The Bulletin 375

The Royal Society of New South Wales

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Future Events

Thursday 3 April 2014
The Jameson Cell (Mining)
AGM & 1220th OGM
Delivered by:
Laureate Professor Graeme Jameson AO
Union, University & Schools Club
25 Bent St, Sydney
AGM 6:00 pm
OGM 6:30 pm

Wednesday 7 May 2014
Annual Dinner, presentation of Awards and Royal Society of NSW Distinguished Fellows Lecture
Speaker:
Professor Barry Jones AO
Union, University & Schools Club
25 Bent St, Sydney
6:30 for 7:00 pm

Tuesday 13 May 2014
Joint meeting with AIP, RACI
The Australian Synchotron in the International Year of Crystallography
ANSTO Discovery Centre
New Illawarra Rd
Lucas Heights
Time: to be advised

SOUTHERN HIGHLANDS BRANCH
Thursday 17 April 2014
Update on Laser Technology
Delivered by:
Professor Ken Baldwin
The Performing Arts Centre,
Chevalier College, Bowral
6:30pm

For more upcoming events see website
www.royalsoc.org.au

Thursday 3 April 2014

Science and practice in mineral processing: the development of the Jameson Cell

Scientist of the Year 2013, Laureate Professor Graeme Jameson

Mining and mineral processing have been fundamental to the Australian economy almost from the beginning. In 1797, Lieutenant John Shortland observed coal seams in the cliffs near Newcastle, and in 1799, coal mined from this area was Australia's first export – to Bengal. Major cities, including Melbourne, were built as a result of gold rushes of the 1800's. Our largest company, BHP-Billiton, received an enormous boost from the discovery of lead and silver at Broken Hill, where the flotation process for extracting the valuable minerals was discovered. The products of mining such as iron ore, coal, gold, copper, silver, lead and zinc, continue to underpin the economy.

The basic technologies of mining and mineral processing are by now relatively mature. Nevertheless, major challenges remain. Reductions in energy consumption, and associated greenhouse gas emissions, are important targets for the industry. But better understanding of the underlying sciences and developments in other fields, have opened up new opportunities. Excellent examples are the development of software to assist in the evaluation of ore deposits and in mine planning, and the use of robotics for iron ore extraction and transport.

The focus of this talk will the development of a new technology for the flotation process, to separate valuable minerals from waste rock. Known as the Jameson Cell, it is based on fundamental research in fluid and particle mechanics. Once the scientific problems had been solved, the commercialization challenge was

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Patron of The Royal Society of NSW
Her Excellency Professor Marie Bashir AC CVO Governor of NSW

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proposed and accepted. The outcome was a radical new device that is highly efficient yet robust and simple to operate. The Cell has generated over $25 billion of fine coal exports since its introduction. The path to commercialization and the hurdles that were overcome will be described.

The talk will highlight the fact that improvements in existing large-scale operations, which may not attract much attention or excitement from the media, can yet generate large benefits to the community.

Graeme has a BSc from the University of New South Wales, and a PhD from the University of Cambridge, both in chemical engineering. He is currently Laureate Professor and Director of the Centre for Multiphase Processes, University of Newcastle, Australia.

After gaining his PhD from Cambridge, Graeme was a research engineer with Standard Oil of California at their research laboratory in Richmond, California, before moving to Imperial College, London. Here he became reader in chemical engineering at the University of London in 1971. In 1978 he took up the chair in chemical engineering at the University of Newcastle, NSW, where he was head of department for almost twenty years. In 1997 he was appointed Director of the Special Research Centre for Multiphase Processes, funded by the Australian Research Council, at the University of Newcastle. He was appointed a Laureate Professor of the University in 2005.

His research interests are in physical aspects of flotation, including cell hydrodynamics and foam drainage, and special problems relating to the flotation of ultrafines and coarse particles. He is the inventor of the Jameson Cell, which is in widespread use for the processing of minerals and fine coal. There are over 300 cells in operation world-wide. The cumulative value of fine export coal recovered from waste streams by the Cell now exceeds AUD30 billion.

During his long career, he has received many medals and awards, and in 2012 was the recipient of the Antoine M Gaudin award, the world's most prestigious award for scientific or engineering contributions that further understanding of the technology of mineral processing. He was named the 2013 NSW Scientist of the Year.

Membership Renewals have been posted!

Let's keep in touch

Details changed?
Please let us know.

royalsoc@royalsoc.org.au

The Council of the Royal Society of NSW seeks volunteers to help on a number of small projects. Volunteers will be able to contribute to the Society in any of the following areas.

Events:
- Marketing and promotion of Events
- Co-ordination of specific events
- Assistance at specific events

Membership and Fellows:
- Promotion of the Society amongst colleagues
- Recommendation of suitable applicants for membership or fellowship

Finance:
- Identification and preparation of funding submissions
- Identification of, and planning for approaches to, supporters of the Society
- Assistance with identification and management of risk
- General administrative / office tasks

Library and Historical Assets:
- Honorary Librarian
- Assistance in cataloguing and maintaining the books and artefacts held by the Society
- Assisting in the research and writing of the Society's (and science in NSW) history

Marketing:
- Assistance with delivery of marketing strategies
- Creation of broadcast marketing of the Society
- Identification of target audiences for approaches by the Society

Publications:
- Submission of papers for publication
- Membership of Editorial Board
- Webmaster

If you are interested, please contact Colin Bradley, Honorary Secretary (secretary@royalsoc.org.au) or Emma, Executive Officer (royalsoc@royalsoc.org.au).

Southern Highlands Branch

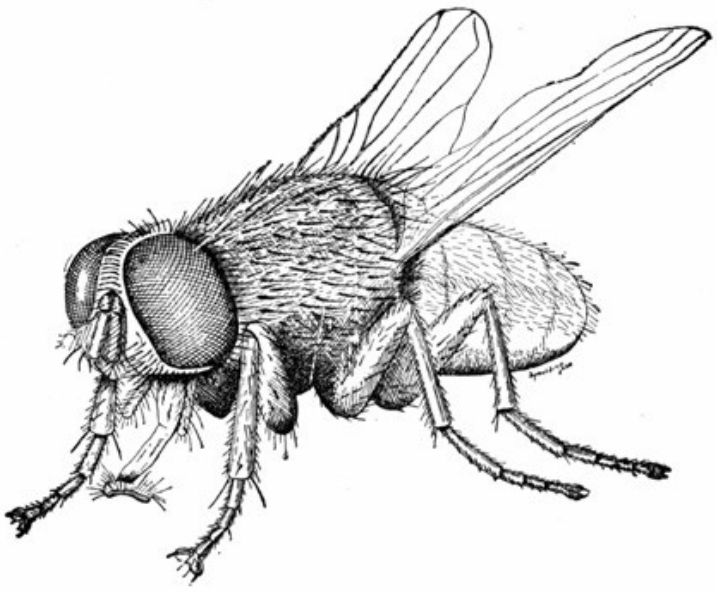
Report of February Meeting 2014

The Witness was a Fly: insects as forensic detectives

Assoc. Prof. James Wallman

An audience of 67 greeted Associate Professor James Wallman to hear him speak on the unusual subject of medico-criminal forensic entomology, a sub-specialty of forensic entomology. Forensic entomology is the scientific study of insects involved in matters pertaining to the law, and is best known for its use in the investigation of crimes, especially violent crimes such as murder.

Humans have been aware of the role of insects in death and decay for millennia. For example, the ancient Egyptians actively use flies in the mummification process. The first systematic treatment of carrion insects from a scientific perspective was by Megnin in 19th century France. Dr Wallman also showed works of art where flies and maggots have featured over the centuries.



Forensic entomology mostly investigates untimely human death, insects being especially useful for estimating the minimum period that has elapsed since a person's death (minimum post-mortem interval (PMI)). The two main methods for estimating min PMI entomologically are 1) determination of the stage of faunal succession in the corpse, and 2) determination of the age of blowflies found in it.

As a carcass decomposes, its insect inhabitants change in a sequential manner, a phenomenon known as succession. It is possible in principle to determine the stage in the successional sequence which the faunal assemblage represents and thus to arrive at the likely age of the corpse. Fly, beetle and other species that invade carrion have particular geographic distributions and environmental and seasonal preferences. Thus the actual species of forensic value will differ depending on the locality and the time of the year. It is therefore impossible to generalize about the details of insect succession in corpses.

The second method of aging corpses using blowflies involves first identifying the blowfly species, based on knowledge of their immature and adult stages. The life cycle of a blowfly involves egg, three stages of larvae (maggots), pupa (within puparium or pupal case) and adult. In some species, the egg stage occurs inside the female, so that she lays maggots, not eggs. Their rate of development is controlled primarily by temperature. The likely period that they could have been present in the corpse is inferred from their stage of development, thus providing the min PMI.

There are many other forensic inferences that may be made from the presence of insects. Insect evidence at the scene can provide a link to the victim or offender, such as through a victim's DNA extracted from the crop (stomach-like organ) of a maggot that has fed on the corpse when the offender has removed the body and only maggots remain. Because insects have discrete geographic distributions, when the species collected from the corpse are not characteristic of the fauna in the locality where it was discovered, they may point to death having occurred elsewhere and the body then being removed.

Dr Wallman emphasized that since evidence in forensic entomology is derived from living animals and the effect of climate, it is inherently and unavoidably variable. For example, toxicological tests on the living tissues of larvae can detect poisons and drugs from the corpses on which they were feeding. The presence of these drugs however may also alter the rate of development of fly species, thus affecting the estimate of the min PMI.

He concluded by saying that as long as forensic entomological evidence is appropriately qualified, it will remain an invaluable tool in criminal investigations and prosecutions.

Anne Wood

From the President

The annual Four Societies lecture that we hold each year in conjunction with the Australian Nuclear Energy Panel, Engineers Australia and the Australian Institute of Energy was delivered by Professor Mary O'Kane, NSW Chief Scientist and Engineer. Professor O'Kane discussed the types of questions to ask if we are to get the optimum solutions to the states power requirements, given the often-conflicting demands of economics, land ownership, environment and so on. The event was extremely well attended, followed by an extensive discussion session

The full speakers programmes for 2014 for both Sydney and the Southern Highlands branch have now been finalised and have been posted on the website. There are a number of important events coming up soon. First, is the annual general meeting, followed by a talk by Laureate Professor Graeme Jamieson, Professor of Chemical Engineering at the University of Newcastle. Professor Jamieson was the NSW Scientist of the Year in 2013 for his work on minerals processing – he invented technologies that have delivered major efficiency advances in minerals processing. (Note that the meeting is on Thursday 3 April, not the normal first Wednesday of the month.)

On Wednesday 7 May, the Society will hold its annual dinner, awards presentation and Distinguished Fellow's Lecture. The Society's 2013 awards (the Walter Burfitt Prize, the James Cook Medal, the Edgeworth David Medal and the Clarke Medal) will be presented, followed by the 2014 Distinguished Fellows lecture, to be delivered this year by Professor Barry Jones AO Dist FRSN.

We are very pleased by the rapid uptake of the new Fellow membership category. The Society seeing the biggest increase in membership for many years. If you meet the criteria for Fellowship (as I know a number of our current members do), please consider upgrading your membership. (The criteria for Fellowship may be found in the Rules and By-Laws – see the link on the Society's homepage.)

If there are any issues you would like to raise with me, I am easily contacted by e-mail at president@royalsoc.org.au and would like to hear from you.

Donald Hector

For information about membership please contact the Society's office or visit the Society's website or contact Emma at royalsoc@royalsoc.org.au

We encourage members to introduce new members to the Society.

Contact your office bearers

Dr Donald Hector President	**02 9484 9007**	**Em. Prof Heinrich Hora Vice President**	**02 4627 7769**
Mr John R Hardie Vice President	**02 9036 5282**	**Em. Prof D. Brynn Hibbert Vice President**	**02 9398 9134**
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