The centenary of the quantum atom: Niels Bohr’s discovery of the quantum atom

Professor Lloyd Hollenberg
The quantum atom as a new technology resource – from quantum computers to ultra-sensitive probes of the machinery of life

School of Physics, University of Melbourne

With the discovery of the quantum atom by Niels Bohr in 1913, we took the first step to understanding the strange quantum mechanical rules that govern the structure of all matter. Now we are able to program and readout the quantum state of atoms and molecules. Remarkably, nanocrystals of diamond, containing a single nitrogen atom, shine very brightly to signal their internal quantum state even when placed inside living cells. I will show how these light signals allow us to study the internal cellular machinery including the dynamics of biological neural networks which is fundamental to gaining insight into information processing in the brain.

FRIDAY 5 JULY 2013, 8:00 PM
Elisabeth Murdoch Theatre, Elisabeth Murdoch Building

Professor David Jamieson
The discovery of the quantum atom and its applications to hold, process and transmit information

School of Physics, University of Melbourne

Niels Bohr proposed in 1913 the idea that electrons orbiting inside atoms can only occupy certain specific levels and transitions from one level to the other results in the emission of a light photon. This was the discovery of the quantum atom and it tells us that nature is fundamentally digital at the atomic level. In this lecture I will show how modern nanotechnology is allowing us to program digital information into the quantum atom including our recent breakthrough programming a single atomic nucleus engineered into a silicon chip. This could take the work of Alan Turing, the architect of modern computing, into the 21st C.

FRIDAY 12 JULY 2013, 8:00 PM
Elisabeth Murdoch Theatre, Elisabeth Murdoch Building

Associate Professor Harry Quiney
From Moseley’s law to the molecular microscope: a century of X-ray physics, chemistry and biology

School of Physics, University of Melbourne

Electrons dropping down into stable orbits around an atomic nucleus follow the strange rules of quantum mechanics which began to be revealed by Niels Bohr’s discovery in 1913. The radiation emerging from the atom as the electron settles into orbit can tell us a lot about the nucleus. Shortly after Bohr’s discovery, Henry Moseley discovered that this radiation, typically in the x-ray part of the spectrum, could be used to discover gaps in the periodic table of the elements where new elements would later be found. In this lecture I will show how one hundred years later intense beams of x-rays from synchrotrons are making new discoveries in the chemical processes of life.

FRIDAY 19 JULY 2013, 8:00 PM
Elisabeth Murdoch Theatre, Elisabeth Murdoch Building

Professor Rachel Webster
The Cosmological History of Hydrogen

School of Physics, University of Melbourne

Most of the universe is made of Hydrogen; indeed in the early universe, there were essentially no elements heavier than Hydrogen and Helium. During this talk I will trace the history of Hydrogen, from its beginnings at the time of recombination through to the present day. In particular, I will discuss several recent experiments that explore key phases in the evolution of Hydrogen, and the new telescopes we are constructing to achieve these observations.

FRIDAY 26 JULY 2013, 8:00 PM
Elisabeth Murdoch Theatre, Elisabeth Murdoch Building