

Observing with Modern Observatories

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NEON Archive Observing School 2006

What is **modern**?

(Merriam-Webster dictionary)

Main Entry: **¹modern**

Pronunciation: 'mä-d&rn, 'mä-d (&-) r&n

Function: *adjective*

Etymology: Late Latin *modernus*, from Latin *modo* just now, from *modus* measure

1 a : of, relating to, or characteristic of the present or the immediate past

b : of, relating to, or characteristic of a period extending from a relevant remote past to the present time

2: involving recent techniques, methods, or ideas

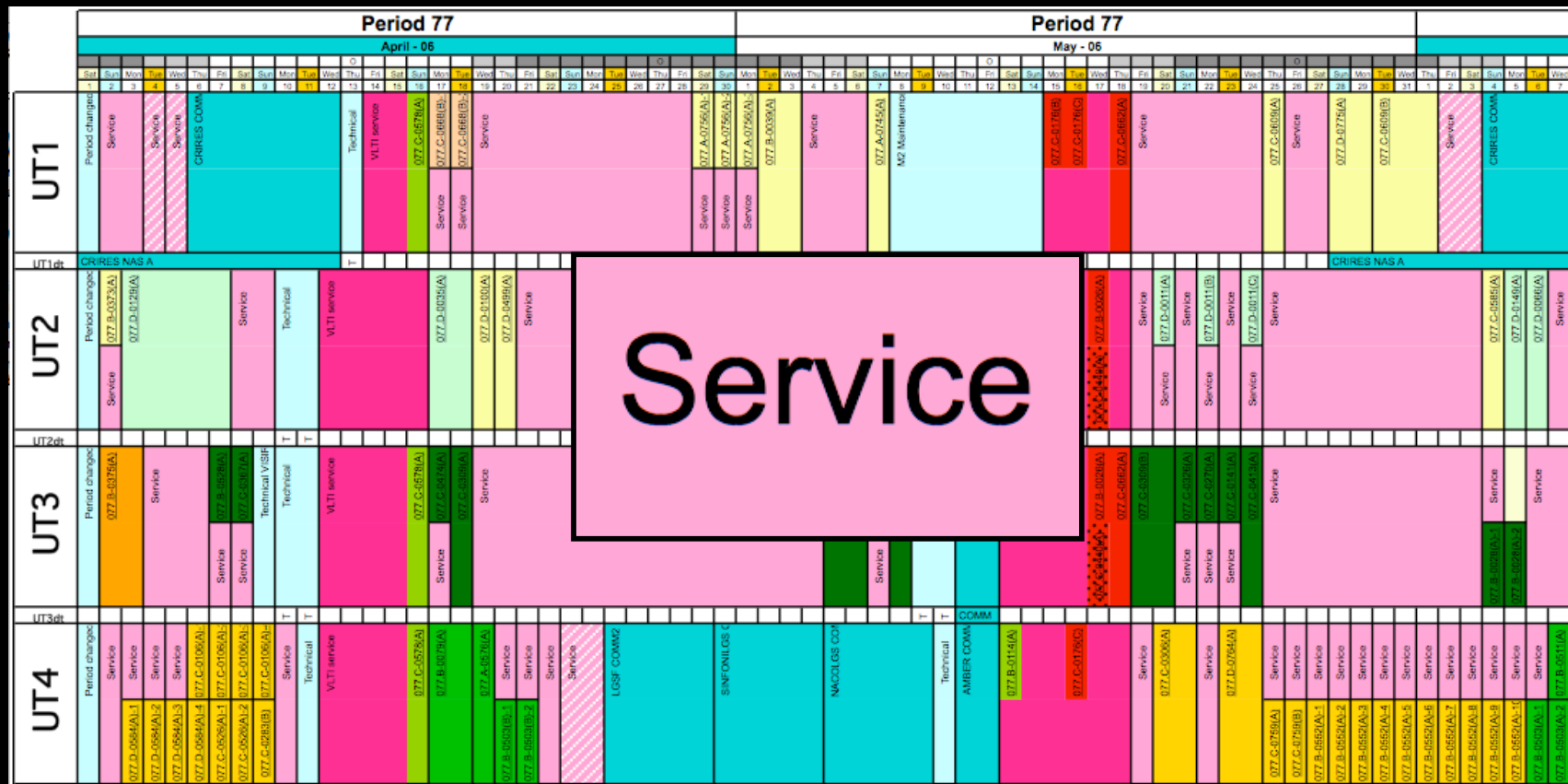
Outline

- The modes of modern observing
 - Visitor Mode
 - Service Mode
- The lifecycle of a proposal
 - Phase 1
 - Phase 2
- The afterlife of a proposal
 - Science Archives
 - Virtual Observatory

It was (almost) 30 years ago today: the Period 22 schedule

PERIOD 22		O C T O B E R																																				
OCT 1 - APR 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3				
1978	SU	M	TU	W	TH	F	S	A	SU	M	TU	W	TH	F	S	A	SU	M	TU	W	TH	F	S	A	SU	M	TU	W	TH	F	S	A	SU	M	TU	W	TH	F
3.6																																						
152																																						
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The modern schedule what's with all this pink?



Service mode observing (aka queue observing)

- The observations are scheduled and executed without the the Principal Investigator (or collaborators) being present at the telescope
- The telescope is above the atmosphere: cumbersome to send observers there
- The telescope is below the atmosphere: desire to control its effects (and efficiently schedule transients/monitoring)

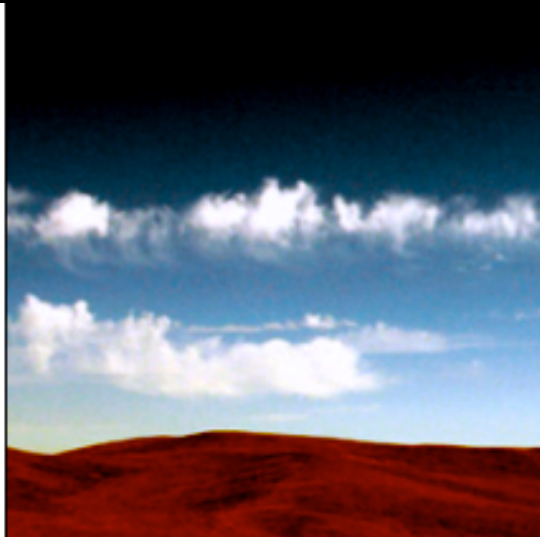
The principle of ground-based Service Observing

- *Flexible Scheduling*, i.e. the capability to continuously adapt the observing schedule to the external, often unpredictable conditions
- For this reason, and unlike in the case of space observatories, it is not generally possible to foresee the precise date when a given observation or programme will be carried out

The effects of the atmosphere



Moon



Transparency

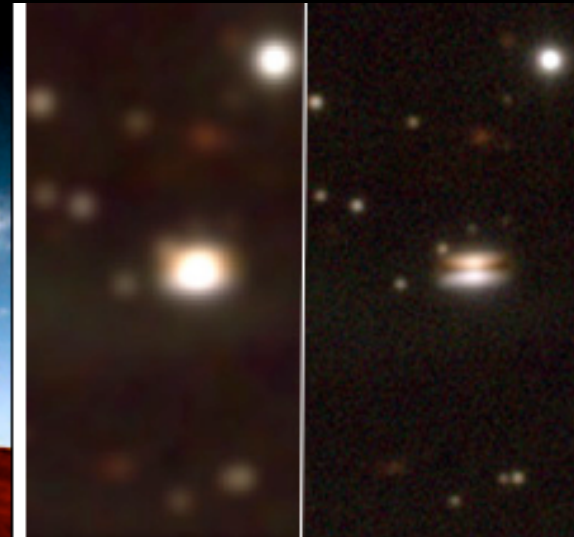


Image quality
(seeing, strehl)

Service Observing to maximize:

- the **science efficiency** by executing the programmes with highest scientific priority first and under the required observing conditions
- the **scientific use of telescope** time by having appropriate programmes ready for execution under a broad range of observing conditions
- the **operational efficiency** by sharing calibration data between programmes

Tips for a Service Mode observer

- Set the loosest possible constraints compatible with your science
- Consider observing in bad weather (filler programme)
- Simplify as much as possible the strategy
- Keep the OBs as short as possible: varying conditions vs. saving on overheads
- Understand very well the Calibration Plan and ask for additional calibrations if needed
- Remember: no real-time decisions

Visitor Mode Observing (aka classical observing)



- The observer is physically present at the telescope: 40% of the time, ~300 people a year
- Rational
 - Real-time decisions
 - Non-standard settings
 - Non-standard calibrations
 - Keep the community familiar with the observatories

Service + Visitor = Modern Observing

Entr'acte I

misconceptions on Service Observing

- Service Mode is cheaper than Visitor Mode
 - **False:** Service Mode requires a rather large supporting structure (User Support, Quality Control, infrastructure, etc.)
- Service Observing is more efficient in terms of scientific shutter open time
 - **False:** many more setup/instrument changes imply higher overheads and calibration load

Entr'acte II

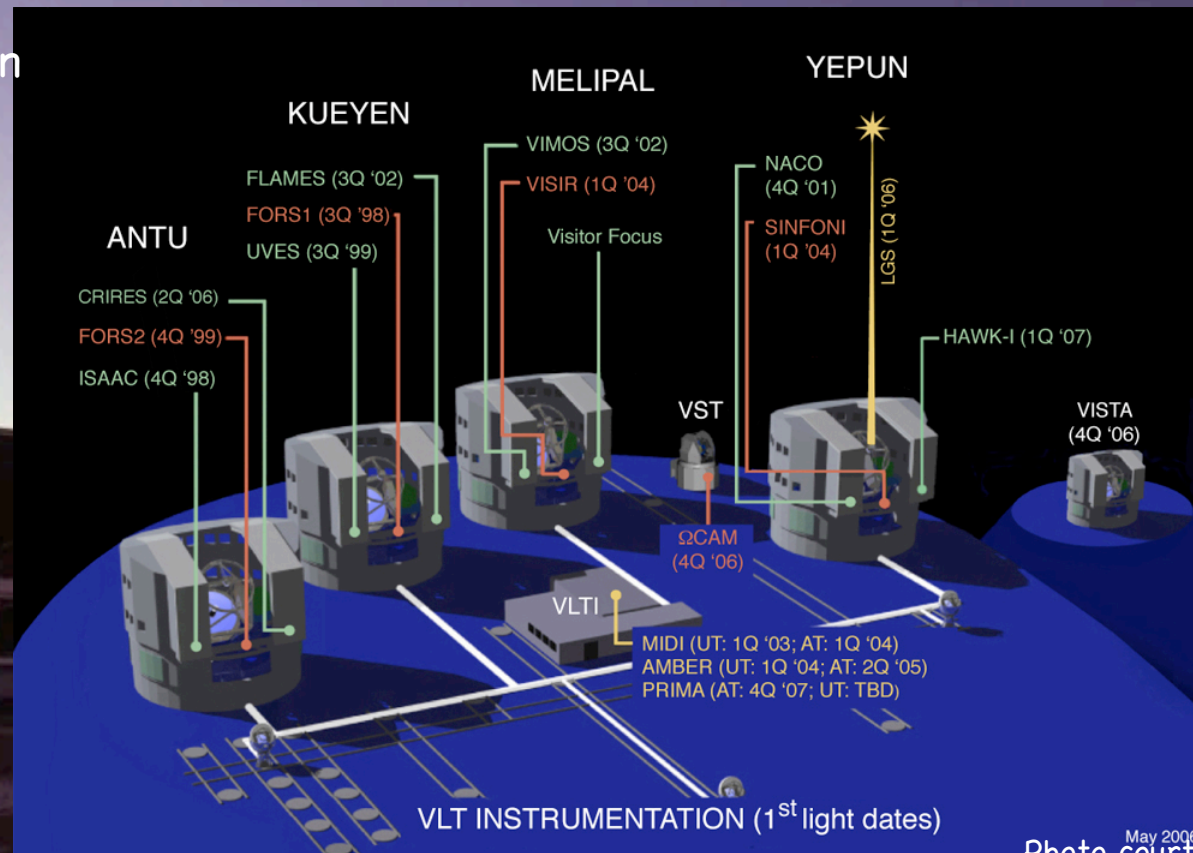
IT infrastructure

- If people don't travel, then information has to!
 - E-mail
 - Teleconferences
 - Videoconferences
 - Databases, database replication
 - Data transfer (internet, hard media)
 - OB transfer
 - ...

Entr'acte III

the VLT/VLTI instruments

More in Alan Morwood's and Andrea Richichi's lectures



May 2006
Photo courtesy of Gerd Hudepol

The lifecycle of a proposal

Phase 1

9. Justification of requested observing time and lunar phase

Lunar Phase Justification: The observations can be performed with any moon phase and, in fact, any atmospheric conditions.

Time Justification: (including seeing overhead) According to the most recent version of the UVES on-line Exposure Time Calculator (4.2.9.3), a S/N of 20, necessary to measure radial velocities with an accuracy of 1 km/s, is achieved in about 0.5 minutes integration for the 2 brightest of our targets ($V \leq 10.5$), while 1.5 minutes are needed for the 3 fainter stars ($10.5 \leq V \leq 11.5$). Let us stress again that we can accept virtually any atmospheric condition, and, in fact, these numbers were computed with a full moon illumination, 0.2 magnitudes of extinction due to clouds and 2" seeing. The overheads, as reported in Table 7.1 of the ESO Period 75 Call for Proposal, amount to 10 minutes per OH, thus yielding an execution time of 10.5 and 11.5 minutes for the 2 bright and 3 faint stars, respectively. In order to apply the Baade-Wessink technique we need 20 epochs per star. We, thus, request 18.5 hours for run A. Run B is aimed at measuring the chemical composition for 3 bright stars from the sample of Andrievsky et al (2002ab) at a single epoch. In this case, 3 minutes of exposure time are sufficient to reach a S/N of 60-70 over the entire spectrum. Including the overheads and one telluric standard star, this corresponds to 1 hour execution time. We, thus, request a grand total of 19.5 hours to complete our proposed project. The FEROS on-line Exposure Time Calculator (version February 2014) and overhead table in the P75 Call for Proposals indicate that the same execution time would be needed with this instrument.

Calibration Request: Standard Calibration

Ultimately, this provides an accurate and uniform calibration of this fundamental primary distance indicator over a factor of 20 in metal content.

3. Run	Period	Instrument	Time	Month	Moon	Seeing	Sky Trans.	Obs.Mode
A	75	UVES	18.5h	jul	n	n	THN	s
A/alt	75	FEROS	18.5h	jul	n	n	THN	s
B	75	UVES	1h	jul	n	n	THN	s
...

13. Scheduling requirements

5. Main special requirement(s)

Run: Special Requirements

A: No special requirements.
B: No special requirements.

14. Instrument configuration

Period	Instrument	Run ID	Parameter	Value or list
75	UVES	A	RED	Standard setting: 580
75	UVES	B	RED	Standard setting: 580

- You have to explain to a peer-review panel...
 - What you want to observe
 - Why you want to observe it
 - How you want to observe it
- ...and convince them to grant you time!

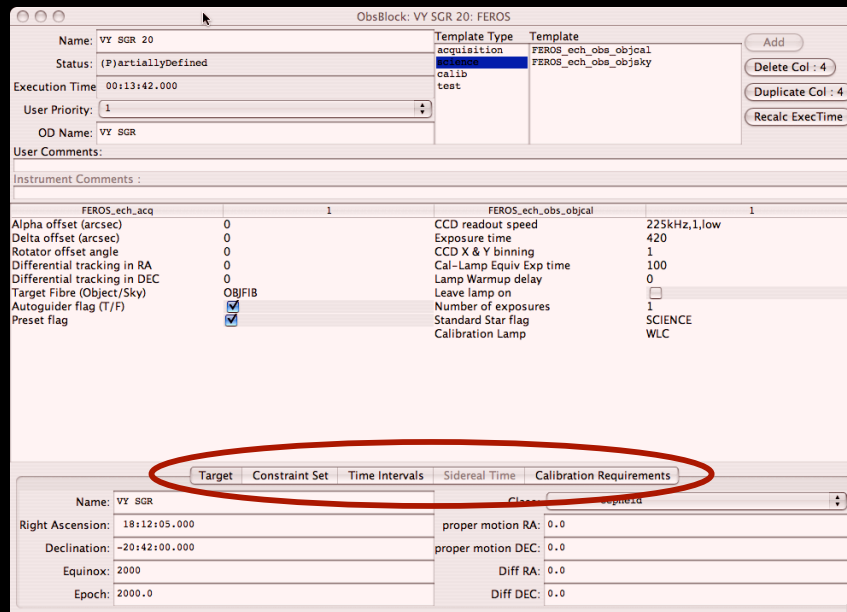
The lifecycle of a (successful) proposal

Phase 2

- Specify all of the details of the observations:
 - Instrumental setups
 - Exposure and execution times (ETC, overheads, etc.)
 - Observing techniques (offsets, chopping, etc.)
 - Constraint set(s)
 - README file
 - Finding charts
 - Ephemeris
 - ...

Phase 2

Observing Blocks and templates



- OBs are observing sequences based on templates
- Templates describe the basic operations that the instrument can perform
- Templates are customized with parameters
- OBs also contain additional information: constraints, timing, etc.

Phase 2 README file

ESO Programme ID : 075.D-0676(A)
Instrument : FEROS
Opc Priority Class : A
Opc Approved Execution Time (Hours) : 0.0
Proposal Type : NORMAL
Principal Investigator Name : M. Romaniello

Special Execution Requirements

The periods of the five target stars is 15-20 days. Ideally, then, observing each star once per night over consecutive nights would provide an adequate phase coverage. The long stretch of Service Mode time at the 2.2 telescope in August 2005 seems ideal for this purpose. In any case, please *do not* execute more than one OB per star per night.

The total execution time for the 5 targets in one epoch is just 55 minutes. It is, then, operationally easy to execute the OBs for the five targets for the same epoch in the same night. This is our preferred strategy, as it would ensure an adequate phase coverage for all stars.

Principal Investigator Email Address : mromani@efeso.org
Estimated Total Execution Time (hours, including overheads) : 18.5

Is this a Pre-imaging run ?

Source(s) of Pre-imaging :

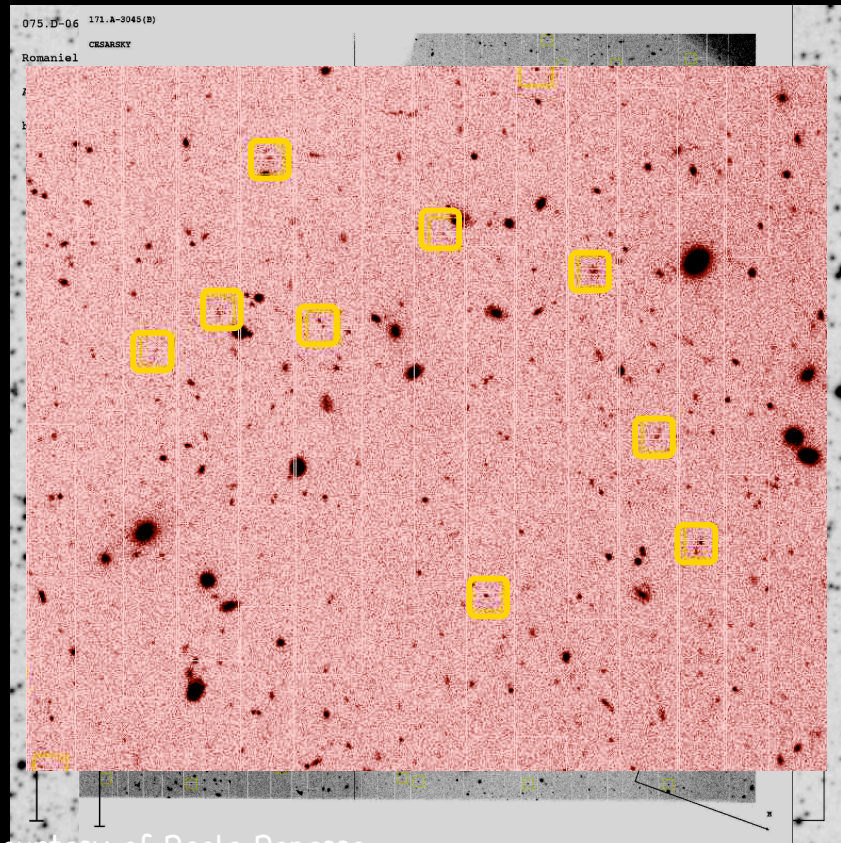
Pre-imaging sources not listed above

Do all your OBs comply with the instrument-specific requirements listed on the instrument-specific Phase 2 web page ? YES N/A
If this is a pre-imaging run, did you select PRE-IMAGING for the Observing Category for each Observing Template ? YES N/A
Do all your finding charts comply with both the general and instrument-specific Phase 2 Web Pages ? YES N/A
If you submitted OBs for standard stars, did you specify the magnitude and spectral type of all standard stars in the OBs ? YES N/A
Have you included OBs for any calibrations that you need but which are not part of the Calibration Plan ? YES N/A
If you are observing Moving Targets, have you attached suitable ephemeris files to your OBs ? YES N/A
If you have preferences which OBs should be executed first, did you make use of the User Priority field in the OBs ? YES N/A
If this is a run that requires coordinated observations with other facilities, did you give proper instructions in the Time-Critical Aspects Section ? YES N/A
Did you set 'New Preset' flag in all acquisition templates to 'True' ? YES N/A
If you use any lamp, did you check that it should never be left on at the end of any OB ? YES N/A

- The README file is used to communicate relevant information to the staff astronomer on the mountain, such as the description of the programme...
- ...and any other special requirements (time constraints, execution sequence, etc.)

Phase 2

Finding Charts



- And, finally, finding charts visually help the observer to identify the intended target...
- ...sometime it's easy...
- ...sometimes not quite!

Phase 2

Definition of the Observing Run

- Service Mode PIs interact with the Observatory staff, e.g. the ESO User Support Department here in Garching, until the Phase 2 package is ready for execution
- Visitor Mode PIs are required to go to the mountain ahead of time to finalize the observations with the local staff
- Ideally all problems are caught and solved **before** the night starts so that no telescope time is lost

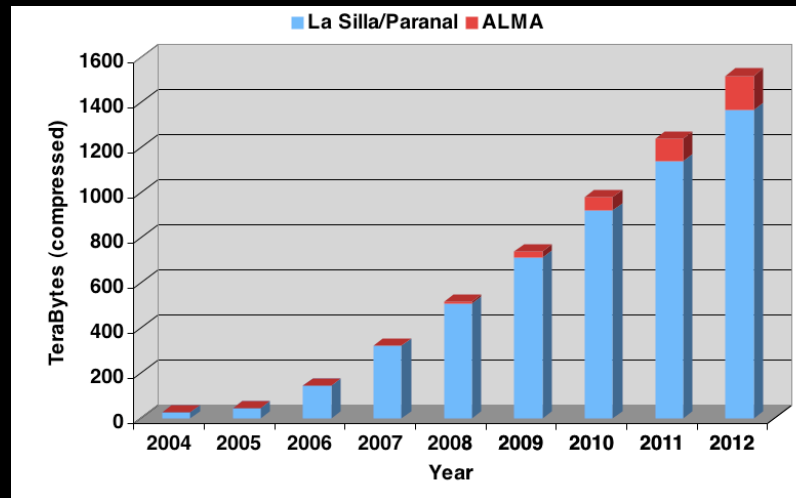


...the data are finally acquired...

(and you go happily about doing your science with it)

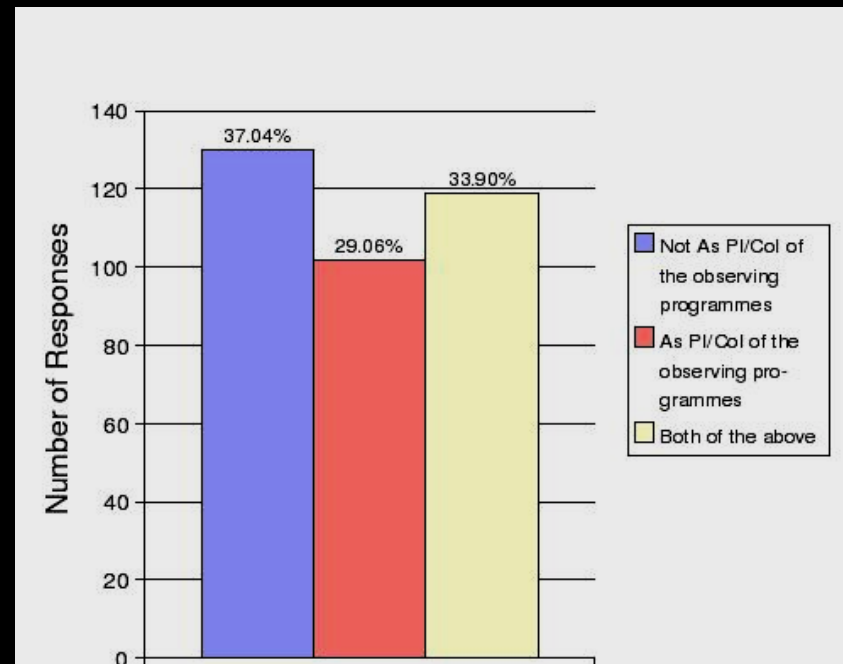
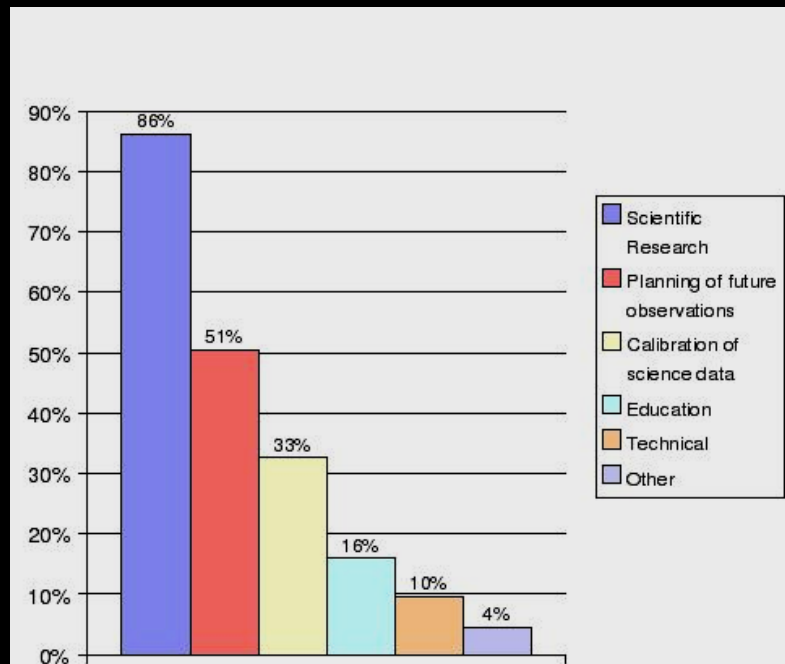
The afterlife of a proposal

Archives and Virtual Observatory



- Data are archived to be used by future generations for research and education
- The archive becomes an instrument in its own right, capable of producing genuinely novel science (and there's money involved, too!)

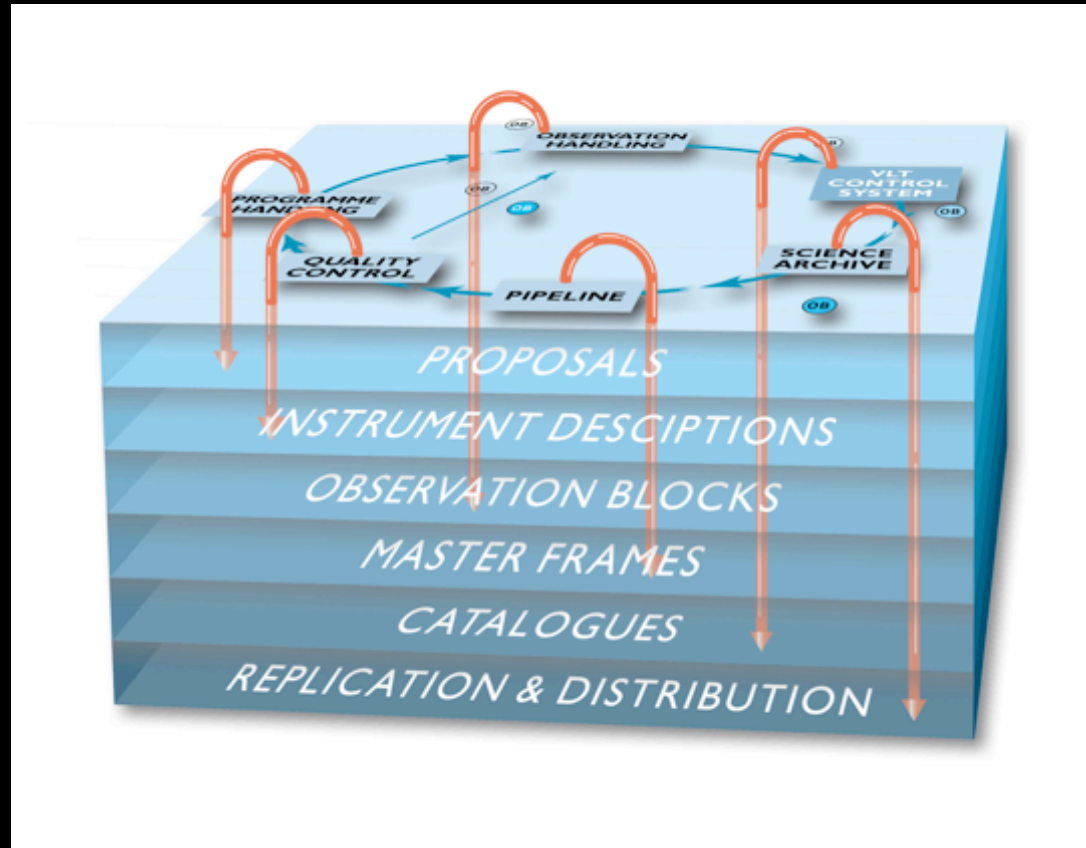
The archive as a new instrument (ESO Science Archive Survey)



The archive as a new instrument

- Data are processed to ensure known and certified quality (e.g. by the ESO Quality Control group)
- A **modern archive** contains the raw data and processed data of different levels, possibly all the way up to highly processed data ready for scientific use
- The full exploitation of archive data requires specific tools to, e.g., easily combine different instruments and observatories: the **Virtual Observatory** (cfr Paolo Padovani's lecture)

Putting everything together the Data Flow System



Courtesy of Benoît Pirene

Service + Visitor + Virtual Observatory

=

The Observatory of the future

