



PRESS RELEASE No 3

Center for Social Communication / CBPF

[For immediate release]

What: Lectures will present details of international experiment - in which Brazil participates - to locate gamma-ray sources in the sky with precision and sensitivity never before achieved.

When: From 02-09 July this year.

Where: SulAmérica Convention Center.

Why: To present the latest scientific results in the physics area.

BRAZIL PARTICIPATES IN INTERNATIONAL EXPERIMENT TO HUNT SOURCES OF GAMMA-RAYS IN THE SKY

The ICRC (International Cosmic Ray Conference) - which will take place for the first time in South America - will have lectures on the so-called CTA, an international experiment bringing together 27 countries - including Brazil - hoping to locate about 1000 sources of gamma radiation in the sky. The experiment will also help understand the composition of the universe.

Rio de Janeiro, April 2013 * - Elected by Europe as a major scientific project of this XXI century, the CTA (Cherenkov Telescope Array) is being planned to hunt cosmic sources of gamma rays, the most energetic radiation known.

For this, the CTA will consist of two sets of 60 telescopes (one in the northern hemisphere and another in the South) which, despite the name, are in fact huge concave mirrors with the shape of satellite-antenna dishes. The function of these mirrors is to capture the so-called Cherenkov radiation, which are ultra-fast (about 9 billionths of a second) *flashes*

of faint blue light generated by the interaction of gamma rays with atoms in the Earth's atmosphere. From this information, the CTA will be able to point with accuracy never attained before, the emitting sources of this radiation. It is expected to identify about a thousand of them - today, about 150 gamma-ray sources are known, the first one discovered only in 1989, in the Crab Nebula.

Each network of the CTA will be composed of large (24 m diameter), medium (12 m) and small (6 m) telescopes. It is estimated that the cost for the construction and installation of each network is around 200 million euros.

The CTA data should also help us understand one of the biggest mysteries in science today: dark matter, which accounts for about 25 % of the 'filling' mass of the universe.

In South America, two locations compete to host the CTA,, one in Argentina and one in Chile. The other candidate in this hemisphere is Namibia (Africa).

CTA should start operating in 2018 and collect data for at least 10 years.

In Brazil, are participating in the CTA the Brazilian Center for Physics Research, Institute of Physics of the UFRJ the Institute of Astronomy at USP, the USP Institute of Physics, Federal University of ABC, the Institute of Physics of São Carlos and the Federal University of São Carlos.

Here is an animation that shows the general aspects of the CTA :

<http://www.cta-observatory.org/?q=node/12>

* Based on published text in *CHonline*:

<http://cienciahoje.uol.com.br/noticias/2013/04/o-universe-in-range>

Scientists worldwide - The 33rd edition of ICRC will be held from 2-09 July this year, in the SulAmérica Convention Center in the city of Rio de Janeiro.

This would be the first time the event will take place in America South

It is estimated that approximately 1000 scientists worldwide - among which are renowned international experts - will come to Brazil for the seven-day conference.

The first edition of the ICRC - as this meeting is best known by the international physics community - took place shortly after the end of World War II, and since then, has happened every two years. The last two meetings were in Beijing (China) in 2011, and Lodz (Poland) in 2009.

Mysteries of Nature - The ICRC is traditionally dedicated to topics related to the

physics of cosmic rays and high energy astrophysics and particle physics. But it also attracts scientists working on topics related to gamma rays and neutrinos - for technical terms, see "**Glossary**" at the end of this release.

For the first time this year, in Brazil, there will be involvement of the community studying the mysterious dark matter. For this reason, the ICRC adopted the subtitle 'The Conference of Astroparticle Physics.'

There are over 300 scientific lectures planned - in plenary and parallel sessions - as well as several lectures for the general public.

Organization - The Brazilian edition of the ICRC is being organized by the Brazilian Center for Physics Research (CBPF) - an organ of the Ministry of Science, Technology and Innovation (MCTI) - Federal University of Rio de Janeiro and the Brazilian Physics Society, sponsored by the National Council for Scientific and Technological Development (CNPq), the Coordination for Improvement of Higher Education Personnel (CAPES) and the Foundations for Research Support of Rio de Janeiro (FAPERJ) and São Paulo (FAPESP).

Prize-- In the ICRC are traditionally presented the prizes of the IUPAP (International Union of Pure and Applied Physics) for research in cosmic ray physics and particle astrophysics.

Tradition - Last year, we celebrated the 100th anniversary of the discovery of the origin of cosmic rays. The experiments that led to the conclusion about the extraterrestrial origin of this radiation yielded the Austrian physicist Victor Hess (1883-1964) the Nobel Prize in Physics in 1936.

Brazil has a long tradition in the related areas to this meeting, with researchers involved in several international scientific collaborations dedicated to the study of the most energetic particles in the universe, such as the Pierre Auger Observatory in Argentina (www.auger.org), the European laboratory CERN (European Organization for Nuclear Research) in Switzerland (www.cern.ch), and CTA (*Cherenkov Telescope Array*) (www.cta-observatory.org), the most important experiment in high energy astrophysics in the next decade and whose operations should begin by 2018 - with a great chance of being installed in South America .

The cosmic ray physics has one of its pioneers in Brazil, the physicist César Lattes

(1924-2005), founder of CBPF in 1949 and one of the discoverers, in the late 1940s, of the so-called the pi meson, a particle that serves as 'glue' of protons and neutrons, keeping the atomic nucleus cohesive.

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GLOSSARY

Cosmic rays - are atomic nuclei - some extremely energetic, the most energetic particles known by science - that bombard the Earth all the time, from space. When they collide with atoms in the atmosphere, they create a 'shower' of secondary particles - sometimes billions - that reach the ground. The less energetic ones come from the sun, the average energies are generated when massive stars explode at the end of life. The ultra-energetic cosmic-rays probably are created in black holes that occupy the core of some galaxies.

Dark Matter - We know only 5% of the constitution of the universe. There is evidence that the remaining 95% are divided into: i) dark matter (about 25%) and ii) dark energy (70%). Dark matter can only be detected by the gravitational pull it exerts on other heavenly bodies, because it does not emit any type of light - hence the term 'dark'. Its nature is still a mystery to science. Dark energy plays a similar role to a 'anti-gravity' and it is suspected that it is responsible for making the universe expand at an accelerated rate.

Gamma-ray bursts - are the most energetic events in nature since the birth of the universe, called *Big Bang*. One of these explosions can emit energy in the form of extremely energetic light

(gamma rays), equivalent to that obtained by the total evaporation, in seconds, of the weight of a thousand planets like Earth.

Neutrinos - They are the most elusive particles known to science. Can pass through a wall of lead about 10 trillion km thick without colliding with atoms. Are created in abundance in the universe: the stars, cosmic rays on Earth, nuclear plants, the natural radioactivity of our planet and even the human body - each of us, because of radioactive elements in our bodies, emit about 10 million neutrinos per hour. Every second, trillions of neutrinos pass through our bodies - and therefore the Earth - almost without interacting with matter.



[End of release]