Australian Academy of Science : the pearly nautilus / Photograph: Edrich Slater ; information: Dr. K. S. W. Campbell, Dr. R. E. Barwick.

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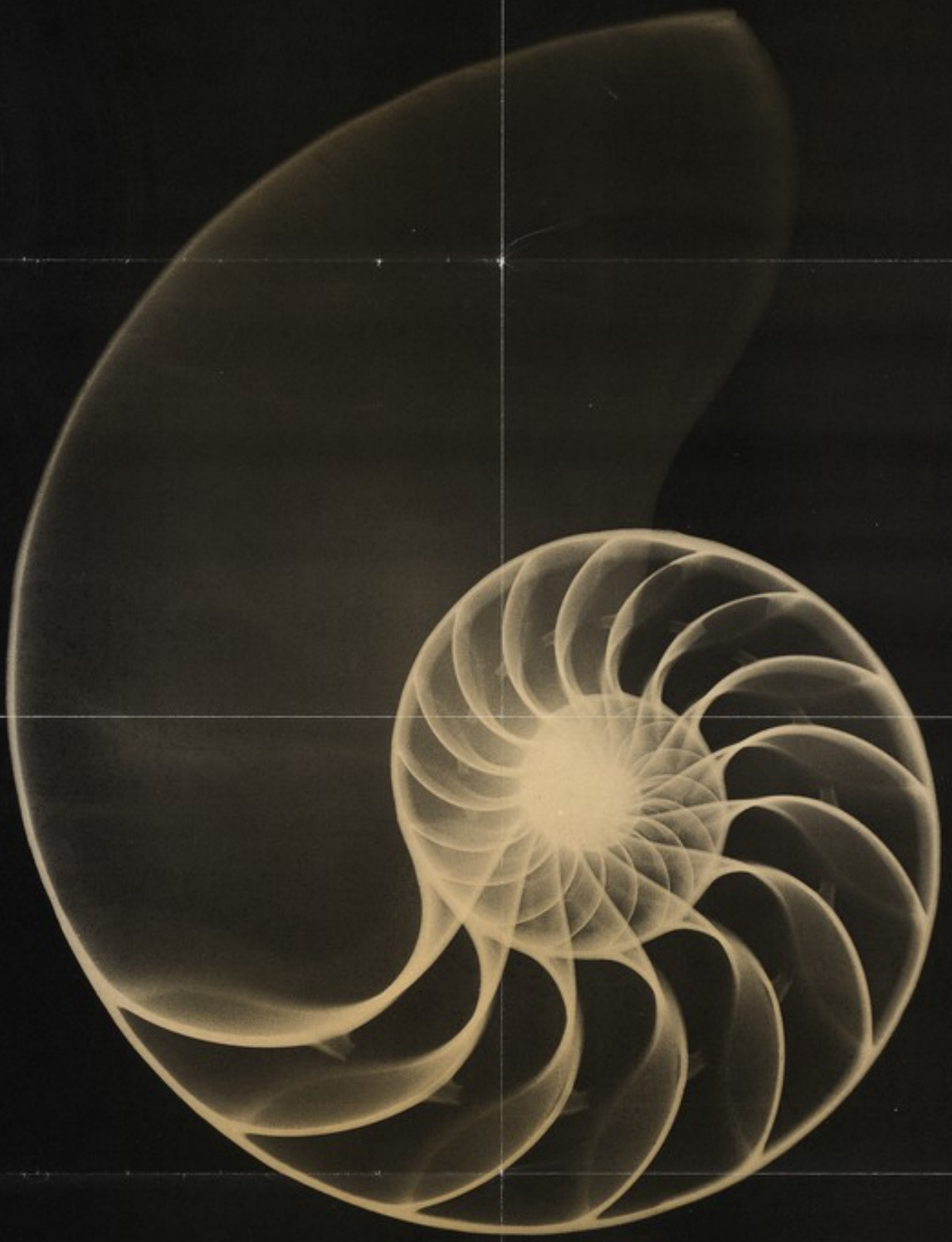

Australian Academy of Science

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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 1978, 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 organised 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.

The Pearly Nautilus

Nautilus pompilius Linnaeus, the sailor mollusc, possesses an austerely beautiful geometrically precise skeleton, which is illustrated in this poster by an X-ray photograph of a shell. *Nautilus* is the sole surviving relic of a vast and important clan that dates back hundreds of millions of years. It lives in the Pacific to the north and northeast of Australia. During daylight hours the animals live in deep waters where they swim actively in search of food above the bottom of the ocean floor. After sunset they ascend to within a few metres of the surface.

Its beauty and its capacity to drift thousands of kilometres in ocean currents, even after it is dead, have made *Nautilus* a popular curio from Japan to New Zealand and from Madagascar to New Caledonia. *Nautilus* has long been a subject of interest to both zoologists and palaeontologists — the first scientific description was given by Linnaeus in 1758.

The shell of *Nautilus* is in the form of an equiangular or logarithmic spiral — a symmetrical form of elegant mathematical simplicity. Both its mathematical beauty and its buoyancy derive from its division into a series of sealed chambers. The animal occupies the outermost chamber, and a central tube (the siphuncle) links the animal with successive chambers. In life, these chambers contain both gas and fluid. Adjustments to its buoyancy over a period of days are possible by changes in the volumes of the fluid and the gas in the chambers. These buoyancy adjustments are necessary for several reasons including changes due to growth. *Nautilus* is usually slightly heavier than seawater and the large vertical migrations from deep to surface waters are made by swimming. *Nautilus* has developed a cunning engineering design for its shell structure: the shell has sufficient strength to prevent chamber implosion when the animal is at depth and chamber explosion when it rises from the bottom.

Recently it has been found that daily growth lines are formed in the shell, and the major chambers are formed at each lunar month. This may provide a means for determining the number of days per lunar month over hundreds of millions of years and hence provide an independent means of checking astronomical calculations.

Swimming is achieved by jet propulsion, a method of movement invented by this group some 500 million years ago. Water is forcibly ejected through a nozzle propelling the animal backwards. The position of this nozzle in the shell is marked by a notch which can be recognised in fossils from the lower Palaeozoic rocks, thus permitting the inference of jet movement at remote periods in the past.

Like its not-too-distant relative, the octopus, *Nautilus* is equipped both with tentacles able to exert suction, and with large paired eyes. Unlike those of the octopus, the eyes of *Nautilus* lack an iris, lens and eyelid and are like an adjustable "pinhole camera", sensitive to variations in the amount of light and probably capable of image formation. Though the animal's agility does not match that of the octopus, its tentacles and eyes together with its jet propulsion make *Nautilus* an efficient carnivore. Its chief diet is crustaceans and fishes which it despatches with its large beak-like jaws.

Adult specimens of *Nautilus* are about 15 cm in diameter.

Photograph: X-ray photograph by Mr Edrich Slater, CSIRO Division of Wildlife.
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