Hands-on experience on medium-sized telescopes

or: **The need to train young researchers in observing techniques**

M. Dennefeld
IAP-Paris and University Paris 6
Coordinator of the NEON schools

The case....

- Large telescopes are run by specialised operators (no space for « trial and error »):

  loss of instrumental knowledge (set-up...)
- Service mode or queue observing often favoured, presence of astronomer not required anymore: loss of feeling on observing conditions and requirements
- Increasing use of archives or large surveys: loss of knowledge on data reduction steps, quality of data, propagation of errors, systematic effects, etc...

The needs

- Basic understanding of atmosphere and telescope optics
- Fundamentals of astrometric, photometric, spectroscopic (low dispersion first!), polarimetric techniques, ..., and detectors!

  With insight into instrumentation details...
- Data reduction steps, propagation of errors, quality appraisal (archives)
- This is fundamental not only to a proper interpretation of the data, but also to get the most out of an instrument and to write a successfull proposal!

The solution(s)

- Bring (« expose ») students or young scientist to a « research » telescope.
- Can be done on medium telescopes (~1m for photometry, ~2m+ for spectroscopy) but not much smaller, otherwise research interest is lost.
- A real observing run is essential: you are in « conditions », motivation and concentration is maximal, you are doing only that (as opposed to practical work during university courses), you have direct and permanent contact with the expert(s) astronomer(s) (teachers or tutors)
- Can be done either as:

  - One student accompanying a senior during his/her run

  - or Workshops or summer schools (but still in small groups) e.g. the NEON schools

The NEON schools (Marie Curie)

- **Exist since 2000;** New program 2005-2008, to « Enhance » skills in observationnal astronomy
- Participants: Asiago, Calar Alto, Eso, OHP, LaPalma (i.e. active research observatories)
- OPTICON now supports lecturers and experts
- Schools either at the telescope, or using archival data (or combination of both)
- Principally for PhD students (or post-docs)
- Work in small groups (4 students), each supervised by an experienced « tutor »
- Around real research program, with results!

Typical agenda of an observing school

- Days 1-4 Introductory lectures, preparation of the observations
- Nights 2-7 Observations
- Days 3-12 Data reduction and analysis
  Complementary lectures
- Day 13 Public Presentation of the results

(If archival school, duration reduced, but similar program)

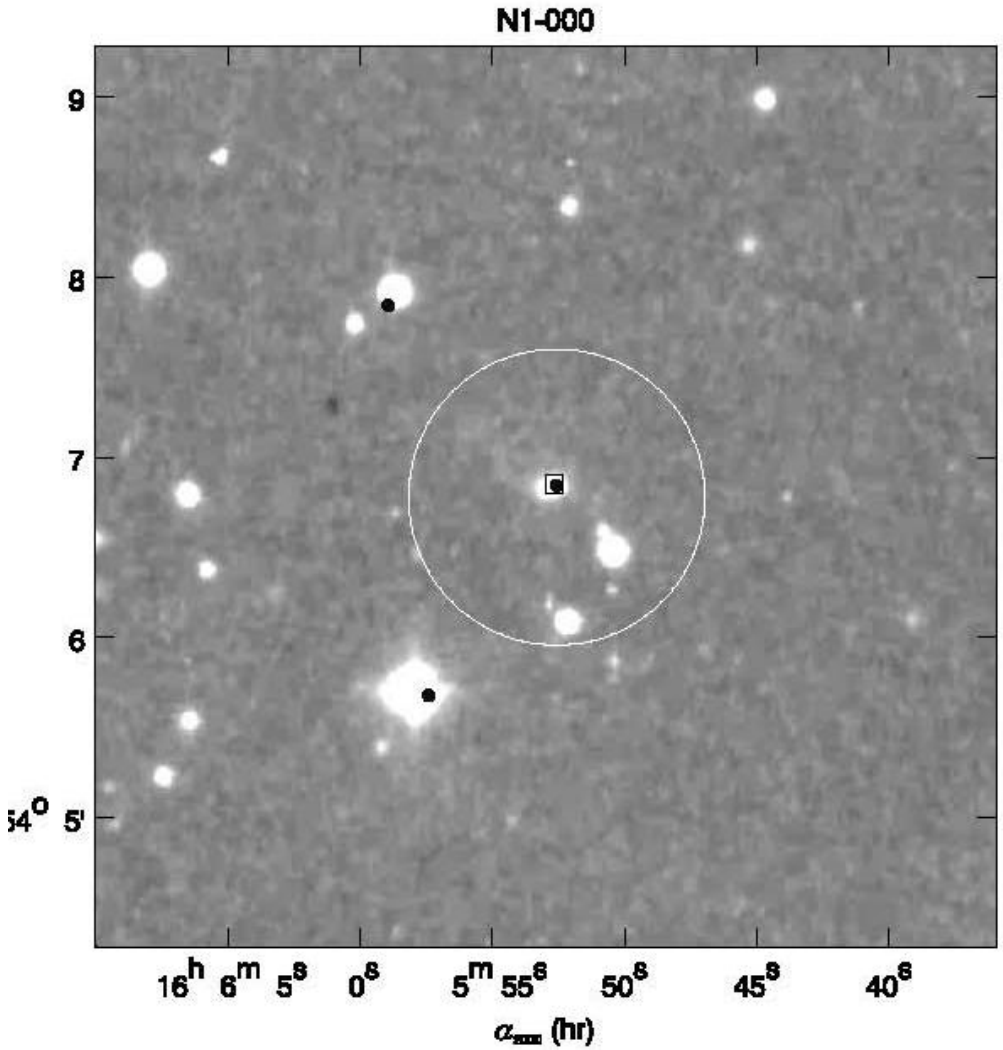
Accomplished NEON schools (FP6)

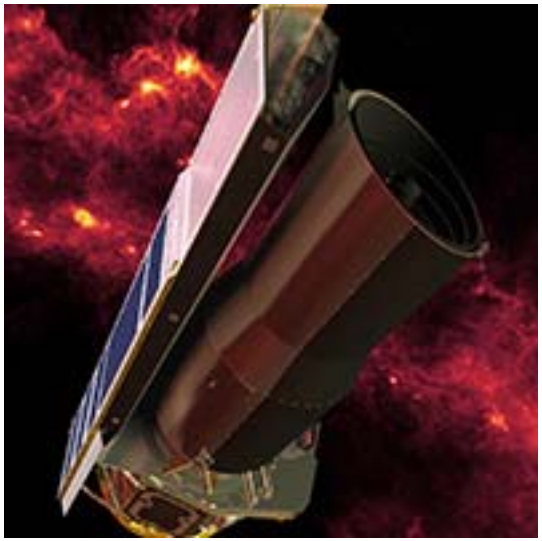
- **Calar-Alto Observatory** (2005, August 7-20)
  16 students, 12 different nationalities, 4 groups
  2 telescopes, pressure factor ~ 4
- **Haute-Provence Obs.** (2006, 23/7—6/8)
  22 students, 13 nationalities, 4 telescopes, 5 groups
- **ESO Archive school** (no fresh telescope data)
  2006 (30/8—9/9), 20 students, 12 nationalities
- **Asiago Observatory** in 2007 (Sept. 4 -18)
  Pressure factor again > 4 (20 students in total, 14 different nationalities, 5 groups)
- And in year 2008:

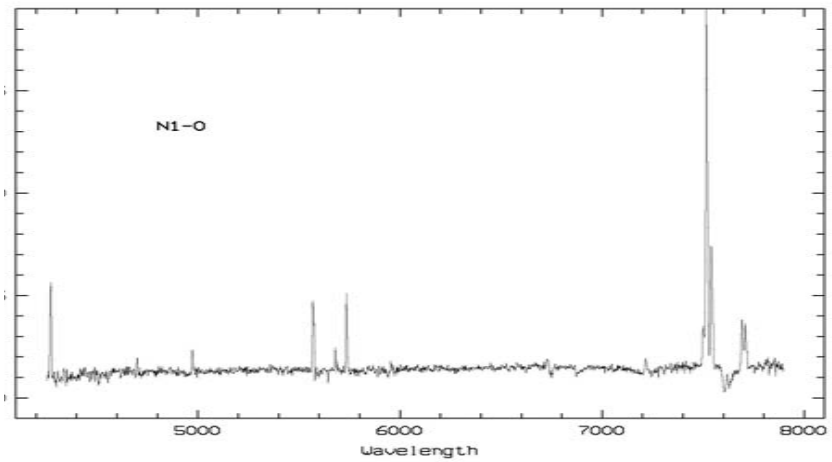
- **La Palma school** (June 23—July 5), with NOT and INT, 16 students, 11 nationalities, 4 groups (more UK, and US! demand...)
- **Archive school at ESO** (August 27—Sept. 6), 20 students, 16 nationalities, 5 groups
- And **the IFU school** (Potsdam, May 19—24) ...
  (Instrument specialised, « life-long training »

- Overall, good gender distribution (close to 50/50)

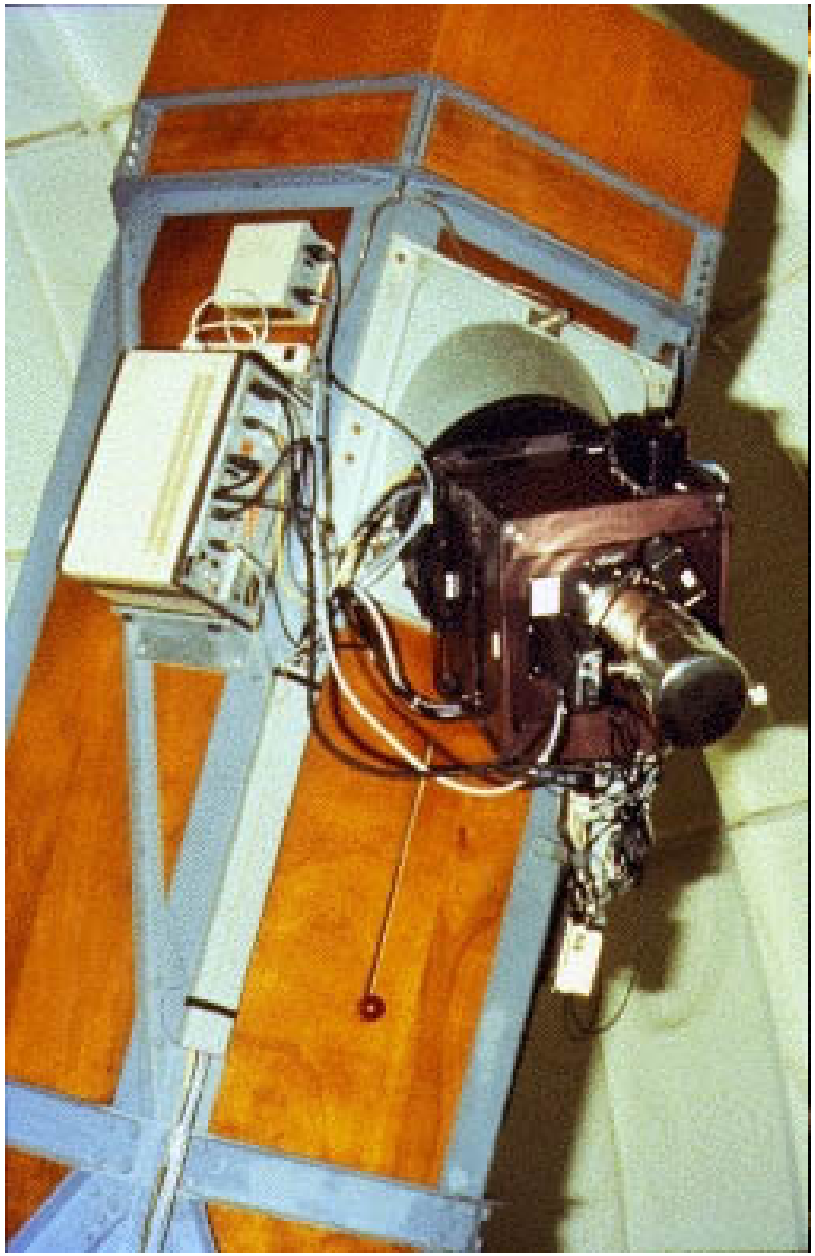
Spectra of IR Galaxies

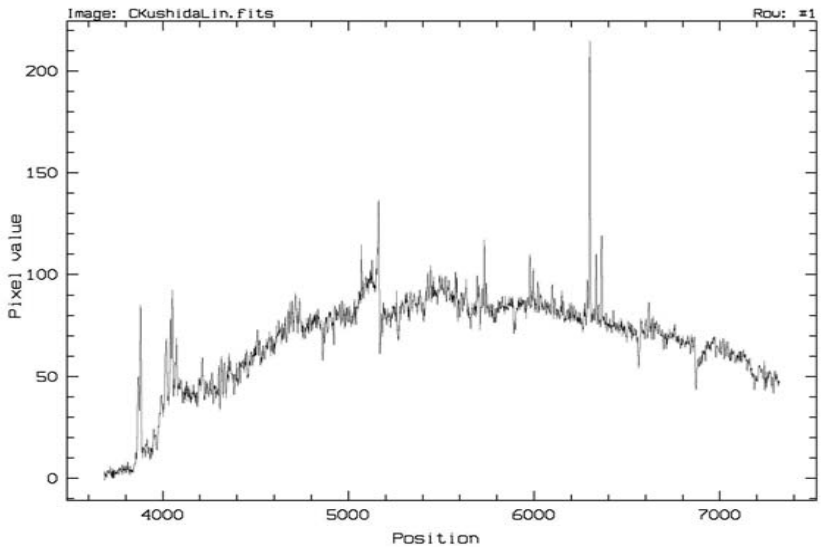






ToO: Comets

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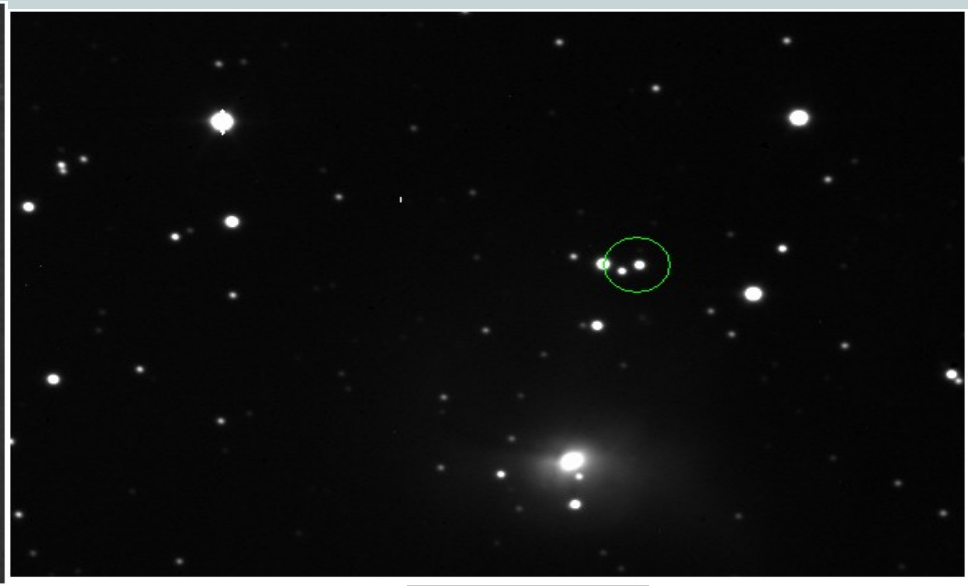
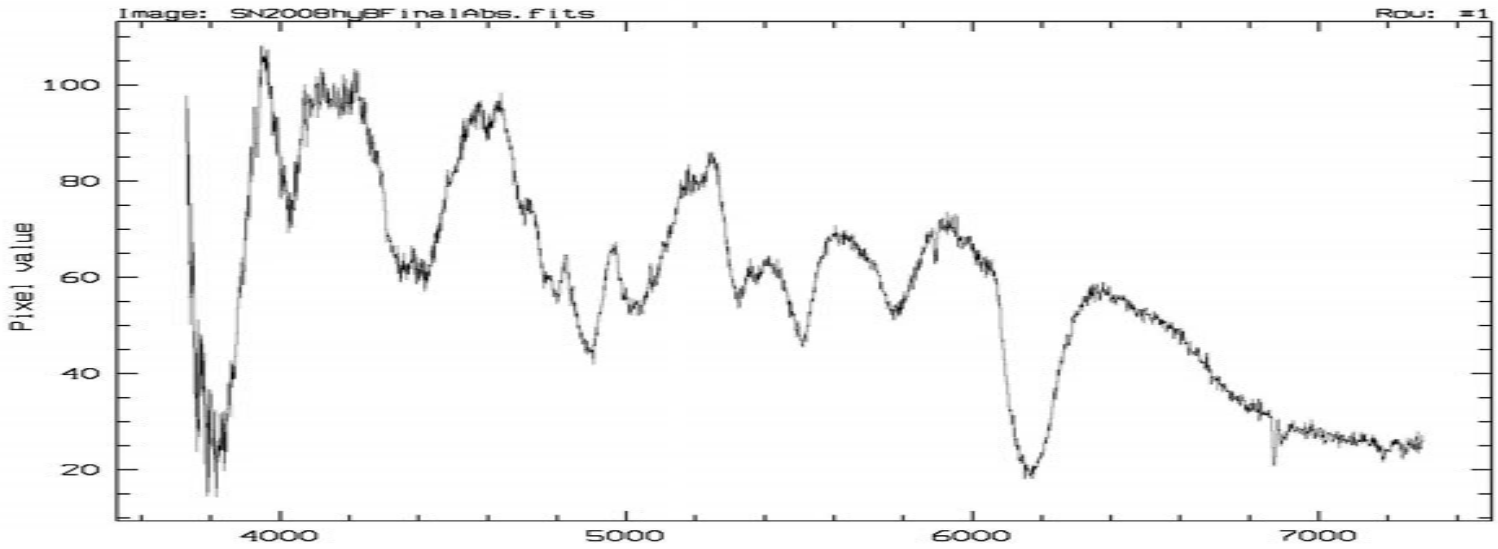
ToO: Supernovae



Before...

After...



Lessons learned

- Hands-on experience unique
- Work in small groups essential
- Quality of tutors is the key for success
- Diversity of origins and nationalities favours interactions and future collaborations

Future activity requires...

- Continued availability of medium-sized telescopes with up-to-date instrumentation used for research
- Adequate funding plans at the national, and european level (and coordination...)

  Thanks to Opticon!

  (see also US Decadal survey)
- A recognition that this type of teaching is essential for an observing science like astrophysics (availability of experts...)
- **Transmission of skills is essential to get good observers, and instrument/software builders, in the future**

Haute-Provence

Lavander fields

The Observatory