Australian Academy of Science

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The Australian Academy of Science has as its aim to spread scientific knowledge, to establish and to maintain scientific standards in Australia, and to recognise outstanding personal contributions to the advancement of science. The Academy, which celebrates its Silver Jubilee in 1979, was set up under Royal Charter by Queen Elizabeth.

Few issues in science in Australia arise without a contribution from the Academy as the only Australian body able to speak for natural science as a whole. While members of the Academy are few, its work touches many segments of Australian society.

Its members, 192 Fellows, are elected for their pre-eminence in science, and include many of those involved in the most exciting scientific developments in Australia. They come from universities, research institutes, industry and the CSIRO.

By its scientific reports on such topics as Supersonic Transport, Use of DDT, Diet and Coronary Heart Disease, Food Additives, Climatic Change, Offshore Resources, Transport, and Effects of Noise, it provides independent information of a high quality to government and the community on problems raised by technology and present-day developments in society. Studies on harnessing solar energy and the feasibility of using icebergs towed from Antarctica to provide fresh water for dry parts of Australia are aimed at contributing to the future development of Australia.

Leaders of science, industry, government and other parts of the community join in the Academy's Science & Industry Forum to explore ways in which science and industry can benefit the nation's development. Hundreds of scientists give their services freely to help achieve the aims of the Academy by contributing to its scientific enquiries, working groups, and in the preparation of its many publications.

Many other scientists have participated in the scientific conferences organized in Australia by the Academy in the past twenty years. School teachers and school children know the Academy for its senior secondary course "Biological Science: The Web of Life", developed and published by the Academy. This is now a standard text which has revolutionised the teaching of biology in all states of Australia.

The Academy is a focal point in Australia for international activity in science. The International Geophysical Year, which, in 1957, saw the launching of the first satellites and the crossing of Antarctica, is one example. The more recent International Biological Programme and the present Global Weather Experiment, a major international collaborative scientific enterprise, which started in December 1978 and which will provide vastly improved understanding of weather systems, follow in the same pattern.

The exchange of visiting groups of scientists from China and Australia, and the start of similar exchange visits with Japan, are among the Academy's other contributions to Australia's role in international science.

The Academy, an independent organisation, receives finances from its own efforts, from private sources, and from Government.

New Guinean Ant, *Orectognathus velutinus*

This poster depicts the head of a small, bizarre New Guinean ant, *Orectognathus velutinus* Taylor. The image is enlarged about 210 times — the maximum head width of the specimen illustrated being only 1.06 mm. Clearly shown are the long jaws, five-pointed antennae and finely faceted eyes.

The genus *Orectognathus* has twenty-nine known species ranging variously in mainland Australia and New Guinea, with one species each on Tasmania, New Zealand, New Caledonia and Lord Howe Island. These ants prey on small insects and hunt with the jaws held open at around 180° — that is, with their shafts approximately in a straight line. Prey is impaled by sharp teeth at the tips of the jaws, which close with a violent trap-like action.

This picture is not as it might appear, an ordinary direct light photograph of the specimen illustrated. It was prepared by photographing an image of the ant formed on the cathode ray screen of a scanning electron microscope, much as if photographing a television screen. For this purpose the specimen was coated with an ultra-thin film of metallic gold, making it electrically conductive and able to be earthed. It was then placed in the vacuum column of the microscope and there progressively scanned in hundreds of parallel lines by a minutely fine electron beam. Under such circumstances most of the scanning-beam electrons are absorbed by the subject specimen and carried to earth. On the way they excite the emission of secondary electrons from the atoms of the gold coating. These electrons can be collected and measured. Since their numbers vary with the topography of the surface, as the beam traverses the specimen, the flow can be monitored and electronically processed into a cathode ray tube image. The picture here represents such an image.

In generating illustrations of minute objects scanning electron microscopy offers several major advantages over light microscopy. This is due largely to the short length of electron waves as compared to those of light. In particular, because of the different way the image is formed electron micrographs have enormous depth of focus, so that most parts of their subject specimens are clearly focussed. A photomicrograph of *Orectognathus velutinus* would be much inferior by comparison. Only a shallow depth would be clearly in focus, with the remainder blurred. At greater magnifications the longer wavelength of light also limits the ability of photomicrographs to depict minute structures.

Scanning electron micrograph of a specimen of *Orectognathus velutinus* from the Australian National Insect Collection, prepared at the Division of Entomology, CSIRO, Canberra, by Dr R. W. Taylor.
Text: Dr R. W. Taylor

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