Harvesting sunlight:
Can solar power meet our requirements for a sustainable energy supply?

Some of our SciBar participants prepared this glossary, independently of Dr Darren Graham. Your feedback on the level of information and usefulness of the SciBar glossaries is most welcome.

Artificial photosynthesis A dream of chemists to emulate how plants use solar energy, by creating a solar 'nanocell' that could use absorbed solar energy to drive a chemical reaction, for example to split water molecules to produce hydrogen 'fuel' that can be stored for use when the Sun is not shining. The nanocells contain quantum dots and catalyst molecules.

Bandgap Also called an energy gap. Each photovoltaic material responds to a characteristic, narrow range of wavelengths in sunlight. Sunlight photons with less than the bandgap energy simply pass through the solar cell.

Catalyst A substance that speeds up a chemical reaction.

Efficiency For a solar cell, the percentage of incident light energy that actually ends up as electric power.

Nanoparticle Particles 1–100 nanometres in size, which have substantially different chemical, physical and electronic properties from those of the 'macroscale' material. Changing the size of the nanoparticle changes the bandgap of the material – the part of the solar spectrum absorbed.

Photoexcitation When a photovoltaic material absorbs a photon its energy is transferred to an electron. This 'energised' electron is then able to move from atom to atom in the material, producing an electric current. The spaces left by the wandering electrons are called 'holes', and can be filled by electrons from nearby atoms.

Photon A packet of light energy with a fixed energy value, which depends on the wavelength of the light.

Photovoltaic material Materials that generate a voltage or current when exposed to light, due to photoexcitation.

Photovoltaic cell A device that absorbs solar energy and converts light energy into electrical energy.

p-n junction A boundary between p-type (**p**ositive charge movement) and n-type (**n**egative charge movement) semiconductor materials. Photovoltaic cells contain a p-n junction. When incoming photons are absorbed, electrons migrate toward the positive side of the junction and holes toward the negative side, forming an electric current.

Quantum dots Semiconductor nanoparticles of just a few hundred atoms. They absorb light, and the wavelength of light absorbed can be manipulated by controlling the particle size.

Solar spectrum The different colours (wavelengths) of the spectrum correspond to photons of different energies. Sunlight also contains photons either side of the visible spectrum, from low-energy infrared to high-energy ultraviolet.

Synchrotron A type of particle accelerator, which accelerates a single beam of electrons round and round at the speed of light, generating a beam of high-energy X-rays**.** A scan using a hair-thin synchrotron beam can show what nanoparticles are composed of.

Useful weblinks: www.solarcap.org.uk SolarCAP is a consortium of five UK research groups exploring novel ways of harnessing solar energy to produce fuels and useful chemicals – Artificial Photosynthesis.

Next SciBar: 16 April 2012. Making and repairing blood vessels with stem cells and fibrous protein. Time: 6.30pm as usual.