

since this approach may lead to instruments of the largest collecting area."

Deferred, except for design studies, were proposals for a very large array of 36 dishes in a pattern 13 miles on a leg by the National Radio Astronomy Observatory (SN: 2/25) and a fully steerable 440-foot-dish, housed in a radome, proposed by the North East Radio Observatory Corporation (SN: 12/31/66).

Declined, partly because of funding problems, was the proposal by the California Institute of Technology for the Associates in Radio Astronomy to fund the design of a conventional 330-foot steerable antenna, bigger by 80 feet than any now in operation. However, the panel noted that if it were not "for the revolutionary possibilities inherent in the Arecibo and NEROC for going to much larger dishes at moderate costs, the ARA proposal would be attractive."

The panel says it is "convinced that, except for the problems of funding, the scientific needs would amply justify the construction of several steerable antennas simultaneously."

Two basic types of facilities were proposed: individual large dish-shaped reflectors, steerable to allow the antenna to track an object during its apparent motion across the sky, and arrays of smaller dishes, also steerable, tied together by complex electronic equipment. The two types complement each other and have different functions.

ASTRONOMY

International Astronomical Union

Some 1,000 scientists who specialize in observing space and the objects it contains, both near and unimaginably far away from earth, gathered in Prague last week for the 11-day Thirteenth General Assembly of the International Astronomical Union.

They came from around the world to discuss such earth-oriented matters as how to keep time and the night-sky glow and such astronomical factors as binary stars and the formation of the universe.

As representatives of 43 nations, the scientists met in some 34 different commissions whose recommendations were approved at the final plenary session on Aug. 31. The preliminary "Agenda and Draft Reports" for the IAU Assembly, on which the discussions and recommendations were based, ran to 1,143 pages.

The feasibility of transporting clocks by air to make microsecond comparisons between standard clocks in widely separated locations was first demon-

In general, large arrays are able to achieve the high degree of resolution needed for obtaining radio pictures of distant celestial sources, such as galaxies and quasars. Large single antennas are especially effective in conducting detailed studies of the radio energy emitted by various chemical elements in hot gaseous clouds.

The proposals reviewed by the panel were for types of facilities recommended by a 1964 National Academy of Sciences report, known as the Whitford Report, calling for such construction in order to help put the United States in the forefront of radio astronomical research.

Dr. Robert H. Dicke of Princeton University was chairman of the panel, which had two optical astronomers as members: Dr. Bart J. Bok, director of the University of Arizona's Steward Observatory, and Dr. W. W. Morgan, former director of Yerkes Observatory.

Dr. Dicke says he is particularly pleased to have had the advice of the two optical astronomers because of his belief that optical and radio astronomy will draw closer together with time.

Other members of the panel included Drs. Rudolph Kompfner of Bell Telephone Laboratories, Merle A. Tuve of Carnegie Institution of Washington, Gart Westerhout of the University of Maryland, Stirling A. Colgate of New Mexico Institute of Mining and Technology and Eugene N. Parker of the University of Chicago. ♦

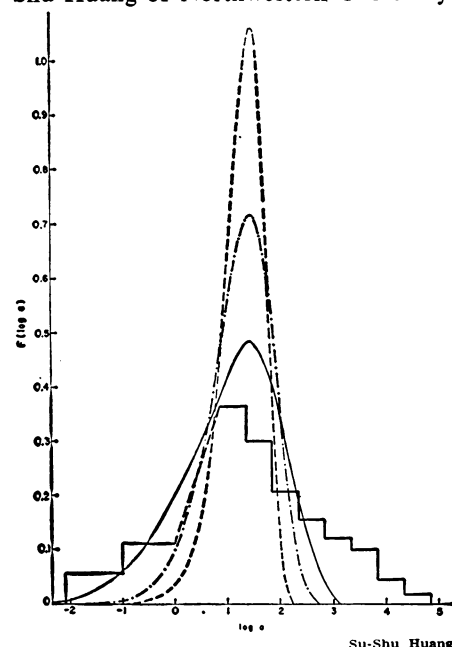
strated several years ago. Since then, a number of quartz and cesium clocks have been used to make precise comparisons of time between selected pairs of establishments, not only within the United States and Europe, and between the two continents, but among 25 establishments in 12 different countries in 1966, with a repeat of the standardization scheduled for this fall.

The IAU Commission on Time (No. 31) was told that satellites can now be used to synchronize far-separated clocks without the necessity of physically moving them. Drs. William Markowitz and C. A. Lidback of the U.S. Naval Observatory in Washington, with Drs. H. Uyeda and K. Muramatsu of the Radio Research Laboratories in Tokyo, successfully used the NASA communications satellite, Relay II, to verify synchronization of two cesium atomic clocks between the U.S. and Japan to within one-hundredth of a microsecond. (Dr. Markowitz is now at Marquette University, Milwaukee.)

The IAU noted that there has been a recent polarization of interest in the night-sky glow by geophysicists, whereas years ago only astronomers troubled themselves about this subdued background light. Although astronomers are still interested because the night glow constitutes a "haze" through which they must see, Commission 21 predicted that the growth of astronomy from spacecraft above the night glow means this soft light will come to be more and more associated with geophysics, at least until data concerning atmospheric radiations of other planets are available.

Geophysicists are interested because studies of night-sky glow indicate the chemical reactions taking place in the high atmosphere.

According to various studies, more than one-half of the stars exist as members of binary and multiple systems. Therefore, any theory of star formation must account for this fact. Dr. Su-Shu Huang of Northwestern University



Distribution of binary stars according to (in descending order), previous theory of star formation, Dr. Huang's first theory, Dr. Huang's revised theory of binary formation from one initial consideration (solid curve)—much closer to the observed distribution, shown by the stepped line.

reported to Commission 42 that his theoretical calculations had shown that there are two distinct processes by which binary stars can be formed, and that his theoretical results agree with observations.

One method of formation is from a single initial condensation eddy in the interstellar gas and dust that then splits into two sections. The other method of formation is from two initially sep-

arate condensations, which means that the binary was very likely formed by capture in the early stage when stars were just emerging from the interstellar medium.

The interplay of magnetic fields, rotation and gravitational contraction is often invoked in connection with the formation of galaxies. The difference between normal galaxies and radio galaxies, which generate considerably more energy, can be explained in terms of the angle between the initial directions

of the magnetic field and the axis of rotation.

If the angle is small, relatively featureless flat galaxies result. If the angle is nearly 90 degrees, the magnetic field is wound in a spiral form, from which it ultimately buckles explosively to produce a radio galaxy. Several scientists, including Dr. J. H. Piddington of the Commonwealth Scientific and Industrial Research Organization in Sydney, have developed similar theories, Commission 42 reported. ♦

bill on cigarette labeling and advertising died in the 89th Congress—to strengthen the Cigarette Labeling and Advertising Act of 1965 which required cigarette packages to carry a statement saying “Caution: Cigarette Smoking May Be Hazardous to Your Health.”

Although the 1965 act prevents the FTC from requiring manufacturers to list tar and nicotine content on their packages, FTC plans to stimulate competition among manufacturers to develop low tar and nicotine products by issuing quarterly reports listing these levels brand by brand. FTC has already set up its own laboratory to conduct the testing (SN: 12/10/66), but is embroiled in a controversy over how much of a cigarette should be smoked by its test machines.

FTC proposes smoking test cigarettes to a 23 millimeter butt length. The Tobacco Institute argues this is too short because most filter brands cannot be smoked that far down and that most smokers leave a butt length 30 mm. long or longer so they are not inhaling the last few millimeters of smoke anyway. The amount of tar and nicotine taken into the lungs increases as the cigarette gets shorter. So far, no decision has been made.

Dr. Moore also called for minimum standards of effectiveness for filters—current filters vary from exerting a good effect to practically none at all—and for regulations establishing a maximum yield of 15 milligrams of tar and nicotine for all cigarettes. Recently reported tests at Roswell Park showed the average king-size cigarette yields 25 mg. tar and the 12 newly marketed 100 millimeter brands yield about 37 mg. tar. “The marketing of most of the new 100 mm. cigarettes is to be deplored,” Dr. Moore told the Magnuson committee.

Also testifying before the Magnuson committee was inventor Robert L. Strickman who announced last July 13 (SN: 7/29) development of a filter that reduces the tar and nicotine yields of cigarettes by as much as 70 percent without reducing flavor. Strickman gave more than 50 percent of the rights to his new filter to Columbia University which is offering it to all cigarette manufacturers.

Strickman, who refuses to release details of how his filter works—namely, how it reduces flavor-carrying tars without reducing flavor—until patent rights are secured, now makes one additional claim of its effectiveness. It not only reduces tars and nicotine, he says. It also cuts down some of the components in the gaseous phase of cigarette smoke.

To date about 550 compounds have

CIGARETTES

Government Pressing Toward a Safer Smoke

The Federal Government's three-year campaign against cigarette smoking has had little success. When the Surgeon General's report on the hazards of smoking was released in 1964, cigarette sales declined somewhat, but the drop was only temporary.

The Government's \$10 million effort to educate the public to the dangers of smoking was countered effectively by a \$297 million advertising budget from the tobacco industry, which last year collected \$8.2 billion from cigarette sales alone.

Now, in the face of such competition, Government leaders are changing their line of attack, pushing for development of safer cigarettes instead of no cigarettes at all.

Health, Education and Welfare Secretary John W. Gardner says “We must get going . . . to persuade the tobacco industry to pursue the kinds of research that will result in a safer cigarette.” Two weeks ago, HEW issued a follow-up to the 1964 document. Additional evidence from 2,000 studies, it said, confirm the earlier findings relating smoking to lung cancer, cardiovascular disease, bronchopulmonary ailments and others.

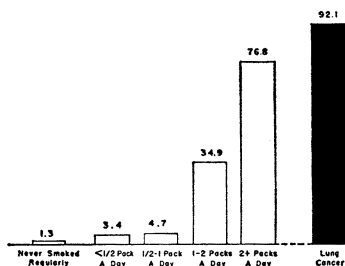
The Tobacco Institute scored the report as “an inaccurate and misleading interpretation” of scientific findings that ignored what it calls “important new studies” that show no link between smoking and lung cancer or heart disease. The Institute takes issue with Secretary Gardner's statement that “the accumulated evidence strongly suggests that the lower the tar and nicotine content of cigarette smoke, the lower the harmful effect.” There is no concrete data to demonstrate that either tar or nicotine is a health hazard, says the industry.

The primary goal of the anti-smokers is to force industry into producing reduced tar and nicotine cigarettes.

Supporting this position, Dr. George E. Moore, newly named director of Public Health Research for New York

State and former head of the Roswell Park Memorial Institute, Buffalo, says “the fact that the exact compounds which cause cancers to develop are not known is not a valid reason for any delay in instituting preventive measures.”

Last week, Senate Commerce Committee chairman Warren G. Magnuson (D-Wash.) held three days of open hearings to review medical evidence against smoking and to see what prog-



Lung lesions increase with smoking.

ress has been made toward a safer cigarette. Out of those hearings may come proposed legislative standards of what a safe cigarette is—within the limits of current knowledge. Such a proposal will be fought both by those who contend cigarettes have not been proved unsafe and those who contend no cigarette can be safe—that such standards will simply encourage smoking.

On the theory that cigarettes should be as safe as possible, Dr. Moore told the Senate that tar and nicotine contents should be listed on cigarette packages which should also carry a warning that cigarettes are hazardous to health. Federal Trade Commission chairman Paul Rand Dixon, whose agency regulates advertising, agrees. Last June 30 the FTC urged Congress to pass legislation on both of these points.

In May, Senator Magnuson reintroduced such legislation—his previous