

PHYSICS

How Air Transmits Laser Light Studied**See Front Cover**

► SCINTILLATING like a star, coherent light generated by a laser travels a mile-and-a-half through the atmosphere.

Ta-Shing Chu and other scientists at Bell Telephone Laboratories, Holmdel, N. J., are studying how this bright, monochromatic light is affected by various types of weather from cloudless days to blizzards.

The star-like pattern shown on this week's front cover is being observed by Mr. Chu. The "star" is caused by the highly directional laser beam hitting the edges of the camera iris. The camera that took this picture was "stopped down" to f64.

These experiments are designed to study the problems of communicating by light beams through the atmosphere.

The power of the light fluctuates randomly in all kinds of weather because of minute inhomogeneities in the atmosphere. On clear days the beam's average power is affected very little. In rain, attenuation reaches 30 decibels (db) and in fog and snow, it often exceeds 80 db.

Therefore, optical communication systems may require that the light beam be transmitted in underground pipes to shield it from the atmosphere.

In this experiment, a 10 milliwatt helium-neon maser generates a continuous beam with a wavelength of 0.63 microns. The beam is vertically polarized and sent through a telescope nine centimeters in diameter.

After passing through the atmosphere, the light is received by a refracting telescope and fed to a photomultiplier.

• Science News Letter, 86:36 July 18, 1964

PUBLIC SAFETY

Study Injuries Produced By Auto Windshields

► THE DANGER of the glass windshield during an automobile accident is being investigated in a three-year research study launched by a team of engineers, physicians, mathematicians and structural experts at the University of California, Los Angeles.

Through laboratory tests and car crash experiments, the investigators will try to measure the potential hazards of brain concussions and lacerations when windshields or side windows are shattered during collisions, the causes of spontaneous glass breakage, and escape methods for trapped drivers and passengers during emergencies.

Because little scientific information is available on the comparative strength, breakage and other characteristics of various kinds of safety glass, the team has started its work by developing its own testing techniques and devices.

These include a drop tower and guide track for testing glass windows by striking them with various weights and simulated

human heads, from different heights. In the design stage is a special "gun" for shooting rocks and other missiles at glass, and propelling glass fragments at simulated human skulls and bodies.

An even more complex job will be the development of life-like scalps, faces, necks and eyes for instrumented dummies, which will have the same biological sensitivity and reactions, including fracturing and bleeding, as real humans.

Backed by a first-year grant of \$94,520 from the U.S. Public Health Service, the research is led by Dr. Harry W. Case, Derwyn M. Severy and Harrison M. Brink of the institute of transportation and traffic engineering at UCLA.

Supervising the medical part of the project are Drs. Charles O. Bechtol and Alan M. Nahum of the UCLA Medical Center and Dr. C. Hunter Shelden, a neurosurgical consultant.

• Science News Letter, 86:36 July 18, 1964

PUBLIC HEALTH

Rocket Fuels Toxic To Plants, Animals

► BERYLLIUM and fluorine, two elements used in high energy rocket fuels, could cause toxic effects in plants and animals if industries testing such fuels are not carefully controlled, the Senate subcommittee on air and water pollution was told.

Vernon G. MacKenzie, chief of the division of air pollution, U.S. Public Health Service, said in Washington, D.C., that three forms of human disease can result from beryllium poisoning: acute respiratory illness, chronic respiratory illness, and skin disease.

"Of the two types of exposure, inhalation is by far the more serious," he said. "Respiratory illness resulting from the inhalation of small quantities of beryllium has proved fatal."

To sensitive plants, fluorine combined with hydrogen is the most toxic air pollutant ever found.

Some plants, however, can absorb fluorine without showing any outward signs of being contaminated. This poses a particular problem to agriculture because these plants could contain enough fluorine to cause ill effects in livestock.

Most toxicants are removed from rocket exhaust through conventional gas cleaning methods. In some beryllium fuel tests, for example, the gases released have been passed through spray scrubbers to remove the beryllium dust.

With the advent of larger rocket motors, however, these methods are becoming outmoded.

New methods of control are required if toxic exhaust is to be eliminated.

Mr. MacKenzie said the Public Health Service is satisfied that the Federal agencies conducting such tests will use all the protective measures necessary for the public welfare.

He did, however, voice concern about private industries carrying on high energy fuel tests which are not under the control of Federal or civil health authorities.

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Questions

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MEDICINE—What data is being collected by a group of physicians in order to "predict" unsuspected heart disease? p. 48.

OCEANOGRAPHY—What was the duration of the record-breaking deep-sea dive made by Lindbergh and Stenuit? p. 38.

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SCIENCE NEWS LETTER

VOL. 86 JULY 18, 1964 NO. 3

Edited by WATSON DAVIS

The Weekly Summary of Current Science, published every Saturday by SCIENCE SERVICE, Inc., 1719 N St., N.W., Washington, D. C. 20036. NOrth 7-2255. Cable Address: SCIENSERV.

Subscription rates: 1 yr., \$5.50; 2 yrs., \$10.00; 3 yrs., \$14.50; ten or more copies in one package to one address, 7½ cents per copy per week; single copy, 15 cents, more than six months old, 25 cents. No charge for foreign postage. Change of address: Three weeks notice is required. Please state exactly how magazine is addressed. Include zip code.

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Printed in U.S.A. Second class postage paid at Washington, D. C. Established in mimeograph form March 18, 1922. Title registered as trademark, U. S. and Canadian Patent Offices. Indexed in Reader's Guide to Periodical Literature, Abridged Guide, and the Engineering Index. Member of Audit Bureau of Circulation.

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