

25 YEARS

Jamboree

A retreat to define
the next 10 years



14th & 15th
January, 2016



9am - 7pm



Cosmocaixa
Isaac Newton, 26
Barcelona



Institut de Física
d'Altes Energies



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Conclusions and Actions

Ramon Miquel
ICREA / IFAE

Purpose

To have a frank discussion about where we want to be in 2021 / 2026

- To review IFAE's mid-term strategy in the light of the results coming from the LHC and others.
- Furthermore, given the stagnation of HEP funding in Spain and the recommendations from the 2013 review by CERCA, we should explore the possibility of diversifying into more applied science.

- In 2013 we had our first ever evaluation by CERCA.

- Among the recommendations:

- A new **Strategic Plan** should be elaborated in the next future...

- The EC believes that IFAE should **not be so dependent on Spanish National** competitive projects in the future.

- In order to improve the standing and funding of the Institute, the EC encourages IFAE to **apply intensively for European Union** research projects, with special emphasis to the **ERC grants**.

- With this respect, **technology transfer should be expanded** to different research programmes of the institute...

- IFAE has very large and relevant scientific infrastructures and skilled staff which could be deployed in part to **provide services to the industry**, or to impart workshops and other type of educational activities for companies...

- Boost additional **collaboration between the theoretical** physics staff in the theory Division **and the experimentalist** researchers...

- IFAE should keep trying **making connections with other CERCA institutes** with which shares some affinities in scientific terms (ICFO, IEEC and others), looking for synergies.

- At the same time, the Institute should also keep trying to look for more **connections with the Universitat Autònoma de Barcelona (UAB)**...

- Next evaluation will take place in 2017.

Diversify
income

Cooperation
(now BIST)

Context: Severo Ochoa

- In 2012 we won the SO award in with a clear strategy for 2013-2016, which we then fine-tuned in 2013.
- We will have to apply again to SO in 2016.
- We need to devise a new strategy for, at least, 2017-2020 that we can defend, is attractive, bold, ambitious, etc.

THURSDAY 14 JAN 2016



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SESSION 1 INTRODUCTION, OVERVIEW

09:00	Introduction / Overview	MIQUEL, Ramon
09:15	Applied Physics at IFAE	CHMEISSANI, Mokhtar
09:45	IFAE Strategic Measures (KTT, Alternative Funding, BIST, Spin-offs, Outreach, etc..)	MIQUEL, Ramon

..... Coffee Break

SESSION 2 PHYSICS AT COLLIDERS

10:45	Overview of Run II Results & Prospects	JUSTE, Aurelio
11:05	Motivations for Exploring the Energy Frontier	POMAROL, Alex
11:35	LHC Upgrade (LH-LHC) @ IFAE	GRINSTEIN, Sebastian
11:55	Technological Impact/Opportunities	GRINSTEIN, Sebastian
12:15	Other Initiatives (FCC, ILC, etc...) and Round Table Discussion	MARTINEZ, Mario

..... Lunch

SESSION 3 GAMMA RAY ASTROPARTICLE PHYSICS

14:00	Theoretical Motivations	RICO, Javier
14:30	MAGIC / CTA Status and Plans	BLANCH, Oscar
14:50	Other Gamma Ray Experiments	WARD, John E.
15:10	Technological Impact/Opportunities	CORTINA, Juan
15:30	Other Initiatives and Discussion	MARTINEZ, Manel

..... Coffee Break

SESSION 4 COSMOLOGY

16:30	Theoretical Motivation	PUJOLAS, Oriol
17:00	Status of DES/DESI	MIQUEL, Ramon
17:20	PAU/EUCLID @ IFAE	PADILLA, Cristobal
17:40	Technological Impact/Opportunities	PADILLA, Cristobal
18:00	Other Initiatives and Discussion	

FRIDAY 15 JAN 2016



FRIDAY 15 JAN 2016

SESSION 5

CHALLENGES IN THEORY, OTHER DM DEDICATED SEARCHES

- 09:00 **DM Theory status and searches** SERVANT, Geraldine
- 09:30 **Exotic searches with gamma-ray telescopes** MORALEJO, Abelardo
- 10:00 **Challenges in Theory** JAMIN, Matthias
- 10:30 **RoadMap of the Theory Division at IFAE** ESPINOSA, José Ramon

..... Coffee Break

SESSION 6

NEUTRINO PHYSICS

- 11:10 **T2K, Neutrino Platform, DUNE Status & Plans** SANCHEZ, Federico
- 11:40 **Other Neutrino Experiments** SANCHEZ, Federico
CAVALLI-SFORZA, Matteo
- 12:10 **Technological Impact/Opportunities** LUX, Thorsten
- 12:30 **Other Initiatives and Discussion**

..... Lunch

SESSION 7

APPLIED PHYSICS, COMPUTING, BIST

- 14:00 **Instrumentation R+D and Spin-offs** LUX, Thorsten
- 14:20 **Micro-electronics Infrastructure** GRINSTEIN, Sebastian
- 14:40 **Evolution of data processing services at PIC** DELFINO, Manuel
- 15:05 **BIST Opportunities** SANCHEZ, Federico

SESSION 8

IFAE PHYSICS (ROUND TABLE DISCUSSION)

- 15:40 **Introduction to Items for Discussion** FERNANDEZ, Enrique
- 15:50 **Discussion**



SESSION 9

APPLIED PHYSICS AND STRATEGIC MEASURES (DISCUSSION)

- 17:30 **Introduction to Items for Discussion** CAVALLI-SFORZA, Matteo
- 17:40 **Discussion**

Process

- Retreat of senior scientists: January 14-15, 2016
- Discussion of conclusions and actions within IFAE's directorate: January 20 - February 17
- Discussion of conclusions and actions in IFAE's Advisory Group meetings: February 19; March 4
- Presentation and discussion of conclusions and actions with senior scientists: March 18
- Presentation to all IFAE (pizza seminar): April 13

General conclusions

- No strong push for new research lines, although some interest was shown for direct dark-matter searches
- Use SO2016 money to fund the hiring of 2-4 excellent young (mid 30s) scientists (“high-level scientists”):
 - 3-4 yr well-paid contracts, with some start-up money
 - Good enough to apply to ERC Starting / Consolidator grants
 - Good enough to eventually apply to ICREA

Conclusion 1.1: The theory division suffers from a very low postdocs/senior ratio.

Action 1.1.1: Split the current single FPA project into two or three projects.

Action 1.1.2: Encourage senior theory researchers to apply to ERC grants as a source of new post-docs.

Action 1.1.3: Include in the SO2016 proposal a larger contingent of post-docs for the theory division.

Action 1.1.4: Encourage the most senior theory post-docs to apply to Marie Curie and Ramón y Cajal calls. Encourage the least senior to apply to Juan de la Cierva calls.

Action 1.1.5: Develop the agreement with DESY related to Christophe Grojean, as a source of short-term post-docs.

Conclusion 1.2: The theory division, and particularly its Beyond the Standard Model (BSM) group, has suffered a large loss with the departure of Christophe Grojean and Géraldine Servant.

Action 1.2.1: Strengthen the BSM line by hiring (if money allows) one high-level scientist through the SO2016 proposal and then ICREA. Otherwise, directly through ICREA. Engage the active help of prominent theorists in this search, eg. Gian Giudice.

Conclusion 1.3: Beyond BSM, the theory division and IFAE would benefit from attracting new good recruits in the following theory areas: astro/cosmo, collider phenomenology, lattice.

Action: 1.3.1: Actively look for suitable ICREA candidates in the above-mentioned theory areas.

Conclusion 1.4: There is a marked deficit of scientific collaboration between the theory and experimental divisions.

Action 1.4.1: Promote a joint Theory/Experimental PhD program. Include a line for this in the SO2016 proposal.

Conclusion 2.1: Due to the cuts in recent years, the ratio of seniors devoted to ATLAS analysis to the number of post-docs and students has become rather large.

Action 2.1.1: Encourage some senior members of the ATLAS group to spend a fraction of their time in other projects, notably ATLAS upgrades.

Conclusion 2.2: Given the effort already invested and the success already achieved, IFAE's contribution to the ATLAS upgrades has to be centered around the pixel effort for the ATLAS inner tracker.

Action 2.2.1: Include in the SO2016 proposal actions to support the R&D (2017) and pre-production (2018-2020) phases of the 3D pixel upgrade (if selected).

Action 2.2.2: In case 3D is not selected, a different plan will be needed, possibly involving the assembly of 2D detectors. SO2016 funds could then be used to ensure the availability of the necessary infrastructure.

Action 2.2.3: Help politically the case of 3D pixels, both within ATLAS (organize locally an ATLAS/pixel meeting, for instance) and within Spain (CDTI), given that it's a Spanish technology.

Conclusion 3.1: MAGIC will continue to be crucially important for the gamma-ray program at IFAE for the next ~5 years. Beyond that, its possible conversion to an installation for ultra-fast optical astronomy merits study.

Action 3.1.1: Include in the SO2016 proposal a line to explore this possibility.

Conclusion 3.2: The construction, operation and scientific exploitation of CTA will be the flagship gamma-ray program at IFAE for the foreseeable future.

Action 3.2.1: Come up with a strategy that will allow substantial SO2016 support for IFAE's effort in CTA.

Conclusion 3.3: While groups in CTA are already engaging in R&D for future upgrades, this is deemed to be still premature at IFAE.

Action 3.3.1: Carefully monitor possible opportunities related to R&D for CTA upgrades. SO2016 start-up money could be useful.

Conclusion 3.4: MACHETE represents an approach to gamma-ray astronomy complementary to CTA and led from IFAE. However, at the current time, when all efforts in the community are focused on CTA, it would be difficult to start a formal collaboration.

Action 3.4.1: Keep working on R&D for MACHETE. Include a line for this on the SO2016 proposal.

Conclusion 3.5: e-astrogam is shaping up to be a lower-energy replacement for the Fermi gamma-ray satellite in the late 2020s timeframe. As such, it can be very complementary to CTA. Furthermore, getting more involved in the Spanish space program can be very valuable for IFAE.

Action 3.5.1: Explore the possibility to contribute to the e-astrogam mission, with particular interest in the Compton camera, and its possible synergies with the medical imaging work at IFAE.

Action 3.5.2: If the exploration is successful, include in the SO2016 proposal a line for R&D in this direction.

Conclusion 4.1: The group is involved at different levels in DES, PAU, DESI and Euclid. The group needs a clear action plan for each project.

Action 4.1.1: Continue the vigorous science exploitation of DES until ~2020, assuming DECam does not continue to operate in survey mode after 2018.

Action 4.1.2: Contribute to the science validation of PAUCam, proving its capabilities as a medium-resolution redshift machine. Focus the involvement in the PAU survey in synergistic opportunities with DESI, Euclid or LSST, with a time horizon around 2018.

Action 4.1.3: Complete the development and construction of the DESI GFA modules. Participate in the DESI science, focusing in cross-science with DES and LSST and possible synergies with PAU, with a horizon around 2025.

Action 4.1.4: Complete the development and construction of the FWA for Euclid. Participate in the Euclid science, focusing on synergistic and cross-science activities with DES and LSST and possible synergies with PAU.

Conclusion 4.2: LSST will operate for ten years (2023-2033), and it has been identified as the ultimate observational cosmology experiment. The other observational cosmology programs in which IFAE is involved will be over by the mid 2020s.

Action 4.2.1: Explore the possibility to join LSST, including the option to defray (part of) the cash cost of joining through in-kind contributions related to the use of PIC as a data center and/or the use of PAUCam to control systematic errors.

Conclusion 4.3: The observational cosmology group would benefit substantially from adding an extra senior scientist.

Action 4.3.1: Strengthen the observational cosmology group by hiring (if money allows) one high-level scientist through the SO2016 proposal and then ICREA. Otherwise, directly through ICREA.

Conclusion 5.1: T2K will continue to be operative and competitive for the next 3-4 years.

Action 5.1.1: Continue the involvement in T2K's science and operations at the current level for the next 3-4 years.

Conclusion 5.2: WA105 is a CERN-based experiment to validate liquid argon (LAr)-related techniques that will be crucial for DUNE. IFAE is involved in the PMTs, but also in R&D for other photosensors, with possible synergies with the CTA upgrades and others.

Action 5.2.1: Continue the work in WA105 in a Spanish-wide context, continuing the R&D on alternative photosensors with FPA funding, supplemented, if necessary, with SO2016 funding.

Conclusion 5.3: A high-pressure TPC can be the backbone of a dedicated experiment to precisely measure neutrino-nucleon cross-sections. It could also be part of the near detector of DUNE or of an upgraded T2K or HyperK. IFAE has achieved a clear leadership position in this area. A proposal for an ITN has been put forward, coordinated by IFAE.

Action 5.3.1: Include in the SO2016 proposal a line for funding R&D on this area.

Conclusion 5.4: Direct dark matter search is rapidly becoming a very mature field with a non-negligible possibility of a near- or mid-term substantial breakthrough. The most promising technique for high-mass WIMPs is based on LAr, and is similar to those considered for DUNE that will be tested at CERN in the context of WA105.

Action 5.4.1: Monitor the R&D that the DarkSide Collaboration is putting in place, looking for synergies with the photosensor R&D mentioned above.

Conclusion 6.1: IFAE scientists in instrumentation R&D have achieved high levels of leadership in at least two areas: pixel detectors and photosensors. These areas should be strengthened to leverage the current knowledge. This would form the basis for a research line on multi-purpose instrumentation R&D. However, care should be taken to avoid putting all emphasis on crowded areas.

Action 6.1.1: Hire two high-level scientists for these two areas, paid from SO2016 and later on ICREA.

Conclusion 6.2: Selling services can provide much-needed income to IFAE. However, the cost-benefit analysis is not trivial. Preliminary analyses seem to indicate that direct sale of services to external user is only marginally profitable, with the possible exception of the clean-room services.

Action 6.2.1: Make a concerted push to try to sell clean-room services. Hold back on sales of other (minor) services.

Conclusion 6.3: Historically, the culture at IFAE and homologous research centers has not valued the valorization of research outputs. This is, however, starting to change. IFAE has to continue to focus on fundamental research, but always keeping an eye open for possible applications.

Action 6.3.1: Improve the education of IFAE's scientists on the possibility of extracting value from fundamental research, through voluntary attendance to KTT courses and workshops.

Conclusion 6.4: H2020 can be a source of much-needed additional income for IFAE. However, most of the H2020 programs emphasize public-private partnerships, for which networking with industry is essential.

Action 6.4.1: Increase the opportunities for networking of IFAE researchers with industry, by, for instance, taking advantage of the economies of scale BIST affords.

Conclusion 6.5: Projects related to applied physics tend to be smaller than IFAE's largest projects in fundamental physics (CTA, Euclid, PAU, etc.), and they may suffer from a comparative lack of support and resources from IFAE's technical services.

Action 6.5.1: Make sure that more IFAE general resources (workshop, etc.) are made available for this line of research.

Conclusion 7.1: PIC is going through an already long interim period where funding and institutional responsibilities are not clearly established.

Action 7.1.1: Continue to work alongside CIEMAT to achieve a stable institutional configuration for PIC, together with a guaranteed funding profile.

Conclusion 7.2: While the distributed computing model that underpins the LHC tier system will remain valid until ~ 2020 , HL-LHC will need a different model, which may require a different profile of responsibilities and different deployment of technologies than today's Tier 0/1/2 scheme. On the other hand, PIC has already gone beyond LHC, extending into Astroparticle Physics (MAGIC and probably CTA), and Cosmology (DES, PAU, probably Euclid, and possibly LSST). Furthermore, its latest improvements in energy efficiency enable a ~ 3 -fold increase in PIC's computing capacity.

Action 7.2.1: Continue the participation of PIC into the European forums (EU-T0, for instance) that will shape the future of computing for LHC.

Action 7.2.2: Continue to work towards PIC's status of data center for both CTA and Euclid.

Action 7.2.3: Propose to LSST that PIC becomes part of its data processing infrastructure.

Action 7.2.4: Explore and advance the possibility that PIC becomes the data center for BIST.

Conclusion 8.1: The ERC grant program has become a symbol of excellence. It can also provide substantial discretionary input to IFAE. Recognizing the difficulties inherent to our field, it is necessary that IFAE researchers obtain more ERC grants. The same applies to H2020 projects, from which the coordinating party tends to get higher returns.

Action 8.1.1: Encourage IFAE researchers to apply for ERC grants and H2020 projects, providing explicit and substantial economical incentives in case of success.

Conclusion 8.2: ICREA has become a fundamental source of high-quality scientific personnel for IFAE. However, in the last calls it has been difficult to attract high-quality candidates.

Action 8.2.1: Speak with the ICREA director about the convenience for ICREA to hire younger people: easier to attract, more productive.

Action 8.2.2: Start a campaign to identify excellent ICREA candidates, within or without the high-level program mentioned above, involving senior colleagues in other institutions, particularly members of our External Scientific Committee.

Conclusion 8.3: Belonging to BIST provides IFAE with, among other things, economies of scale that make new initiatives possible, particularly in areas related to KTT. It also enables multidisciplinary research that can be attractive for ERC and H2020 calls.

Action 8.3.1: Propose to BIST a TALENT-like initiative, putting BIST researchers in contact with ESADE (or another local business school) students.

Action 8.3.2: Propose to BIST a BIST-wide internal “science fair” with about 10 researchers per center to exchange ideas for future collaborations.

Action 8.3.3: Propose to BIST a BIST + industry “science fair” networking event with about 5 researchers per center, plus industry.

Action 8.3.4: Propose to BIST that PIC plays a leading role in a common BIST data center.

Conclusion 8.4: H2020 does not include many programs suitable for the research competencies at IFAE. Lobbying in Brussels cannot be done at IFAE level, but in a European-wide coordinated way, ideally led by CERN.

Action 8.4.1: Speak to CERN’s management and reinforce the convenience of a CERN-led European-wide lobbying effort in Brussels on behalf of the entire HEP field and related areas.

Conclusion 8.5: H2020 and other European calls are mediated by CDTI on behalf of Spanish industry. CDTI has to consider IFAE as a technological partner of relevance for these calls.

Action 8.5.1: Help put IFAE in the CDTI map as a technologically-oriented center, possibly starting with a discussion with CDTI management about the 3D pixel technology.

Summary

- This was a very valuable exercise
- Excellent degree of participation in talks and discussions: thank you!
- We have come up with an actionable plan for the next ~5 years
- Valuable input for SO2016 proposal
 - Manel and Marta B have already started to work on it