galaxy, were formed, according to the team. Considering that the solar system is believed to be about 4.6 billion years old and the Milky Way is believed to have formed about 10 billion years ago, this is old light indeed.

The search that resulted in discovery of PKS 2000-330 began 10 years ago, using antennas of the Deep Space Network. Samuel Gulkis and David Jauncey had first suggested that the Deep Space Network antennas could determine accurate positions of the radio sources that might be quasars. They linked the 26-m and 64-m antennas at the Deep Space Network Tidbinbilla tracking station in Australia. As part of a larger group they accurately measured the positions of a large number of radio sources that had been discovered with the 64-m Parkes radio telescope in Australia. The radio sources were then matched with objects of photographs. The spectrum of PKS 2000-330 was measured, using the 3.9-m Anglo-Australian telescope.

On the night of March 26-26, 1982, the spectrum of PKS 2000-330 revealed emission lines of oxygen, hydrogen, nitrogen, and carbon at a red shift of 3.78, greater than any red shift ever measured.—PMB

Rain or Snow?

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It's easy to look out the window and decide whether it's raining, snowing, or hailing, right? Well, not always—especially when the region of interest isn't directly outside your window. To help discern the difference, the National Oceanic and Atmospheric Administration (NOAA) has developed a laser beam device that differentiates between the precipitation types.

The laser weather identifier produces different signals when raindrops, snowflakes, or hailstones pass through the laser's beam, according to Ting-i Wang—until recently a scientist at NOAA's Environmental Research Laboratories in Boulder, Colo. These signature signals can be read by computer and integrated into present weather networks. 'It can eliminate human error or negligence, and can be cost effective by constantly observing and monitoring the weather,' Wang noted. Wang and his colleagues are developing several of the laser instruments for evaluation by NOAA's National Weather Service. The first of these is scheduled to be installed in 1984.

Hydrologists and airplane pilots could benefit from the device's potential applications. The information collected by the laser weather identifier would enable hydrologists to measure the total water falling on the ground over a large area. The data collected also could tell airplane pilots destined for small, unmanned airstrips what type of precipitation, if any, they could expect; they could extrapolate from this information the resulting ground conditions and what precautions should be taken for landing.—BTR

Search for ET

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A new commission of the International Astronomical Union (IAU) has been established to formally coordinate efforts to search for extraterrestrial life. Commission 51, Search

for Extraterrestrial Life, was approved at the 18th IAU General Assembly held in Greece this past August.

Among the new commission's objectives are the search for planets around other stars; the search for radio transmissions, intentional or unintentional, of extraterrestrial origin; the search for biologically relevant interstellar molecules and the study of their formation processes; the examination of detection methods for potential spectroscopic evidence of biological activity; and the coordination of efforts in all these areas at the international level and the establishment of collaborative programs with other international scientific societies with related interests.

The more than 100 members of the commission plan to publish a newsletter at regular intervals. The first major commission meeting probably will be at the IAU symposium in Budapest, Hungary, in the summer of 1984.

The establishment of the new commission will greatly strengthen the search of astronomers for life (bios) in the universe, according to the newly elected commission president, Michael D. Papagiannis of Boston University's astronomy department. A new chapter has begun for this field of astronomy, he added. That new field is bioastronomy. IAU members who would like to join the commission should call or write to Papagiannis at the Department of Astronomy, Boston University, Boston, MA 02215 (telephone: 617-353-2626).

Nation's Water Remains High

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Streamflow conditions throughout most of the nation remained normal to above normal during October, the fifth straight month of wet conditions across the country, according to a month-end check of water resources conditions by the U.S. Geological Survey. USGS hydrologists said that 86% of the 188 key index gaging stations across the country reported normal to well-above normal flows during October, with 10 stations in the West and Midwest reporting record highs for the month.

As a general indication of the nation's water resources conditions, combined flow of the nation's "Big Five" rivers—Mississippi, St. Lawrence, Columbia, Missouri, and Ohio—

averaged 508 billion gallons a day (bgd) during the month, 7% above normal. Individually, only the Ohio River was running below normal for this time of year, averaging about 17 bgd, 27% below normal.

The Big Five rivers, which together drain more than one half of the conterminous United States, provide USGS hydrologists with a quick, useful check on the status of the nation's water resources.

Two of the five key index gaging stations in Iowa set new record high averages during October. Flow of the Des Moines River at Fort Dodge, Iowa, for example, averaged 2.8 bgd, more than 12 times the normal flow for this time of year, and the highest October average flow in 51 years of record.

On the negative side, small scattered pockets of low flow were reported in several states, including Maine, New York, Kansas, and Louisiana. Streamflow conditions in New York were especially varied. In upstate New York, flow of the West Branch Oswegatchie River near Harrisville, N.Y., averaged 310 million gallons a day (mgd), 114% above normal. In central New York, however, flow of the Susquehanna River at Conklin, N.Y., averaged only 140 mgd, 77% below normal, and the second lowest October average in 71 years of record.

Working in cooperation with federal, state, and local agencies, the USGS regularly monitors the quantity and quality of the nation's surface- and groundwater resources at more than 43,000 sites across the country.

During October, individual flows of the Big Five averaged: Mississippi River near Vicksburg, Miss., 211 bgd, 12% above normal, but 23% below that of September; St. Lawrence River near Massena, N.Y., 172 bgd, 5% above normal, but 2% below last month; Columbia River at The Dalles, Ore., 5% above normal, but 21% below last month; Missouri River at Hermann, Mo., 47 bgd, 21% above normal, but 33% below September; and the Ohio River at Louisville, Ky., 17 bgd, 27% below normal and 22% below last month's flow. (Map courtesy of the U.S. Geological Survey.)

Books

Scanning Electron Microscopy and X-Ray Microanalysis

J. I. Goldstein, D. E. Newbury, P. Echlin, D. C. Joy, C. Fiori, and E. Lifshin, Plenum, New York, xii + 673 pp., 1981, \$29.50.

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Reviewed by Arden L. Albee

This outstanding volume has managed the nearly impossible task of combining the expertise of all six authors in a lucid and homogeneous style of writing. Subtitled 'A Text for Biologists, Material Scientists and Geologists,' the book has evolved from a short course taught each summer at Lehigh University.

The book provides a basic knowledge of (1) the electron optics for these instruments and their controls, (2) the characteristics of the electron beam-sample interactions, (3) image

formation and interpretation, (4) X ray spectrometry and quantitative X ray microanalysis with separate detailed sections on wavelength dispersive and energy dispersive techniques, and (5) specimen preparation, especially for biological materials.

All of these topics are presented in detail (note the length of the book) with emphasis both on fundamental concepts and on practical and instrumental aspects of the techniques. One of the most useful aspects is the similarity to a good review article: There are extensive references with expert comparison and evaluation of competitive techniques and ideas. Errors are discussed throughout the book and not relegated to a separate section. I found their discussion of quantitative analysis by means of energy dispersive techniques particularly useful and balanced in its presentation.

The final chapter consists of about 10 case histories illustrating various applications and techniques. A useful addition would be an il-

lustration of a modern multi-element analysis (including F and Cl) for a complex silicate such as hornblende. Students would find useful a detailed worked example of a full ZAF correction and a more extended section on preparation techniques for polished sections of ceramics and geologic materials. Currently, when every instrument comes with an attached computer, the volume is somewhat light on automation. Case histories could illustrate applications such as point counting or shape analysis, which demonstrate the power of computer-controlled interactions between analytical results and instrument parameters such as beam or stage position.

Scanning electron photographs and X ray microanalyses are now used in a wide variety of fields, and I strongly recommend this volume as a single comprehensive reference for the professionals who use them.

Arden L. Albee is professor of geology, California Institute of Technology, Pasadena, Calif.

and for *Geophysical Research Letters*. He also has been a member of the editorial committee for the *Annual Reviews of Earth and Planetary Sciences*.

His dedication to hard work shines clearly through his academic record: He was awarded Bachelor of Engineering Physics and Master of Aeronautical Engineering degrees from Cornell University in 1961; 3 years later he received a Ph.D. in Aeronautical Sciences from the University of California, Berkeley. While serving as a lieutenant in the U.S. Navy from 1961 to 1965, he taught nuclear reactor physics, heat transfer, and fluid mechanics at the U.S. Naval Nuclear Power School. He was then awarded a postdoctoral fellowship to visit the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge.

In 1966, he joined UCLA's planetary and space science department as an assistant professor. He received several promotions within the department until, in 1974, he became a professor of planetary physics. The James B. Macelwane Award of AGU, which he received in 1975, is but one of the many awards bestowed upon him.

Schubert will not have too many opportunities to visit the United States in the next 6 months, but he will be at the AGU Fall Meeting in San Francisco in December and is anxious to talk with anyone about anything concerning JGR.—BTR

AGU

Schubert Edits JGR-Red

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'As editor, my major concern will be to maintain and strengthen the *Journal of Geophysical Research's* position as the preeminent journal in solid earth and solid planet geophysics,' asserted Gerald Schubert, the new editor of the red section of JGR. 'I will endeavor to ensure that all major subject areas covered by JGR-Red are adequately represented among the published papers.' Schubert, professor of geophysics and planetary physics at the University of California, Los Angeles, officially begins his 4-year term as editor on December 1, although he has been receiving manuscripts since October 1.

The new editor brings to JGR enthusiasm and dedication. 'I will try to make it the type of journal that the readers want it to be in terms of both rapid publication time and publication of the best papers.' He expects to continue the traditions that his predecessor, Thomas J. Ahrens, has established. In particular, Schubert wants to continue publishing special issues that focus on specific research topics. He welcomes suggestions for such issues from the research community.

Schubert is on sabbatical as a visiting professor in the geology department at The Hebrew University of Jerusalem in Israel until June 1983. Both personal and professional reasons beckoned him to the Middle East: He wants to learn more about the country and its people and he wants to broaden the directions of his research, which presently sweep across planetary and solar system physics and geophysical fluid dynamics. His major research areas have included the electrical and

magnetic properties of the moon; the dynamics, circulation, and structure of the Venus atmosphere; heat transfer, temperature, and flow in the earth's interior and in geothermal systems; and mantle convection and the thermal histories of the earth and planets.

'I want to get closer to the field of structural geology and generally to the problems of deformation and heat flow in the very near surface regions of the earth, in the earth's crust, and in the lithosphere,' he explained. 'These days, I'm interested in the processes of rifting, for example. Israel is located right at the Dead Sea rift (transform). It's a good place to be if you're interested in rifting.'

He became interested in rifting through his studies of mantle dynamics. 'Our attempts to understand plate tectonics on earth provide a great stimulus for studying rifting because it is the process that is responsible for the breakup of continents and for the initiation of continental drift,' he said. 'I am interested in the earth and the way the plates move and what drives them. It's important to understand rifting from this point of view.' His interests in the other planets and involvement as an interdisciplinary scientist for the Pioneer Venus multiprobe and orbiter help to focus his attention on rifting because, as he notes, 'the data from numerous spacecraft missions show that rifting is an important process on other planets as well as the earth, although it has not apparently initiated plate motions anywhere but on earth.'

While he is in Israel, Schubert will maintain the standard editorial activities, and will be assisted by the associate editors, by Tanya Harter at UCLA (the new editor's assistant), and through telephone and mail communication. William M. Kaula, professor in the earth and space sciences department at UCLA, has been appointed deputy editor (*Eos*, October 12, 1982, p. 812) and will handle situations requiring immediate attention during Schubert's sabbatical.

No stranger to the AGU editorial process, Schubert's previous editorial responsibilities include associate editorships both for JGR