A Crystal Ball to Gaze Upon Atoms will Contribute to Medicine

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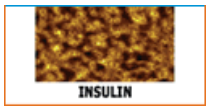
A sphere of crystals for observing the secrets of atomic nuclei such as those formed at the centre of a star will be inaugurated today at the National Laboratories of Legnaro (LNL) of the Istituto Nazionale di Fisica Nucleare (INFN, Italy's National Institute of Nuclear Physics). AGATA (Advanced GAmma Tracking Array) is a detector for studying the structure of very unstable atomic nuclei at the extremes by observing the gamma rays that they emit as they decay. Physicists refer to these nuclei as "exotic" (they are for example produced in nature by fusion in stars) because they are so unstable that they exist for a very short time, self-destructing and producing the stable matter of which we are made.

The technological solutions used in this experiment could also have important practical applications in other fields. In Biomedicine, this technology will allow images with a much higher resolution and efficiency to be obtained in diagnostic tests using PET and SPECT. An instrument using this new technology is being developed in the United Kingdom with laboratory tests being successful. Moreover, developments in this technology could improve the effectiveness of security controls for the detection of radioactive materials.

The AGATA experiment involves hundreds of researchers from over 45 institutes in 13 European countries: Italy, Bulgaria, Denmark, Germany, Hungary, Finland, France, Poland, Romania, Spain, Sweden, Turkey and the United Kingdom.

Atomic nuclei constitute most of the visible matter in the Universe; thus the study of their structure is fundamental for understanding the forces of nature and how chemical elements are formed. Exotic nuclei are "spied on" by scientists, who observe the gamma rays



nuclei. It is precisely this type of study that has allowed us to understand the phenomena that occur at the heart of matter. AGATA is the greatest technological development in nuclear spectroscopy in the past 30 years. AGATA is a research and development project for the realisation of a 4p spectrometer, that is a detector capable of capturing the gamma rays produced by nuclear reactions, in whatever direction they are emitted. The AGATA demonstrator constitutes a new generation of gamma-ray tracking detectors, whose level of performance has never been reached before. AGATA will allow a new approach to be adopted for the study of the structure of atomic nuclei and will be used in experiments that employ both very stable particle beams and radioactive heavy-ion beams. The "eyes" of AGATA will consist of 180 hexagonal germanium crystals assembled in 60 triplets. AGATA will be completed over the next few years and will have an enormous impact on the understanding of those atomic nuclei with an excess of protons or neutrons (relative to stable nuclei), nuclei at high temperatures and nuclei with angular momentum.

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