GENERAL SCIENCE

Predict Super Rocket Fuel

Topics ranging from tooth decay to the effect of lunar tides were discussed at the American Association for the Advancement of Science meeting—By Watson Davis

➤ SUPER FUELS for space rockets, giving 50% more efficient performance for only 2% more weight, were predicted by Dr. H. J. Bernstein, chemist of the National Research Council of Canada, Ottawa, as the result of a theory which he believes can be applied eventually with 100% efficiency.

He told the American Association for the Advancement of Science meeting in Montreal that any fuel with a basic nitrogen or oxygen atom can, according to the theoretical studies, be stepped up in power punch.

Injection of this souped-up fuel into conventional rocket propellants could increase the efficiency by 5% to 15%, he said, by applying hydrogen bonding techniques.

Plasma, the fourth state of matter, needs to be understood if plasma shields created around space vehicles are to be countered and interruptions to communications with our space probes are to be prevented, Dr. M. P. Bachynski of RCA Victor Research Laboratories, Montreal, warned.

Plasma is the most abundant state of matter in the universe, more plentiful than solids, liquids and gases. A mixture of many free electrons and ionized atoms, it makes up probably more than 99.9% of the universe's matter.

When a spaceship comes back to earth or descends on another planet, a shock-induced plasma of ionized gas will surround it and block radar or radio contact.

The solar wind plasma consists of charged particles which, plunging into the earth's electrical field, cause magnetic storms and auroras.

If plasma can be controlled, the fusion reaction of the H-bomb can be tamed and used to release large amounts of energy, Dr. Bachynski explained.

A new kind of neutrino-detecting telescope that would be placed not on mountain peaks but underground in the deepest mine shafts was forecast for the future by Dr. Philip Morrison, physicist of Cornell University and Massachusetts Institute of Technology.

These massless neutrino particles are enormously more penetrating than any light. They are emitted by the sun and amount to some 5% to 10% of the whole solar power output. They come from the thermonuclear furnace of the sun's core. They are "our only chance to study directly what otherwise we can only calculate, the nature of the conditions under which the sun burns hydrogen," Dr. Morrison explained.

Study of cosmic rays from the depths of the galaxy is another new astronomical investigation for the future, he predicted. Gamma rays from all parts of the sky, seemingly connected with exploding stars, will also be studied by astronomers who are not limiting themselves to radio signals and rays of light.

Tooth Decay Is Plague

➤ A SLOW-MOVING PLAGUE of civilization is enveloping the world, causing few direct deaths but bringing ill health and costing millions of dollars.

It is tooth decay, dental caries. Medical scientists studying the disease find that it is extremely complex in its nature, like cancer in this respect. They can not yet assign any one cause or any completely sure cure or prevention.

The American Association for the Advancement of Science meeting concentrated on the environmental effect upon tooth decay and gum disease.

Dr. Albert L. Russell, chief of the National Institute of Dental Research's epidemiology and biometry branch, Bethesda, Md., heads a six-man team that has ranged the world studying the puzzling differences.

Drinking water containing natural or added fluorides during childhood seems almost the only known way to be sure to have good teeth. In distant localities like Jordan, in U.S. areas like the Dakotas and elsewhere, even if the excessive fluorides do cause ugly staining, the teeth are remarkably free of cavities.

This effect of fluorides is one of the great dental discoveries, proved by extensive large-scale tests that led to the addition of the anti-decay chemical to city water sources throughout the world. That some American cities under mistaken propaganda have rejected at the ballot box this simple preventative is one of the tragedies of public health.

One other thing the dental researchers are sure of is that caries is a disease of civilization.

Transplant Alaskan Eskimos or East Indians with good teeth in their native habitat to modern cities and they will have a higher number of cavities.

They are sure that sugar, sucrose, is bad for the teeth. Various additions to sugar or to the diet have been unsuccessfully tried to "neutralize" the sugar effect.

No method that Madison Avenue can exploit in advertisements to prevent decay has been proved.

Caries does seem to be a bacterial disease, at least in animals. Strains of various streptococci cause cavities, but the kind that causes the trouble in hamsters does not cause it in rats, and the one that does damage in rats does not produce the trouble in guinea pigs.

Animals raised under germ-free conditions do not have tooth decay. But no scientists have been able to infect human beings with the tooth decay germs from animals.

There are puzzles that Dr. Russell has discovered that are not explained. In Viet Nam and Lebanon, for instance, permanent teeth are good and free from decay, while baby teeth in the same mouths are not.

Similarly, the researchers are not able to determine the guilty cause of periodontal, or gum disease, the greatest cause for loss of teeth after age 35. Two factors, increasing age and poor oral hygiene, seem to have causative roles.

It is hard to get one's scientific teeth into this dental problem, although there is no question but that dental disease is on the rise and that the danger is greater in some parts of the world than in others.

Union Carbide Corporation

CHIP OFF THE OLD BLOCK—This 34,000-pound graphite block which is two by six feet in cross-section and 26 feet long is the largest ever made —twice as big as its nearest competitor.

Learn From Animals

➤ SCIENTISTS learn from lower animals many interesting things that help to understand human beings.

Take the wild rat, not the kind pampered in the medical laboratory. The wild ones have a sweet tooth, like the lab beasts, but wild rats do not eat all the sugar they can even if offered an unlimited amount of sugar water.

The wild rats watch their body weight carefully, thus being wiser than fat men and the domesticated rats that indulge in triple sugar rations when they can. Jungle fowl too watch their weight better than domestic chickens.

The American Association for the Advancement of Science meeting heard such facts from Drs. Morley R. Kare and Owen Maller of North Carolina State University, Raleigh, because "an understanding of the role of taste on food intake could be critical in providing nourishment for the exploding populations of animals and man."

Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to *The Science News-Letter.* www.jstor.org

When drugged with sedatives or tranquilizers, spiders spin webs that show changes in pattern. When punched on computer cards, these patterns can be used to tell the drug effect. Lesions of the spider "brain" caused by laser light surgery also create abnormalities in webs. Dr. Peter N. Witt of N.Y. Upstate Medical Center, Syracuse, and Dr. Charles F. Reed, psychologist of Temple University, Philadelphia, hope to apply to medicine what they learn from the spiders.

Kittens permitted to play with a variety of objects as they grow up are definitely smarter in running mazes than those reared without such play material, Prof. John M. Warren of Pennsylvania State University, University Park, reported.

In training infant monkeys, Dr. G. P. Sackett of the University of Wisconsin, Madison, found that raising the babies under deprived conditions causes them to prefer less complexity in life than more fortunately stimulated animals. Prof. Robert Hess of the University of Chicago reported that when human mothers give more adequate answers to the questions of four-year-old children the youngsters solve their problems more effectively.

Children who go to nursery school from culturally deprived homes were found by Prof. Susan Gray of George Peabody College for Teachers, Nashville, Tenn., to do better in grade school than those who do not have the nursery experience.

Lunar Tides Affect Rain

➤ THE MOON'S changing faces and varying places in the sky are linked to the amount of rainfall.

The tides the moon causes in the atmosphere, resembling those seen on ocean shores around the world, appear to affect heavy rainfall at certain times of the day and year.

Glenn W. Brier of the U.S. Weather Bureau, Washington, D.C., found the link between moon-caused atmospheric tides and precipitation while trying to determine the reason that rainfall and snowfall are much heavier than usual during the week following the new moon and full moon.

The twice-monthly variation was reported by Mr. Brier and his colleagues in 1962. Since then, Mr. Brier has been taking a closer look at possible reasons for the association between precipitation and the lunar month.

Because the sun and the moon are known to cause tidal changes in the atmosphere as well as the oceans, Mr. Brier examined atmospheric tides as a possible explanation.

All evidence so far supports the atmospheric tidal theory, Mr. Brier reported to the American Association for the Advancement of Science meeting. However, this does not mean that gravitational forces resulting in tides are the actual cause of heavy rainfall, he said.

His examination showed that the average amount of precipitation over the United States is 20% higher at certain times than at others.

These times occur two days after, but not two days before, the moon, earth and sun are lined up, when the moon is closest and also in the plane of the earth's orbit during its travels through the sky. Such conditions occur at the time of a total lunar eclipse.

This finding is predicted by a mathematical model of tidal theory suggested by Mr. Brier.

The line-up of moon, earth and sun involves three different periods of the moon entering into tidal theory.

When the three objects are exactly in line and the two other conditions are met, Mr. Brier found that rainfall variation is three times greater than average. Since tidal forces are highest at this time, there is "strong evidence" that tidal effects in the atmosphere affect rainfall.

Need 'Free' Research

➤ WHAT SEEMS the most "practical" U.S. policy for supporting science research, stressing only mission-oriented basic research and applied research, may ultimately prove to be the least practical, believes Dr. Alan T. Waterman, first director of the U.S. National Science Foundation, now retired.

Speaking as retiring president of the American Association for the Advancement of Science, he said that there must be retained and expanded "free" basic research, in which the scientist is unfettered in his research by even a loose "mission" orientation or support from agencies with practical missions.

"For most of its history the devotees of science have been attracted to its study not primarily for the purpose of securing information that might be useful," he said.

Dr. Waterman estimated that about two-thirds of U.S. research is "applied." Even in the "basic" one-third, 80% is "mission-oriented" in its financial support. This means that a very modest seven percent of U.S. research is of the "free" basic variety.

This percentage should not be cut further, but on the contrary, should be expanded, he said.

Applied and mission-oriented basic research are easier to justify before Congressional and Budget Bureau scrutineers, Dr. Waterman observed.

Any uncertainty as to the importance of free-basic research should be dispelled by looking into the history of science, he said, and noting the impressive discoveries made solely in the interest of pure science, and the statistical evidence that most of the body of science ultimately achieves practical utility."

Basic research is important because of its stimulating effect on the imagination and its philosophical implications concerning the universe and man's place in it, Dr. Waterman said, asking "Who can say that ultimately this may not be the most important consideration of all?"

Dr. Waterman sees wonderful opportunities for scientists to lead the world's nation-states into cooperative, world-wide ventures such as exploration of space, the oceans, the earth's crust, the Antarctic; and such practical ventures as studying human population dynamics and control, and international economic development.

Questions

ASTRONOMY—How many quasars have so far been identified? p. 22.

GENERAL SCIENCE—What is the disadvantage of stressing mission-oriented basic and applied scientific research? p. 20.

NUTRITION—What have studies shown about skipping breakfast? p. 25.

OCEANOGRAPHY—What are some of the problems that both astronauts and aquanauts must face? p. 23.

SPACE—How may desensitization help both the Mariner spacecraft and a radioaltimiter in an airplane? p. 29.

VETERINARY MEDICINE—Why is it difficult to find a good anesthetic for a dolphin? p. 24.

SCIENCE NEWS LETTER

VOL. 87 JANUARY 9, 1965 NO. 2

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: SCIENSERVC.

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.

Copyright © 1965 by Science Service, Inc. Republication of any portion of SCIENCE NEWS LETTER is strictly prohibited. Newspapers, magazines and other publications are invited to avail themselves of the numerous syndicated services issued by Science Service. Science Service also produces and distributes THINGS of science (monthly), produces and publishes books, and conducts the National Science Youth Program.

Printed in U.S.A. Second class postage paid at Washington, D. C. Established in mimeograph form March 13, 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.

SCIENCE SERVICE

The Institution for the Popularization of Science organized 1921 as a non-profit corporation.

Board of Trustees—Nominated by the American Association for the Advancement of Science: Athelstan F. Spilhaus, University of Minnesota; Wallace R. Brode,*** Washington, D. C.; Bowen C. Dees, National Science Foundation. Nominated by the National Academy of Sciences: Henry Allen Moe, The Clark Foundation; Harlow Shapley, Harvard College Observatory; Detlev W. Bronk, Rockefeller Institute. Nominated by National Research Council: Leonard Carmichael,* National Geographic Society; Benjamin H. Willier, Johns Hopkins University; Eric A. Walker, Pennsylvania State University. Nominated by Journalistic Profession: O. W. Riegel, Washington and Lee University; Gordon B. Fister, Allentown (Pa.) Call-Chronicle; Ralph B. Curry, Flint Journal. Nominated by the Scripps Estate: Edward J. Meeman, Memphis Press-Scimitar; Ludwell Denny, Scripps-Howard Newspapers; Edward W. Scripps II,** Edward W. Scripps Trust. *President; **Vice-President; ***Treasurer.

Staff—Director: Watson Davis. Assistant Director: Dorothy Schriver. Writers: Jonathan Eberhart, Ann Ewing, Edith Lederer, Faye Marley, William McCann, Barbara Tufty, Judith Viorst, Ruby Yoshioka. Science Youth Division: Joseph H. Kraus, Lloyd Ulmer. Photography: Fremont Davis. Production: Marcia Nelson. Syndicate Sales: Forrest L. Snakenberg. Librarian: Margit Friedrich. Interlingua Division in New York: Alexander Gode, 80 E. 11th St., GRamercy 3-5410. Advertising Manager: Fred A. Moulton, MEtropolitan 8-2562, Washington, D. C.