Astrofísica Observacional

The art of writing proposals

(telescope, funding, etc)

Bibliography:

How to write a proposal (Wilms et al.): http://pulsar.sternwarte.uni-erlangen.de/black-hole/1stschool/coursematerial/proposals.pdf

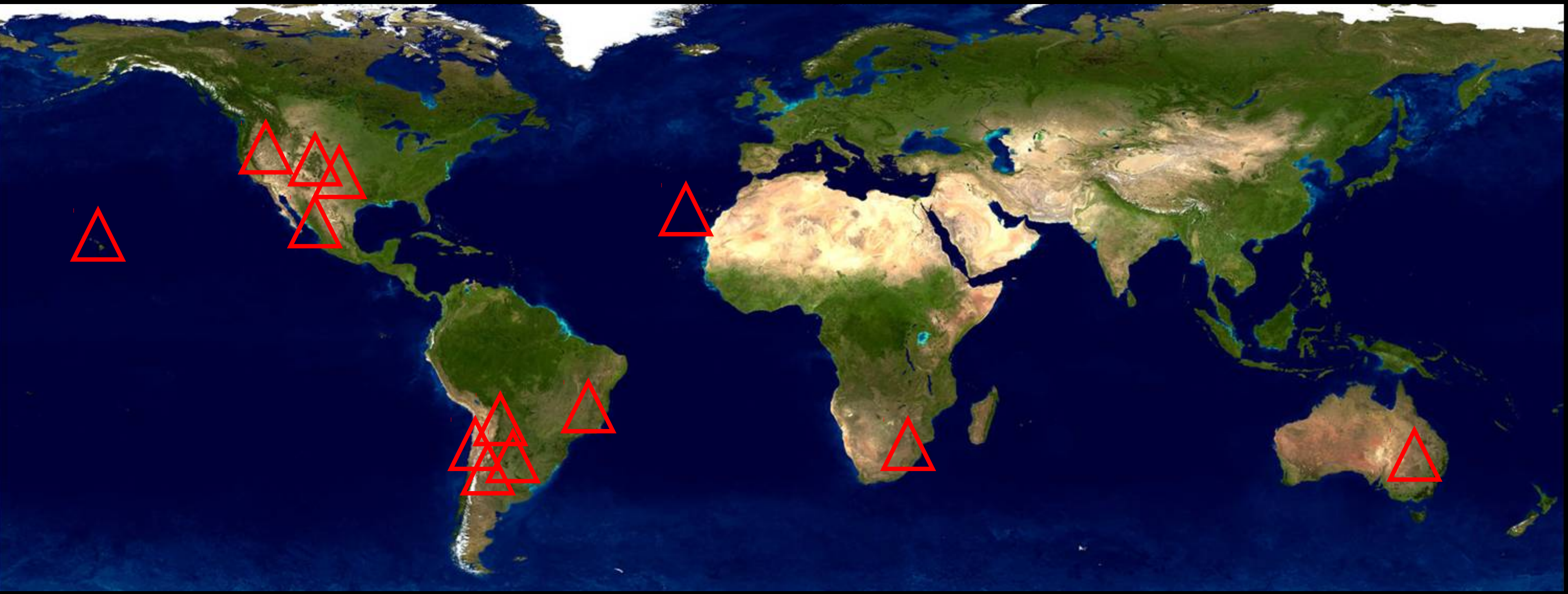
How to write a successful proposal (Bruno Leibundgut): http://venus.ifca.unican.es/~barcons/JornadaESO2011/02_B.Leibundgut_ESO.pdf

Prof. Martin Asplund's slides on **how NOT to write a proposal**

- Information given in the call for proposals (ESO, Gemini, etc)
- Based on my own experience (>50% success at 6.5 - 10m telescopes

Prof. Jorge Meléndez

My previous experience

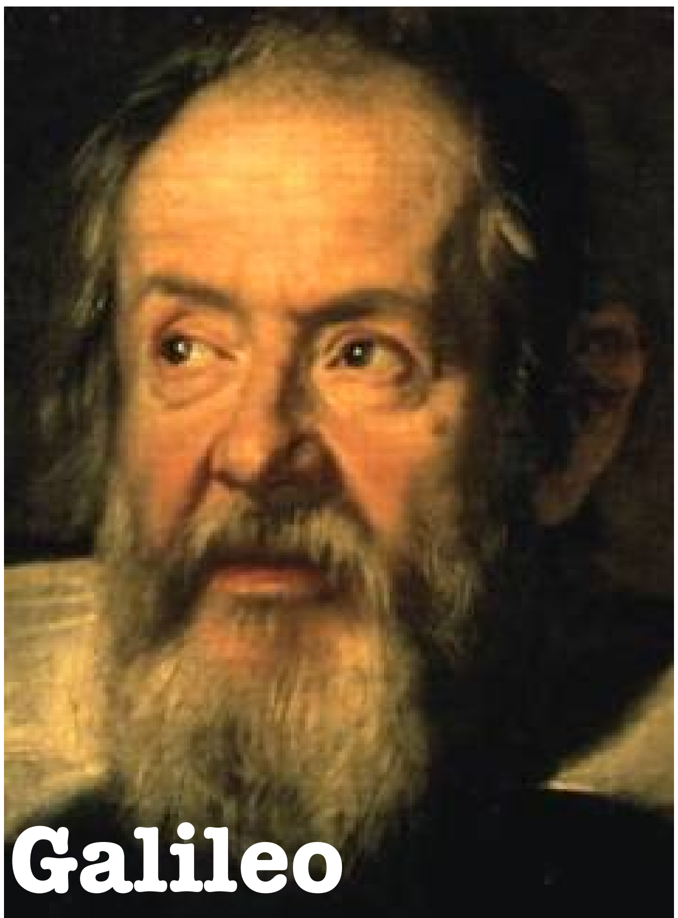


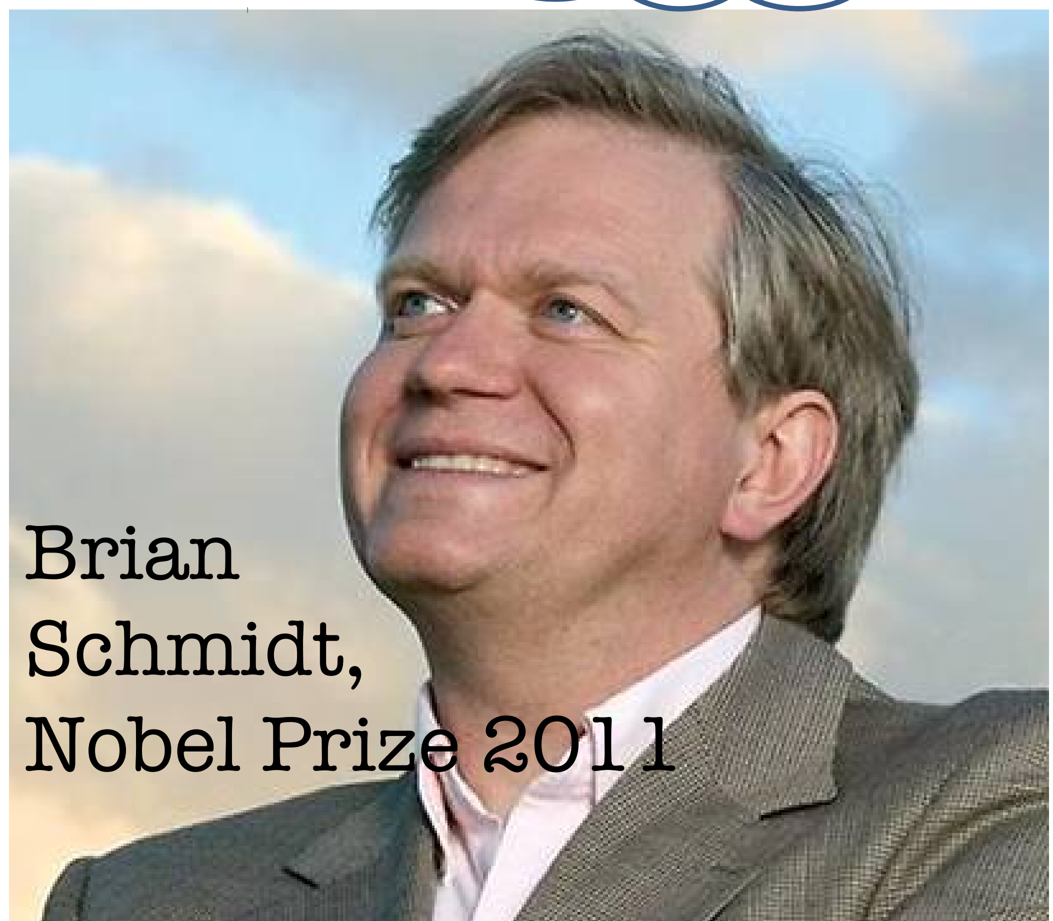
My previous experience

Competition

I've got a brilliant idea!

Me too!

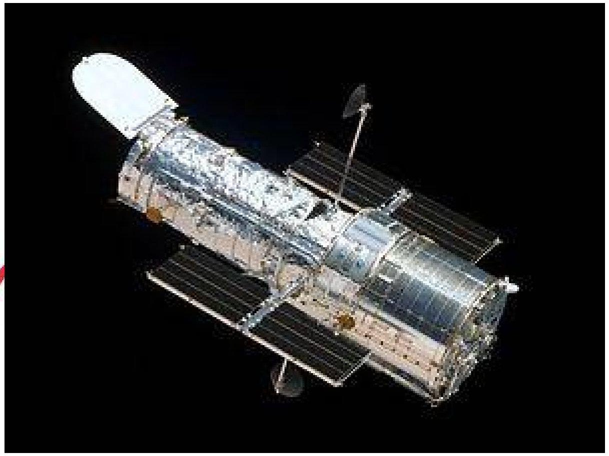




Challenge!

The most important telescopes and instruments can be heavily oversubscribed.

Pressure factor at the most important observatories is > 3 (only 1 in 3 is approved, or worse)



ESO

European Southern Observatory

www.eso.org

NASA

GEMINI OBSERVATORY

Exploring the Universe, Sharing its Wonders

SPACE TELESCOPE SCIENCE INSTITUTE

esa

European Space Agency

How to write an observing proposal

- Why do you want to write a proposal ?
- You have an important scientific problem that **needs** to be solved
- You have new exciting ideas

The process

- Call for proposals usually twice a year (likely **March** & **September**)
- Review of the proposals
- In most cases there are too many proposals, so only a small fraction of time is spent by the TAC (time allocation committee) in each proposal. Double blind review. Peer review.
- If your proposal is badly prepared, it can easily be discarded

General structure

1. Title
1. Abstract. Some reviewers may only read this
1. Introduction. Big picture? Why is your science interesting? What are the open questions?
1. Scientific Justification. Why is your observation interesting? How will you do the analysis?
1. Technical Feasibility. Prove the observation is doable. For example, perform S/N estimates, simulate spectrum or image, show that source is visible, discuss why other facilities couldn't do the science better

http://pulsar.sternwarte.uni-erlangen.de/black-hole/1stschool/coursematerial/proposals.pdf

Tip #1: Don't be afraid!

- "I can't"
- "My science case is not interesting enough"

Tip #1: Don't be afraid!

If you want to make an important contribution to Astronomy, don't be afraid of competition

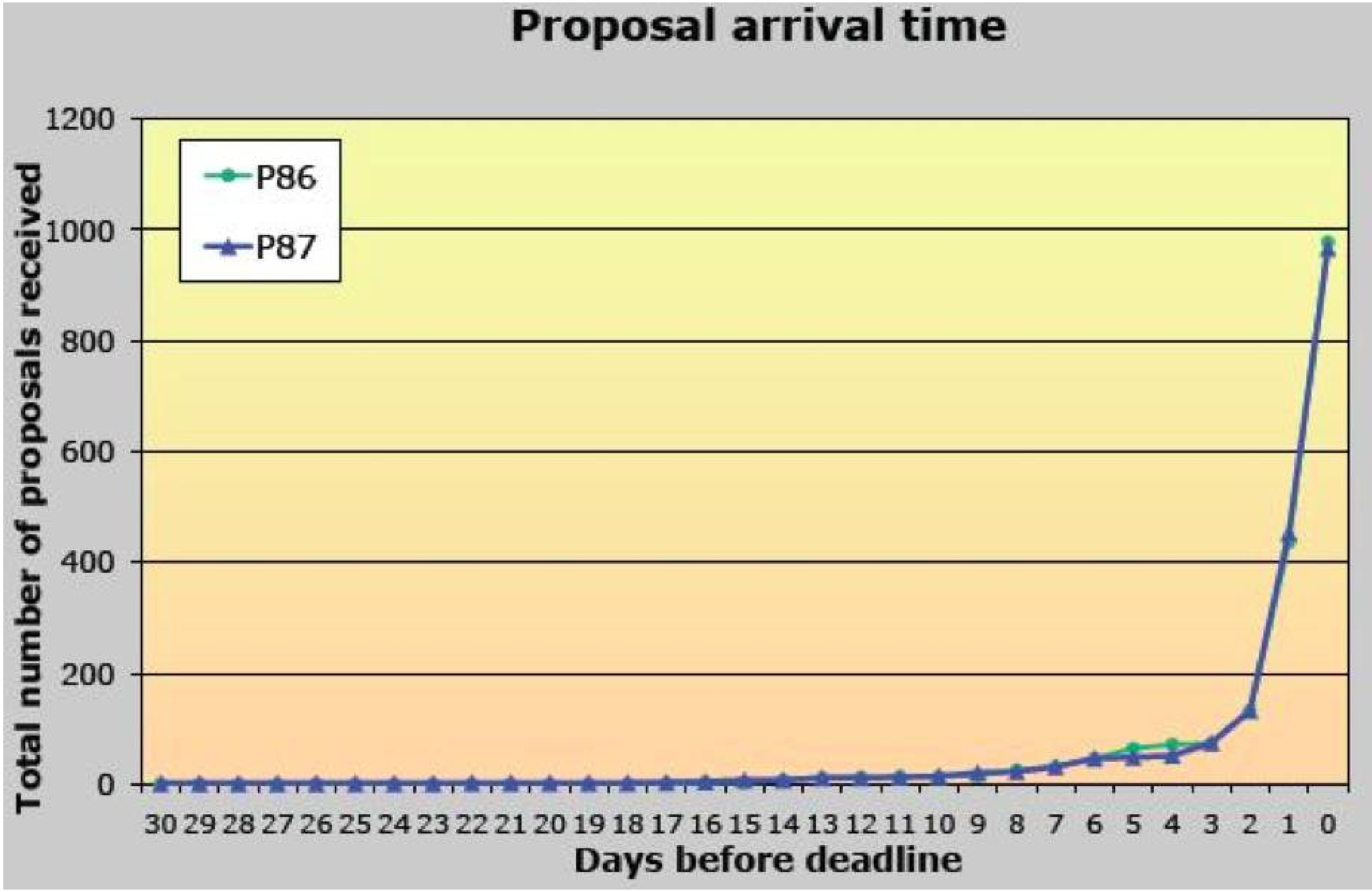
Pressure factor by telescope:

HST, Chandra: 5

ESO: 3

Gemini: 2

Tip #2 Don't wait until the very last minute ...



http://venus.ifca.unican.es/~barcons/JornadaESO2011/02_B.Leibundgut_ESO.pdf

Tip #2 Don't wait until the very last minute ...

European Southern Observatory

ESO Call for Proposals – P102

Proposal Deadline: 28 March 2018, 12:00 noon CEST

GEMINI OBSERVATORY

Data limite para submissão de propostas: 2 de abril de 2018, segunda-feira, às 23:59 (horário de Brasília)

SOAR TELESCOPE

SOAR - Chamada para envio de propostas de observação SEMESTRE 2016B (01/08/16 - 31/01/17)

Data limite: 15 de abril de 2016 às 23h59min de Brasília

As **datas limites** para o recebimento dos pedidos de tempo são:

Semestre A: 28 de outubro, às 24h de Brasília

Semestre B: 29 de abril, às 17h* de Brasília - *Fique atento ao NOVO HORÁRIO para submissão

O encaminhamento dos pedidos de tempo é aceito somente através do formulário on-line.

OPD 2022B

Tip #3: be flexible with your targets !

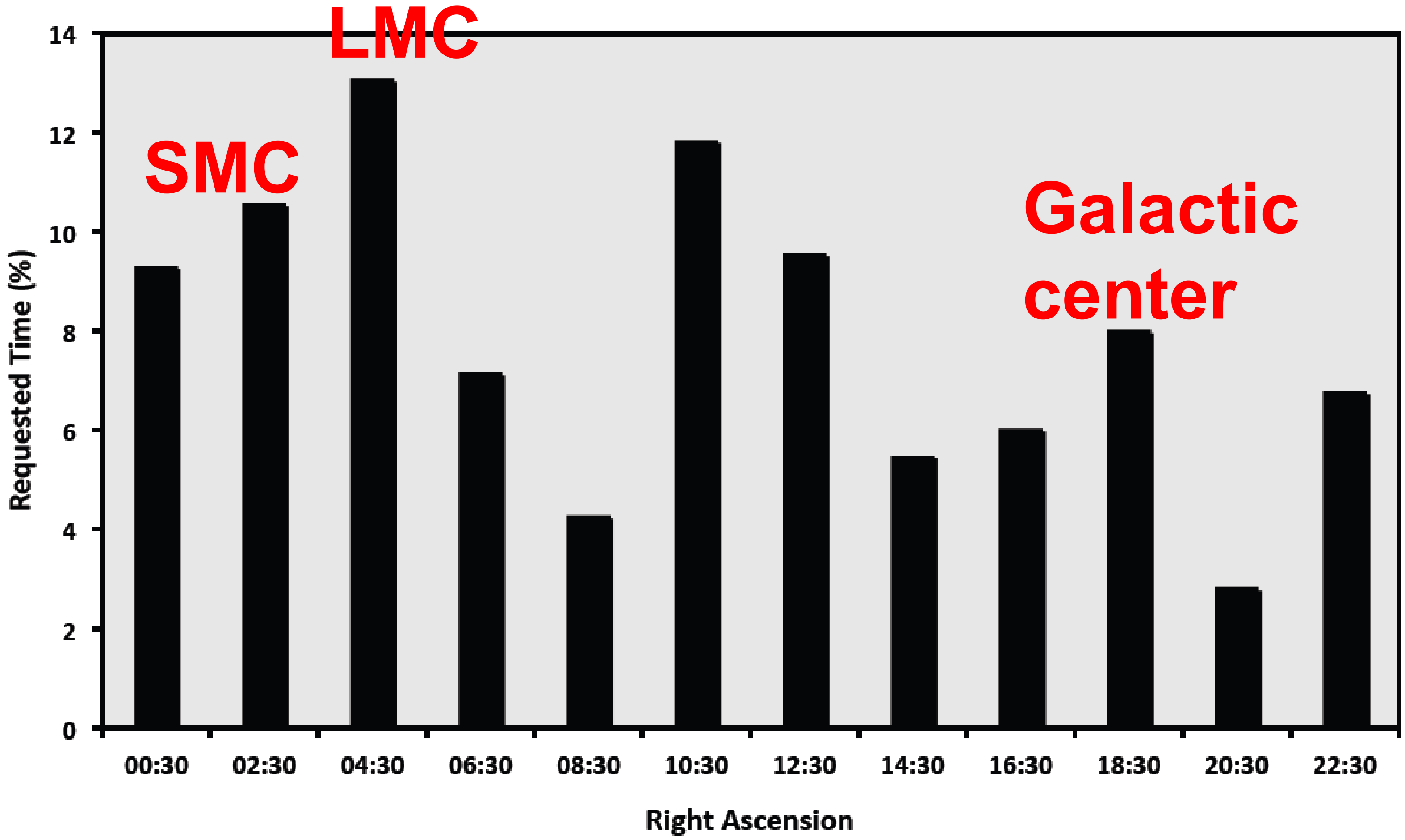
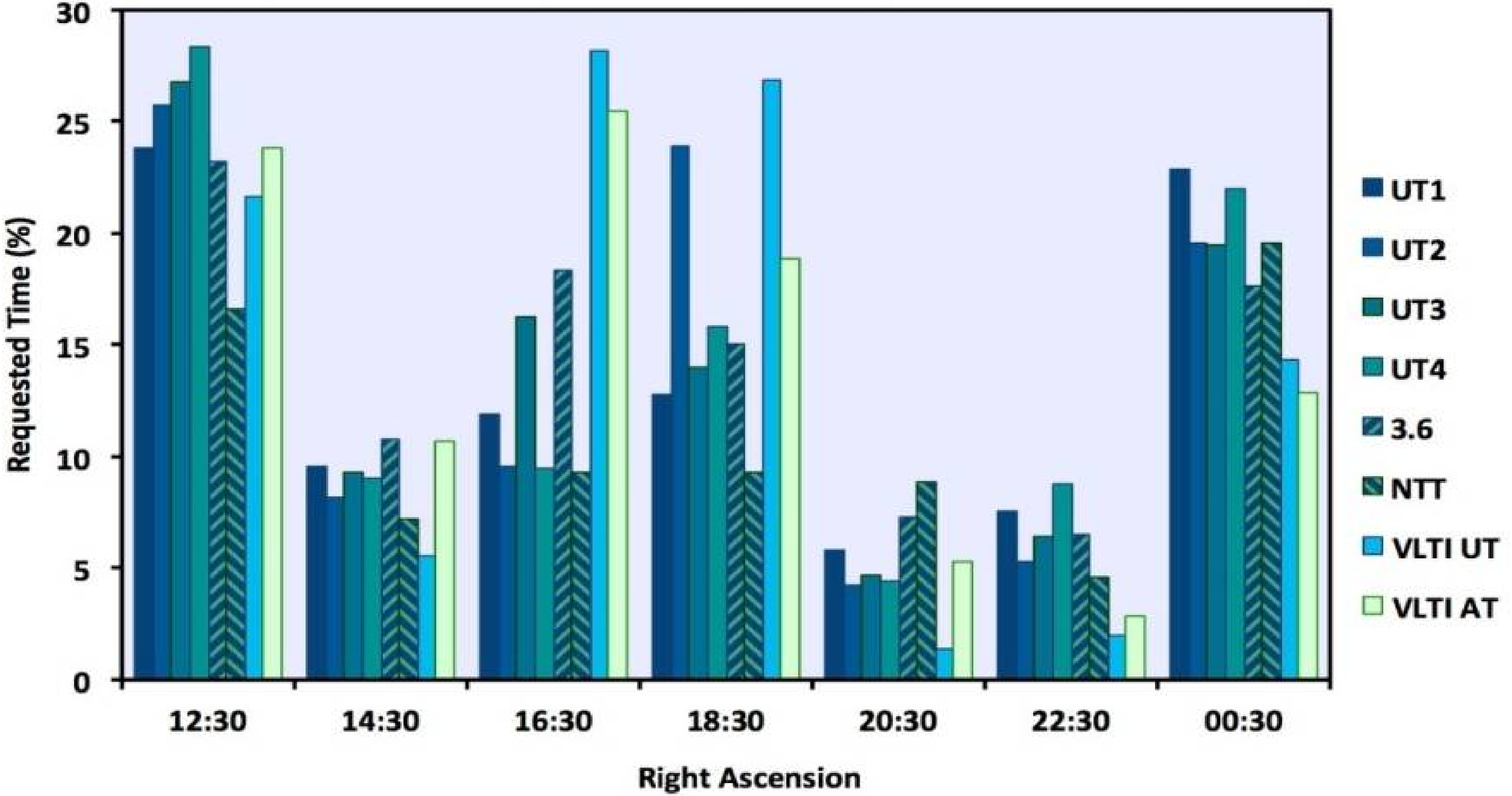


Figure 2: Distribution of requested time (percentage of total) on Paranal and La Silla as a function of Right Ascension (RA). The histogram bins have a width of 2 h and are labelled with the RA of their centre. The data for all requested targets over the last 10 periods are shown here.

Tip #3: be flexible with your targets !



Prediction of demand 2017 for ESO telescopes

http://www.eso.org/sci/observing/phase1/p99/pressure.html

Tip #4: keep it simple!

- TAC (Telescope Allocation Committee) members are not familiar with all areas, especially for small TACs (e.g., Gemini Brazil)
- Don't be too specific or too generic
- Explain important facts that may be obvious to you

Your proposal must be understood by people from other areas

Tip #5A. Clear language: avoid language errors and poor readability

- Use grammar check
- Ask somebody familiar with English (If possible ask a native speaker) to check your proposal
- Don't cheat using a smaller font (dense text)
- Use good figures

Don't use uncommon words. For ex:
"*kakorrhaphiophobia***"**

Tip #5B. Clear language
make your writing exciting!

Present an exciting story, interesting for many people

- This project intends to measure the mineralogy of the family of asteroids X27

Tip #5B. Clear language
make your writing exciting!

Present an exciting story, interesting for many people

- This project intends to measure the mineralogy of the family of asteroids X27

- This project will study the family of asteroids X27, which probably caused the extinction of the dinosaurs

Tip #6: Don’t forget the “Big Picture”

- Why is your topic important in Astronomy?
- Will it provide insight to other Astronomy areas?

At the very least, show the relevance of your research in your extended area

What is the point of analyzing the galaxy NGC2347 besides obtaining its SFH?

Tip #7: be ambitious

- Why analyzing just another metal-poor star?
- What is the advantage in analyzing just one (1) bulge-less galaxy?

Show that your project can have a significant impact in your area

- **Large sample**
- **Small sample (could be even just 1) but using a new technique or exploring a unique object**

Tip #8: Be ambitious BUT REALISTIC

- Never promise something that you cannot fulfill

Example: if you promise that the observation of one (1) planetary system will allow you to solve the problem of planet formation, the Telescope Allocation Committee (TAC) will not believe you

Tip #9: show that you can reach your aims

- Have previous experience in the area?
- Is the team qualified to perform the data reduction and data analysis?
- If you don't have any previous experience (papers), show that you have the capacity

Example: show a figure with the expected results according to your models

Tip #10: show a detailed technical justification

- You cannot just say that you "think" that a given exposure time is enough. That reasoning **is not enough.**
- Use the ETC (exposure time calculators)
- Justify the choice of telescope and instrument, and your instrument setup

Why is the instrument and telescope ideal for your project?

Tip #11: Show the previous use of your time allocations

(e.g., 2-year previous allocations)

- Show that you have done something useful with previous data (papers? theses? meetings?)
- If you didn't work with the previous data, explain the reason (e.g., data reduction in progress, or data is useless [why?])

Telescope time is expensive

Tip #12: establish clearly your long term plans

- Not necessary if proposal only lasts 1 semester
- If needed, evaluate the possibility of applying for a long term project
- Do not assume that just because you got time once you will get it again next semester **for the same project**

Tip #13: Justify your sample size

- Important to justify the sample size (1, 10, 1000)

- Is half the sample enough for your aims? Or actually you need twice as many objects?

- Be consistent with the numbers. For ex., do not mention about 30 objects in the abstract, 35 in the text, and 25 in the technical justification! Inconsistencies → proposal could be rejected

Tip #14: Careful with weakness

- **Controversy?** Be careful when discussing hotly controversial topics, as some of the TAC members may have a different opinion than your preferred view.
- **Too many applications**. It could be beneficial to the proposal if the data are useful for additional objectives, but be careful. As you have little space to explain other applications, your project could be criticized on those parts

Example.

which one is the best title ?

- Planets around solar twins: Leveraging high-accuracy stellar abundance determinations to trace the formation and evolution of planetary systems

- Planets around solar twins: tracing planet formation using highly accurate abundance determinations

ESO proposal

European Organisation for Astronomical Research in the Southern Hemisphere

OBSERVING PROGRAMMES OFFICE • Karl-Schwarzschild-Straße 2 • D-85748 Garching bei München • e-mail: opo@eso.org • Tel.: +49 89 320 06473

APPLICATION FOR OBSERVING TIME PERIOD: **96A**

OPC category

Important Notice:

By submitting this proposal, the PI takes full responsibility for the content of the proposal, in particular with regard to the names of CoIs and the agreement to act according to the ESO policy and regulations, should observing time be granted.

1. Title Category: **C–7**

Unveiling signatures of planet engulfment in the chemical composition of young solar analogs

Example: first proposal written by Lorenzo Spina https://www.eso.org/sci/observing/phase1/p98/opc-categories.html

A - COSMOLOGY

A1	Surveys of high-z galaxies
A2	Identification studies of extragalactic surveys
A3	Large scale structure and evolution
A4	Distance scale
A5	Groups and clusters of galaxies
A6	Gravitational lensing
A7	Intervening absorption line systems
A8	High redshift galaxies (star formation and ISM)
A9	Surveys of AGNs and AGN host galaxies

B - GALAXIES AND GALACTIC NUCLEI

B1	Morphology and galactic structure
B2	Stellar populations: unresolved and resolved
B3	Chemical evolution
B4	Galaxy dynamics
B5	Peculiar/interacting galaxies
B6	Non-thermal processes in galactic nuclei (incl. QSRs, QSOs, blazars, Seyfert galaxies, BALs, radio galaxies, and LINERS)
B7	Thermal processes in galactic nuclei and starburst galaxies (incl. ultraluminous IR galaxies, outflows, emission lines, and spectral energy distributions)
B8	Central supermassive objects

C - INTERSTELLAR MEDIUM, STAR FORMATION and PLANETARY SYSTEMS

C1	Gas and dust, giant molecular clouds, cool and hot gas, diffuse and translucent clouds
C2	Chemical processes in the interstellar medium
C3	Star forming regions, globules, protostars, HII regions
C4	Pre-main-sequence stars (massive PMS stars, Herbig Ae/Be stars and T Tauri stars)
C5	Outflows, stellar jets, HH objects
C6	Main-sequence stars with circumstellar matter, early evolution
C7	Young binaries, brown dwarfs, exosolar planet searches
C8	Solar system (planets, comets, small bodies)

D - STELLAR EVOLUTION

D1	Main-sequence stars
D2	Post-main-sequence stars, giants, supergiants, AGB stars, post-AGB stars
D3	Pulsating stars and stellar activity
D4	Mass loss and winds
D5	Supernovae, pulsars
D6	Planetary nebulae, nova remnants and supernova remnants
D7	Pre-white dwarfs and white dwarfs, neutron stars
D8	Evolved binaries, black-hole candidates, novae, X-ray binaries, CVs
D9	Gamma-ray and X-ray bursters
D10	OB associations, open and globular clusters, extragalactic star clusters
D11	Individual stars in external galaxies, resolved stellar populations
D12	Distance Scale - stars

1. Title Category: **C–7**

Unveiling signatures of planet engulfment in the chemical composition of young solar analogs

2. Abstract / Total Time Requested

It is well known that newly formed planetary systems undergo processes of orbital reconfiguration and planet migration. As a result, planets and protoplanetary objects may fall onto the central star, being fused and mixed into its external layers. Such episodes may alter the chemical composition of the stellar photosphere. Our proposal will provide an excellent opportunity to improve our understanding on the incidence of these catastrophic events and to investigate the nature, the composition and the fate of this rocky material accreted onto the star, through a precise chemical abundance analysis in young stars from the Pleiades, where there are chances of detecting the effect of planet engulfment. This will be accomplished by using high-resolution, high- SNR UVES spectra, which will allow us to achieve extremely precise abundances at the level of 0.01-0.02 dex, as demonstrated in our previous works

3. Run	Period	Instrument	Time	Month	Moon	Seeing	Sky	Mode
A	96	UVES	21.3h	nov	n	0.8	THN	s
A/alt	96	UVES	11.8h	nov	n	0.8	THN	s

4. Number of nights/hours	Telescope(s)	Amount of time
a) already awarded to this project:		
b) still required to complete this project:		

5. Special remarks:

The ideal time allocation to achieve the aims of this project is ~21h, to observe all the 11 stellar analogs selected as our targets. A smaller allocation would still be useful, but less significant due to a more restricted sample of only 6 targets (preserving our SNR requirements).

6. Principal Investigator: Ispina

6a. Co-investigators:

J.	Meléndez	1854

7. Description of the proposed programme

A – Scientific Rationale: ***Using unprecedent precise chemical abundances, we aim to constrain early planet engulfment in young solar analogs.***

Open clusters are groups of stars formed from the same nebula. For this reason, members of a specific cluster are expected to share the same distance, age and kinematics. Most importantly, it is also generally accepted that stars of the same association also have the same chemical content (Freeman & Bland-Hawthorn 2002 ARA&A 40 487). Hence, **open clusters are the ideal targets for the study of chemically anomalous stars**.

Some chemical anomalies observed in open clusters could be explained through episodes of planet engulfment (Laughlin & Adams 1997 ApJ 491 L51; Gonzalez 2006 PASP 118 1494; Chambers 2010 ApJ 724 92; Spina et al. 2014 A&A 567 55). Indeed stars can be subject to occasional episodes of accretion during their lifetime through different processes. Apart from the well known phase of gaseous accretion that characterizes the newly born stars during their first Mys of existence, the fall of planet or planetesimals adds to the accretion episodes that a star can experience.

Several recent studies showed that such **fatal episodes of planet engulfment are not only plausible, but also probable**. In fact, high-precision radial velocity surveys revealed that ~20-30% of solar-type stars have low-mass planets (1-30 $M_{\oplus}$) with orbital periods <50 days (Mayor & Udry 2008 PS T 130 014010; Howard et al. 2010 Science 330 653). In addition, simulations shown that many of these planet embryos can coagulate on timescales of some tens of Myr (e.g., Chambers 2010 Icarus 208 505; O'Brian et al. 2006 Icarus 184 39) within the inner planetary system (e.g. <1 AU). Their mutual interaction and tidal perturbation of the host star can easily produce their orbital decay (e.g., Zhou 2010 EAS 42 255 and references therein). In addition, observations of jupiters having extremely small orbits clearly indicate that episodes of planet migration are feasible. It is also likely that a giant planet migrating inward can induce other planets to move into unstable orbits (Zhou & Lin 2008 IAU Sym 249; Mustill et al. 2015). **These catastrophic events may happen more frequently during the early stages of planetary systems**, when planets may not have cleared their orbits yet.

The major consequence of planet ingestion would be a metallicity enhancement due to the pollution of planetary material: when rocky material enters into the star, it is rapidly dissolved and mixed. If the accreting star has a thin convective zone (CZ), the metal-rich planet material is not too diluted and can produce a significant increase of the atmospheric metallicity, which can be reliably detected. In fact, such dilution will not yield an indiscriminate abundance rise of all the heavy elements, but likely will produce a characteristic chemical pattern that mirrors the composition observed in rocky material (Chambers 2010) with most refractory elements (e.g., those having condensation temperature $T_{cond}\gtrsim$1000 K) being over-abundant relative to volatile elements. This effect is $\leq$0.05 dex (Chambers 2010), hence high precision is needed.

7. Description of the proposed programme

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Try to write an exciting proposal (some drama is OK, but do not exaggerate):

… These catastrophic events may happen more frequently during the infancy of planetary systems ...

also likely that a giant planet migrating inward can induce other planets to move into unstable orbits (Zhou & Lin 2008 IAU Sym 249; Mustill et al. 2015). **These catastrophic events may happen more frequently during the early stages of planetary systems**, when planets may not have cleared their orbits yet.
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However, the induced over-metallicity is not supposed to remain unaltered for the entire main-sequence, but it is expected to disappear in few tens of Myrs. The main responsible of erasing this chemical anomaly is the “thermohaline convection” (Theado & Vauclair 2012 ApJ 744 123).

Recently Melendez et al. (2009 ApJ 704 66) and Ramirez et al. (2009 A&A 508 L17) (hereafter, M09 and R09) pioneered a differential method based on high-quality spectra of field stars very similar to the Sun (i.e., solar twins), allowing them to **achieve abundance precision as small as $\leq$0.01 dex**. Through this approach they detected a number of stars with chemical patterns characterized by anomalous overabundances of refractory elements relative to the Sun (Fig. 1). The existence of chemical anomalies related to planets has been confirmed by Tucci-Maia et al. (2014 ApJ 790 L25), using a binary pair of solar twins, where only one star is a planet host. These authors also suggested that such chemical patterns can arise from a rocky core rich in refratories.

These enthralling findings led us to some suggestive questions : what is the frequency of these chemically enriched atmospheres within stars belonging to the same native environment and sharing the same evolutional context? Is this pollution related to the ingestion of planet or planetesimals? Which is the nature and the composition of the objects accreted onto the stars? Which is the fate of the metals diluted into the stellar CZ? Are these chemical anomalies related to the planet migration and the evolution of planetary system architectures? If so, which are the causes that could trigger planetary engulfment?

These fascinating issues are leading us to perform an extremely precise abundance analysis, reaching for the first time accuracies of 0.01-0.02 dex on stars belonging to a young open cluster: the Pleiades. We will benefit of the already known membership of this nearby and well-known cluster.

Why a cluster?

⋆ **Why a cluster?** The obvious advantage of clusters is that they should have started as chemically homogeneous; furthermore, the stars should be roughly coeval. This can help elucidate whether the planetary signatures found by M09 and R09 are actually due to others causes such as differences in birthplaces or differences in ages, as recently suggested by Adibekyan et al. (2014 A&A 564 L15). Indeed, observations of cluster members is the most straightforward way to remove this disambiguation. In fact, the eventual detection of chemical differences between similar stars belonging to the same cluster could be reasonably explained through pollution processes due to external causes (e.g., supernova explosion, planet engulfment, etc...). At what level are open clusters chemically homogeneous? De Silva et al. (2006 AJ 131 455) claimed that abundances of Hyades members ($\sim$600Myr) show scatters between 0.03-0.06 dex, that is at the same level as their uncertainties. Similar results have been found by De Silva et al. (2007 AJ 133 1161) for an older cluster. Thus, at low precision open cluster seems to be chemically homogeneous, but they have not been tested at higher precision.

7. Description of the proposed programme and attachments

Description of the proposed programme (continued)

Why the Pleiades?

⋆ **Why the Pleiades?** The Pleiades is a young (∼120Myr; Kharchenko et al. 2005 A&A 440 403) cluster. Its members are "adolescent" stars, since they are old enough not to limit a spectroscopic analysis (e.g., high extinction, strong accretion, veiling, fast rotation, etc...), but they are still young so their planetary systems have formed only ∼100 Myr ago. The newly born planets are still cleaning their orbits from the gas and dust left by the circumstellar disk and this viscous process makes the planetary migration extremely likely. On other words, the planetary system architecture of these stars is still under evolution. In addition to that, these stars are not too old so the thermohaline convection did not have had time to quench the effect of a metal enrichment, thus the youth of these stars allows us to appreciate the genuine consequences of rocky engulfment events and to establish the mass and composition of the material that polluted the stellar atmosphere. In addition to these arguments, the Pleiades is nearby (∼130pc; Percival et al. 2005 A&A 429 887) making the solar-type stars bright enough ($V\lesssim11$mag) to achieve spectra of the SNR required for our aims in a reasonable time. Pleiades is key because it has been well studied (temperature, vsini, existence of a debris disk, binarity, etc...). This will allow us to observe secure members characterized by being solar analogs and slow-rotators. It will be also possible to differentiate the targets by the presence or not of a debris disk.

B – Immediate Objective: We aim to test with unparalleled precision the chemical homogeneity of solar analogs in a young cluster and compare the chemical patterns with the Sun's. Our goal is to unveil the signatures of rocky-material accretion expected for such adolescent stars, to improve our understandings on the early evolution of planetary systems.

Sample selection

⋆ **Sample selection.** We selected 11 targets to be observed from the list of Stauffer et al. (2007 ApJS 172 663) having V<11 dex and B-V=0.65±0.05 ($[B-V]_\odot$=0.65, Ramirez et al. 2012 ApJ 752 5). Then we selected as our final targets those with vsini $\lesssim$10 km/s from Hartman et al. (2010 MNRAS 408 475). We excluded binaries and selected stars with and without debris disks.

Observations & analysis

⋆ **Observations and analysis.** These targets will be observed with UVES (580 setup) using a 0.4" slit (R∼85,000). The requested time will ensure SNR∼500. We will analyse the data using the differential technique pioneered by our group, thus exploiting the expertise of our team in obtaining extremely precise stellar parameters and chemical abundances at the level of 0.01 dex (e.g., Melendez et al. 2014 ApJ 791 14).

⋆ **Outcomes of the analysis.** We expect to study ∼30 elements comprising both volatiles (e.g., C, O, S, Zn) and refractories (e.g., Fe, Al, Sc), the light element Li, s-process (e.g., Ba) and r-process (e.g., Eu). So that, we are able to distinguish different nucleosynthetic processes, as for example shown in Melendez et al. (2014), allowing us to separate the chemical signature of planets from other processes.

Attachments (Figures)

Outcomes of the analysis

Figure 3 from J. Meléndez et al. 2009 ApJ 704 L66

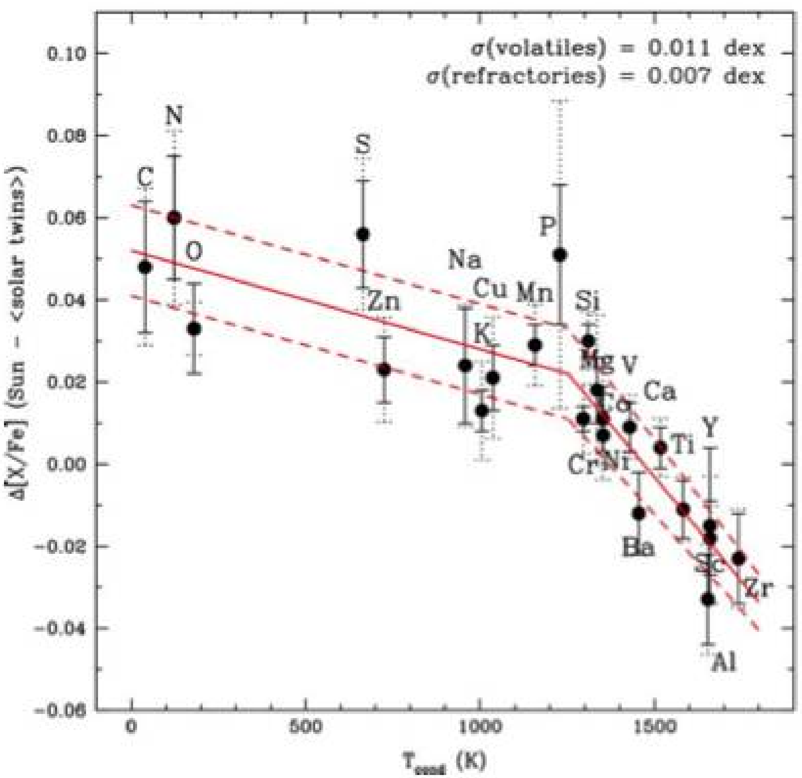

Fig. 1: Differences between [X/Fe] of the Sun and the mean values in the 11 solar twins observed by M09 as a function of T_{cond}. The Sun is deficient in refractories, probably due to the terrestrial planet formation.

8. Justification of requested observing time and observing conditions

Lunar Phase Justification: Our observations are not critically affected by the moon phase.

Time Justification: (including seeing overhead) This project will use DIC-1 (390+580) high-resolution, high-SNR spectra obtained for 11 solar analogs within the Pleiades.

Our purpose is to reach the highest resolution considering the typical vsini of our targets (<vsini>$\sim$6.7 km/s). Thus, we chose a slit of 0.4" that ensures a resolving power of $\sim$85,000. Our experience using MIKE/Magellan (M09), HIRES/Keck (Melendez et al. 2012 A&A 543 29), UVES/VLT (Monroe et al. 2013 ApJ 774 L32; Melendez et al. 2014) and Espadons/CFHT (Tucci Maia et al. 2014), shows that we can achieve a precision of $\sim$0.01-0.02 dex using spectra of SNR$\sim$400-500. As the effects of planet engulfment on the chemical composition of stars are at the level of few 0.01 dex, it is imperative to acquire the best quality spectra. Also, the study of small chemical anomalies due to pollution by different nucleosynthesis processes, require a precision of $\sim$0.01 dex.

Why 11 targets? The first planet signature has been detected by M09 over a sample of 11 solar twins. The exact sample size that we need will depend on the exact frequency of planet engulfment, but that will be known only after we perform this experiment. However, assuming a frequency (f) of stars that engulfed planets equal to 20% and adopting a binomial distribution, we can guess that the uncertainty related to our f estimation based on observation of 11 stars will be $\pm$12% (see Bevington 1969), so we can recover the frequency within 2-sigma. M09 obtained an extremely high significance because 23 elements were used (see Fig. 1), implying a very small probability (10^{-9}) that the signature was arising by pure chance. We will be able to detect $\sim$30 elements in all the targets, making our sample compatible with our aims of having a definite detection of planet signatures.

Our targets have magnitudes V = 10.3 - 10.8 (median V = 10.5). According to the UVES ETC (version 6.0.0), assuming an airmass of 1.6 (due to the high declination) and a seeing of 0.8", an exposure time of 1h 45min for a V = 10.5 star allows as to achieve a SNR$\gtrsim$450 in the entire red arm (580) and to obtain a SNR>200 in the range of the blue arm (390) populated by Fe I lines with low excitation potentials and Fe II lines useful to better constrain the stellar parameters, as well as lines of heavy elements. Each exposure can be splitted in three integrations of 35min to avoid too many cosmic rays. Thus, including the overheads (4 min pointing, 1 min instrument setup, 2 min acquisition, and 2 min for the CCD red-out of the three exposures), we estimate that with 1h 54min per target we will fully satisfy our requirements. Therefore, the accomplishment of the entire project will take about 21h and 20min, that also includes the observation of the asteroid (e.g., Vesta or Papagena that in November have V=7.3-9.9 mag)

A less ambitious exploratory project could be performed by observing a sample of 6 stars plus the asteroid, resulting in about 11h and 45min, bringing important but less stringent constraints.

8a. Telescope Justification:

Due to the high spectral resolution ($R \sim 85{,}000$) and high SNR (400-500) required for our sample stars with $V = 10.3$ - 10.8, a large telescope is needed to accomplish this project in a reasonable amount of time (no more than 3 nights). UVES + VLT is the obvious choice.

8b. Observing Mode Justification (visitor or service):

These observations are ideally carried out in service mode. Visitor mode, however, is possible if required.

8c. Calibration Request:

Standard Calibration

9. Report on the use of ESO facilities during the last 2 years

This is the first proposal of the PI.

9a. ESO Archive - Are the data requested by this proposal in the ESO Archive (http://archive.eso.org)? If so, explain the need for new data.

The archive does not include UVES observations of G-type members of the Pleiades.

9b. GTO/Public Survey Duplications:

As mentioned above, the data requested in this proposal are unavaliable.

10. Applicant's publications related to the subject of this application during the last 2 years

- Ramírez, I.; **Meléndez, J.**; Bean, J.; Asplund, M. et al., 2014, A&A, 572, 48: *The Solar Twin Planet Search. I. Fundamental parameters of the stellar sample*
- Bedell, M.; **Meléndez, J.**; Bean, J. L.; Ramírez, I. et al, 2014, ApJ, 795, 23: *Stellar Chemical Abundances: In Pursuit of the Highest Achievable Precision*
- **Meléndez, J.**; Ramírez, I. et al., 2014, ApJ, 791, 14: *18 Sco: A Solar Twin Rich in Refractory and Neutron-capture Elements. Implications for Chemical Tagging*
- Tucci Maia, M.; **Meléndez, J.**; Ramírez, I., 2014, ApJ, 790, L25: *High Precision Abundances in the 16 Cyg Binary System: A Signature of the Rocky Core in the Giant Planet*
- **Meléndez, J.**; Schirbel, L. et al., 2014, A&A, 567, L3: *HIP 114328: a new refractory and Li poor solar twin*
- Monroe, T. R.; **Meléndez, J.**; Ramírez, I. et al., 2013, ApJ, 774, L32: *High Precision Abundances of the Old Solar Twin HIP 102152: Insights on Li Depletion from the Oldest Sun*
- Lanzafame, A. C.; Frasca, A.; Damiani, F.; Franciosini, E.; Cottaar, M.; Sousa, S. G.; Tabernero, H. M.; Klutsch, A.; **Spina, L.** et al, 2015, A&A, 570, 122: *The Gaia-ESO Survey: The analysis of high-resolution UVES spectra of FGK-type stars*
- **Spina, L.**; Randich, S.; Palla, F.; Biazzo, K. et al., 2014, A&A, 568, 2: *The Gaia-ESO Survey: Metallicity of the Chamaeleon I star-forming region*
- **Spina, L.**; Randich, S.; Palla, F.; Sacco, G. G.; Magrini, L. et al, 2014, A&A, 567, 55: *The Gaia-ESO Survey: the first abundance determination of the pre-main-sequence cluster gamma Velorum*
- Magrini, L.; Randich, S.; Friel, E.; **Spina, L.**, 2013, A&A, 558, 38: *FAMA: An automatic code for stellar parameter and abundance determination*
- Robberto, M.; **Spina, L.** et al., 2013, AJ, 144, 83: *An HST Imaging Survey of Low-mass Stars in the Chamaeleon I Star-forming Region*

11. List of targets proposed in this programme

Run	Target/Field	α(J2000)	δ(J2000)	ToT	Mag.	Diam.	Additional info	Reference star
A	BD+23 455	03 27 42.1	+23 48 13.1	1.9	10.30			
A	HIP 17020	03 38 56.9	+24 34 11.3	1.9	10.54			
A	2MASS J03344722+2605415	03 34 47.2	+26 05 41.4	1.9	10.48			
A	BD+26 592	03 39 53.7	+26 43 01.1	1.9	10.27		has debris disk	
A	HII 250	03 44 04.2	+24 59 23.4	1.9	10.70		has debris disk	
A	HII 293	03 44 13.9	+24 46 45.8	1.9	10.79			
A	HD 282952	03 46 27.3	+25 08 08.0	1.9	10.52			
A	BD+23 527	03 46 53.7	+23 35 00.8	1.9	10.55			
A	HD 282962	03 46 54.9	+24 47 46.8	1.9	10.49			
A	HD 282965	03 49 11.7	+24 38 11.7	1.9	10.44		has debris disk	
A	HD 283058	03 52 17.2	+24 24 00.7	1.9	10.66			
A	Vesta/Papagena	00 00 00	00 00 00	0.4	7.3/9.9			

Target Notes: All the stellar targets are members of the Pleiades (Stauffer et al. 2007). Vesta and Papagena are two of the brightest asteroids observable by VLT in November 2015.

12. Scheduling requirements

13. Instrument configuration

Period	Instrument	Run ID	Parameter	Value or list
96	UVES	A	DIC-1	Standard setting: 390+580

Observing proposal, deadline 28/Mar/2023

- Write proposal (real or fictitious) for any telescope (e.g., Gemini, OPD, Chandra). Use format of the facility, or a free format that must include:

1) Title, 2) Abstract (<= half a page)

3) Science Justification (min ½ page, max 1 page)

4) Additional: 1 page for figures or references

5) Technical Justification (< ½ page)

6) Targets: coordinates, brightness, expos. time

- You must have the approval of your supervisor if you intend to submit the project

Observing proposal

- Send me the proposal (PDF file) by March 28th Brasília midnight, through Moodle (edisciplinas)

- Defend your proposal (2-4 min) on March 28th :

Big picture? Why is interesting?

Without slides (only blackboard could be used)

Suggestions (if you don't have a target)

- Verify the Skumanich (1972) rotational decay law using v sin *i* in stars of different ages (at least 2 stars in 3 different open clusters). Instrument: UVES/VLT, HDS/Subaru, Graces/Gemini
- Detect metallic lines in the spectrum of a white dwarf in a wide binary pair that has a planet-hosting star. Instrument: UVES/VLT, HDS/Subaru, Graces/Gemini

Suggestions (if you don't have a target)

- Observe continuously a galaxy (cluster?) to try to spot the beginning of a supernova. Any small telescope (> 60 cm) with a CCD is fine.
- Observe continuously the pair of star twins ζ^1+ζ^2 Reticuli binary system over one rotation period, to try to understand the different magnetic activity
- Exoplanet transit in polarized light

Suggestions (if you don't have a target)

- Confirm the RV planet detections of hot Jupiters in the open cluster M67.

MAROON-X at Gemini

- Observe a planet transit in a multi-planet system, in order to detect TTV (transit time variation)

Photometry with any small (60 cm) telescope