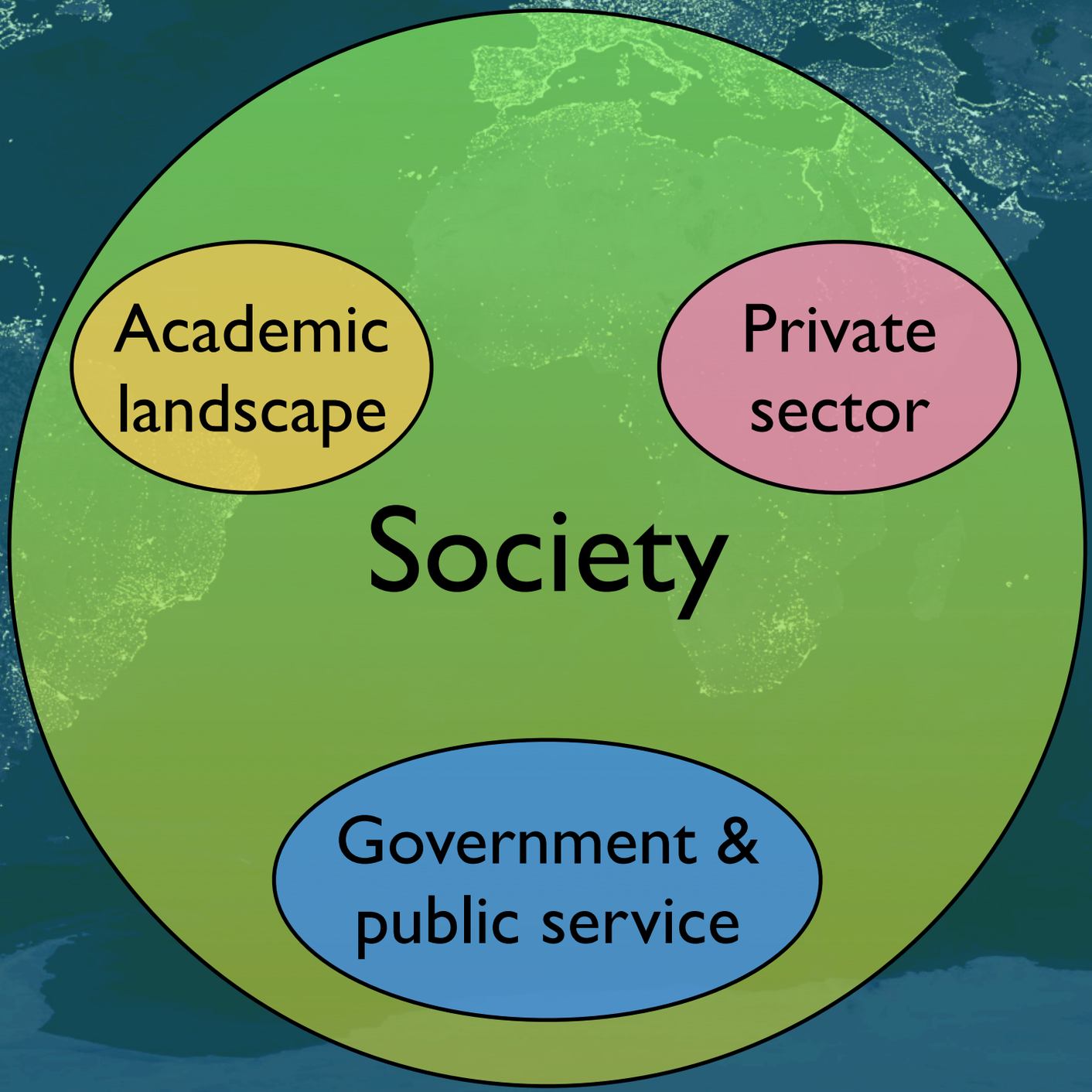
- ICT is a basic infrastructure necessary for the economic and social development of a country but also for its scientific and technological progress
- The academic community is a fundamental starting point for these efforts to permeate to the rest of society
- The underlying problem is the lack of sufficient well qualified human resources able to handle the new systems and technologies

Why ICT at ICTP ?

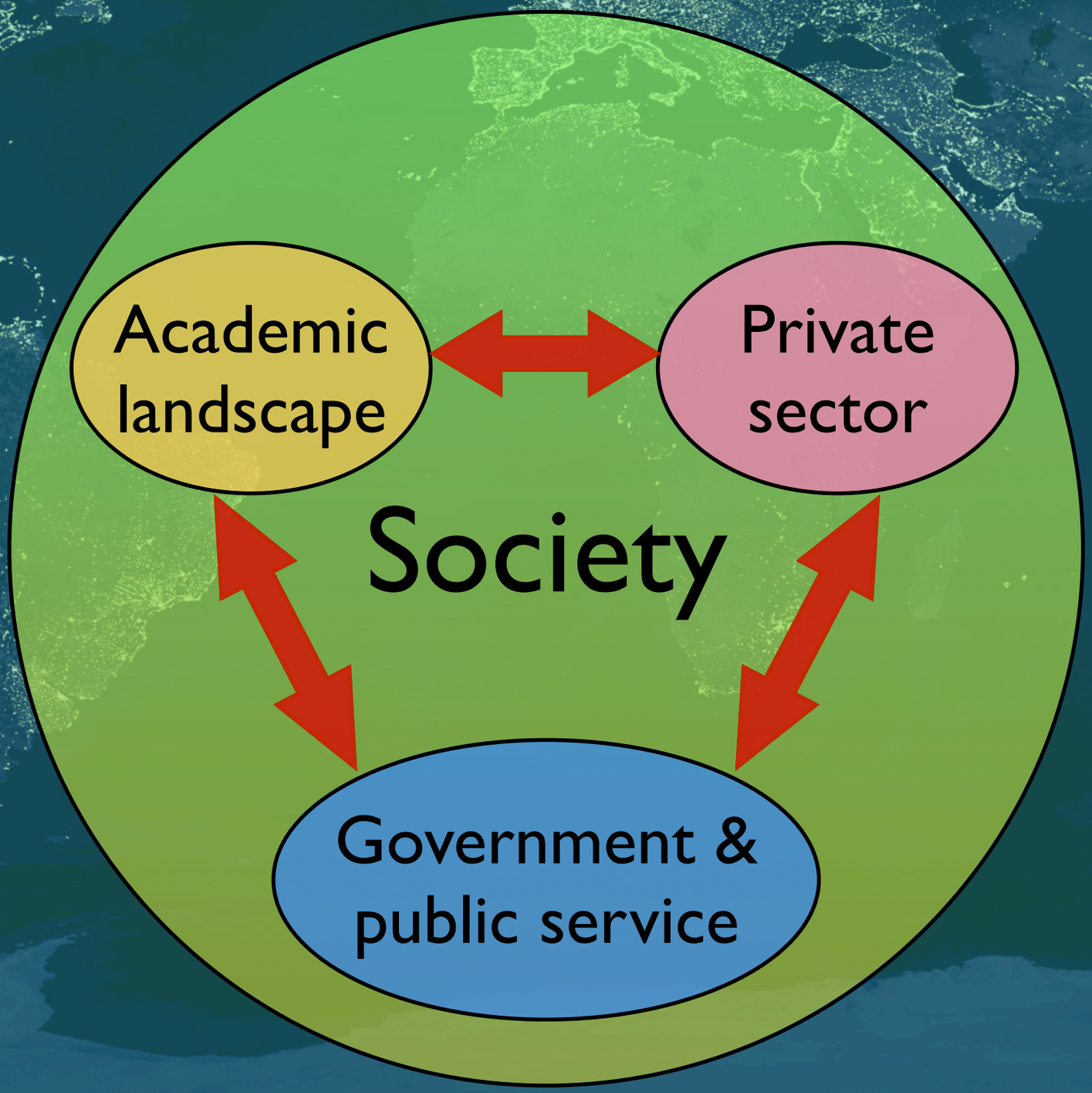
The communicated world

An outsider
(a D.C.)

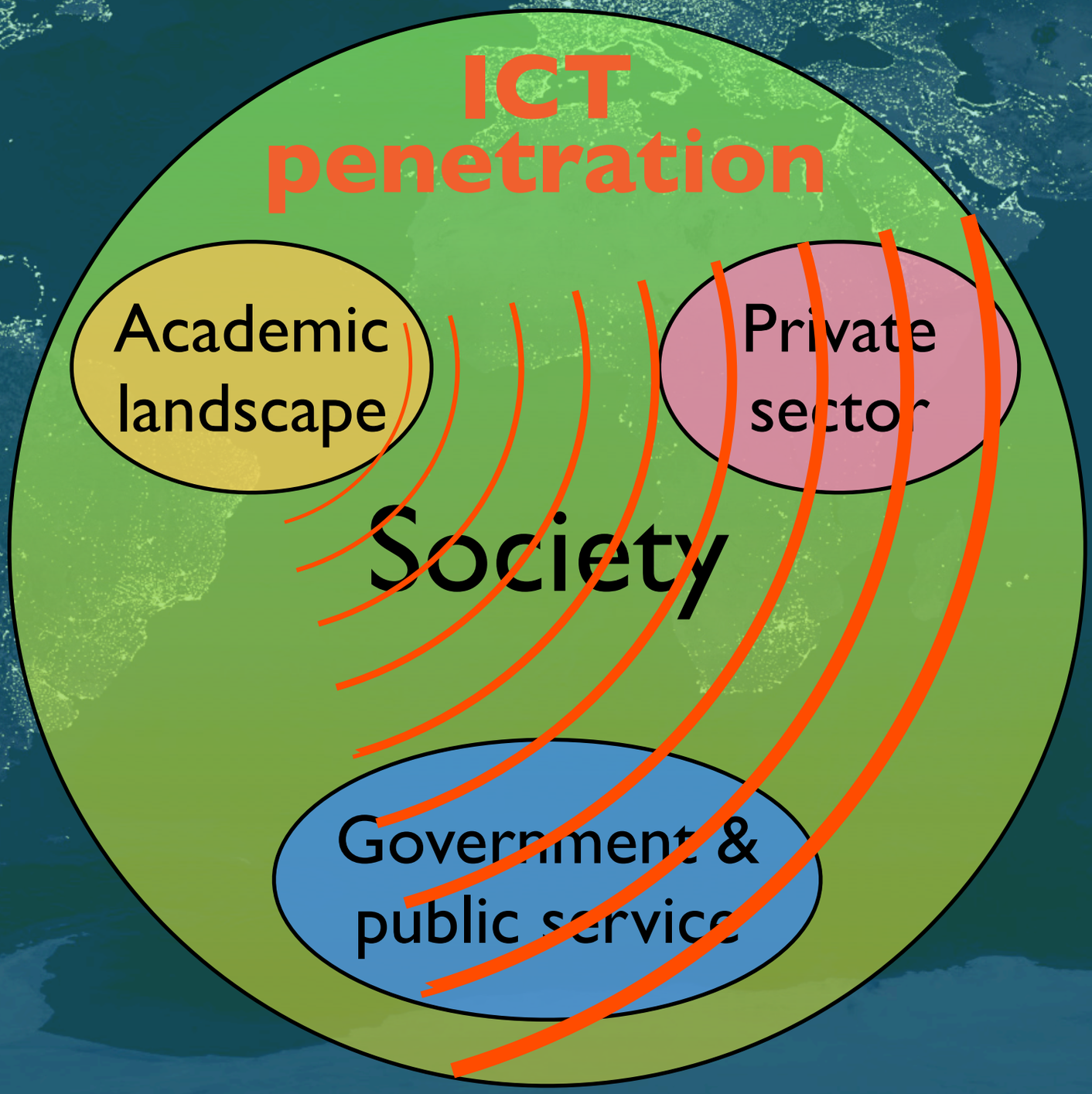
The situation within the outsider



The ideal status



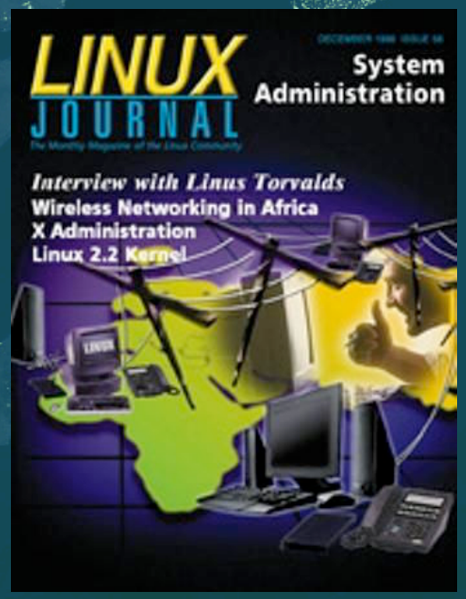
A way towards it



Before the Schools

- Activities of the “Programme of Training and System Development on Networking and Radiocommunications” (1995 - 2000)

- Pilot projects: Local Area Network at the Obafemi Awolowo University in Ile-Ife, Nigeria and link between the National Institute for Material Physics located at the Magurele Physics Platform and the node of the Polytechnic University of Bucharest, Romania



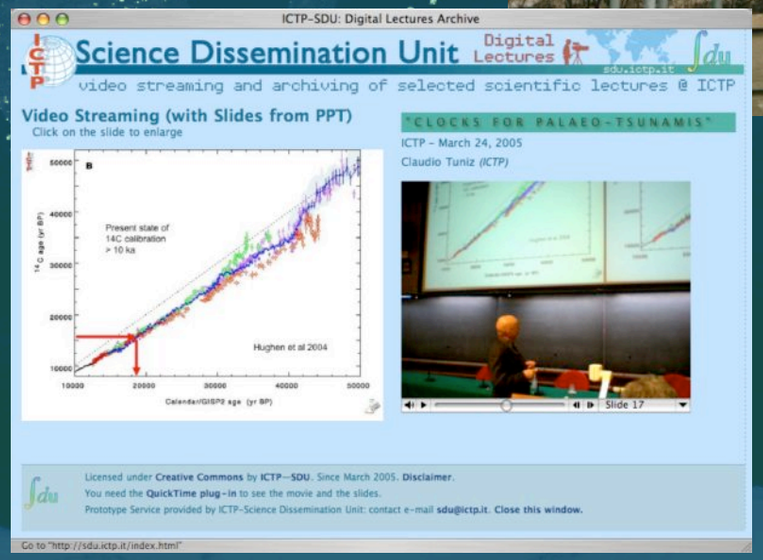
- Long training and Workshops: “NUC Capacity Building Training in Networking Technology” for Nigerian Universities (1996)...

ICT today at ICTP

ICT activities carried out at ICTP to help developing countries scientists:

- the “C”, communications, is covered by the Aeronomy and Radiopropagation Laboratory (ARPL) which deals with wireless networking

- the “I”, information, is covered by the the Science Dissemination Unit (SDU) which works on electronic scientific contents



Why wireless?

Wireless links in campus networks

- inexpensive
- easy to setup
- upgradable
- expandable
- ideal for the “last mile” solution

But needs appropriate training!

Wireless training at ICTP

- 1993 to 1996 - Activities cosponsored with ITU/BDT
- 1997 - ICTP-URSI-ITU/BDT Workshop on the use of Radio for digital communications in developing countries
- 1998 - 1st yearly “School on the use of Radio for digital communications in developing countries”
- Its 9th edition in February 2006

The Schools

From 1998 yearly Schools on the use of radio for digital communications and computer networking have been carried out with intensive use of hands-on experimental practice, including open source solutions and the construction of low cost microwaves directive antennas.

The Schools on Radio

- 1998 Use of radio for digital communications in developing countries, including spectrum management
- 1999 Use of radio for digital communications in developing countries, including spectrum management
- 2000 School on data and multimedia communications using terrestrial and satellite radio links
- 2001 School on data and multimedia communications using terrestrial and satellite radio links
- 2002 School on Radio Use for Digital and Multimedia Communications
- 2003 School on Radio Use for Information and Communication Technology
- 2004 School on Digital Radio Communications for Research and Training in Developing Countries
- 2005 School on Radio based Computer Networking for Research and Training in Developing Countries

From theoretical training to technology observatory and hands-on training

A new step

⇧

The need to link the choice of cost-effective tech with training

⇧

The question: What technology?

⇧

Courses on wireless technology for networking with emphasis on hands-on training

⇧

Theoretical courses on application-oriented topics

⇧

Theoretical courses on radiopropagation

Agreement with ITU/BDT

A Cooperation Agreement was signed by ITU/BDT and ICTP Directors in February 2004 to carry out joint activities in training and research for development of ICT in Developing Countries, with special focus on the LDC

- One activity in 2004
- Three activities carried out in 2005 (one of them in India)
- More than 100 persons trained
- Three activities programmed for 2006

ICT TO & TU

- In 2005, in the framework of the agreement, the "ICT Technology Observatory and Training Unit for Developing Countries" was created at ICTP
  - The goal is to identify the most modern and cost-effective technology to be deployed typically in academic and research institutions in Developing Countries and to train trainers in their use

"ICTP-ITU/BDT Project-Based Advanced Training on the Use of Wireless for Campus Networking"

13 June - 1 July 2005

- focus on Africa
- project-based training
- participants with wireless projects in Universities, Hospitals and Rural Areas

The TO & TU dream

ICTP
ARPL

ITU
BDT

ICT
TO & TU

Outsider

Outsider

Outsider

The communicated world

A dream

Other ICT-active countries

that is becoming reality

Science Dissemination Unit

- Since 1993, ICTP has pioneered in the implementation of Web technologies and Web-to-email gateways to help transferring knowledge and e-Journals to scientists in remote areas with low-bandwidth access to the Internet.

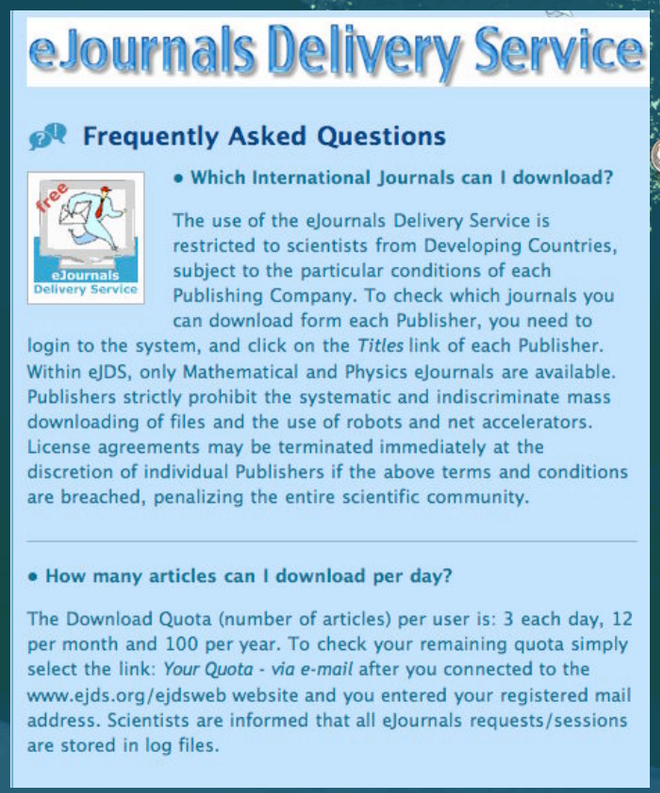
- The Centre has organized since 1999 hands-on Workshops on Web-enabling technologies for scientific research, publishing and e-Learning.

State-of-the-art technologies

- New prototype services directed to the on-line ICTP community are being implemented using state-of-the-art, low-cost technologies and keeping in mind both the scientific audience and their available computer/network facilities.

- These services includes synchronized multimedia presentations of some public lectures and seminars which integrate streaming audio and video with images, text or any other media type.

eJDS: Free electronic Journals Delivery Service



eJournals Delivery Service

Frequently Asked Questions

- **Which International Journals can I download?**

The use of the eJournals Delivery Service is restricted to scientists from Developing Countries, subject to the particular conditions of each Publishing Company. To check which journals you can download form each Publisher, you need to login to the system, and click on the *Titles* link of each Publisher. Within eJDS, only Mathematical and Physics eJournals are available. Publishers strictly prohibit the systematic and indiscriminate mass downloading of files and the use of robots and net accelerators. License agreements may be terminated immediately at the discretion of individual Publishers if the above terms and conditions are breached, penalizing the entire scientific community.

- **How many articles can I download per day?**

The Download Quota (number of articles) per user is: 3 each day, 12 per month and 100 per year. To check your remaining quota simply select the link: *Your Quota - via e-mail* after you connected to the www.ejds.org/ejdsweb website and you entered your registered mail address. Scientists are informed that all eJournals requests/sessions are stored in log files.

- The eJDS is a prototype programme geared to facilitate the access to current scientific literature free of cost. The goal is to distribute individual scientific articles via e-mail to scientists in institutions in the Third World Countries who do not have access to sufficient bandwidth and financial resources to download material from the Internet.

- The eJDS was made possible through agreements with several important scientific publishing companies and societies who provide access to their journals for free to scientists from Developing Countries. Among them are: American Physical Society, Elsevier , World Scientific , Optical Society of America , American Mathematical Society , Proceedings of the National Academy of Sciences, Institute of Physics.

Thank you for your attention!