Introduction

The First International Congress on Astrophysics and Archeology of the UNSAAC was held on the Auditorium of the Faculty of Science on July 4, 5 and 6, 2019 with the presence of local professors, foreign guests, students and university authorities with the programming in annex. The objective of this event was to discuss and shape a proposal for the creation of a Postgraduate degree in Archaeoastronomy and Astrophysics at the Doctorate level, giving a strong boost to human resources research and training activities at UNSAAC. The initiative of the meeting had the contribution of several teachers of the institution, from the first contacts made by the meeting coordinator (CZV) with Professor Milton Rojas Gamarra, in Ollantaytambo, in 2018, during the IWARA2018 meeting (8th International Workshop on Astronomy and Relativistic Astrophysics), until the later stages that culminated with the writing of this proposal. Among the various professors involved in the different stages of the meeting, we highlight the relevant participation of professors Marco Antonio Zamalloa Jara, Milton Rojas Gamarra, Miriam H. Romero Peña, Pastor Raúl Chura Serrano, Sayri Tupac García Roca and Victor Ayma. We also cite the extremely important contribution of the UNSAAC authorities. The full nominate is: Dr. Gilbert Alagon Huallpa (Vice Chancellor for Research), Dr. Alejandro Ttito Ttica (Dean of the Faculty of Science), Dr. Edilberto Atau Enriquez (Director of the Professional School of Physics), Dr. Líbio Ricardo Latorre Escalante (Director of the Academic Department of Physics), Dr. Félix Hurtado Huamán (Director of the Graduate School), and Dr. Cleto de La Torre Dueñas (Director of the Postgraduate Unit in Physics). It will be clear later that cultural and educational aspects, of great importance for the region, are a natural byproduct of this proposal and should thus be considered.

In the sessions, an overview of Peruvian research was presented in its entirety, based mainly on the I National Census conducted by CONCYTEC. Among the facts that emerge are the low percentage of GDP spending by Peru in R & D, close to 0.08%, of which the region of Cusco participates only with 1.2%, considering all areas of research. The percentage of works in journals of international circulation with referee is consequently low: on average, an accredited Peruvian researcher produces 0.6 articles / year, less than other countries in the region. It is not possible here to analyze the factors that provoke this picture, but to point out that it is far from what was expected a priori, and there were unanimous opinions to indicate that there are resources and willingness to improve substantially the present situation.

The discussion moved on issues that are clearly the subject of a scientific policy, both locally and at other levels. Although there are Postgraduate degrees of the most varied nature in Peru, there is generally an idea that a Postgraduate degree is something like a competitive advantage in the market for its holder. Certainly, this is the case for a majority of activities of great social insertion, but not the case of Sciences, still less of the disciplines that are the object of this proposal. In this way, it is impossible to consider a general scheme where students are supposed to contribute to the
Working Document for the creation of a Doctorate in Archaeoastronomy and Astrophysics in the UNSAAC of Cusco

payment of a fee. On the contrary, the difficult task of turning a student into a trained and productive researcher requires a grant to pay for these studies. These scholarship schemes, rented assistantships and similar funding sources exist in all the countries that support their development in the Sciences, and would make possible the training of the students.

It is important to emphasize that, contrary to other social activities, in Sciences research and Postgraduate activities are symbiotic. It is not possible to think of R & D as something optional. In many of the countries with established scientific systems, access to university positions, for example, has a doctor's diploma and a record of publications as a prerequisite. Similar qualifications are often demanded by private companies, which in many cases finances the Postgraduate of its candidates. We believe that the concrete financial support for the potential candidates for the Doctorate must exist and constitutes an essential element to encourage the candidates to dedicate themselves to these activities.

On the other hand, the body of research professors that will execute the Program requires conditions that today almost do not exist in Peru and in Cusco. The integral dedication to the investigation is fundamental so that the efforts are not diluted in a series of different activities (administration, teaching, and even others outside the scope of the program). To be completely clear we affirm that, although the didactic load (which must include postgraduate courses), administrative and extension can and should exist, but never exceed the time devoted to research. This is essential to create a favorable working environment for the training process of the new doctors, increasing in turn the quality and quantity of the research carried out. The increase in the production of specialized works will be a direct consequence.

Finally, we would like to mention that in both Archaeoastronomy and Astrophysics, numerous researchers offered a very encouraging scenario for the construction of the program, given that there are already advanced initiatives to work and produce Science in these areas, and better yet, willing to establish concrete collaborations with the groups to be trained in UNSAAC. The partial list includes

- **Dr. Steven Gullberg** (U. Oklahoma, USA), chairman of a Working Group of the International Astronomical Union and coordinator of a program of Archaeoastronomy in the United States.
- **Dr. César Zen Vasconcellos** (UFRGS, Brasil), event organizer, ex. Vice Rector of Research of UFRGS and responsible for a working group in Nuclear Astrophysics and Compact Stars, as well as chairman of the series of events International Workshop on Astronomy and Relativistic Astrophysics (IWARA) whose last edition was held in Ollantaytambo. Dr. Zen is also chairman of the Caribbean Symposium on Cosmology, Gravitation, Nuclear and Astroparticle Physics (STARS) and the Symposium on Strong Electromagnetic Fields and Neutron Stars (SMFNS) events held every two years respectively in Havana and Varadero, Cuba. Dr. Zen is also a retired Senior Lecturer and Full Professor at the Federal University of Rio Grande do Sul (UFRGS), Porto Alegre, Brazil and Associate Professor at the International Center for Relativistic Astrophysics Network (ICRANet), Pescara, Italy.
- **Dr. Ernesto Kemp** (UNICAMP, Brasil) researcher of the DUNE collaboration of neutrinos and specialist in Astroparticles and High Energies.
- **Dr. Julio César Tello Gálvez** (UNI, Lima) astrophysicist specialist in photometry and Stellar Astrophysics.
Dr. Javier Solano Salinas (UNI, Lima) experimental physicist of Elementary Particles and participant in neutrino experiments in collaboration with Fermilab.

Dr. Diego Cogollo (UFCG, Brasil) experimental physicist of the LAGO Collaboration / Water Cerenkov Detectors.

Dr. Anderson Campos Fauth (UNICAMP, Brasil) experimental physicist specializing in muon detectors.

Dr. Moisés Razeira (UNIPAMPA, Brasil) theoretical astrophysicist of neutron stars and High Energy.

Dr. José Bellido Cáceres (U. Adelaide, Australia) experimental physicist at the Auger Observatory, specialist in cosmic ray and gamma radiation detection.

Dr. César Castromonte Flores (UNI, Lima) experimental physicist with projects in Tomography with Muons of archaeological structures.

Dr. Jorge Ernesto Horvath (USP, Brasil) Astrophysicist of High Energy and Star Evolution, co-chairman of the series of events International Workshop on Astronomy and Relativistic Astrophysics (IWARA) whose last edition was held in Ollantaytambo.

Proposal for the creation of the Postgraduate Career (Doctorate) in Archaeoastronomy and Astrophysics

General Orientations

The effective creation of the career must be debated and be agreed with the faculty and the authorities of UNSAAC. As we have already pointed out, this requires positioning and concrete decisions in the direction of a Postgraduate evaluation in the university context.

In this way, the support group proposes to the UNSAAC authorities the hiring of at least 6 professors in total who are part of the cadre devoted mainly to the research and training of the new doctors. It is highly recommended to incorporate, among the hired professors, one or two senior professors, with extensive experience, at least as visitors, with two or three years of effective presence in UNISAAC Cusco. There are several current programs, as for instance from BID and/or UNESCO, that can finance teaching and research. At least four new positions (with the senior professors totalizing the 6 new mentioned professors), with international convocation and in the same conditions, will be necessary to achieve a "more critical mass" for the offer of the courses and the direction of the students. The role of the FONDECYT / CONCYTEC to ensure full-time salaries can be important in this step.

Finally, professors already working in UNSAAC who enter, as part of the program, must have similar conditions to those just described. In this context, a revision of their status and eventual offer of changes in their condition is recommended that allows them to be in equal standards concerning the dedication and in receiving salary benefits in comparison to the new group of professors/researchers to be incorporated.
A second important item has to do with the physical space for the Doctorate program to work. The need for offices dedicated exclusively to teachers and to students, grouped in appropriate workspaces, must be strongly considered. There will be a need for computer equipment and others that require this space, as well as permanent contact between students and their teachers, a well-known dynamic that is normal in large institutions with consolidated and recognized successful research programs.

The Graduation program aims at two main lines of work that present a specific challenge. Archaeoastronomy and Astrophysics share many ideas and concepts, but they also require specific methodological training for each group. The most concrete possibility would be to have two or three courses of Post-graduation in common (for example Arqueoastronomia and General Astronomy, or, for simplicity, in General Astrophysics), to then choose one of the paths and receive specific training in each area. We recommend emphasizing the work and the production of knowledge on the mere approval of courses, and for this, the total number to be followed obligatorily by the students should not be higher than eight courses. All these general recommendations can and should be adjusted at the time of shaping the proposal, and are here explicit as ideal parameters.

We finally arrived at the issue of collaboration and external participation in UNSAAC, both in Peru and abroad. The list in the previous section contains researchers who are willing to collaborate with this initiative, and the terms of their participation (via agreements or other forms) must be discussed for each individual case. The so-called double degree can be possible, a model in force in many parts of the world where both the UNSAAC and the collaborating institution grant the doctor’s diploma to the candidate, prior specific agreement and conditions that are specific to each case. It is important to point out that, however important and significant external participation may be, the UNISAAC staff will have to play the central role in this initiative. Several concrete lines of research already emerged during the event (Archaeoastronomy and Cultural Astronomy, of central importance for Cusco and its history, Relativistic and High Energy Astrophysics, Experimental Astrophysics of Cosmic Rays ...) and will be the basis of this collaboration.

We would like to end that part by highlighting the participation of UNSAAC teachers, the attention of university authorities given to the event and the initiative, and the participation of a very expressive number of students, which clearly indicates an interest that should be considered the time to ponder the creation of the suggested Postgraduate.

Nature and Structural Aspects of the Postgraduate Course

The Graduate Program in General Astrophysics is linked to the Graduate School of the Faculty of Sciences | UNSAAC. This unit also brings Doctorate Courses in Administration and Law and Masters in Administration, Architecture, Social Anthropology, Food Science and Technology, Sciences, Accounting, Law, Rural Development, Economics, Education, Civil Engineering,

The Graduate School of the National University of San Antonio Abad of Cusco was created on October 1, 1984 as an academic unit responsible for training specialists of high academic, scientific, technological and humanistic, leading to the achievement of academic degrees of teacher and doctor. Since that date, the Graduate School has put into operation 47 programs of postgraduate programs, of which 38 masters and 2 doctorates are currently offered.

One main goal of the UNSAAC is the assurance of a teaching quality that guarantees the formation of human resources capable of generating positive changes in our regional and national society. For this reason, the Graduate School has launched a new regulation appropriate to University Law No. 30220 and the University Statute, as well as a set of appropriate management tools for the student to develop and successfully complete their studies. In this sense, UNSAAC wishes that the postgraduate felt proud to be an Antonian.

At the same time, UNSAC seeks into taking into account the production of new scientific, technological and humanistic knowledge according to the reality in which we live and with proposals of solution useful for the regional and national socio-economic development. For this reason, the Graduate School has been implementing a set of academic and administrative processes to increase the terminal efficiency of its graduates and improve the quality of the investigations leading to the dissertation or thesis.

In this context, the present proposal contemplates a multidisciplinary postgraduate course in Astrophysics, which includes two sequential programs, Master's and Doctorate, with a total duration of 60 months (5 years), providing that the master's degree will have a duration of 24 months (2 years) and the doctorate course with a duration of 36 months (3 years). The courses will have a common core and three specific emphases: Archaeoastronomy and Astronomy in Culture, Relativistic and High Energy Astrophysics and Experimental Astrophysics of Cosmic Rays and are structured as follows:

**Master's degree**

Next, we consider an academic Master's course based on research on the determinations of the Legal Rules of Law No. 30220 of July 2014, article 43.2.1.

In the maximum term of 24 months (for both scholars and non-scholars), the **Master's Degree in General Astrophysics** will be awarded, with emphasis on **Archaeoastronomy and Astronomy in Culture** or **Relativistic and High Energy Astrophysics** or **Experimental Astrophysics of Cosmic Rays**, to whom:

I) Obtain approval in the curricular activities (courses, seminars, research practices, directed readings and publication of articles);

II) Meet the minimum number of 48 credits required by the Course at the Master's level, as follows:
Working Document for the creation of a Doctorate in Archaeoastronomy and Astrophysics in the UNSAAC of Cusco

- Two obligatory common core courses of 4 hours each, totaling 8 credits;
- Two obligatory courses of one of the 3 emphasis of 4 hours each, totaling 8 credits;
- Research practices, totaling 16 credits, and
- Dissertation development activities, totaling 16 credits.

The research practices and dissertation development activities totalize 32 credits.

III) Approve in a reading test in a modern foreign language: German, Spanish, French, Portuguese, English, and Italian or a native language, as established in article 45.4 of Law No. 30220 of July 2014.

IV) Approve in public session defense of the dissertation proposal (equivalent to the qualification exam) in accordance with the provisions of the Regulations and Resolutions of UNSAAC;

V) Present an approved dissertation, in Portuguese, Spanish or English, in accordance with the provisions of the Regulations and Resolutions of UNSAAC;

VI) Obtain the homologation of the final version of the dissertation, observing the incorporation of the recommendations of the Examining Juries;

VII) Be up to date with the Library System of the University and activities developed in the Program;

VIII) Check the publication or acceptance of a bibliographic production, according to specific regulations.

The student in conjunction outlines the curriculum with his / her counselor, taking into account the theoretical training and the specific questions of his / her dissertation proposal. In order to pass the courses, seminars, research practices and directed readings, the student must have concepts A, B, or C in each one.

The Master's student, for the internalization of the 32 credits required in the research practices (16 credits) and dissertation development activities (16 credits), will be able to take advantage of:

I) Up to four credits taken in optional courses of this program;

II) Up to one credit completed as an external student of this program;

III) Up to one credit in postgraduate courses strict sense, taken out of this program;

IV) Up to five credits in works published during the course;

V) Up to one credit for teaching practices in higher education, as long as the practices are not compulsory.

The dissertation projects are examined in scope, in the field of knowledge in which they are inserted, and in depth, in the light of the theories of reference. They are valued, moreover, from the point of view of the construction of the research object, of the delineation of the research, on the adequacy of the methodology, data treatment, and professional commitment to the results and bibliographic sources, of the chronogram and of its feasibility.

Doctorate

Next, we consider a Doctorate course of an academic nature based on research and on what is determined by the Legal Rules of Law No. 30220 of July 2014, in article 43.3.
In the maximum term of 36 months (for both scholars and non-scholars), the **Doctor's Degree in General Astrophysics** will be awarded, with emphasis on **Archaeoastronomy and Astronomy in Culture** or **Relativistic and High Energy Astrophysics** or **Experimental Astrophysics of Cosmic Rays**, to whom:

I) Obtain approval in curricular activities (Master's Degree obtained in this course or equivalent, obligatory course, seminars, research practices, directed readings and publication of articles);

II) Meet the minimum number of 64 credits required by the Course at the Doctorate level, required as follows:

- Four obligatory courses of the 4-hour emphasis, totaling 16 credits;
- Research practices, totaling 24 credits, and
- Dissertation development activities, totaling 24 credits.

III) Pass an aptitude test in reading in two modern foreign languages: German, Spanish, French, Portuguese, English, and Italian, one of which may be replaced by a native language, as provided for in Article 45.5 of Act No. 30220 of July. 2014IV);

IV) To approve in a public session of defense a thesis proposal (equivalent to the qualification examination), in accordance with the provisions of UNSAAC Regulations and Resolutions;

V) Submit an approved thesis in Portuguese, Spanish or English, in accordance with the provisions of the UNSAAC Regulation and Resolutions;

VI) Obtain the homologation of the final version of the thesis, observing the incorporation of the recommendations of the Examining Jury;

VII) Be up to date with the Library System of the University and possible reports of activities developed in the Program;

VIII) Check the publication or acceptance of a bibliographic production, according to specific regulations of the UNSAAC.

The Doctorate student, for the internalization of the 48 credits required in the research practices (24 credits) and dissertation development activities (24 credits), will be able to take advantage of:

I) Up to 8 credits taken in optional subjects of this program;

II) Up to two credits taken as an external student of this program;

III) Up to two credits in postgraduate courses strict sense, taken out of this program;

III) Up to 10 credits in works published during the course;

IV) Up to two credits for teaching practices in higher education, as long as the practices are not compulsory.

The thesis projects are examined in scope, in the field of knowledge in which they are inserted, and in depth, in the light of the theories of reference. They are valued, moreover, from the point of view of the construction of the research object, of the delineation of the research, on the adequacy of the methodology, data treatment, and professional commitment to the results and bibliographic sources, of the chronogram and of its feasibility.
Postgraduate Courses in General Astrophysics

<table>
<thead>
<tr>
<th>Emphasis</th>
<th>Courses</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Common Core (obligatory)</strong></td>
<td>Fundamental Astronomy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Astrometry and Spherical Astronomy</td>
<td>4</td>
</tr>
<tr>
<td><strong>Archaeoastronomy and Astronomy in Culture (obligatory)</strong></td>
<td>Methodology and Tools in the Investigation in Archaeoastronomy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Introduction in Inca Archaeoastronomy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Anthropology and the Study of Archaeoastronomy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Fundamental Topics in the Investigation of Archaeoastronomy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Advanced Topics of Inca and Pre-Inca Archaeoastronomy</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Archaeoastronomy in Ancient Cultures</td>
<td>4</td>
</tr>
<tr>
<td><strong>Astrophysics of Cosmic Rays (obligatory)</strong></td>
<td>Physics of Cosmic Rays</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Hadrons, Quarks and Nuclei</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Elementary Particles Astrophysics</td>
<td>4</td>
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<tr>
<td></td>
<td>High Energy Astrophysics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Introduction to the Cosmic Ray Instrumentation</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Advanced Cosmic Ray Instrumentation</td>
<td>4</td>
</tr>
<tr>
<td><strong>High Energy Relativistic Astrophysics (obligatory)</strong></td>
<td>Relativistic Quantum Mechanics</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Hadrons, Quarks and Nuclei</td>
<td>4</td>
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<tr>
<td></td>
<td>Nuclear Physics</td>
<td>4</td>
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<tr>
<td></td>
<td>Effective Theories of Nuclear Matter</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Astrophysics of Elementary Particles</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Relativistic Nuclear Astrophysics</td>
<td>4</td>
</tr>
</tbody>
</table>
Profile of Teachers / Researchers to Hire
(Recommendations from professors external to UNSAAC)

Only external professors of UNSAAC carried out this part of the proposal. Our proposal is to hire four doctors / researchers to work full time in research and graduate activities, with the following profiles:

- One doctor specializing in archaeoastronomy and cultural astronomy;
- One doctor specialized in archeology;
- One theoretical doctor specialized in relativistic nuclear physics;
- One doctor specializing in particle physics with an emphasis on instrumentation, equipment and experiments to detect cosmic rays.

Additionally, it would also be appropriate to hire two visiting professors, with contracts of 2 to 3 years, who can help in the proposed academic activities. However, it is important to reiterate, once again, that the research activities corresponding to this proposal must be fully assumed by permanent 4 professors and researchers contracted by UNSAAC. The four new doctors, whose profiles are described above, will join Professors Marco Antonio Zamalloa Jara (specialist in cosmic rays), Milton Rojas Gamarra (specialist in archaeoastronomy) and Sayri Tupac García Roca (specialist in cosmic rays), and to the two visiting professors also hired forming a technical group of 9 doctors who will promote the planned master/doctorate program.
Other disciplines (for example, anthropology, history, ethnography, linguistic, arts, religion) that may be important for the materialization of the proposal can be complemented with other professors/researchers belonging to other postgraduate courses of the UNSAAC or in activities carried out in association with other Peruvian or external institutions. These other Peruvian institutions will be of great value either to achieve the proposed objectives, through complementary activities or to fill gaps in the training of students in the proposed program.

Budget of the Proposal

The maximum salary of professors in Peruvian universities is 5,956 soles. This should be the monthly salary that should be offered, according to our conception, to the professors / researchers hired for the postgraduate course. We would like to remind once again that our proposal includes the hiring of four doctors, in permanent character, who must act, in our opinion, fully and exclusively in the orientation of students to carry out their master's and doctoral studies and the publication of scientific articles. The proposal also includes the additional hiring of two visiting professors, who will act as is common in this type of hiring, in activities of academic support to the teaching and research activities of the program. The other three effective professors of the institution, previously appointed, once they have completed their doctorates and are enrolled in the teaching and research activities of the proposed postgraduate program, must have their remuneration, in the interests of equity, equated with the remunerations of others. Our calculations below only consider the salaries of future teachers to be hired, whether they are effective or visitors, without taking into account the current salaries of the three UNSAAC teachers previously named, whose salary costs are already included in the costs of the University. Our calculations also do not include other labor costs. Therefore, they only serve to give an idea of the approximate operating costs, with a view to allow to the UNSAAC authorities instruments for a decision-making.

It is important to emphasize again that it is essential for the realization of the proposal that professors / researchers and postgraduate students have an appropriate physical space, furnished, located in the same place to facilitate the interaction between them, as well as last generation desktop computers. In the calculations computed below, we only insert the approximate costs of the desktop equipment. In the calculations computed below, we only insert the approximate costs of the desktop equipment. Therefore, the costs to provide a physical space consistent with the proposal are not included in this calculation.

<table>
<thead>
<tr>
<th>Year</th>
<th>Costs of salaries</th>
<th>Desktop*</th>
<th>Operational Costs</th>
<th>Scholarships**</th>
<th>Total general</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020</td>
<td>5,956 x 12 x 6 = 428,832</td>
<td>12 x 3,500 = 42,000</td>
<td>120,000</td>
<td>3 x 2,500</td>
<td>598,332</td>
</tr>
<tr>
<td>2021</td>
<td>5,956 x 12 x 6 = 428,832</td>
<td>3 x 3,500 = 10,500</td>
<td>120,000</td>
<td>3 x 2,500</td>
<td>566,832</td>
</tr>
<tr>
<td>2022</td>
<td>5,956 x 12 x 6 = 428,832</td>
<td>3 x 3,500 = 10,500</td>
<td>120,000</td>
<td>3 x 3,000</td>
<td>568,332</td>
</tr>
<tr>
<td>Total</td>
<td>1,286,496</td>
<td>63,000</td>
<td>360,000</td>
<td>24,000</td>
<td>1,733,496</td>
</tr>
</tbody>
</table>

- All costs in new Soles; *9 professors + 3 new student per year; ** Master scholarships: S/. 2,500/month, PhD scholarships: S/. 3,000/month

Impact and Scope of the Proposal
The Master's and Doctorate Program in General Astrophysics, with emphasis on Archaeoastronomy and Astronomy in Culture, due to its structure and design, is unique. In addition, as such, because of its uniqueness, it must attract the attention of students, professors and researchers from the most recognized teaching and research institutions in the world. Whether it is to contribute to the advancement of the thematic knowledge with UNSAAC professors, researchers and students, or to take advantage of a local structure of education and research that allows them to deepen their own thematic studies in this field of knowledge, this attraction factor should be strongly considered in this proposal. After all, Cusco, Machu Picchu and the neighboring regions are “open-air museums”, places where an important part of the history of humanity took place. Carrying out research in these places represents the dream of any researcher, either in the known archaeological sites or in the archaeological sites that will surely be discovered because of the systematic research proposed by this Program. This is the only Doctorate Program in the world dedicated to the exploration of the experience of the Incas and pre-Inca civilizations through interdisciplinary and multicultural studies, enriched by advanced scientific components, as well as mythological, ritual, religious, archaeological and artistic aspects. The Program thus cultivates scientific research and imagination in those who seek to understand and express the depths of the cultural experience of the Incas and pre-Inca civilizations and their impact on modern societies, as well as current scientific development. By discerning, through the union of elements of science with the underlying threads in the myths and traditions of the Inca and pre-Inca world, we understand better the evolution of science and, in particular, of astronomy and also of our own humanity, thus valuing scientific and non-scientific elaboration throughout the history of humanity. Finally, it is important to note that the emphasis of the program on Inca and pre-Inca archaeoastronomy has an obvious and indisputable prominence but it is also important to emphasize that the program intends to encompass cultural astronomy worldwide to enrich in a proper way the education of the Master / Doctoral students.

The second emphasis of the Program, in Experimental Astrophysics of Cosmic Rays, was also motivated, on the one hand, by another singularity of the region, the presence of high mountains, and on the other, by the possibilities of complementing the studies motivated by the previous emphasis. The presence of high mountains in the Cusco region provides a competitive academic advantage for the scientific study of cosmic rays. In addition, the study of cosmic rays allows learning the structural aspects of the archaeological sites of the region. That is, there is an important symbiosis between these two emphases, to be explored, as we shall see below. We begin with the first aspect, listed above. Cosmic rays are composed of subatomic particles, such as protons or nuclei, among many others, that can reach almost the speed of light when they travel through space. Scientists theorize that a large number of phenomena such as supernova explosions, among many others, some known and others unknown, produce cosmic rays. His study is very important for this reason and can provide subsidies to publicize and reveal some of the most important mysteries of the universe. The problem is that the Earth’s atmosphere absorbs these rays, which are subdivided into cascades of low-energy particles. The installation of cosmic ray detection equipment at high mountain altitudes is a competitive factor in this study, since the detectors will be able to
 capture the component particles of the cosmic ray showers before they reduce their energies to much lower ranges, providing this way valuable information about the composition, structure and dynamics of its sources. On the other hand, there are studies that indicate the possibility of combining the detection of cosmic rays crossing-archaeological structures with the understanding of their structural characteristics. In this study, researchers use a nuclear physics technology known as *muon radiography* that works by tracking subatomic particles generated when cosmic rays interact with the Earth’s atmosphere. As they pass through space, nuclear emulsion plates are used as detectors to "capture" the particles and develop an image of where the muons have passed and where they have been absorbed or diverted. By using this method to meticulously scan archaeological structures, even underground, scientists can deepen their knowledge of its structural aspects of archaeological sites. And, eventually discover, as has been documented over the years, hidden mortuary and religious cameras, devices, utensils, sacred sites, among many others, still unknown, increasing in this way the cultural richness of archaeological sites such as those existing in Cusco or Machu Picchu for instance.

The third emphasis, in Relativistic and High Energy Astrophysics, in turn, is in a way complementary to the two previous emphases. Insofar as this topic of study is at the limit of our current knowledge about stellar evolution and the known structure of the Universe, creating a bridge between the empiric knowledge of the sky, developed in the past by the Incas and the scientific knowledge of the evolutionary universe. In addition, this research topic is very current and involves celestial bodies that still represent conceptual mysteries, such as black holes, neutron stars, pulsars and white dwarfs. In fact, the third emphasis is a research topic that will put the UNSAAC Doctoral Program in tune with some of the most important research centers in the world. In addition, it represents in a way a tribute to the empirical knowledge developed on the stars by the Inca and pre-Inca peoples and the scientific development that connects today the stars and other celestial bodies with the evolutionary process of formation of the universe.

The Quechua language is said to be the monument of spiritual amplitude, of the high-level aesthetics and sensitivity of the Incas. In addition, that the cultural heritage of the Incas is like a poem, made of stones, light and spiritual breadth. In that city, Cusco, the presence of that cultural and spiritual heritage is permanently felt. That generates deep feelings of peace, resilience, collective spirit. In that environment, it is impossible not to believe in our ability to create a project that reaches the borders of our collective dream.

This is then the preliminary doctoral proposal to be implemented by UNSAAC. With our sincere gratitude,

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Working Document for the creation of a Doctorate in Archaeanastronomy and Astrophysics in the UNSAAC of Cusco