

ICTP RESEARCH
ON DIGITAL LECTURES:
***Open Academic Webcasting
with ICTP EyA System***



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ICTP SDU

The Science Dissemination Unit has been created in late 2004 with the broad aim of **disseminating ICTP scientific contents and programs to more people than are able to visit the Centre**, throughout the world, via electronic, digital, satellite and other information and communication tools.



Workshops on ICT

Open Source for Science

Digital Lectures

iRooms

eJDS

PingER

Open Access (African Physical Review, e-Print Archive)

Digital Lectures

- Two years ago, we started to think on how to create a web archive of video recordings of seminars delivered at ICTP by renowned guests.

Tsunami Physics and Preparedness

March 24, 2005

Selected lectures from the special workshop organized by the ICTP SAND Group (Structure and Non-Linear Dynamics of the Earth) after the tragic Tsunami event of December 2004.

The Wobbly Wind

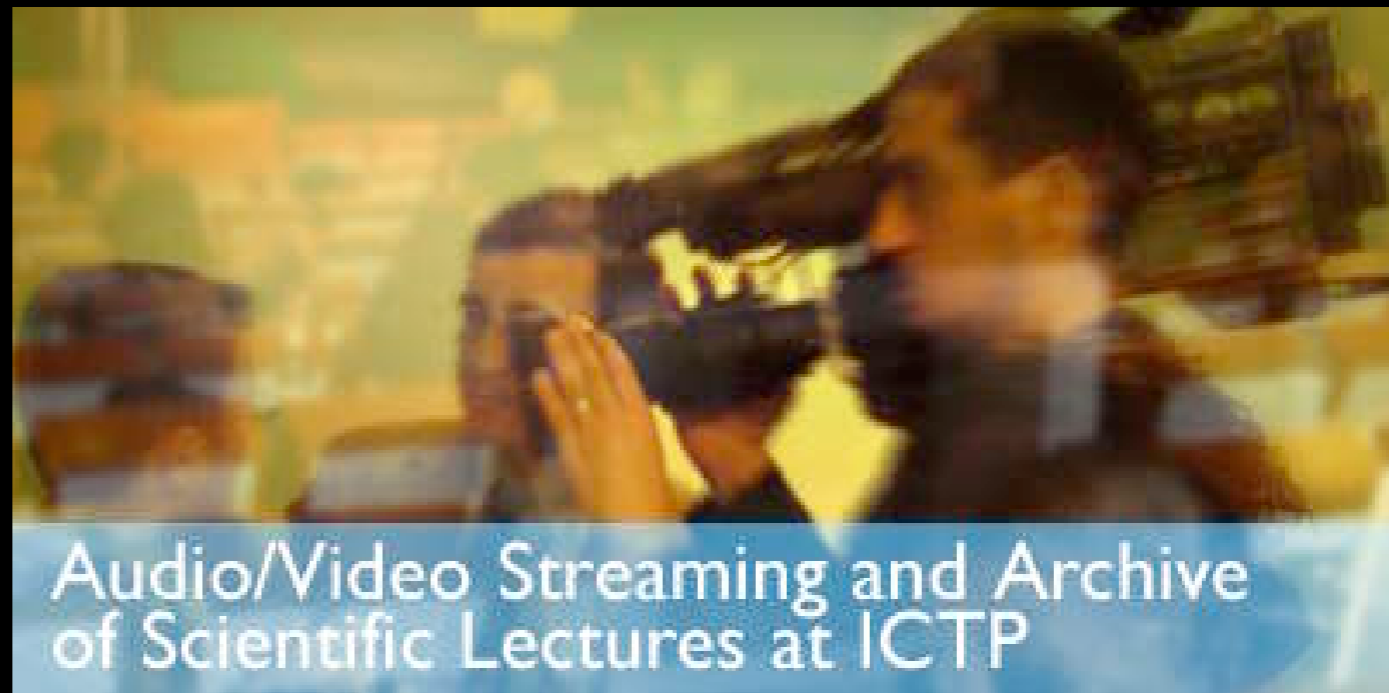
March 23, 2005

Scientific talk on physics of thermal convection, given by ICTP Director Prof. Katepalli R. Sreenivasan for the SISSA Colloquium Series.

ICTP Dirac Medal 2004

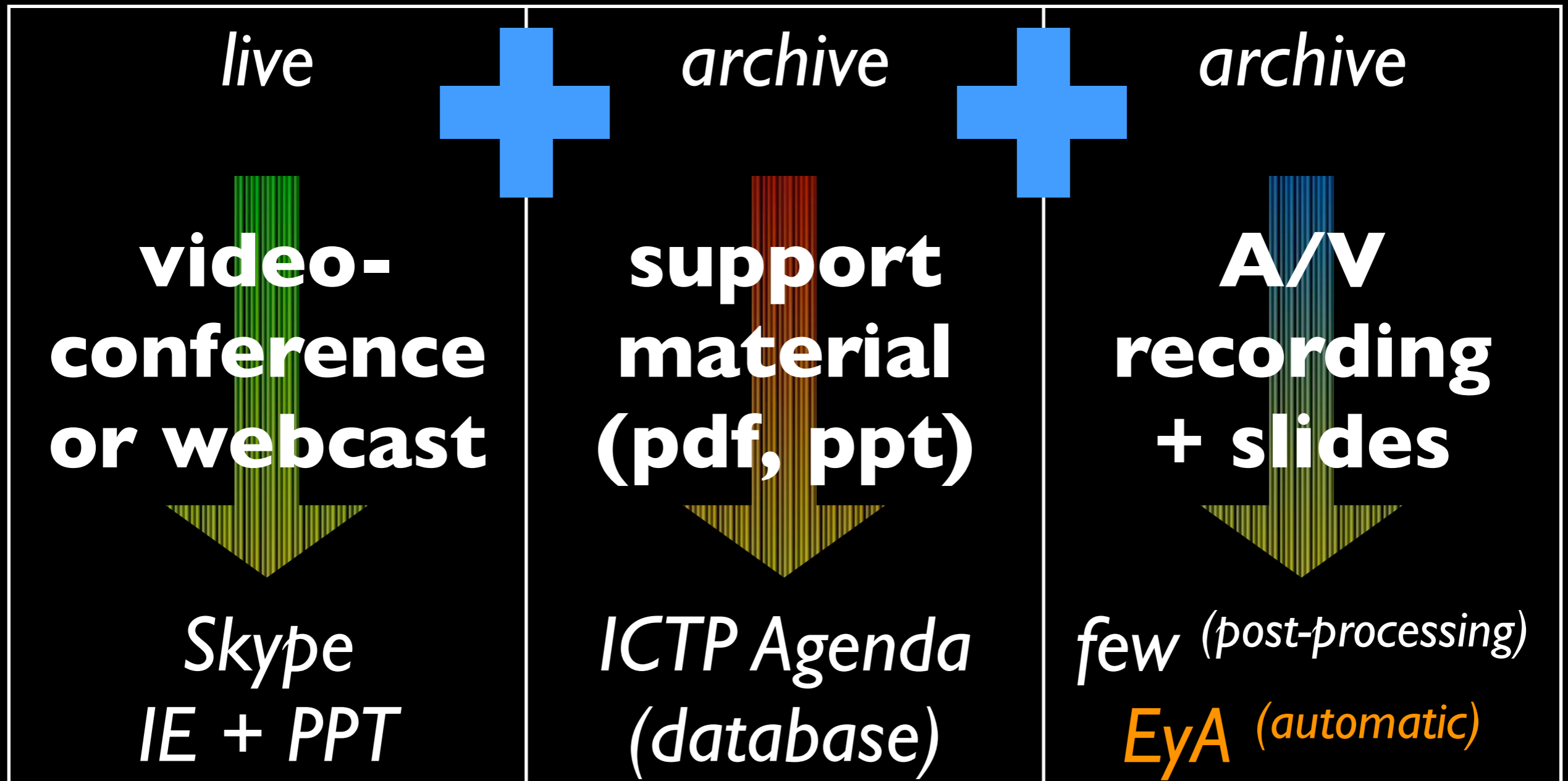
March 16, 2005

The 2004 Dirac Medal of the ICTP awarded to James D. Bjorken and Curtis G. Callan during an award ceremony hold at the Centre on Wednesday, March 16, 2005.



Three-fold way

Those three are complementary solutions!



Examples of DL

MIT:

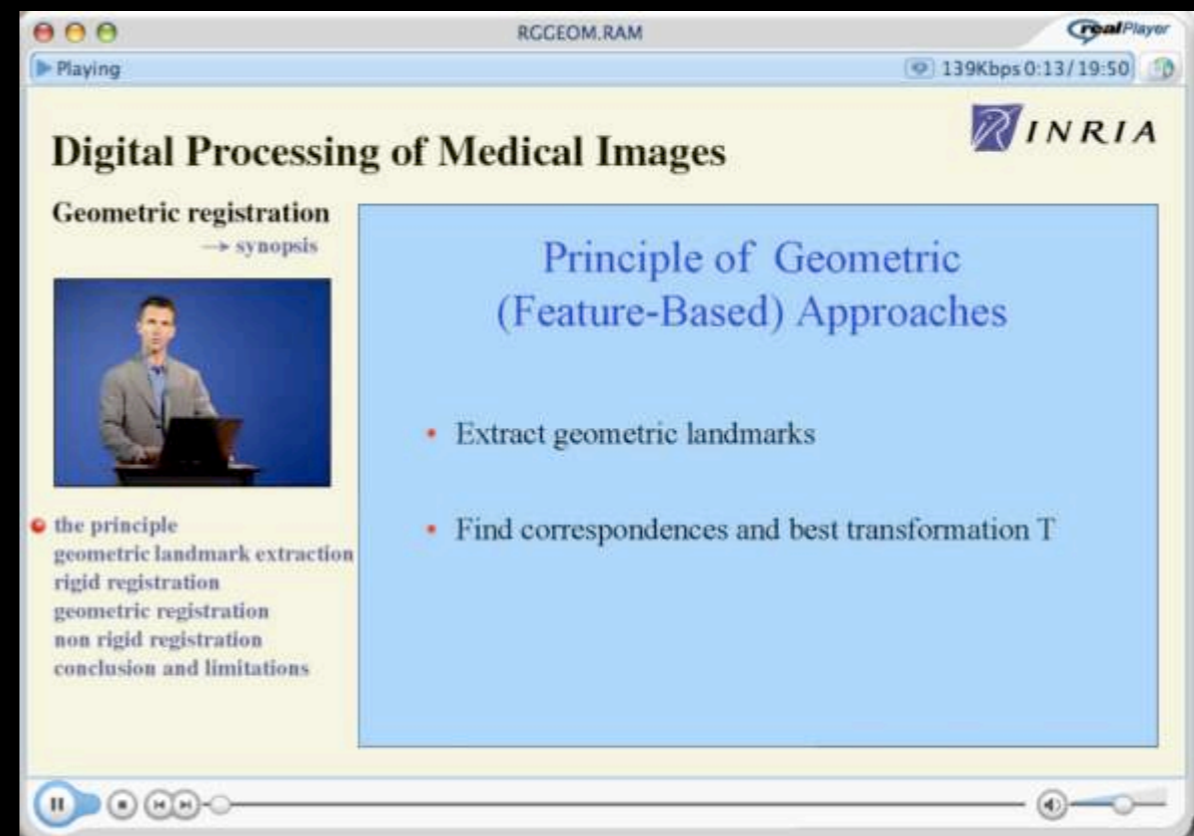
- RealVideo
- Bandwidth Selection
- No Slides
- No download
- Post-processed



Examples of DL

INRIA:

- RealVideo+XML-SMIL
- Synchronized Slides
- Post-processed















Examples of DL

ePresence:

- Multi Formats
- Audio only option
- Synchronized Slides
- Post-processed

Dissolving Boundaries. KMDI series (March 2006)

Archive	Presenter	Viewed	Watch
March 9, 2006 Parallel Worlds: The evolution of real and virtual communities	Rodney Hoinkes and Stacey Spiegel	311 times	 WM  Real  QT  MP3
March 23, 2006 Beyond Ryan Due to technical difficulties this archive is incomplete – slides are missing from Chris Landreth's talk. This will be repaired shortly.	Chris Landreth & the Ryan crew from Department of Computer Science, UoT	115 times	 WM  Real  QT  MP3
March30, 2006 Body image : Image of the body	Shannon Bell & Johanna Householder	78 times	 WM  Real  QT  MP3

Examples of DL

Cambridge:

- Quicktime
- No Slides
- Post-processed



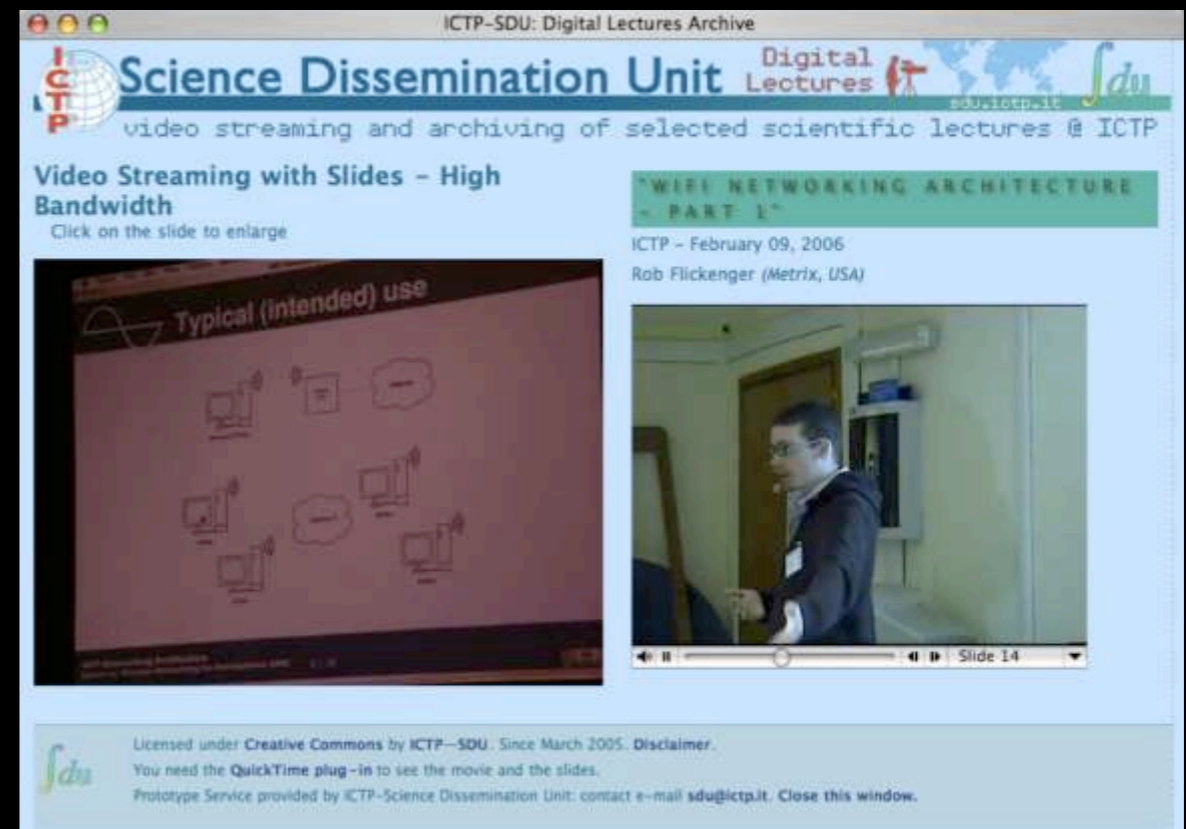
The screenshot shows the ScienceLive.org website. The header features the URL 'www.ScienceLive.org' with a stylized logo. Below the header is a 'Video Archive' section with the title 'Browse the ScienceLive video archive'. A selection bar allows filtering by 'movies', 'lectures', 'interviews', or 'all'. A table lists video titles and the names of the people starring in them.

Title	Starring ...
A Beginner's Guide to Geological Time	The Time Truck and CUSP
A small nanomachine that makes the Irish flag	Tim Mantle
A visit by C. F. Fitzgerald	Denis Weaire
All about Hamilton	James Lunney
Astronomy	David Moore
Big bang: A history of cosmology	Simon Singh
Can maths tell what happened?	Chris Budd

Examples of DL

ICTP-SDU (first version):

- Quicktime
- Audio only option
- Synchronized Slides
- Minimal post-processing
- Downloadable



THE problem

- “Our research so far has shown that making streaming video presentations accessible - increases **staff time** by an additional factor of up to fifty.

The cost of **outsourcing** this service at 100% content accuracy is about **\$250 to \$350 per hour of video.**”

[<http://www.utexas.edu/computer/grants/di4/cit/cit.html>]

- “...that the key problem of recording is that it is necessary to have **one person in the room** to follow the lecture/recording equipment or even 3 or more persons depending on the number of **lectures going on simultaneously.**”

[ICTP referee report for an SDU workshop]

Our problem

ICTP has:

3 rooms for the Diploma Programme

6 main conference halls (40 to 300 seats) across the campus

... that sum up to:

$$9 \times 300\$ = \mathbf{2700\$/hour}$$

$$6 \times 2700\$ = \mathbf{16200\$/day}$$

$$20 \times 16200\$ = \mathbf{324K\$/month}$$



Our approach

- To have a Digital Lectures system which has:
 - ✓ high-quality
 - ✓ no human intervention
 - ✓ non invasive approach
 - ✓ **low cost** of equipment

plus few additional requests:

 - ✓ continuous service with minimal maintenance
 - ✓ low-bandwidth friendly features (zip, CD/DVD)
 - ✓ compatible with all web browsers and Operating Systems



Boundary conditions

- Scientific lectures given mostly by physicists (blackboard, transparencies, PowerPoint slides, whatever...)
- Different types of room are used for lecturing, staff for recording/assistance is not always available:
- *from the Main Lecture Hall (huge, with some assistance) to small unattended rooms*



John Nash at ICTP, 2004

one innovative solution



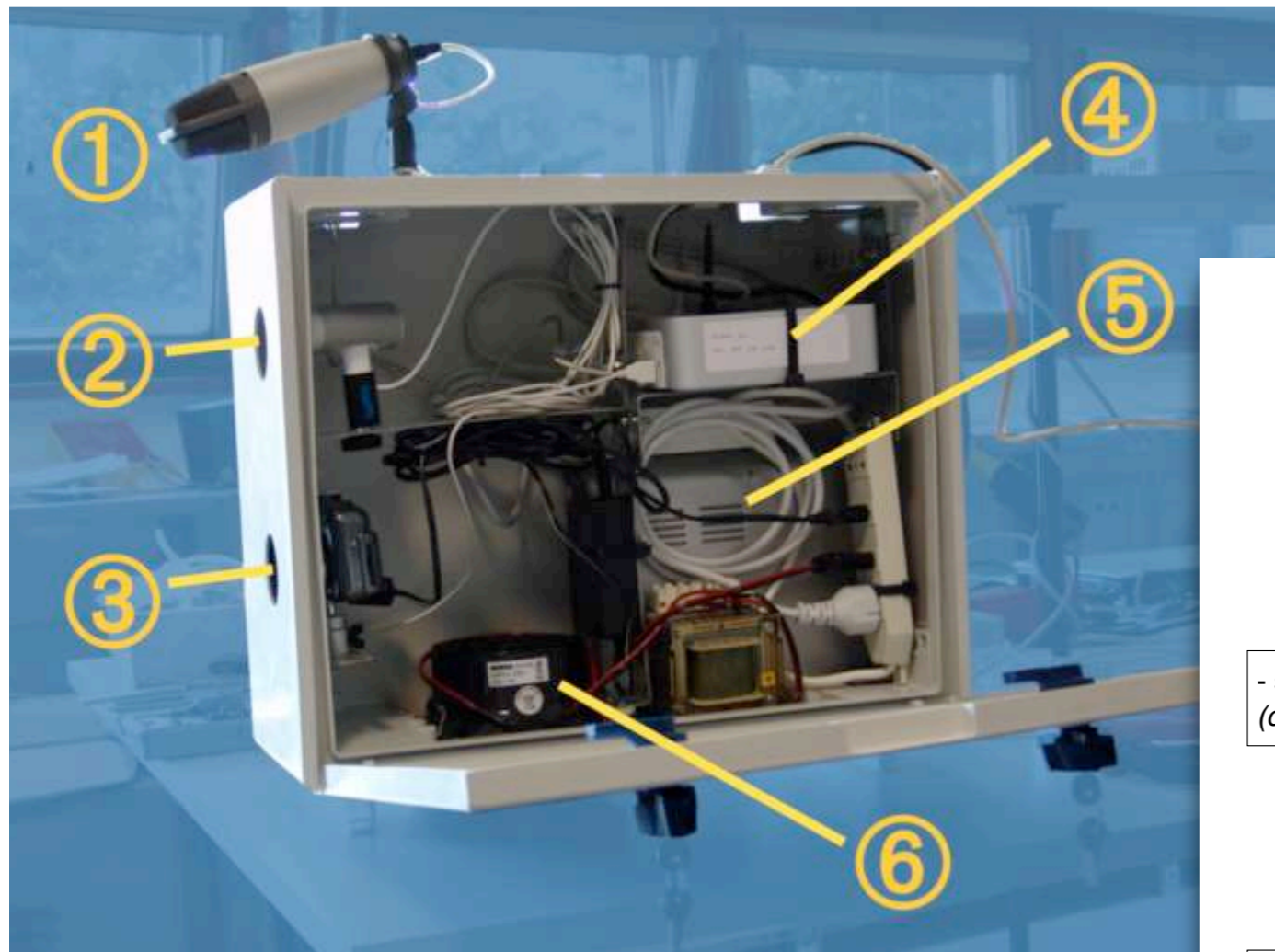
2007 version of EyA

- started to test different versions recording selected courses in 2006-07
- 6 months of work for development and test
- deployed in 3 rooms (Diploma Programme), for intensive use (~4-6 hours/day, mon-fri)
- one mobile unit
- one more lecture room (Kastler @ AGH)



Our solution: EyA

- EyA (“Enlarge” your Audience ;-) has 3 parts:
 - hardware (Mac computer, cheap webcam, cheap digital camera, USB microphone, ...)
 - software (free or cheap sw components, some have been developed at ICTP, some are provided free with the hardware)
 - system integration + network



```

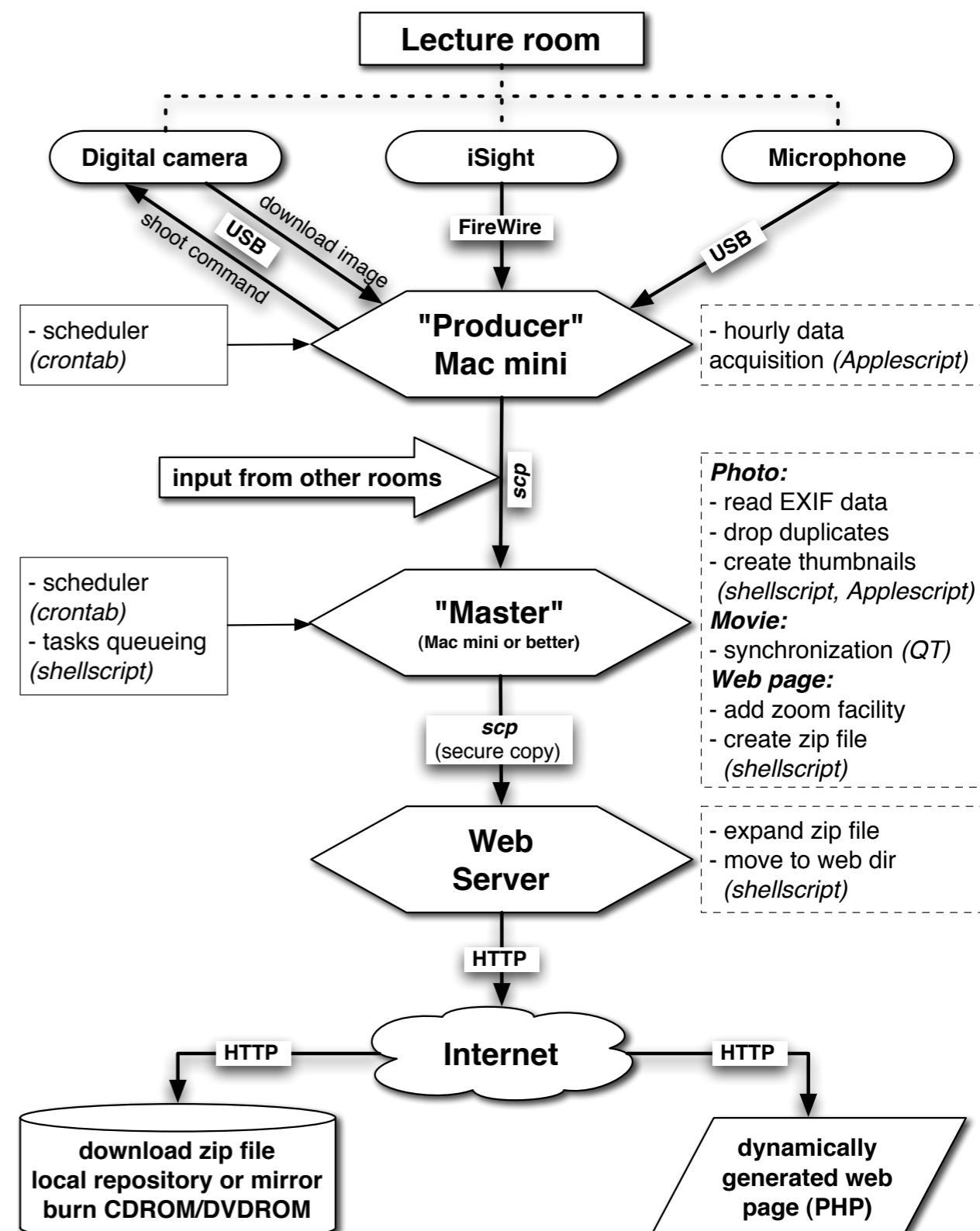
if test $SLIDEOFFSET_ALLSEC -ge $T_LENGTH_SEC # when the slides are going after the
then echo "* WARNING on image $A.jpg: Offset is $SLIDEOFFSET_ALLSEC sec, that is
if [ $LASTA -eq $SLIDES ]
then LASTA=$A # if we did not changed it before (i.e. this is the first slide
he movie), let's change it now
fi
rm -f "$S_PATH/$A.jpg" # delete the small image file
rm -f "$OUT_PATH/big/$A.jpg" # delete the big file
continue # go to the next iteration of the loop
fi

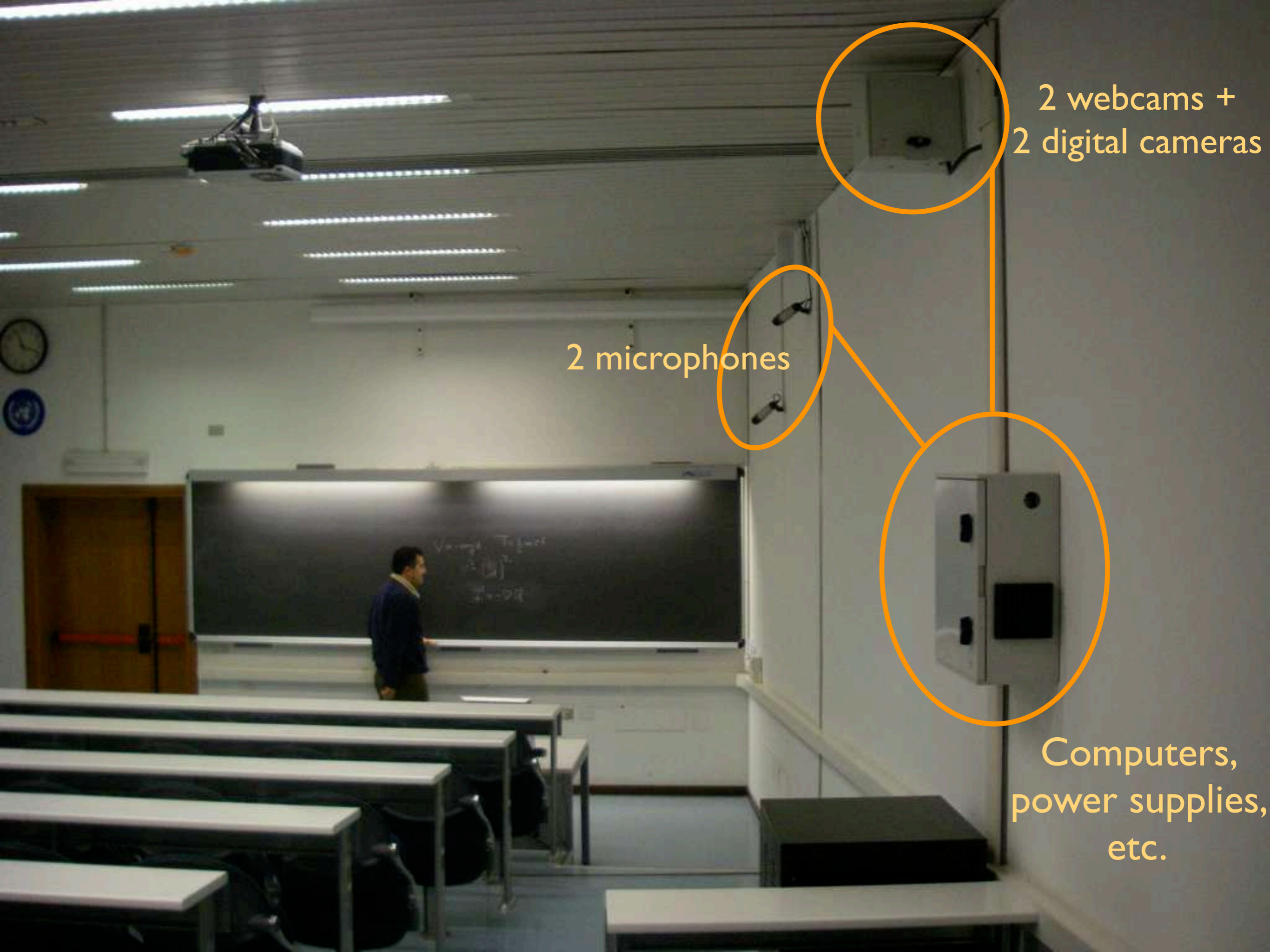
```

```

SLIDEOFFSET_SEC=$(echo "scale=0; $SLIDEOFFSET_ALLSEC % 60" | /usr/bin/bc -l)
SLIDEOFFSET_SEC="00$SLIDEOFFSET_SEC" ; SLIDEOFFSET_SEC=${SLIDEOFFSET_SEC:${#SLID
SLIDEOFFSET_MIN=$(echo "scale=0; ($SLIDEOFFSET_ALLSEC/60) % 60" | /usr/bin/bc -l)
SLIDEOFFSET_MIN="00$SLIDEOFFSET_MIN" ; SLIDEOFFSET_MIN=${SLIDEOFFSET_MIN:${#SLID
SLIDEOFFSET_HOURS=$(echo "scale=0; ($SLIDEOFFSET_ALLSEC/3600) % 60" | /usr/bin/bc -l)
SLIDEOFFSET_HOURS="00$SLIDEOFFSET_HOURS" ; SLIDEOFFSET_HOURS=${SLIDEOFFSET_HOURS
-2:2}
SLIDETIME=$SLIDEOFFSET_HOURS:$SLIDEOFFSET_MIN:$SLIDEOFFSET_SEC.00

```

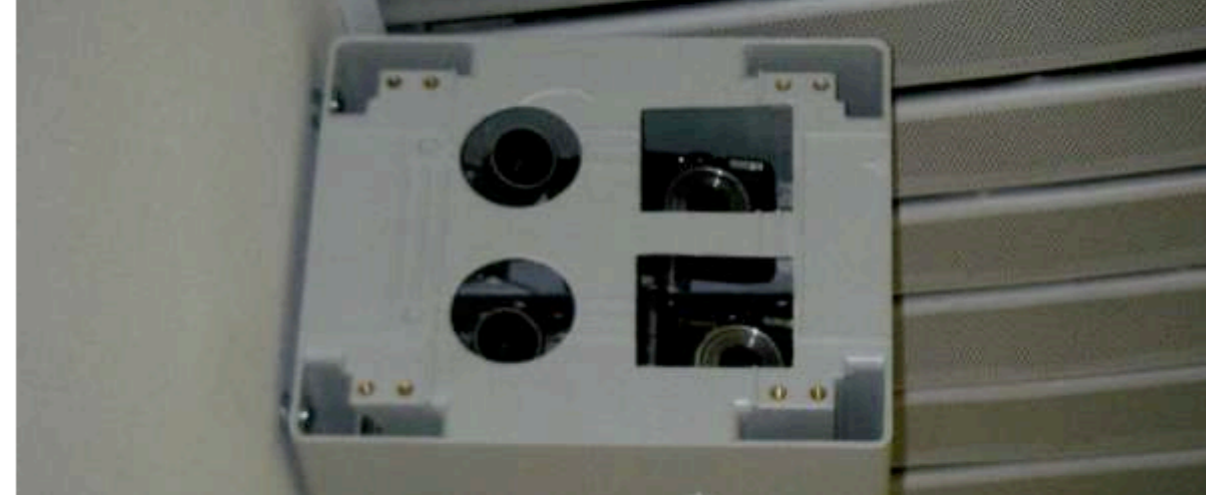




2 webcams +
2 digital cameras

2 microphones

Computers,
power supplies,
etc.



How does EyA work?

- ▶ during the talk:
 - audio/video recording
 - it also takes photos of the “wall”





5 Superfluidity

1) Superfluid II
 2) Went into BEC
 3) Magnetism III

$E = \int \frac{E_p}{e^{E_p/kT} - 1} p^3 dp \sim \int \frac{p^3 dp}{e^{E_p/kT} - 1} \sim T^4$

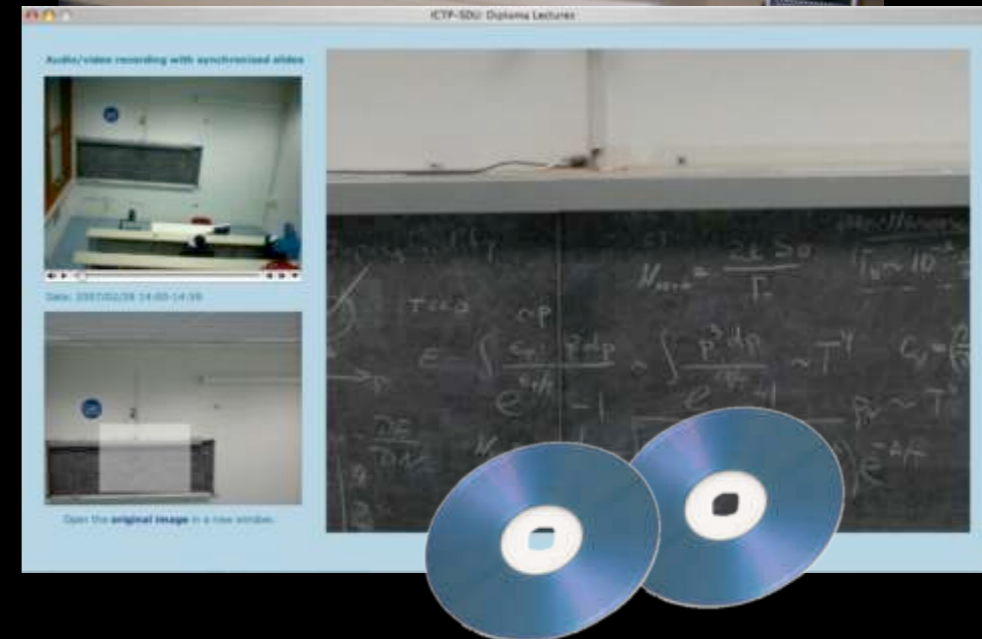
$N_{00} = \frac{1}{e^{E_0/kT} - 1}$

$N_{00} = \frac{2\pi S_0}{\Gamma}$

$C \sim \left(\frac{2}{T} + \frac{5}{T} + \left(\frac{\Delta}{T} \right)^2 \right) e^{-\Delta/kT}$

Enhance your Audience (EyA)

- ▶ during the talk:
 - audio/video recording
 - it also takes photos of the “wall”
👉 **no human intervention here!**
- ▶ file transfer to server for processing
- ▶ immediately after the talk:
 - synchronization of photos (slides, blackboard, ...) with the video
 - making of a web page (+ zip file)
 - making of CD/DVD
👉 **no human intervention here too!**



The output

ICTP Science Dissemination Unit: EyA System

Digital Lecture from www.ictp.tv

Date: 2007/12/17 10:00-10:59

Open the **image 72** in a new window.



The main image shows a lecturer pointing at a chalkboard. The chalkboard contains the following content:

① $\int_{-\infty}^{\infty} \frac{e^{ax}}{1+e^{\pi x}} dx, \lim_{R \rightarrow \infty} \frac{1}{R} \int_{-R}^R \frac{e^{ax}}{1+e^{\pi x}} dx, \text{Re } a < 1$

$f(z) = \frac{e^{az}}{1+e^{\pi z}}$

A diagram of the complex plane is shown with a vertical line at $x = 0$ and a horizontal line at $y = 2\pi i$. The region between $x = -R$ and $x = R$ is shaded.

On the right side of the chalkboard, there is a diagram of a triangle in the complex plane with vertices at 0 , R , and $R + 2\pi i$. The area is labeled Δ and the contour is labeled $3(C)$. Below this, there is a formula for $X =$ and an integral $\int \frac{\log(1+e^{\pi x})}{1+x} dx$.

“Near Real-Time”



“Near Real-Time”



REC on



“Near Real-Time”



REC off



“Near Real-Time”



**copy all
files**

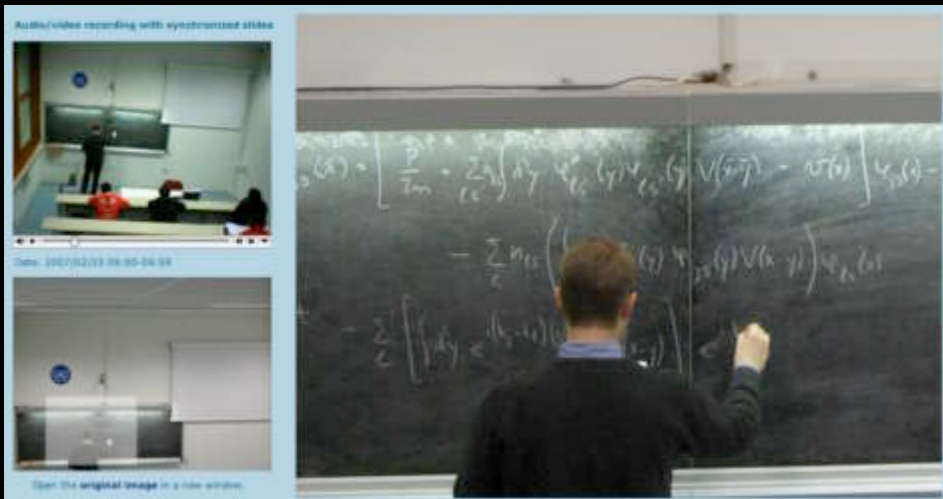


server

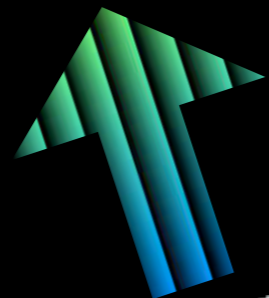


“Near Real-Time”

<http://www....>



**published
on the web**

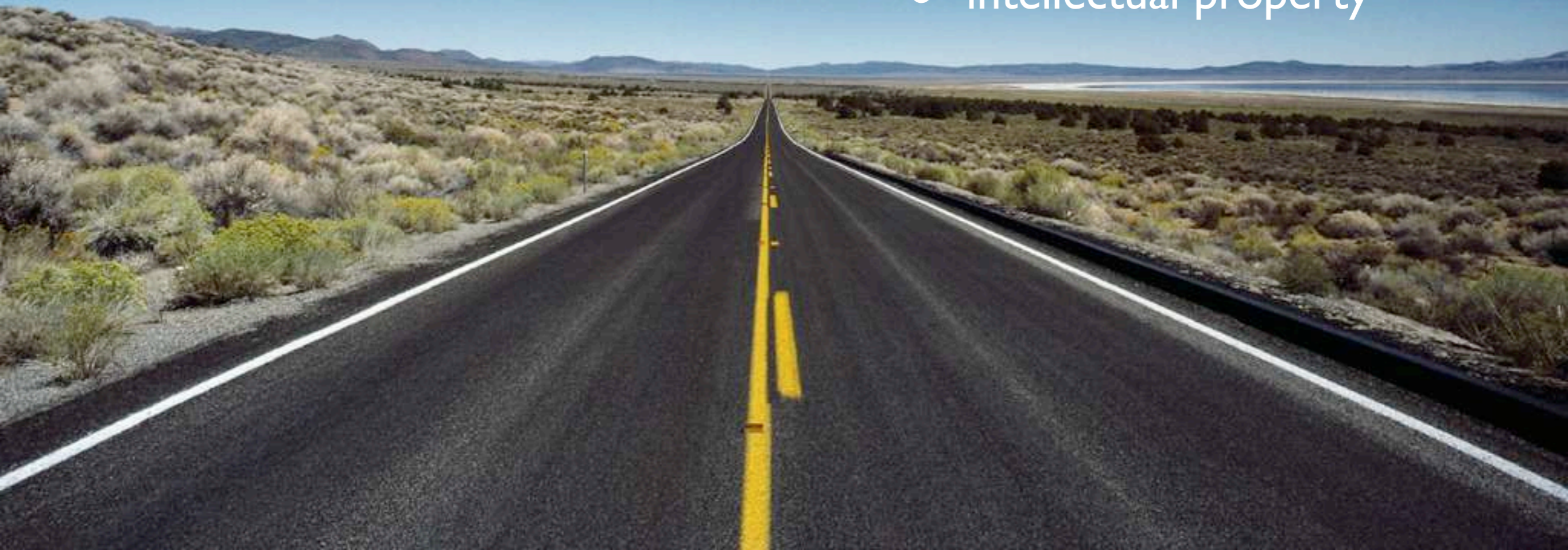


post-processing



The way ahead

- future enhancements
(technology-related):
 - touch-screen toaster
 - remote conference
 - tagging, data mining
- institutional policies
(decisions to be taken):
 - wide adoption
 - www.ictp.tv
 - administration
 - intellectual property



Discussion: costs

- **low cost** for system development (done)
- **low cost** for installation
~ 2000 €/room
1 – 5000 € for servers
- **no cost** for maintenance and management (*maybe the replacement of digital cameras...*)



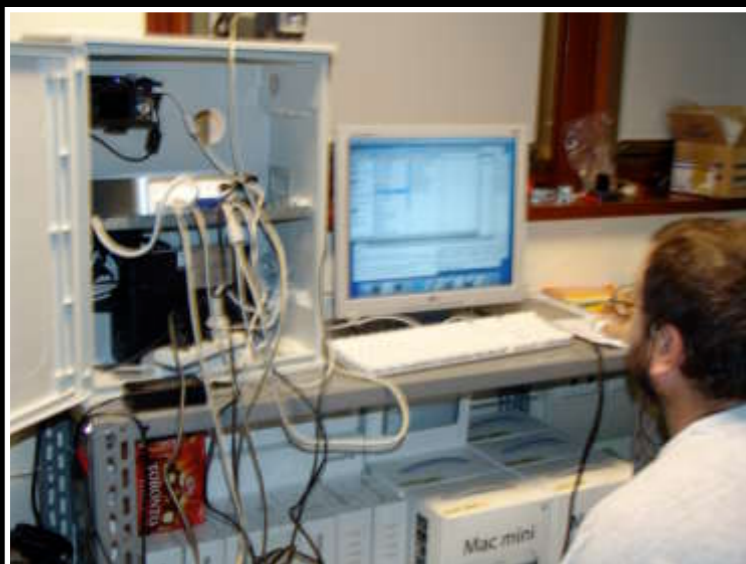
Discussion: technology

- Apple computers (OSX)
 - ➡ **QuickTime,**
Flash, Applescript,
shell scripts, ...
- bandwidth optimization
 - ➡ image comparison to
cut duplicate images
- EXIF data from JPEGs
 - ➡ used to synchronize
video and images



options/versions

- fixed unit *or* mobile unit (laptop)
- basic system *or* redundant (double) system
- with *or* without an independent server for post-processing





looking at the results



Condensed Matter Physics

one full year, pre-PhD level

[View the courses](#)



Earth System Physics

one full year, pre-PhD level

[View the courses](#)



Basic Physics

new one-year Diploma Programme

[View the courses](#)



High Energy Physics

one full year, pre-PhD level

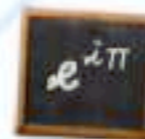
[View the courses](#)



Mathematics

one full year, pre-PhD level

[View the courses](#)



From September 2007, all lectures given within the ICTP Diploma Programme are being automatically recorded using the new [EyA technology](#) developed by the [ICTP Science Dissemination Unit](#). The access to this digital material is made here available to the public.

This project aims to enhance ICTP's mandate of transferring knowledge to scientists from developing countries. It is our hope that these public recordings will be useful for students as well as lecturers beginning their teaching careers in science.

For more information about the courses, including the schedule of lessons, please visit the [website of the Diploma Programme](#).

Disclaimer: ICTP publishes these lectures on the web and distributes them in digital form only for educational purposes. It will not endorse or sponsor any commercial product, service or activity, and does not permit the recorded material to be used for commercial purposes.



What kind of

More than just

ictp.tv is based on a... developed at ICTP: it... audio/video recording... high-definition pictures (refreshed... seconds), allowing you to zoom or... detail and making you feel one of... audience.



Technical requirements

Q.: what is needed to see ictp.tv?

To view ictp.tv, the free Apple [QuickTime plugin](#) is required (available for PC and Mac).

Any web browser should work fine; we recommend MS Internet Explorer, Safari or Mozilla/Firefox.



Q.: Can't you improve this?

A better ictp.tv to satisfy your needs.



Bandwidth requirements

Q.: does ictp.tv require a fast network?

Faster network connections, like DSL or similar, allow faster download of ictp.tv recordings.

As an example, it will takes ~7 minutes to download one hour of recordings using an ADSL connection and ~7 hours using a 56Kbps modem.

enhance our EyA software
eat features:
faster view, no more to
download);
ddition to QuickTime;
ersion, to enjoy ictp.tv on
layer.

About EyA

EyA ("Enhance your Audience") is an innovative automatic audio/video/slide recording system, developed to archive and share scientific lectures and talks carried out using modern presentations (PPT, PDF, animations, etc) as well as the traditional chalkboards found in classrooms.

The EyA system has these main features:

- no human intervention during recording and post-processing;
- scalable architecture;
- no special requirements for the speaker or lecturer;
- high resolution of images;
- low total cost of ownership and implementation;
- low-bandwidth friendly features (zip, CD, DVD).

[More info.](#)



Condensed Matter Physics

one full year, pre-PhD level

[View the courses](#)



Earth System Physics

one full year, pre-PhD level

[View the courses](#)



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new one-year Diploma Programme

[View the courses](#)



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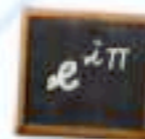
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one full year, pre-PhD level

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v1.1



Diploma on

www.ictp.tv

Visit ICTP-SDU for info

select diploma course

- ◀ Basic Physics (BP)
- ◀ High Energy Physics (HEP)
- ◀ Mathematics (MTH)
- ◀ Condensed Matter Physics (CMP)
- ◀ Earth Systems Physics (ESP)

archives

- ◀ last year (password required)
- ◀ other recordings

resources

- ◀ www.ictp.tv
- ◀ Main ICTP Website
- ◀ About EyA

DIPLOMA COURSE IN BASIC PHYSICS

Disclaimer: ICTP publishes these lectures on the web and distribute them in digital form only for educational purposes. It will not endorse or sponsor any commercial product, service or activity, and does not permit the recorded material to be used for commercial purposes.

For more information about the courses, including the schedule of lessons, please visit the [website of the Diploma Programme](#).

AVAILABLE TOPICS – ACADEMIC YEAR 2007/2008

Mathematical Methods
(recorded hours: 98)

Classical Mechanics
(recorded hours: 40)

Quantum Mechanics
(recorded hours: 62)

Advanced Electromagnetism
(recorded hours: 2)

(4 topics found, for a total of 202 hours)

v1.1



Diploma on

www.ictp.tv

[Go back to the Main Page](#)

select diploma course

- « [Basic Physics \(BP\)](#)
- « [High Energy Physics \(HEP\)](#)
- « [Mathematics \(MTH\)](#)
- « [Condensed Matter Physics \(CMP\)](#)
- « [Earth Systems Physics \(ESP\)](#)

archives

- « [last year \(password required\)](#)
- « [other recordings](#)

resources

- « [www.ictp.tv](#)
- « [Main ICTP Website](#)
- « [About EyA](#)

DIPLOMA COURSE IN BASIC PHYSICS (BP)

LECTURES ON QUANTUM MECHANICS

A total of 62 hours was found for this topic.

Complete list, in reverse chronological order ([invert](#)):

[HOURL 61&62 \(2008.01.07\)](#)

Lecturer: G. Thompson (ICTP)



Hour 61: 14.00—14.59 (room "H")

Download: [zipfile](#) (QT format, 224.0MB)
or View now: [QuickTime](#), [Flash](#).

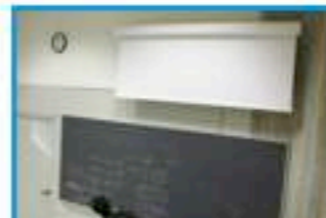


Hour 62: 15.00—15.59 (room "H")

Download: [zipfile](#) (QT format, 190.2MB)
or View now: [QuickTime](#), [Flash](#).

[HOURL 59&60 \(2007.12.18\)](#)

Lecturer: L. Velasco-Sevilla (ICTP)



Hour 59: 11.00—11.59 (room "H")

Download: [zipfile](#) (QT format, 169.4MB)
or View now: [QuickTime](#).

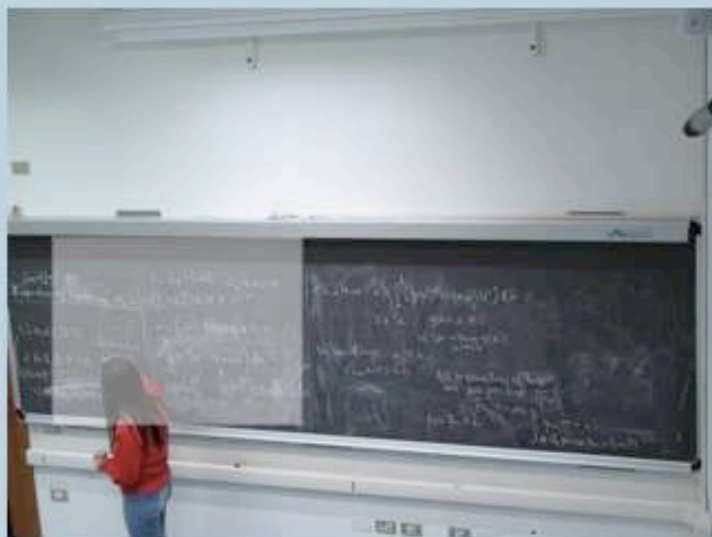
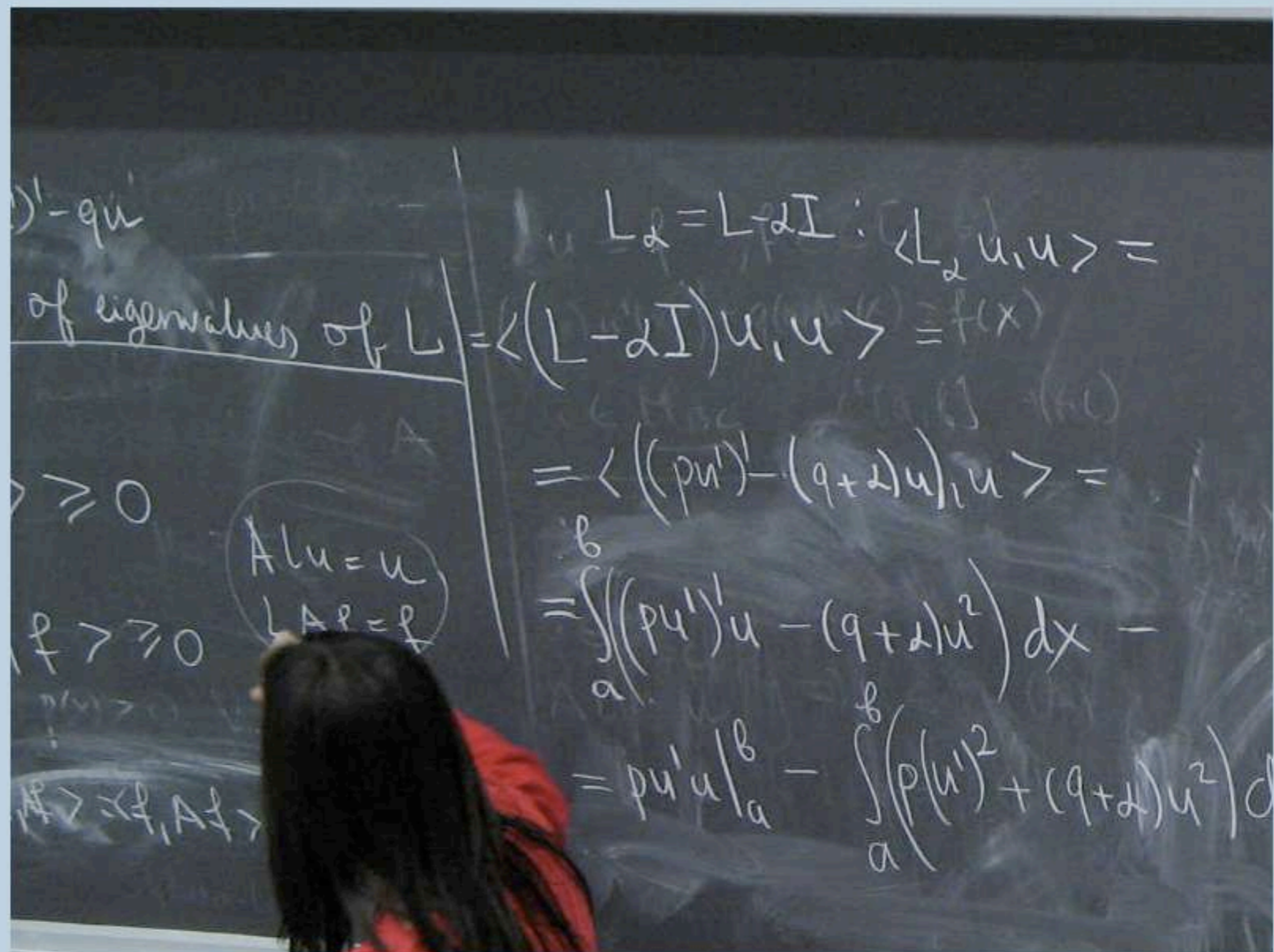
Notes: tutorial



Audio/video recording with synchronized slides



Date: 2007/03/08 10:00-10:59

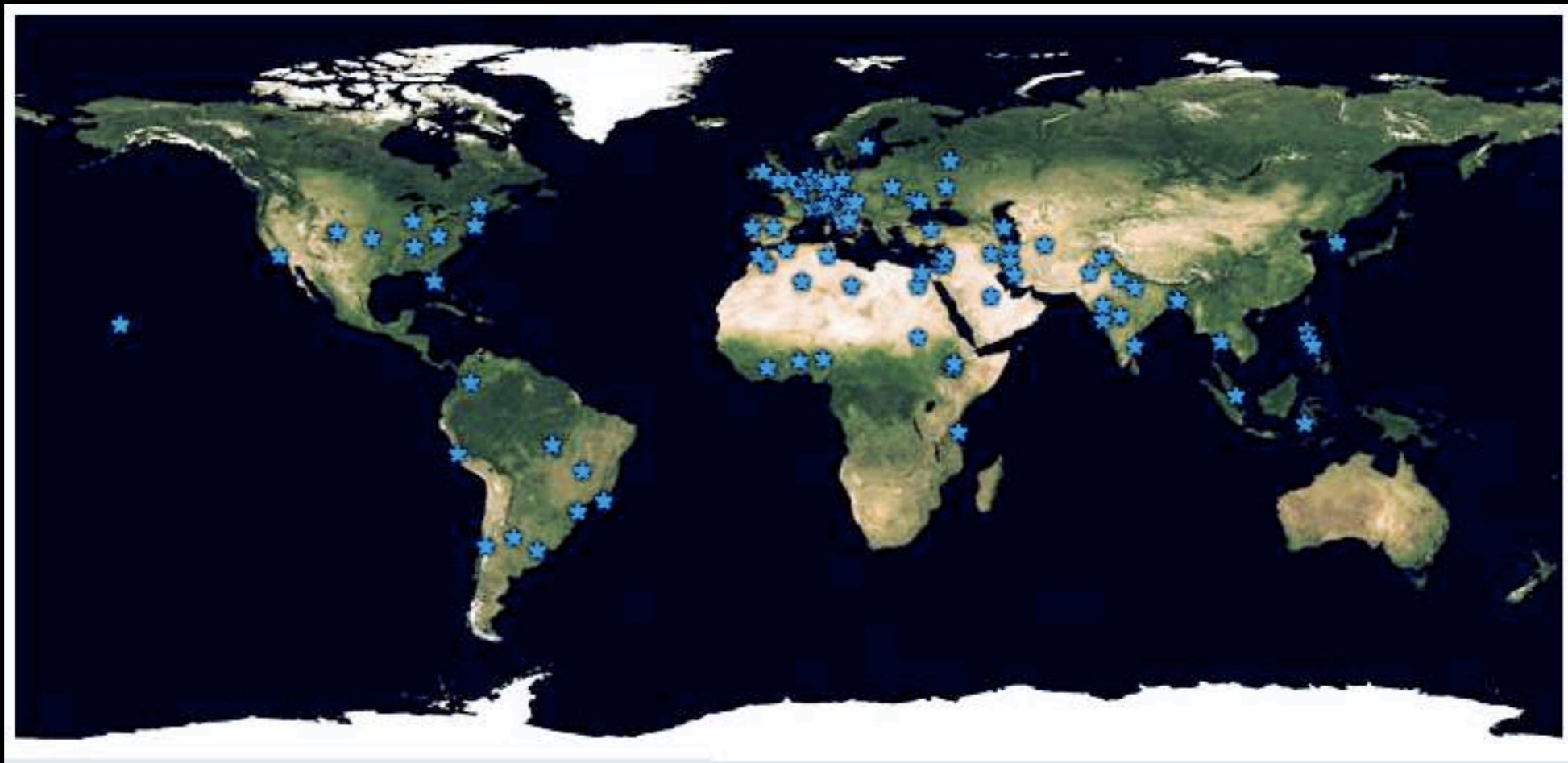
Open the **original image** in a new window.

statistics: EyA 2007

ICTP Diploma Programme (3 sep '07 - 10 jan '08)

- number of rooms with (redundant) recording capability: 3
- fields of teaching: 5 (BP, HEP, CMP, ESP, MTH - pre-PhD)
- number of recorded courses: 25
- total recorded hours: 1100
- missing hours (for technical problems): 4
- number of local students (from Developing Countries): 52
- number of computer used: 8 (Mac, total cost: <5000 euro)

website: www.ictp.tv

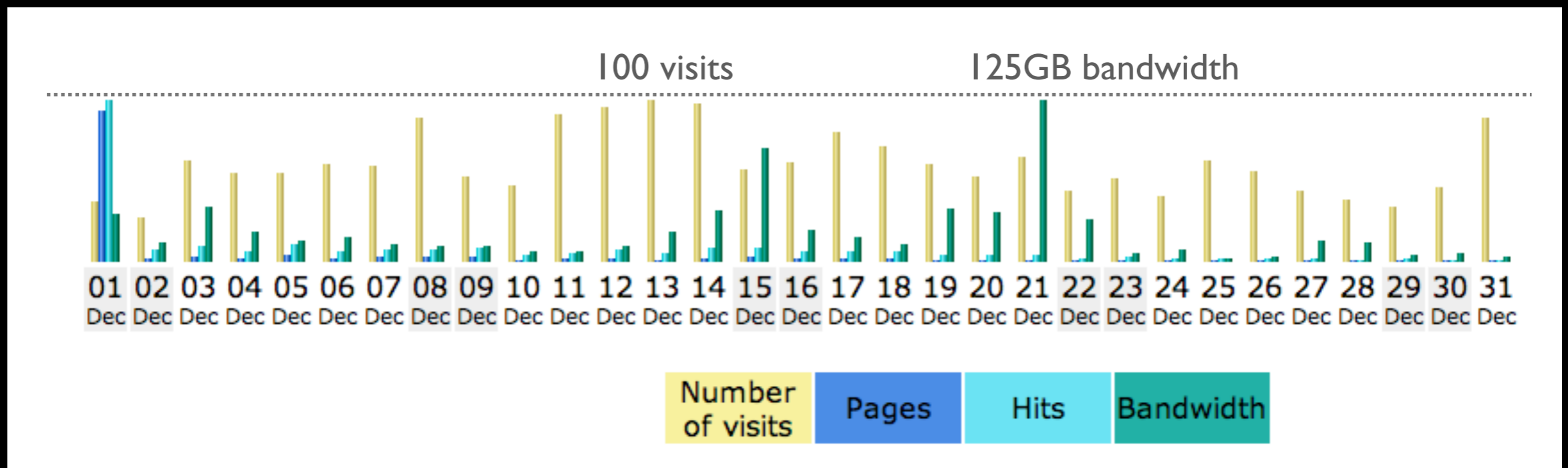


(location of **top 50** downloaders of recordings)

ICTP Diploma on web

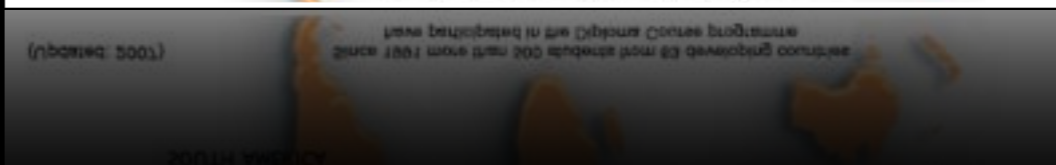
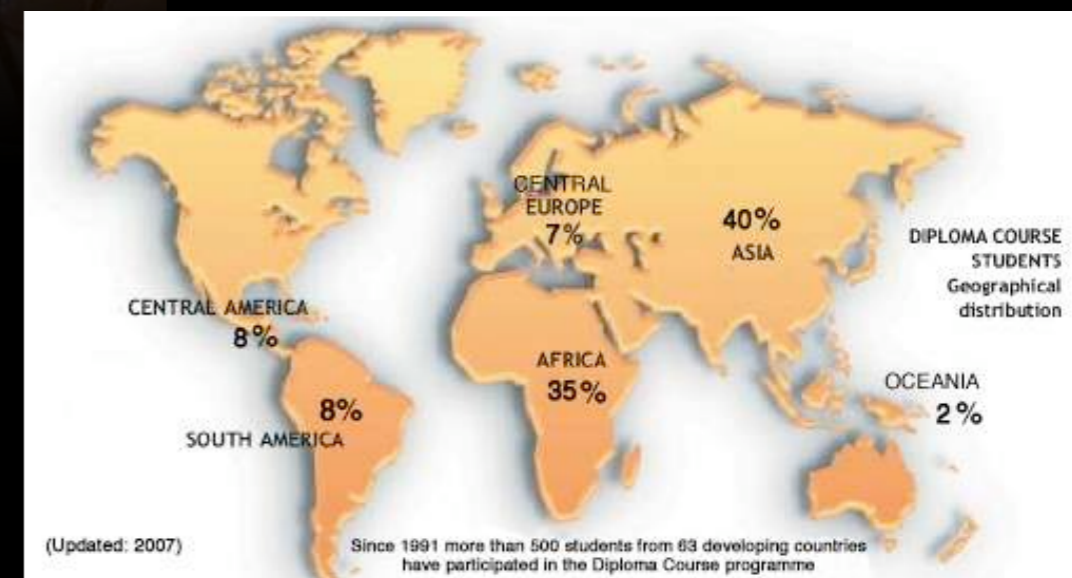
recording seen from the web (dec 2007)

- **708,83 GBytes** (~3540 hours) in 1 month
- unique visits (excluding locals): **1600** in 1 month





Opening Ceremony, 2007/2008 ICTP Diploma Programme



feedback from students

benchmarking: questionnaire proposed to 52 students
at the end of 1st semester (3 sep - 21 dec 2007)

- time spent reviewing recordings: ~10 hours/week
- 20% of students advertise the on-line recordings to colleagues in their countries
- half students have followed on-line recordings of courses belonging to other fields
- availability of on-line recordings changed the learning methods for 97% of students

comments from students

students told that on-line recordings have been useful:

- *“to review/revise missing points and concepts”*
- *“to clarify handwritten notes”*
- *“to recover missed classes”*
- *“to understand concepts when lecturers go too fast”*
- *“to prepare for exams”*
- *“to adapt with the english environment”*
- *“to avoid writing notes and concentrate on the blackboard”*
- *“to mark it for possible long-term research”*

other tests of EyA

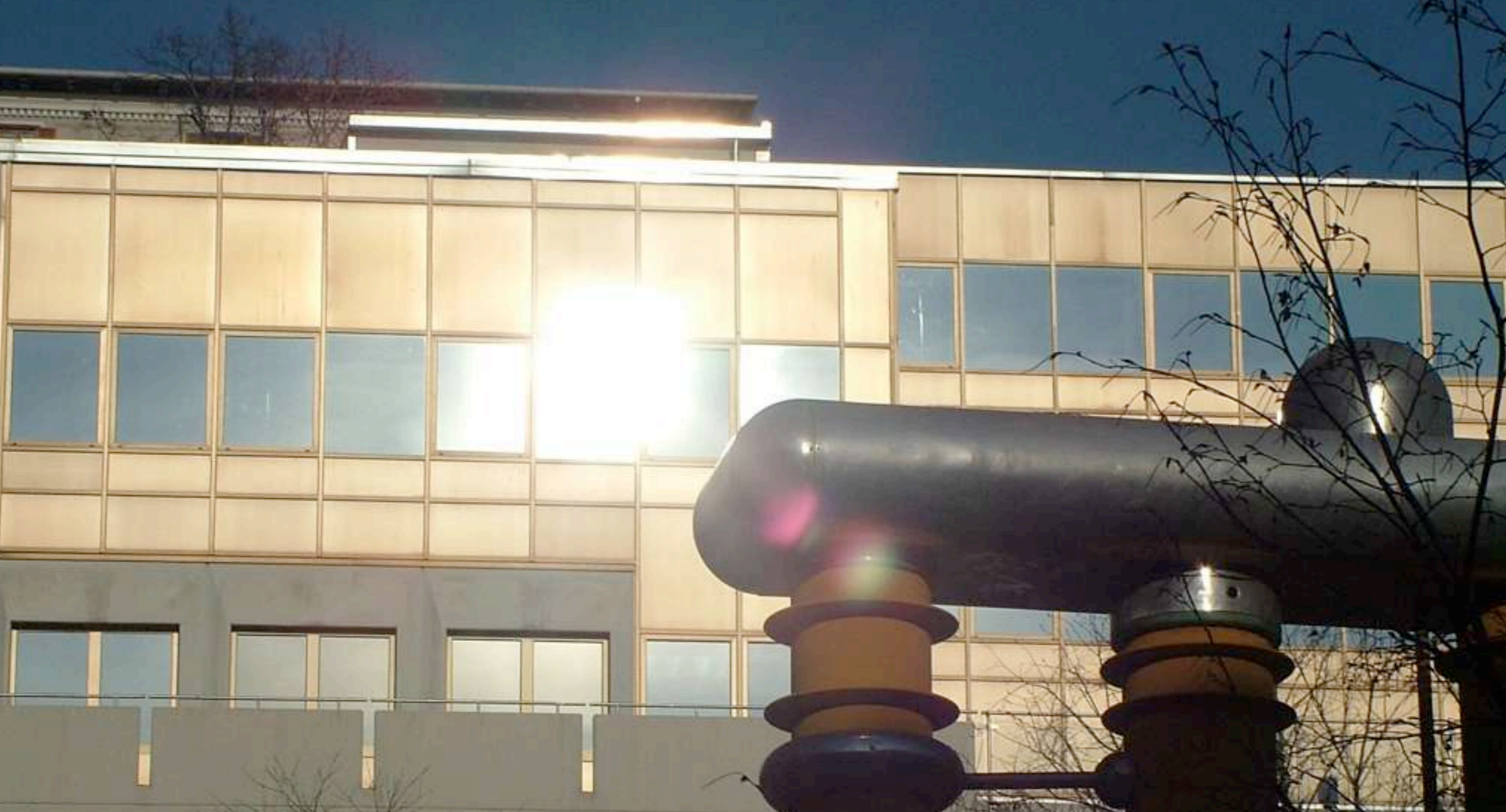
- Latin America and Caribbean (EsLaRed, mobile unit)
- Netherlands (NIKHEF, also interested in developing OpenEyA)
- Belgium (IODE, UNESCO centre)
- Trento (UNITN, software development, research)
- Trieste: FEST 2007, G8-UNESCO meeting
- SISSA (SISSA-ICTP joint seminars)
- other workshops and conferences at ICTP

publications

- *presentations and proceedings at international conferences*
- poster selected for WWDC07: **Apple Developers Conference**, USA, june 2007
- article on **EURODL European Journal of Open and Distance Learning**: "*Webcasting of Traditional Chalkboard Lectures: The EyA System*", september 2007
- article on **DE QUALITATE: Rivista Italiana della Qualità**: "*Come Registrare Automaticamente e Pubblicare in Internet Conferenze e Lezioni e Raggiungere un Milione di Scienziati*", november 2007
- article on **Physics World**: "*The Video Revolution Made Simple*", december 2007

Questions?

thank you for your attention!



www.ictp.tv



$\int du^{(EyA)}$