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The promise and the prospects of gravitational wave astronomy

Prof. David Blair (University of Western Australia)

David Blair was educated in Australia and the UK. He worked on large scale cryogenic resonant mass gravitational wave detectors first in the USA and then in Australia. He used a large bar of superconducting niobium to build the gravitational wave detector NIOBE, which operated in a worldwide network from 1993-2000. He now works in the area of laser interferometer gravitational wave detectors, spin-off technologies and Einsteinian physics education. He leads the Australian International Gravitational Research Centre at Gingin, Western Australia, site of the planned southern hemisphere gravitational wave detector.

Abstract

Gravitational waves (GW) offer astronomers a means of probing extreme states of matter beyond the reach of electromagnetic astronomy, from the earliest moments of the big bang to the vibrating event horizons of black holes. Through 40 years of effort, the flux sensitivity of GW detectors has been improved by a factor of 10^{16}. GW has not yet been detected but the latest generation of detectors now under construction promises certain detections of known sources.

In 40 years with no GW signals, theorists have amassed a large array of predictions. Indeed, GW astronomy provides a rich range of testable predictions. The development of gravitational wave detectors such as the Laser Interferometer Gravitational Observatory (LIGO) in the USA is technologically very significant. Beverley Berger, past National Science Foundation Director for Gravitational Physics stated: “Of all the large scientific projects out there, this one is pushing the greatest number of technologies the hardest. Every single technology they’re touching they’re pushing, and there’s a lot of different technologies they’re touching…..It’s the ultimate high-risk, high-payoff research project.”

The world requires a southern hemisphere detector to obtain accurate direction information on sources that can allow X-ray telescopes and optical telescopes to follow up the signal sources. An international detector in Australia would be a pivotal element in a world array of detectors, enabling all sky imaging of sources with adequate angular resolution.

All are welcome! Tea, coffee, biscuits will be served at 2:15 P.M.

You are welcome to nominate speakers to Weimin Yuan (wmy@nao.cas.cn), Mei Zhang (zhangmei@bao.ac.cn), Licai Deng (licai@bao.ac.cn), Xuelei Chen (xuelei@cosmology.bao.ac.cn), Shude Mao (smao@nao.cas.cn)