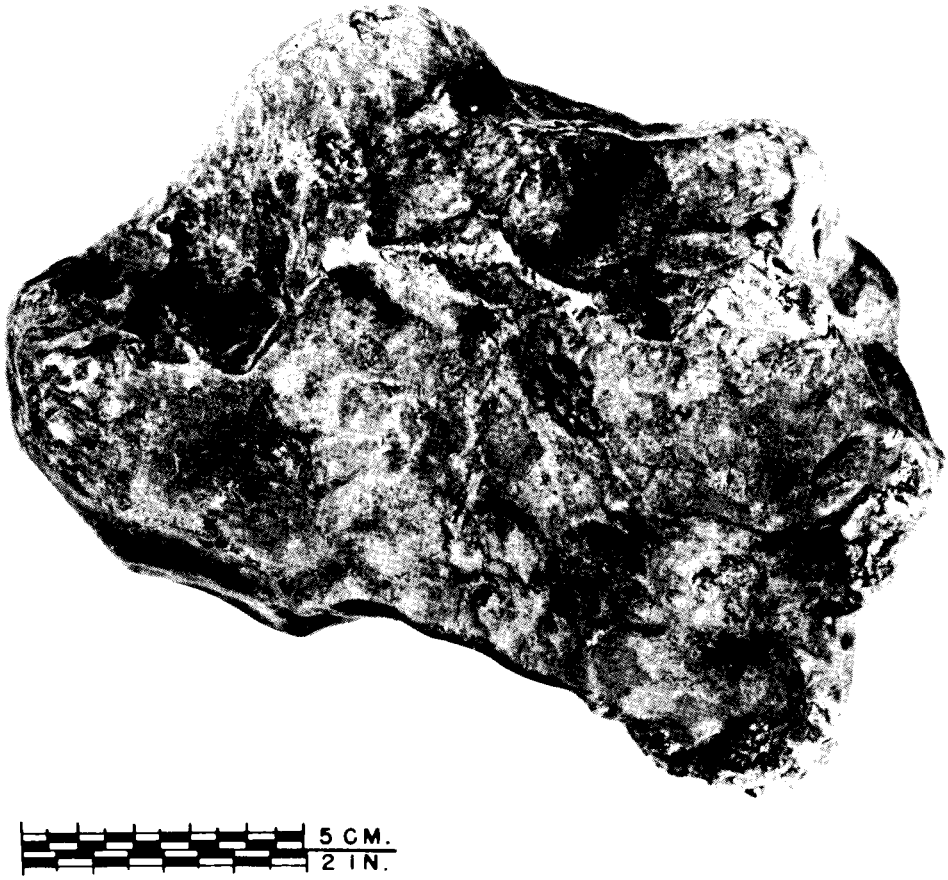
The complete absence of national laboratories for standardizing radiation measurements and the lack of physics departments in most radiotherapy centres in Latin America warrant the setting up of one or more regional dosimetry facilities, the functions of which would be primarily to calibrate dosimeters; to provide local technical assistance by means of trained staff; to check radiation equipment and dosimeters; to arrange a dose-intercomparison service; and to co-operate with local personnel dosimetry services. To be most effective, this activity should be in the charge of local personnel, with some initial assistance in the form of equipment and experts provided by the Agency.

Although the recommendations were presented to the IAEA as the organization responsible for the setting up of the panel, the participants recommended that the co-operation of the World Health Organization and the Pan-American Health Organization should be invited. It was also suggested that the panel report be circulated to public health authorities in the countries represented.

MESSENGERS FROM OUTER SPACE

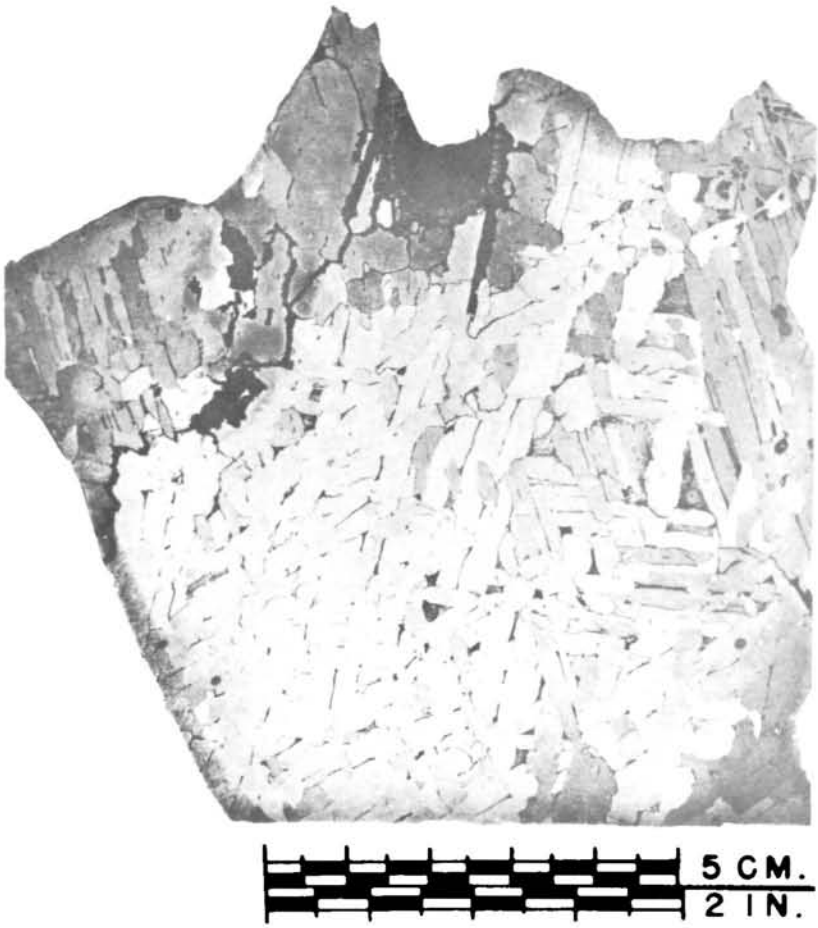
Although no evidence has yet been confirmed of living beings reaching the earth from space, it has been estimated that hundreds of tons of solid matter arrive every day in the form of meteorites or cosmic dust particles. Much is destroyed by heat in the atmosphere but fragments recovered can give valuable information about what has been happening in the universe for billions of years. Some of the results of worldwide research on meteorites were given at a symposium in Vienna during August.

During six days of discussions a total of 73 scientific papers was presented and a special meeting was held for the purpose of improving international co-operation in the research. More than 150 scientists drawn from 20 countries and six international organizations took part. The event was organized by the Agency in co-operation with UNESCO, the Joint Commission on Applied Radioactivity, the International Astronomical Union, the International Union of Geological Sciences, the International Association of Geochemistry and Cosmochemistry and the Meteoritical Society.



This meteorite, which fell at Bogou, Upper Volta, West Africa in 1962 and has been the subject of much research, has been estimated to be 440 million years old.

At the opening meeting Professor B. Grinberg, Director of the Agency's Division of Research and Laboratories, spoke of the importance attached to the subject of meteorite research by the scientific community. The spectacular nature of the fall of some meteorites had, he said, aroused not only curiosity but often fear and superstition for many centuries. One of them which fell at the small Alsatian town of Ensisheim in 1492 was thought to have been taken by Emperor Maximilian I as a sign from the heavens to mount a crusade against the Turks. In modern times scientific work on meteorites had been transformed by the discovery of new analytical techniques, particularly those based on measurement of radioactivity. These methods had given an example of the way in which the peaceful applications of nuclear techniques could advance human knowledge.



Crystal size in the Bogou meteorite indicates that it was originally part of a much larger body and that cooling was very slow. Much of the surface was burned or melted away after entering the atmosphere at about 125 000 miles an hour.

Professor Grinberg predicted that many reports presented would give results obtained with the new methods and his forecast was fully born out. Some of the information was obtained from determinations of the products of decay of natural radioelements: helium-4 from uranium and thorium, argon-40 from potassium and strontium-87 from rubidium. This information is directly relevant to considerations of the radiogenic age of meteorites - the time during which they have existed as parts of solid bodies. In the gaseous or liquid state, decay products are rapidly transported away from the site of their formation by convection or diffusion. The solidification of matter, however, sets the radiogenic clock to zero: decay products from this moment accumulate at the site of their origin at rates characteristic (and known) for each species, and their concentration is a measure of the time elapsed since solidification took place.

From different measurements and calculations reported at the meeting it now seems firmly established that the solid matter in meteorites is up to 4.7 billion years old. This value corresponds well to that determined for the age of the earth.

A different kind of information was provided by the measurement of products of cosmic radiation including non-radioactive materials such as argon isotopes 36 and 38 and radioactive argon-39 and chlorine-36. Their measurement provides a clue to the "radiation age" of meteorites, the time during which meteorites have existed as separate small bodies in space, no longer shielded from cosmic radiation by the large parent bodies in which - according to most theories - they are believed to have been buried and from which they were released by their break-up, probably due to collision. Such radiation ages are typically several hundred million years for iron meteorites and from less than one up to about sixty million years for most stony meteorites. Different types of meteorites also fall into characteristic radiation age groups, which indicates that they were produced in different cosmic events and from different parent bodies.

One question discussed was whether meteorites originally came from asteroids, comets or from the moon. Lunar origin is now considered rather improbable, not only because an event leading to the ejection of a meteorite from the moon would have to be energetic enough to provide it with at least the lunar escape velocity of 2.4 km/sec, which would lead to shock structures not in fact observed in most meteorites, but also because recent measurements of lunar surface material have shown its composition to be different from that of meteorites.

Some other facts interesting to the layman are that the cooling rate of a body in space 100 kilometers in diameter would be 1-10°C in a million years, and that erosion caused while travelling through space would be 0-1.1 cm in a million years. It is also considered that there has not been much change in cosmic rays during the last 10 million years.

Considerable efforts are being made to obtain meteorites as quickly as possible after they have fallen in order to gather the greatest amount of information about their radioactive contents. A meteorite which fell in France in 1966 was made available to laboratories within a few weeks, and eight papers at the symposium dealt with aspects of its analysis. Efforts are also being made to establish the trajectories through which the meteorites fall. So far only one has been observed successfully by photography and subsequently recovered, although there have been a number of photographs of fireballs.

The proceedings are to be published by the Agency.