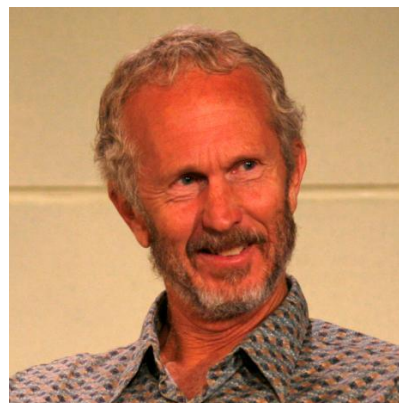


Oxford University Scientific Society — Trinity Term 2014

‘An Evolutionary View of Technological Progress’

**Professor Doyne Farmer — Wednesday,
30th April 2014 at 8.15pm in
the Inorganic Chemistry Lecture
Theatre on South Parks Road**



Abstract:

In spite of the fact that technological improvement is widely recognized by economists as the primary driver of economic growth, our current understanding of how technology improves and what underlies its improvement is poor. Economic historians have compiled a variety of fascinating case studies and anecdotes, but without any over-arching theory. We have recently begun to collect and analyze a variety of datasets with the goal of constructing more quantitative models. There are many striking regularities that cry out for explanation. One of these is the vast difference in rates of technological improvement. For example, why it is that in the last fifty years solar photovoltaic technology dropped in price by nearly a factor of five thousand while nuclear power has increased in price? My talk will review both the empirical and theoretical aspects of technological change, as well as the similarities and dissimilarities to biological evolution. I will argue that there are persistent differences in the improvement rates of technologies that have important policy implications.

About the Speaker:

Prof. Farmer is the co-director of the Complexity Economics programme at the Oxford Martin School, Professor of Mathematics at the University of Oxford, and an External Professor at the [Santa Fe Institute](#). He has broad interests in complex systems, and has done research in dynamical systems theory, time series analysis and theoretical biology. At present his main interest is in developing quantitative theories for social evolution, in particular for financial markets (which provide an accurate record of decision making in a complex environment) and the evolution of technologies (whose performance through time provides a quantitative record of one component of progress). He was a founder of Prediction Company, a quantitative trading firm that was recently sold to the United Bank of Switzerland, and was their chief scientist from 1991 – 1999. During the eighties he worked at Los Alamos National Laboratory, where he was an Oppenheimer Fellow, founding the Complex Systems Group in the theoretical division. He began his career as part of the U.C. Santa Cruz Dynamical Systems Collective, a group of physics graduate students who did early research in what later came to be called ‘chaos theory’. In his spare time during graduate school he led a group that designed and built the first wearable digital computers (which were used to beat the game of roulette). For popular press see *The Newtonian Casino* by Thomas Bass, *Chaos* by Jim Gleick, *Complexity* by Mitch Waldrup, and *The Predictors* by Thomas Bass.

‘Statins: a simple story, so why the confusion?’

**Professor Sir Rory Collins — Wednesday,
7th May 2014
at 8.15pm in the Inorganic Chemistry**



Lecture Theatre on South Parks Road

Abstract:

Observational studies in different populations indicate a positive continuous relationship between vascular disease risk and blood LDL cholesterol concentration that extends well below the range seen in Western populations. This relationship is approximately linear when vascular disease risk is plotted on a logarithmic (or doubling) scale, which implies that the proportional difference in risk associated with a given absolute difference in usual LDL cholesterol is similar throughout the range studied. In randomized trials of LDL-lowering statin therapy, the rates of heart attacks, ischaemic strokes and revascularisations are reduced by about one quarter per 1 mmol/l reduction in LDL cholesterol, irrespective of the pre-treatment blood lipid concentrations or other patient characteristics (e.g. age, gender, previous medical history). Consequently, the absolute benefits of lowering LDL cholesterol depend chiefly on an individual's overall risk of major vascular events, rather than on their blood lipid concentrations alone, and bigger LDL cholesterol reductions and more prolonged therapy produce bigger benefits. The randomized trials have also shown that statin therapy is very well tolerated and safe.

About the Speaker:

Rory Collins studied Medicine at St Thomas's Hospital Medical School, London University, from 1974–1980, and Statistics at George Washington University (1976–7) and Oxford University (1982–3). In 1985 he became co-director, with Professor Sir Richard Peto, of the University of Oxford's Clinical Trial Service Unit & Epidemiological Studies Unit (CTSU). In 1996, he was appointed Professor of Medicine and Epidemiology at Oxford, supported by the British Heart Foundation. He became Principal Investigator and Chief Executive of the UK Biobank prospective study of 500,000 people in September 2005. From July 2013, he has become Head of the **Nuffield Department of Population Health** at Oxford University. His work has been in the establishment of large-scale epidemiological studies of the causes, prevention and treatment of heart attacks, other vascular disease, and cancer. He was knighted in 2011 for his services to science.

‘Crowdfunding Fusion—Focus Fusion as the Short Route to Fusion Power’

**Eric Lerner — Wednesday, 14th May
2014 at 8.10pm
in the Inorganic Chemistry Lecture
Theatre on South
Parks Road**



Abstract:

Focus Fusion—A Short Route to Fusion

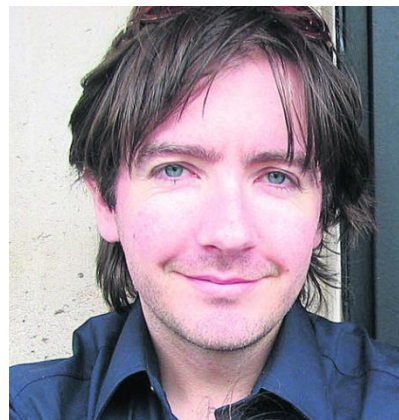
LPPFusion, Inc. is carrying out an effort that could lead to the demonstration of a new source of energy that is safe, clean, unlimited and far cheaper than any existing energy source. Our approach to fusion, Focus Fusion, based on the dense plasma focus (DPF) device, uses the natural instabilities of plasmas to concentrate energy. This is very different than most approaches to fusion that instead try to suppress these instabilities. Our approach is theoretically based on the behaviour of plasma as observed both in astrophysical phenomena like solar flares and quasars as well as in thousand of laboratory experiments with the DPF. In our own experiments, we have achieved confined temperatures in excess of 1.8 billion degrees, high enough to ignite aneutronic fuels, especially hydrogen-boron. Aneutronic fuels, which produce no neutrons, have enormous promise as an energy source. They produce no radioactive waste and, since the energy is generated in the form of moving charged particles, energy conversion can potentially be far cheaper than existing steam turbines. This talk will report on our latest results, which we believe show the way to achieve net energy production in the laboratory within about 12–18 months. In order to raise money for some critical parts, we are now carrying out a crowdfunding campaign. If this research phase is successful we estimate the engineering development of these small devices will take about 3–4 more years.

About the Speaker:

Eric Lerner is President and Chief Scientist at [LPPFusion](#) and has been active in [dense plasma focus](#) (DPF) research for 30 years. Beginning in 1984, he developed a detailed quantitative theory of the functioning of DPF. Based on this theory, he proposed that the DPF could achieve high ion and electron energies at high densities, suitable for advanced fuel fusion and space propulsion. Under a series of contracts with NASA's Jet Propulsion Laboratory, he planned and participated in carrying out experiments that tested and confirmed this theory. In addition, he developed an original model of the role of the [quantum magnetic field effect](#) on DPF functioning, showing that this effect could have a large effect on increasing ion temperature and decreasing electron temperature, which would reduce unwanted X-ray cooling of the plasma.

'Enhancing Sight for Blind Individuals'

Dr Stephen Hicks — Wednesday, 21st May 2014 at 8.10pm in the [Inorganic Chemistry Lecture Theatre](#) on South Parks Road

**Abstract:**

There is a great deal of research under way to recover or support failing sight. Some approaches, such as gene therapy and implanted prosthetic devices offer hope, but are limited in the number of people they can help and are in some sense still a long way off. The field of computer vision has expanded in the last decade and can now perform a range of real-time image detection and enhancement techniques, some of which can be employed to improve the functional sight of legally blind individuals. Over the past three years, researchers at the Nuffield Department of Clinical Neurosciences have developed prototype wearable visual aids that provide a simplified and easy to see view of the nearby world, primarily to improve navigation and obstacle avoidance. In this talk Stephen will discuss much of the background and development that has led to a pair of smart glasses for the visually impaired. He will also outline some of the areas in which computer vision can enhance sight for people in the near future.

About the Speaker:

[Dr Stephen Hicks](#) is a Research Fellow in Visual Prosthetic at the [Nuffield Department of Clinical Neurosciences \(NDCN\)](#). He leads a research effort to develop low-cost computerised visual enhancement techniques for registered blind individuals. He is the recipient of the 2013 Royal Society's Brian Mercer Award for Innovation and the Gold Medal for Engineering at the SET for Britain prize in 2014. He is an enthusiastic researcher and public speaker with background in neuroscience, engineering and human and computer vision.