"Global Challenges – Chemical Solutions"
Professor David Garner
President of the Royal Chemical Society

Professor Garner began by outlining the integral role chemistry plays in every aspect of human life. Almost every living thing is made up of carbon, hydrogen and oxygen (~99%) but with many trace elements needed to catalyse the processes that enable us to function.

He identified the major global challenges to sustainable life, as we know it. These arise mainly from the expectation that the quality of life will improve for all people and the predicted population growth to 8 billion in 20- 30 years which will lead to about a 30% increase in the demand for energy and additional requirements for clean air, water and food.

Chemistry for tomorrow's world will need to address the requirements for energy, food, water & air, human health, future cities and lifestyle.

In 2007 almost 75% of the world's energy was derived from gas, oil and coal. Burning fossil fuels results in the emission of carbon dioxide (CO_2), a greenhouse gas, that not only contributes global warming but also to increase acidity of the oceans thus endangering marine life cycles. However fossil fuels are also the source of many essential chemicals and this needs to be recognised. New sources of energy must be found so that as a minimum, CO_2 emissions do not increase above the current levels of about 360ppm. Although many of the alternative energy sources appear to be either sustainable or result in no CO_2 emissions, almost all have at least some negative points such as cost, overall carbon footprint etc. For example the use of hydrogen as a fuel has the key feature that only water is produced on combustion. However the practical use on a large scale is some way off. There is an almost unlimited source of energy i.e. the sun and hence there is currently large-scale investment in the chemistry of photovoltaic cells. Photosynthesis captures the sun's energy and uses it to convert CO_2 into useful organic materials. Professor Garner postulated a "dream" energy source where the sun's energy was captured by photovoltaic cells in say, the Sahara, and used in situ to produce organic raw materials: however much chemistry is needed before this can even be considered a reality.

Chemistry plays a vital role in the monitoring of air and water quality and also in the understanding of the processes involved. Water is of course essential for both human health but also for food production. Food production must also be sustainable and therefore new chemistry is needed to provide new approaches to plant growth and pest resistance as well as pest control. Greater understanding of the role of trace elements in human health will enable a more informed approach to medicine and treatment.

Green chemistry should aim to achieve production processes that eliminate or reduce waste and/or hazards and thus get to grips with the environmental issues. Professor Garner closed by stating that he was optimistic that chemistry would help achieve this and that he did not subscribe to the view

that “if we do not find a solution to our environmental problems the a solution will find us”.

Given on Wednesday 9 June 2010 at the Royal Agricultural Society