

Optical and Infrared Astronomical Instrumentation for Modern Telescopes Brazilian Workshop

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Ladies and Gentlemen,
Dear Colleagues:

It is an extraordinary pleasure for me to welcome you at this beautiful place and to open the first Brazilian Workshop of “Optical and Infrared Astronomical Instrumentation for Modern Telescopes”, jointly organized by the Instituto do Milênio MEGALIT and the Laboratório Nacional de Astrofísica – LNA.

At the beginning of an event such as this, it is worthwhile to reflect a bit on its purpose. To ask: Why are we here? Of course, I know that most of you are here because you don't have very frequently the opportunity to be for a couple of days at so beautiful a place as the Bay of Angra dos Reis! And that's all right! However, there might be a second purpose; and I'd like to concentrate on that.

In what follows, I will emphasize the importance of this Workshop for the development of the Brazilian astronomical community. Thus, I will mainly look upon it from a national point of view. For this, I apologize to those of you who came here from abroad. But I am confident that by the end of my talk, you will appreciate why I consider it important that in particular the young generation of our community, the students and postdocs, understand the significance of this event; why this Workshop is held; and what is the context within which it is to be seen.

I would not like to see you spending a few nice days here, listen to a couple of (hopefully) interesting talks, and then walk away and forget about the Workshop. No! I want it to have an impact! I want to see consequences afterwards! I want to see the Workshop move something within Brazilian Astronomy!

My dear friend João Steiner recently wrote in one of our most important newspapers, Folha de São Paulo, that Brazilian astronomy is going to play in the major league. He referred himself to the fact that our community will have, in the near future, ample access to one of the best 4-m class telescopes in the world, SOAR. This, together with our more limited access to Gemini provides us with the tools to perform fore-front research. And that means: Playing in the major league.

But playing in the major league, just drawing upon resources provided by others, will not work forever. Without developing skills and capabilities to sustain the players and to provide them with the means they need to act independently – on an equal basis with their partners – we will sooner or later be relegated back to minor league.

Actions in various directions are required to maintain and secure the good position which the Brazilian astronomical community has reached. Among those which come to my mind immediately, are organizational questions. How should we organize ourselves internally in order to optimize the use of the resources available to us? There is certainly a lot to be done in this respect. However, this is not the topic of today.

Rather, this workshop is part of another line of actions which I consider important to consolidate Brazilian astronomy, namely to improve and develop its capacities to build competitive astronomical instrumentation.

Instrumental development is not new to Brazilian astronomy. Since Brazil acquired its first modern observational facilities at the Observatório do Pico dos Dias, it has always been understood that competitive instruments are important. Thus, a number of interesting and productive instruments have been built over the years to be used at telescopes of the OPD, mostly in collaboration between the LNA and other Brazilian institutions. However, instrumentation has not been the first priority.

During the 80th of the past century, in the first decade of the LNA, it was necessary to consolidate its structural and organizational basis. And that took most of its resources. Moreover, I guess that the economic problems during that decade also did not leave much space to maneuver. Others may be better suited than I to judge this point. Then, during the 90th, the top priority was to organize the Brazilian participation in Gemini and SOAR, again leaving little space and resources (in particular financial resources) for other large scale activities.

Now, with the LNA consolidated and recognized as the national facility for providing the infrastructure for observational optical astronomy in Brazil, and with a stable national economy – let's knock on wood – the LNA regards as the next strategic challenge the strengthening and focussing of instrumental development in astronomy nationwide.

While the LNA neither can nor wants to do this alone, I think that it has to play a key role in this process. This is part of its very mission and thus of its *raison d'être*: The LNA exists to “plan, provide and operate the means and the infra-structure to foster, in a cooperative manner, the Brazilian observational astronomy”. I think that says it all!

In my view, the workshop which we are initiating today has three main purposes:

1. Lend visibility, on the national and international level, to the efforts in instrumental development in various Brazilian institutions in order to promote collaborations between the involved groups;
2. Foster interaction and collaboration with international groups acting in the field;
3. Sensitize in particular the students and young scientists of our community to the importance of instrumental development as a means to promote scientific progress.

Please allow me to elaborate a bit on each of these topics.

The first purpose of this workshop is to define the perspective; to get an overview over the current activities in the area on the national level; and to compare them to what is done internationally.

This perspective is meant to be viewed from two directions: First from within the Brazilian community; to promote a better understanding of the activities of the individual groups; to focus them, if possible, in order to avoid breaking them up in many inefficient fractions; and to foster a discussion about projects important for the entire community; projects which can be regarded as of national importance.

However, not less important is the outward perspective. We want to show to our international partners that instrumental efforts are going on in Brazil, and that we do have the ambition to play a larger role in instrumentation in the future than we were able to do in the past. After all, the Gemini Agreement, for instance, foresees that Project funds should be distributed uniformly back to the Partners. We acknowledge that we were not able in the past to contribute substantially to Gemini from a technical point of view; and we may not be able to do so for a couple of years to come. However, there is no law of nature saying that this must remain so forever!

When I say that the second purpose of this Workshop is to “foster interaction and collaboration with international groups acting in the field” I refer myself to the fact that it is impossible (or at least very difficult) for a national community without ample experience in the field to develop, all by its own, the necessary Know How to contribute competitively to astronomical instrumentation. It is a long process to acquire the necessary skills. And this process can obviously benefit decisively from collaborations with groups well established in the field.

But then, what makes me confident that they want to share their knowledge with us? What is the benefit for them?

I hope that I am not too blue-eyed expecting, that the common interest in promoting our science, so

fascinating to all of us, will be the incentive for our international partners to work together with us. There are in fact quite a few examples, showing that this already happens. And that makes me confident that these are not singular cases, but rather the rule.

I guess that one of the reasons for the willingness for collaboration is the lack of commercial interests involved in building astronomical instruments, at least to a large degree. There is just no market. Exaggerating somewhat I'd say that it does not make sense to build up an industrial assembly-line for spectrographs for 8-m or 4-m class telescopes. All instruments are custom made for a specific purpose and will not easily suit the needs of other observatories.

A couple of weeks ago, I received at the LNA the visit of two representatives of the Agencia Brasileira de Inteligência. This is the Brazilian equivalent of the CIA, the KGB, the MI6, the Bundesnachrichtendienst, or whatever similar organizations there are in the world. They wanted to alert and sensitize me on topics such as protection of intellectual property, industrial espionage, necessity to acquire patents for products and procedures, etc.

I kept quiet and let them explain their purpose. And when they had finished I told them that all these concerns do not apply to the LNA or to astronomy in general. On the contrary. We are not going to protect our work from foreign eyes; we are not going to screen ourselves against "intruders". Because we are aware that any such action would be grossly counter-productive.

How can we expect that others will let us take part in their knowledge if we build a wall around us? Why should we strangle collaborations, on the national and international level, by jealously protecting the little that we know, if we can benefit so much from the Know How that these collaborations will transmit to us? Not to speak of the nonsense of paying dearly for patents for products and procedures which have no market that would pay back such investments.

No! Progress in instrumental development depends on the free flow of information and Know How between institutions and across national borders. And that is why the collaboration, and possibly more than that – the integration – of the various groups within our country is important to join and focus our efforts, knowing that the total will be more than the sum of the parts. In the same sense we must seek interaction with groups on the international level; most naturally, but not limited to groups of those countries which are our partners in the international telescope projects.

Let me now turn my attention to the third purpose of this Workshop, to sensitize our community to the importance of instrument development.

Up-to-date instrumentation, innovative instrumentation, is paramount for the progress of science. I do not claim that all important new discoveries in science were made with new instrumentation. This is certainly not so. However, the opposite is probably true: Each time new, innovative instruments have been introduced, important discoveries soon followed. Let us perform a brief sweep across the history of modern astronomy!

Tycho Brahe in the late 16th century used improved instruments to obtain high precision (for the time!) measurements of the positions of planets. Half a century later Johannes Kepler used them to derive his famous laws of planetary motion.

In the first years of the 17th century Galileo Galilei was the first – as far as we know – to point a telescope at celestial bodies. We all know to which stunning discoveries this led immediately. Let me just mention the four major moons orbiting Jupiter which, by analogy, convinced Galileo of Copernicus' heliocentric cosmology.

Herschel's 1-m telescope opened the path for research in galactic structure, as we would say today.

In the midst of the 19th century the application of a new technique, photography, revolutionized astronomical research because, for the first time, it was possible to archive data for subsequent, more detailed analysis than was possible directly at the telescope.

About the same time the first spectrographs were attached to telescopes. At this instance, astronomy transcended the limitations imposed by just studying the positions and motions of celestial bodies: Astrophysics was born.

And the opening of new spectral windows in the second half of the 20th century! Beginning with the

emergence of radioastronomy in the 50th. Then, from the late 60th on, artificial satellites permitted observations across virtually the entire electromagnetic spectrum, inaccessible from the earth's surface: the infrared, the ultraviolet, x-rays, gamma rays. It would lead too far to name all the satellites, that is "instruments", most of which opened new horizons, brought new important insights, shaped our conception of the world.

It is dear to me that the young people in this room, the future of Brazilian astronomy, not only understand, but are aware of the importance of up-to-date instrumentation. I really hope that this workshop contributes to the understanding that the necessary instruments will not just fall from heaven. It is up to us, the astronomers, to make happen the technical innovation, necessary for front-line research. We have to define what we want and need. We have to specify new instruments. And while we might not have all the skills, the knowledge and the training to actually build them, we have to work together with the engineers in order to get what we want and need.

But then, why bother? We have as yet only rather modest capacities and skills to develop astronomical instrumentation in this country. We are partners in two large telescope projects, Gemini and SOAR. The other members in these partnerships have much more experience and qualification to build instruments. So why not just let them do so for us and we use the instruments?

I'd say, because we do not want to remain second class partners forever. We do not want to rely solely on other's – best friends as they might be – as to the tools we have at our disposal for the research we want to do. We want and must play an active part in creating these tools if we want to continue the enormous progress which the Brazilian astronomy has achieved during the past quarter of a century. We want to stay in the major league!

I have talked quite a lot and I am afraid that I am starting boring you (maybe I did so quite a while ago!). Therefore, let me come to the end of my introductory words. However, not without thanking those organizations and institutes which contributed with financial means to the event, in the first place the CNPq, and then FAPESP, FAPEMIG, FAPERJ, ON, IAG. And I must not end my talk without recognizing the dedicated work of the Local Organizing Committee, which made our meeting possible. That we are all here today, is the particular merit of Bruno Castilho and his wife Marília Sartori, who did most of the preparations for this Workshop. Thank you very much, Bruno and Marília! But they were not alone. So I extend my thanks to all those who participated in organizing this event: Thank you, Clemens, Marina, Gabriel, Jaqueline, Daniela, Simone, Miriani!

And now I hope that all of you take as much advantage as possible of this meeting and that you enjoy not only the scientific and technical contributions but also – and I am sure you will – the beautiful place at which we convened.

Thank you very much!