

Instrumentation: The Great Enabler

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Instrumentation is the great enabler of science both pure and applied. New directions in science are launched by new tools much more often than by new concepts. Instrumentation is critical to the missions of astrophysics, particle physics and medical imaging. To explore the fundamental nature of energy, matter, space and time, to explore the cosmos and the objects within it and to understand the workings of the human body and mind, and to diagnose and treat disease. These three fields are in the midst of a new golden age of discovery. Intelligent signal processing is a vital part of this. The recent turn-on of the LHC at 13 TeV, new experiments being planned at proposed new accelerators, deep underground, on mountain summits, at the poles, and in space together will teach us more about the origin of mass, explain the matter anti-matter asymmetry of the universe, determine if extra spatial dimensions exist, reveal the nature of dark matter and dark energy, and probe the Planck scale. Simultaneously, advances in medical imaging and in biomedical engineering will change the human condition. For the very first time we may come to know how our universe was born, how it will evolve and its ultimate fate and more about humankind and our place within it.