**LATAM Synchrotron in the Greater Caribbean and AfLS**

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World is unequal. Today much more than it was few centuries ago, when China was an advanced country, science was flourishing in Persia and India, and Mali was a great empire

The change has a root, the Industrial Revolution. Since then, science has been mainly a matter for Europeans and Americans, And it will continue to be, with the addition of Asia, if the current situation is not corrected.

Data are eloquent.

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| **Continent** | **GDP per capita ($)** | **Educaion GDP %** | **Science GDP %** |
| North America | 64300 | (USA) 6 | 3.32 |
| Europe | 50100 | 4.8 | 2.02 |
| South America | 19500 | (LAC) 3.8 | 0.55 |
| Africa | 6300 | 5 | 0.33-0.74 |

The claim of the existence of a right to science granted by Art.27 of the Universal Declaration of Human Right is only a claim, an ambiguous claim. To share science and to benefit of it is not enough.

!n 1871, Argentinian president Domingo Sarmiento, inaugurating Cordoba’s Observatory said: “ "And well, I say that we must renounce the rank of Nation, or the title of a civilized people, if we do not take our share in the progress and movement of the natural sciences." And, few days earlier, inaugurating The Exposition of Argentinian products he had stressed the importance of industrial development for the former colonies of Spain.

It was not a speech for Argentina only. He addressed the continent from Cape Horn to Mexico, observing what already then was the difference with the former British colonies.

As a matter of fact, 0ne hundred and fifty years later, too many Latin American countries have an economic matrix based on items like internal trade, agriculture, their migrant remittances and are lacking high technology industry, whose prerequisite is science.

And not much different is African situation.

In both continents, the production of Science is insufficient. UNESCO, whose World Reports on Science confirm it, ia contributing to broaden the meaning of “right to science”. It is becoming a goal to overcome gender and geographical inequalities, But how?

Much of the advanced research is realized in big research structures. And in the regard both regions are lacking, Structure like CERN, do not exist. Understandable that they are out of question. The Superconducting Supercollider was too much for US and a.billionaire investment was interrupted. KAON factory for Canada.

In the South of the World, there is some big research infrastructure. However, they are only in Astrophysics and Astronomy. Their motivation is marginally the scientific development of the South. There are specific, unique geographical conditions that favor their installment. Thus, in Africa, where South Africa has been leader in this scientific area, recently the Square Kilometer Array has been launched in a dual collaboration with Australia. In Latin America, already in the forties of last century a laboratory was established. It was Chacaltaya, where the pion was discovered, but the Nobel Prizes went to two British scientists. Their local collaborator, Cesar Lattes became famous, but nothing more. More recently others, like the Pierre Augier project, an Argentinian-Brazilian one. Proposer a Northern hemisphere Nobel Prize, Jim Cronin, whose project of a sister structure in the Northern hemisphere did not materialize.

During the process that led to the creation in Bogotá of the Centro Internacional de Física, the first activity was a Workshop on Gravitational Waves. First Conference: Edoardo Amaldi, among the speakers some would have a major role in the Gravitational Waves discovery. Our goal was to promote the creation of a small research group. We failed. In the team that made the discovery Latin American are few, and active in the North.

In our regions, science must produce results of social and economic impact, if one wants that it makes part of the political agenda of a country. What the first Latin American Nobel Prize in Science, Bernardo Houssay, said in 1954 is still valid. “It is very common in backward countries an inordinate concern for immediate applications, and therefore it is customary to boast of practical judgment and to call for research exclusively of **immediate application and useful to society**”. Now backward countries are called devoping, but have not recovered from that disease.

It is easier to call for technology transfer through imitation, reproduction and innovation of what First World Science produces. Young people are trained, but the lack of opportunities forces the best among them to migrate.

The notable change of paradigm of Southern Korea that in a couple of decades, its income per capita increased by a factor 20 is a reference, but forgetting that it was possible thanks to an aggressive policy of scientific development.

An area where the inequality is appalling is that of the synchrotrons, none in Africa, only one in Latin America. This despite the fact that for their versatility they are an ideal instrument to face the basic needs of our countries. Medicine, Food Security, Biodiversity, Climate, Energy, priority areas for social development, would all benefit.

In that framework, two projects, AfLS and GCLS arose and are developing, and their synergy can contribute to their successful realization. For what concerns beautiful story of AfLS, I refer to the many colleagues who, in this Conference, described it, with the competence coming from having been promoters and actors of this initiative.

Let me instead describe what happened in Latin America, where, about at the same time of the first significant date of the AfLS, 2015, the idea arose and was proposed independently in different countries.

Where the project went farer was Mexico. There, among the main proposers were two speakers at this Conference, Brenda Valderrama, then minister of Innovation, Science and Technology of the state of Morelos, and Victor Del Rio, who authored a broad feasibility study. Unfortunately, Morelos project did not materialize. It was then taken by another state, that of Hidalgo. Neither there the project could be implemented, despite having the state offered the land to host the facility. There were two other attempts, at the level of proposals. In Colombia, a visionary colleague, Bernardo Gómez advocated for a national synchrotron in an article on the Journal of the Colombian Academy of Science. In Cuba, taking advantage of the atmosphere that followed Obama’s visit, there was a proposal of an US physicist, Jeremy Rothstein.

When two years ago another Latin American group presented a regional proposal, the main motivation was not to rescue these previous experiences. The idea was that, following SESAME’s example, perhaps it could be possible to utilize the dismantled VUV of Campinas, and have a second synchrotron in the Greater Caribbean. At that time, when we started exploring the feasibility of such a project, I did not know Harry Westfahl, but still remember how his immediate and enthusiast support prompted us to pursue the idea.

A natural evolution of all those projects was their merging in just one, LAmistad (Latin American International Synchrotron for Technology, Analysis and Development), which takes advantage of the previous Mexican experience and of the regional character of that of the last group, a factor that has contributed to attract interest from SESAME, SIRIUS ICTP, the main US and European Synchrotrons.

A milestone was our joint participation, together with AfLS and SESAME, in an ICTP panel at the World Science Forum, last December in Cape Town. From it, the perspective of a synergy between GCLS and AfLS started to acquire momentum, for reasons that go beyond the fact that both are facing so many structural problems in the respective environments, such as the need of scientific and industrial development, and a demographic growth that, together with political instability and the big unequalities between and within the countries, are causes of migration.

Of course, we are aware that building and running a synchrotron requires a large community of users, the staff operating it, the civil engineers able to build it. We must be frank. In our case we can only count on the last group. However, SESAME experience shows that this is not a problem. SESAME was established in a region where those human resources did not exist and has to design and launch from scratch a vigorous training program. When the Synchrotron started operation, it was immediately productive.

We must start soon a similar vigorous training program. For what concerns future staff and technicians, we must start from scratch. Instead, in the case of users, currently their community, is basically limited to the Mexican one and rare cases of young people, a couple in Dominican Republic, or of experienced researchers, a couple in Colombia, who have worked in similar facilities, DESY, Elettra, CERN. However, a broad basin of potential users exists, in particular in areas such as biology, medicine, health, agriculture. They are advanced scientist who simply do not use synchrotrons because they are too far. Their training will be easy, whereas for other personnel it may require to start from zero.

For this training, we can count on the support of several existing synchrotron, and a coordination with AfLA, besides the scale economy, will have a fringe benefit, that of creating the conditions and connections for future South- South cooperation.

The synergy between GCLS and AflS may be even more valuable.

A Synchrotron is an expensive facility. Certainly, user countries must contribute, but in our regions the cost of opportunity cannot be disregarded. External funding may be necessary. Certainly, some external technical support may be needed.

In the current geopolitical situation, it is a delicate political problem to identify which countries may provide such supportn Whichever, they will be, np doubt that the UN system must be an actor.

UNESCO played a major role for SESAME. Even if the formal step was the decision of the Executive Council in May 2002, its support had started earlier. Understandable. It was the end of Federico Mayor’s direction, and the linkage with his flag program, the promotion of the Culture of Peace was obvious for a Middle East project in which would participate countries like Turkey and Cyprus or Palestinian Authority, Israel, Iran, Egypt and Jordan. Fortunately, we have not to use this argument in our region, whereas in Africa the heritage of the European frontiers left ethnical tensions.

However, there are other arguments even stronger for looking to the UN system. Synchrotrons are useful for almost all, at least 13, Sustainable Development Goals. This should attract the attention not only of UNESCO, but also of FAO, for food security, water contamination, soil and agriculture, of UNIDO, for the development of local industry, of UNDP, for social and economic development, and one could continue with the agencies for energy and climate, and, though it may seem rare, also with UNWTO, the tourism organization. A synchrotron, the labs and institutes and centers of Science around it. are a structure that can promote scientific tourism, and tourism is an area where, even if possibly it is not well known, the interregional contacts between Africa and Caribbean are very intense. Last April, at the African Tourism Investment Summit, the Jamaican Minister of Tourism underscored the great possibilities of cooperation in human capital development, particularly training, in building out of investment, in the open opportunities for investment in tourism industry and noticed that air connectivity is going to increase.

Let us now return to focus on UNESCO. It is one of our first common goals. UNESCO, with CERN and SLAC, was instrumental for the creation of SESAME. We are pursuing a similar support. And the opportunity exists. In the case of SESAME, SLAC’s support triggered that of US Government. A resolution, stating that “*Funding is intended to promote scientific excellence in the Middle East region and prevent the loss of scientific expertise that is holding back science education and research in the region”* was introduced by Rep. Bill Foster, a former Fermilab physicist by the way, and was approved by US Congress.

It does not belong to me to analyze whether US have reasons of supporting our projects, and which they may be. I only assume that they may find such reasons in the current geopolitical situation. Then the instrument is on the table. Last July US rejoined UNESCO. It is not the first time that this happens, but, differently from the previous cases, US are going to contribute their arrears, spreading their payment over a few years. Does this create an opportunity for our projects? It will depend on our governments, on their ability of making clear that fair international cooperation requires that its object be discussed also according to the priorities of the recipients, on the diplomatic ability of African and Latin American-Caribbean countries of making this a crucial point in a year of election of UNESCO DG.

How far are we with the possibility of having a project of resolution introduced to UNESCO? I am optimistic. Five African Governments already explicitly support AfLS. Even if no Greater Caribbean Government have already explicitly declared its support to ours, some positive indication exists. In several countries we found interest at ministerial government, as was confirmed through the June multi venue Sympoisium. The support is not limited to our region. Brazil, with SIRIUS, is supportive. Australia has supported the realization of a conference in New York, side activity of the recent General Assembly of United Nations, Spain has been venue of one of the six local minisymposia.

At this point, I imagine, of course, that I am expected providing more details about the project. Which, where and when?

The synchrotron we envisage must be a 4th generation one, for the same reasons for which in this conference it has been stressed that AfLS must be a 4th generation synchrotron. Of course, we are considering, just like the African colleagues, compact light sources. In this conference, many colleagues mentioned the case of STAR, in Calabria. Interesting example. Calabria is in Italy a developing region, and, for what concerns me in particular, STAR, is associated to the department of University of Calabria, where I have been for a quarter of century.

CLS can accompany the synchrotron, under the unique umbrella of a big Regional Research Organization. Many reasons suggest that CLS ifacilities, even if they can be established at national level, be part of a regional collaboration. exactly for the same reasons, commented in some previous talk, and with the same caveat. They can be a way to train people for when the synchrotron will be operating. Moreover, they can allow a broader geographical impact of the initiative.

However, it must be clear that they cannot, must not, and will not be the cheap alternative to the unaffordable dream of the synchrotron. First of all because it is not true that it is unaffordable. During the pandemic, the Central American Bank of Economic Integration gave the eight SICA countries 400 M$ each. And do you know what is the amount of military expenditure in the region? In 2021, it has been 21 billion dollars. But this is not the main point. Let me recall President Sarmiento’s declaration. If one accepts that such a facility cannot be in the plans of our regions, he/she would endorse the surrender of our countries to neocolonialism.

What about energy? It is still object of discussions. My personal opinion is that probably 1.5 GeV might be a sound choice. Cheaper, of course, and useful for a range of applications, that might be those of greater interest for most countries of the region. Of course, it may sound appealing to think about a solution similar to MAX IV.

Where? Nothing has been decided, and indeed cannot be decided until we have a definition of Governmental commitment.

A few ideas: Mexico is an excellent opportunity to host a big scientific infrastructure of this sort. There is the option of Hidalgo. Acapulco’s reconstruction, after OTIS destructions, will require huge investments. It is true. Acapulco is not in the Caribbean, but in the Caribbean a 2000 billion dollars project is being considered, that of an interoceanic corridor between Oaxaca and Veracruz. Either one could have the synchrotron project as side part. In Dominican Republic, In February 2021, the president announced an ambitious project, a Caribbean Silicon Beach that would be a second City of Knowledge in the region, after that of Panama. It was February 27th. Few weeks later, the COVID-19 pandemic arrived to the country. Since both countries will have presidential elections in 2024, for the moment being, no long-term projects can be easily put in place, but discussion of projects that are State projects, and not project of a president or a political party is certainly possible.

In Southern America, the Colombian Caribbean Coast developed a lot in the last two decades. Higher Education infrastructure was an important aspect of this development. The socioeconomical impact of a synchrotron may fit with the program of the Government elected in 2022. What about Venezuela? Until now, it has not participated in our project, even if a Venezuelan scientist is involved in a project in Jamaica. We hope that it may join our project. Recently, there have been interesting developments in its relation with the US that may, in a near future make possible, perhaps, that it may be interested to host the Synchrotron or a CLS,

This brings me to discuss when.

The experience of SESAME, and that of AfLS, show that we have several years before seeing the GCLS operative.

This time must be used to build the scientific community that can make use of it, to convince the civil society that we are not proposing, novel *apprentis sorciers*, to build an Ivory tower in desert, just to satisfy our scientific curiosity and ambitions, to convince the politicians that science is not a minor chapter of their program, to be mentioned only in their election campaign.

For this, it may be useful, I would better say it will be necessary, a capillary work of involvement of the press and television. However, if we want that our projects receive the needed international attention and support, we must have a strong South alliance. Excellent experience that of our participation in the African Light Source Conference. But we need more, .much more. We must associate the Central Asia project. We must establish a permanent coordination structure. Perhaps LAAAMP can assume this as an additional task, and complement the UN expected action.

Hopefully, this can be a. discussion item if the project of an International Conference in Brazil at the beginning of next year materializes. And, perhaps, the forthcoming 7th African Light Source Conference may be intercontinental.

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