

SCIENCE NEWS of the week

IRAS: A Study in Starbirth

Almost as soon as it started looking around from its earth-orbiting vantage point earlier this year, the U.S./Dutch/British Infrared Astronomy Satellite (IRAS) found itself witness to stages in the birth of stars in the Large Magellanic Cloud (SN: 3/5/83, p. 149). Now nearly halfway through what is planned as the first infrared survey of the entire sky, IRAS has found signs of similar genesis in other locales such as the Andromeda galaxy, at 2 million light-years' distance the nearest spiral galaxy similar in size to the Milky Way. This false-color image of Andromeda (at right, shown exaggerated in its vertical dimension) shows orange and yellow hotspots representing regions of intense 60-micron IR emission believed to be sites of star-formation. (Blue and green mark areas of fainter emissions.) An intensity map (below) from the same observations, though at 100-micron wavelengths, shows computer-generated contour lines and shadings of gray, with the blackest areas representing regions populated by either numerous or massive young stars. The satellite's observations, according to IRAS officials, are the first study of Andromeda at long IR wavelengths.

The IRAS survey has also discovered two regions where stars like our sun are apparently being born. As many as five

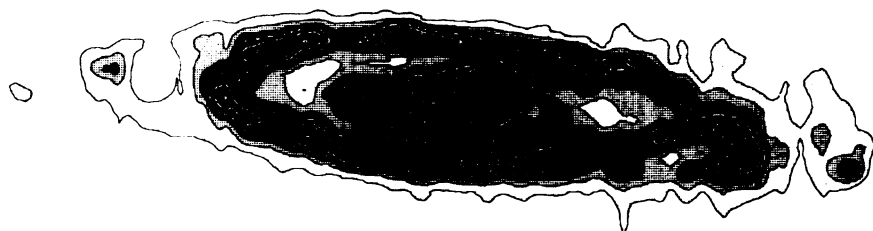


such "protostars," each no more than one million years old, seem to be coalescing within a dark cloud of dust and gas called Barnard 5, while a similar cloud known as Lynds 1642 may hold one or two more. As regions of the clouds collapse into protostars, they gravitationally attract additional mass from their surroundings, until their temperature and density reach a point at which thermonuclear fusion reactions ignite to create a star. The similarity of the newly found protostars to the early sun also suggests the possibility that planetary systems might be forming around them.

Yet another possible stellar birthplace may be indicated by strong IR emissions that IRAS has detected where a pair of galaxies known as NGC1888 and NGC1889 are passing close together and being torn apart by their mutual gravitational attraction.

At the other end of the stellar life cycle, IRAS has observed a planetary nebula labeled NGC6302, an ancient star that has nearly consumed its hydrogen fuel. The outer layers of the old star have expanded into a shell that looms fully as large as our solar system around the dying core.

—J. Eberhart



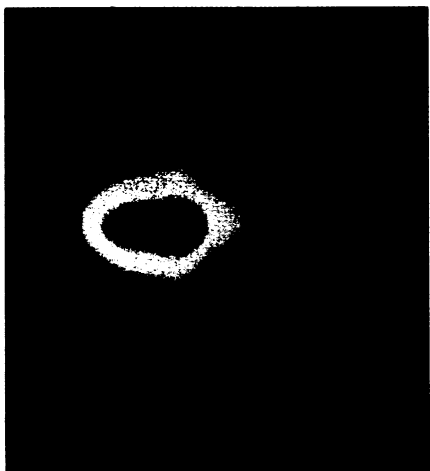
Fossils indicate early land animals

Microscopic fossils extracted from rock in upstate New York have provided the earliest known evidence for the evolution of land animals in the Americas, suggesting that aquatic animals may have come ashore much earlier than previously thought. The 380-million-year-old fossils also indicate that the important transition to terrestrial life probably took place in an equatorial environment — on an ancient continent that has since split into northern Europe, eastern North America and Russia.

The fossils — which include the oldest known centipede, several arachnids, a mite and perhaps the earliest known insect — were discovered six years ago at Gilboa in the Catskill Mountains by biologists Patricia M. Bonamo and James D. Grierson of the State University of New York in Binghamton. The fossils have been analyzed by a team of paleontologists, who now conclude that the diverse sample provides the best evidence anywhere for fully adapted land animals during the so-called Devonian era. The scientists reported their findings at the meeting of the American Association for the Advance-

Mapping the coma of IRAS-Araki-Alcock

Besides surveying the stars, IRAS has also been hunting asteroids, including a special search for fast-moving objects that would presumably be asteroids passing close to the earth. The first two fast-movers IRAS has found, however, have been not asteroids at all, but comets. This false-color image is a 20-micron-intensity map of comet IRAS-Araki-Alcock (SN: 5/14/83, p. 311), first detected on April 25. The map is of the comet's huge coma — an enveloping cloud of materials that boil off from the nucleus and are then deflected by solar radiation pressure. The coma covers an area about the size of earth; the comet's nucleus is about 1 kilometer in diameter. (The sharp cutoff along the right side is the edge of the scan path.)



ment of Science in Detroit last week.

According to one of the collaborators, William A. Shear of Hampden-Sydney College in Virginia, older fossils of land animals (400-million-year-old millipedes) are known from Scotland, but the New York sample is much more diverse and contains animals that were more fully adapted to terrestrial life. Five species have been identified with certainty, Shear says, and the sample may contain as many as 15 different animals, depending on how the fossil fragments are finally interpreted. The ancient bugs had developed primitive lungs — called “book lungs” because of their shape — and some had also developed tracheal tubes — the earliest evidence of such an adaptation, according to Shear. The evidence that so many animals had fully adapted to breathing air indicates that the transition from water to land must have taken place much earlier, according to a second co-worker, W.D. Ian Rolfe of the University of Glasgow.

The New York fossil sample is unique because it contains exclusively land ani-

mals, according to Shear. The two other sites where fossilized land animals have been found — the Scotland site and a slightly younger German site — have revealed a mix of aquatic and terrestrial animals, suggesting swampy environs. All three present-day sites were part of what is called the Old Red Continent, which 400 million years ago rested on the equator, according to Shear. Because no similar evidence for early terrestrial adaptations has been found on other ancient continents, Shear says, it appears that animals — at least these particular groups of animals — made the transition to land in the tropical environment.

All of the fossils represent animals that are now extinct, probably for more than 200 million years, according to Shear. But some are “remarkably similar” to modern forms, Shear says: the mite can actually be assigned to a living class of animals, indicating an amazing degree of evolutionary stability, the centipede looks very much like a modern centipede, he says, and one of the arachnids resembles the existing

daddy longlegs. Another of the collaborators, Edward L. Smith of the California Academy of Sciences, has indentified another of the fossils as a machlid, or silverfish; if it is indeed a silverfish (others on the team are less sure), it would be the oldest known insect ever found.

One of the most exciting things about these fossils, Shear says, is the “exquisite detail” that has been preserved — including minute hairs and sense organs. In contrast to the work in Europe, Bonamo and Grierson extracted their fossils by dissolving rock with a strong acid that leaves the fossils intact. The method can also be used to obtain fossilized plants (indeed, Bonamo and Grierson discovered the animal fossils by accident while looking for plants); what this means is that scientists will for the first time be able to study in minute detail a truly terrestrial ancient ecosystem. Of the animals studied so far, all except the mite were carnivores, suggesting the existence of soft-bodied land animals during the same time period.

—W. Herbert

Task force on science communication and secrecy gets rolling

In an attempt to examine the ongoing controversy surrounding the question of restrictions on scientific communication, a National Security Council-sponsored task force will in a few weeks begin interviewing industry and university scientists on the matter. The results will be reviewed by select scientists in secret, and some scientists fear that the task force's conclusions and recommendations will remain secret as well.

The survey is part of a review of efforts to control the flow of militarily critical technology from the United States to the Soviet Union. “Our mutual concern is to arrive at a policy that is acceptable to the research community and does the job required,” explained Louis T. Montulli, until recently an analyst at the White House Office of Science and Technology Policy. Montulli spoke last week at a panel discussion at the American Association for the Advancement of Science (AAAS) annual meeting in Detroit.

The NSC's interagency task force on technology transfer, called for in a February presidential directive, is an attempt to bring order to a confused, controversial export control program. According to Montulli, about 44 groups scattered across 14 government departments and agencies are involved in executing the administration's present policy.

In the new attempt to streamline operations and clarify policy, one task force study group is examining the role that all types of scientific and technical communications play in technology transfer. The review covers all means of communication, from conference speeches and patents to exhibits and air shows.

The group plans to send out a question-

naire this summer to collect opinions on the issue from researchers. After analyzing the replies, it will formulate “a detailed description of the problem and a draft set of policy and implementation recommendations.” The resulting document, before its scheduled release at the end of the year, will be reviewed by selected representatives of the scientific and technical community, in the course of “very private conversations,” Montulli said.

However, some scientists are concerned that the NSC may choose to keep all or part of the final document and policy directive secret. Furthermore, panelist Stephen Unger, a computer scientist at Columbia University, is worried that the largely secret review process would inevitably lead to recommendations for increased research secrecy.

To counter this trend, Unger said, the U.S. Congress ought to make a strong statement on the need for openness in scientific communication. Recently, during debate on revising and extending the Export Administration Act, which authorizes export controls on sensitive technologies, House and Senate committees did just that. The House committee, for instance, has passed an amendment affirming the need to protect “the ability of scientists and other scholars freely to communicate their research findings.”

Rosemary Chalk of the AAAS Scientific Freedom and Responsibility Committee noted that several events during the past year have already negatively affected the work of researchers, students and officials in universities and industry (SN: 4/2/83, p. 218). Although information on the numbers involved is impossible to obtain, both Chalk and Unger suggested that individual

researchers have, on occasion, voluntarily withheld new research findings in the belief that such work might fall within, or close to, areas of current concern to the government. Some companies, particularly those having contracts with the Department of Defense (DOD), have issued more stringent guidelines governing the public release of company research results. The guidelines affect even subsidiaries that are not DOD-funded.

Moreover, a DOD policy, spelled out last September, required that all new DOD research contracts allow researchers to submit their papers for publication at the same time that they submit them to DOD for review. Despite this policy, the U.S. Air Force, for one, still reserves the right to review, censor and hold, for indefinite periods, papers before they are circulated to anyone else.

Chalk also described a case in which U.S. Customs officials seized several shipments of magnetic computer tape scheduled for delivery to the Soviet Union. The tapes, from the Institute for Scientific Information (ISI) in Philadelphia, contained scientific bibliographies. “These shipments were seized not because of the sensitivity of the bibliographic information but because of the quality of the magnetic computer tape itself, which exceeded the criteria currently listed in the Commerce [department] export control guidelines,” Chalk said. The solution to ISI's dilemma may involve shipping the information on 20-year-old, poorer-quality tapes.

Chalk concluded, “There is much about the secrecy issue that remains a mystery.” More and more scientific groups are becoming concerned.

—J. Peterson