

2020 Jacques Solvay International Chair in Physics



Professor Roger Blandford
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5 ONLINE LECTURES VIA ZOOM

Thursday 11 March 2021 at 5:30 PM

Black Holes: Nature or Nurture?: The Role of Rotation in Powering Cosmic Sources

Black holes power many of the most powerful sources in the universe through releasing the gravitational energy of accreting gas and by donating their rotational energy using electromagnetic field. The interpretation of recent, remarkable images made by the Event Horizon Telescope of M87 will be discussed in the context of both modes. It will be proposed that the rotational mode dominates in sources like M87 so that the black hole spin drives away the accreting gas as a powerful hydromagnetic wind that collimates a pair of relativistic jets.

Zoom Link: <https://zoom.us/j/92256891111?pwd=NmROZHRBdStvbnUxR1BWb1A1Zllydz09>

Monday 15 March 2021 at 5:30 PM

Cosmic Blowtorches: Relativistic Jets from Stars and Galaxies

Powerful relativistic jets are made by black holes and neutron stars. They are prodigious emitters from the lowest radio frequencies to the highest energy gamma-rays. They may also create high energy cosmic rays and neutrinos. They are remarkably persistent as they escape from collapsing stars, active galaxies and merging neutron stars. It will be argued that their collimation, resilience and emission is generically due to the tensile action of electromagnetic field.

Zoom Link: <https://zoom.us/j/93200154324?pwd=R2xqOEpKNVYwbU5xU1Z5bm1WL3djdz09>





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Friday 19 March 2021 at 4:00 PM

Fast Radio Bursts: ElectroMagnetic Pulses from Cosmologically Distant Neutron Stars with Hundred GigaTesla Magnetic Field?

For over a decade, radio astronomers have been observing millisecond pulses of intense radio emission. They now appear to be associated with strongly magnetized neutron stars called magnetars where extreme QED and plasma processes take place. The rapidly developing observational picture will be summarized and a plethora of theoretical models will be reported. The possibility that Fast Radio Bursts, and pulsar radio emission, are an expression of force-free electrodynamics, as originally developed by Maxwell, will be discussed.

Zoom Link: <https://zoom.us/j/98158316261?pwd=aXhZekJVT1lMVThoS05PeEFNRWFYQT09>

Tuesday 23 March 2021 at 4:00 PM

Ultra High Energy Cosmic Rays: On the Acceleration of Hundred Joule Particles by Intergalactic Shock Waves

Cosmic rays have been observed at earth for over a century with energies ranging from 0.1 GeV to 0.3 ZeV. Those with energies from ~ 1 GeV to ~ 0.1 PeV are generally supposed to have been accelerated by shock fronts associated with Galactic supernova remnants. Sources of ~ 0.1 PeV - 0.3 EeV cosmic rays are galactic wind termination shocks and the highest energy particles may come from accretion shocks around clusters of galaxies. A multi-scale model that takes ~ 0.1 GeV particles and elevates them to energies as high as 0.3 ZeV will be outlined.

Zoom Link: <https://zoom.us/j/92712287397?pwd=WnRQeElhT0VtMHlZn0RTRWNnUzF3UT09>

Wednesday 24 March 2021 at 4:00 PM

The Unbeatable Rightness of Being: A Cosmic Ray Origin for Biological Homochirality?

The laws of physics were long thought to be unchanged when viewed in a mirror. We have known for over sixty years that they are not. As Sakharov first explained, this asymmetry, in action during the first moments of the universe, may account for the prevalence of matter over antimatter today. Likewise, as Pasteur first showed, the laws of biology are similarly asymmetric, as is exhibited by the structure of DNA. In this talk, a possible causal connection between these two asymmetries, mediated by cosmic rays, will be discussed.

Zoom Link: <https://zoom.us/j/91772093680?pwd=K2h2Q0F5TDFxSm dpWm9lM1k4anF3Zz09>

