BEARDED PLANT

Donald P. Murrill of the University of Richmond and R. E. Alley, Jr., of Princeton are among those who inspected the exhibit at the AAAS of Drs. P. W. Zimmerman and A. E. Hitchcock of Boyce Thompson Institute for Plant Research. Roots growing from the tip of this plant developed as a result of growth substances applied in the form of a salve.

MEDICINE

Produces Immunity Against The Bite of Wood Ticks

"Vaccinations" on Guinea Pigs First Demonstration That Animals Can Become Immune to Insects as to Germs

SUCCESSFUL "vaccination" against ticks, carriers of deadly Rocky Mountain spotted fever and cause of another disease, tick paralysis, has been achieved by Dr. William Trager, of the Rockefeller Institute at Princeton, N. J.

The "vaccinations" were made on guinea pigs, but presumably attempts will be made later to apply the method to dogs, cattle and even humans.

The work, reported to the American Association for the Advancement of Science at Richmond, furnishes, Dr. Trager said, the first experimental evidence that an animal like a guinea pig can become immune to a blood-sucking arthropod (insects, spiders and crustaceans are all arthropods) as well as to a disease germ.

Dr. Trager's discovery shows also that the classical conception of immunity or resistance to disease germs can be extended to still another group of parasites, because, as in the case of germ-resistance or immunity, tick-resistance or immunity is a result of the defensive action of antibodies and white blood cells.

When a tick attaches itself to a "vaccinated" or immune guinea pig, a mass of these white blood cells surrounds the mouthparts of the tick and the skin of the guinea pig thickens and begins to grow beneath this mass of white blood cells.

"A larval tick attached at such a point," Dr. Trager said, "is unable to feed and soon dies and drops off the host." The immunity, as Dr. Trager sees it, depends essentially on the presence in the blood of the class of germ-fighters known as antibodies, which speed up mobilization of the other germ-fighters, the white blood cells, which in turn wall off the tick from its source of supply of blood.

"Vaccination" of the guinea pigs against ticks was done by injecting under their skin an extract of larval ticks or of the salivary glands of adult ticks.

Guinea pigs also acquire what is termed natural resistance or immunity to ticks after one infestation with the larvae of ticks themselves. The immunity is not confined to the region of infestation but rapidly becomes generalized throughout the body. Blood serum from guinea pigs with this type of immunity when injected into other, non-immune, guinea pigs makes them also able to resist ticks.

Grow Worms In Test Tubes

A STEP toward the more adequate understanding of the minute parasites that damage the health of animals and human beings has been taken through the successful "in vitro" cultivation in the laboratory of the twisted wire worm of sheep and other cud-chewing animals.

Achieving success where others had failed, Drs. R. W. Glaser and Norman R. Stoll of the Rockefeller Institute for Medical Research laboratories at Princeton, N. J., reported that they had raised this worm, scientifically known as Hae*monchus contortus,* through the four larval stages. A germ-free diet, consisting of liver extract, agar, rabbit kidney and killed yeast, was made available in test tubes to the worm eggs carefully made germ-free by sterilizing agents. In this way the worms were taken through their two free-living stages. These test-tube worms, when fed to a three-months-old, bottle-raised lamb which was worm-free, produced a normal infection of the worm parasites.

Using a slightly different food medium, the worms were carried through the two further larval stages, which are parasitic. Adult worms have not yet been grown in the test-tubes but Drs. Glaser and Stoll are confident that these will be obtained with some further slight modification of the nutritional environment.

The worm used in the experiments has a development very similar to that of the hookworm which causes serious human disease.

"The successful in vitro culture of the parasitic worms," the scientists declared, "should lead to a more adequate understanding of their physiology and to further elucidation of *(Turn to page 10)*

BRAIN DEMONSTRATION

Attracting considerable attention at the AAAS exhibits was this model of the brain with electric buttons in the different centers, each of which would light up the corresponding activity illustrated in a panel of photographs. Joseph A. Bracco of the New York Museum of Science and Industry is shown demonstrating the exhibit.

From Page 7

the mechanism of immunity developed against helminths by their hosts."

This means that it will be possible to raise parasitic worms and experiment with them much as cultures of bacteria are handled in research laboratories.

Men Against Toothaches

A DEVOTED band of men against toothaches sat in an all-day session at the Richmond meeting, discussing that painful problem of dental caries or tooth decay. The problem is painful in more than the literal sense of aching teeth, because in spite of a vast amount of research scientists have unfortunately not yet found a way to prevent caries.

Two new ideas have recently been added to the older ones about causes of caries. The condition runs in families, U. S. Public Health Service scientists have reported. Brothers and sisters of children with caries, in a group of over 4,000 given careful dental examinations, have more than twice as much caries as brothers and sisters of the children examined and found free from caries. This suggests that there is an inherited tendency, but the federal health service scientists are not yet ready to give any specific explanation for the familial differences.

Fluorine in the water, cause of the ugly tooth condition of mottled enamel, may provide protection against caries, another group of U. S. Public Health Service scientists suggest. They found a higher percentage of children had no caries in communities where the domestic water supplies contain higher concentrations of fluorides than in communities using waters of lower fluoride concentrations.

The fluorine may not be the substance responsible for the difference. Reporting the U. S. Public Health Service findings, Dr. H. Trendley Dean suggests that some other constituent of water may play a role.

Just how fluorine, if it is fluorine, protects teeth from decay is not known, but if this proves to be a fact the means of preventing tooth decay would be relatively simple. Communities have already stopped the ravages of mottled enamel by changing their water supplies. Adding fluorine would be simple enough.

Mottled enamel would not be the necessary price to pay for such a method of caries prevention, either. Dr. Dean's studies showed that even where the amount of fluorides in the water was too small to cause mottled enamel, the children's teeth were free from caries.

Diet as a cause of tooth decay was discussed at length. Latest angle on this is the idea that diet does not cause decay because of its composition, acting through the body chemistry, but because of its physical character, acting mechanically. Coarse particles of food are blamed for causing caries, according to this theory.

Reporting studies on this line, Dr. C. A. Lilly and associates of the University of Michigan asserted:

"In our studies of between 1,500 and 1,600 rats over a period of six years, unquestionable dental caries has never occurred, regardless of what diet was fed, if the diet was kept absolutely free of coarse hard particles."

Scientists Must Help World

IT IS the duty of scientists "to assist in the establishment of a rational and harmonious social order out of the welter of human conflict into which the world has been thrown through the release of uncontrolled sources of industrial production and lethal weapons."

This is the message brought to the American Association for the Advancement of Science by Sir Richard Gregory, Bart., for many years editor of the British science journal, *Nature*.

Exalted spiritual ideals combined with research results in fields of natural knowledge, Sir Richard believes, will give scientific guidance towards individual fitness and also towards a higher human perfection and social life "which will make the world truly a celestial dwelling place."

Man's future is here on earth, Sir Richard indicated.

"Science is concerned with the progress of knowledge and the evolution of man not only in the past but also in the present and future," he said. "The idea that such development is possible is relatively modern. The chief philosophers of ancient Greece held that the Golden Age was in the past and that mankind was receding from it; and the same view of human decadence is given Biblical authority in Genesis. It is quite possible that some savages have fallen from a higher to a lower level of savagery, but this is an unusual course to follow. We need not believe that man has degenerated from a state of perfect knowledge to that of being 'born in sin and shapen in inquity,' or that the recovery of his

lost position must be looked for not in this world but in the next. The adoption of the degradation doctrine is opposed to evolution as a whole and subservient to all progress."

Science and religion meet on common ground in the pursuit of truth and its influence upon human life and conduct, Sir Richard said, whatever differences of opinion may exist as to their respective fields.

"Men of science are citizens as well as scientific workers," Sir Richard emphasized. "They are beginning to realize their special responsibilities for securing that the fruits of scientific knowledge are used for human welfare. They can no longer remain indifferent to the social consequences of discovery and invention, or be silent while they are blamed for increasing powers of production of food supplies, providing means of superseding manual labor by machines, and discovering substance which can be used for destructive purposes. It would be a betrayal of the scientific movement if scientific workers failed to play an active part in solving the social problems which their contributions to natural knowledge have created.

"The view that the sole function of science is the discovery and study of natural facts and principles without regard to the social implications of the knowledge gained, can no longer be maintained. It is being widely realized that science cannot be divorced from ethics or rightly absolve itself from the human responsibilities in the application of its discoveries to destructive purposes in war or economic disturbances in times of peace. Men of science can no longer stand aside from the social and political questions involved in the structure which has been built up from the materials provided by them, and which their discoveries may be used to destroy."

Can Photograph Viruses

THROUGH the use of the new electron microscopes scientists are nearing the day when they may be able actually to photograph objects in the border zone of nature between the living and the dead.

The technique of using electron beams to disclose tiny details in nature, far beyond the limits of any microscopes using light in the usual way, is rapidly being perfected, Dr. V. K. Zworykin of the Radio Corporation of America reported.

"It can be shown that, even taking account of certain fundamental defects of electron lenses, electron microscopes are essentially capable of resolving separations of the order of 0.000001 millimeters," said Dr. Zworykin.

This resolution, amounting to a millionth of a millimeter, reaches down into the size of the super giant molecules which have been shown to be present in some of the filterable viruses, particularly the virus causing tobacco mosaic disease. Some of these molecules have weights 25,000,000 times greater than ordinary molecules of common chemical elements.

The essential point about these huge chemical molecules of the viruses is that they are believed to represent the borderline, in nature, between animate and inanimate matter.

Although the viruses, at least some of them, have been shown to be chemical in nature, they have been found to be capable of reproduction and possess biological activity which has always been associated only with living things.

Scientists are not yet seeing much borderline matter in the scale of living with their electron microscopes, Dr. Zworykin indicated, but they may be just on the experimental threshold of doing it. The electron microscope is able potentially to do the job. It only remains to iron out the experimental kinks in the observing and photographing system.

German scientists using electron microscopes are now studying colloidal suspensions and have reported the separation of detail spaced only one hundred-thousandth of a millimeter apart (0.00001).

The use of electron microscopes in the study of extremely minute particles has so far found its best use in studying the surfaces of glowing metal filaments of electric lights and in analyzing crystal structure in thin films of metals.

Much more difficult is the study of biological specimens. The swift-flying electrons used in electron microscopes can not only kill biological specimens but can actually destroy them. Care must be taken, therefore, to preserve their initial appearance if only for the brief instant while they are having their "picture" taken.

Cobra Venom Relieves Pain

RELIEF of the severe pain of cancer, tic douloureux, locomotor ataxia and a number of other conditions without any dulling or depressing effect on the mind, but, on the contrary, with a stimulation of intellectual processes—these are the effects chalked to the credit of cobra venom in a report by Dr. David I. Macht and his son, Moses B. Macht, of the pharmacological research laboratory of Hynson, Westcott and Dunning at Baltimore.

Although cobra venom is a poison, the Baltimore scientists report that it can be safely given in sterile solution in suitable doses.

Nearly two-thirds of a group of patients suffering from advanced cancer were relieved of pain by the venom. Small doses of it have also been given to patients suffering from chronic arthritis, neuritis and neuralgia, particularly tic douloureux, locomotor ataxia and Parkinson's disease. At least half these patients derived some relief of pain, Dr. Macht and his son report.

Physicians using the venom reported not only a relief of their patients' pain but a brightening of their minds. At first this was thought to be the indirect result of the relief of pain. Psychological studies which the Machts report seem to show that the venom may actually stimulate the mental processes.

Tests of normal persons to whom cobra venom had been given showed an improvement of mental activity. Injections of morphine, codeine, dilaudid and heroin in these subjects, on the other hand, uniformly prolonged the reaction time of all the subjects with regard to mental arithmetic. These persons also did better on coordination tests after doses of cobra venom but did less well after morphine or other opiates. The field of vision, especially for green, was widened or extended after doses of cobra venom, the Machts report, but narrowed after morphine.

From these and other studies including animal investigations, the Machts conclude that cobra venom achieves its pain-relieving effect by its action on the central nervous system, particularly the brain.

For relief of pain, the Baltimore scientists report, cobra venom is slower than morphine, but its effect lasts longer.

Rate of Genius Production

GREAT geniuses and men with the capacity to amass great fortunes crop up in the population in about the same manner, stated Carl Snyder, general statistician of the Federal Reserve Bank of New York, before an audience of his fellow statisticians. Their numbers tend to follow what is known as the Pareto curve.

This curve, named for the Italian-French statistician who first worked it out, was originally an expression for the

numerical relation between sizes and individual numbers of money incomes in a population. Mr. Snyder stated that the same numerical relations seem to apply to outstanding abilities in other realms besides money-getting, whether in sports, science, or the arts.

Air Records Near Limit

RECORD-SEEKING airmen, who have steadily pushed upward speed, range and altitude marks during the 35-year history of aviation, are now closely approaching the theoretical limits of the airplane as we know it today, Prof. William F. Durand of Stanford University, pioneer aeronautics student and former chairman of the National Advisory Committee for Aeronautics, told the American Association for the Advancement of Science.

Airplanes will not be able to climb much beyond 60,000 feet, he predicted. Only a few weeks ago an Italian flyer pushed a specially designed aircraft beyond 56,000 feet. He himself and others who may go after the record are thus narrowed within a band in the atmosphere about 4,000 feet deep.

Two British bombers which recently flew more than 7,000 miles to set up a new distance mark closely approach the 8,000 to 9,000 mark limit, Dr. Durand indicated. This performance is comparatively not so good as some of the other marks, but "when we realize, however, the remote chance, for a period of 60 to 80 hours (the period of flight), of a complete absence of all adverse weather conditions and a continuous perfect functioning, during this period, of all factors contributing to the desired end, the larger margin between actual and ideal performance is not surprising."

If everything, such as load-carrying ability and range, is sacrificed to speed, the scientist said, a speed of about 500 miles an hour should be possible. Already the record is within shooting distance of this mark. The record is now 440.8 miles an hour. But the plane that made it, an Italian seaplane, sacrificed everything to its engine; only room enough for a pilot and a few gallons of fuel for the speed dash was left in the plane.

Mental Coin Flipping

COIN flipping, if done only in the mind, will come out very differently from what happens when the actual metal coin is tossed.

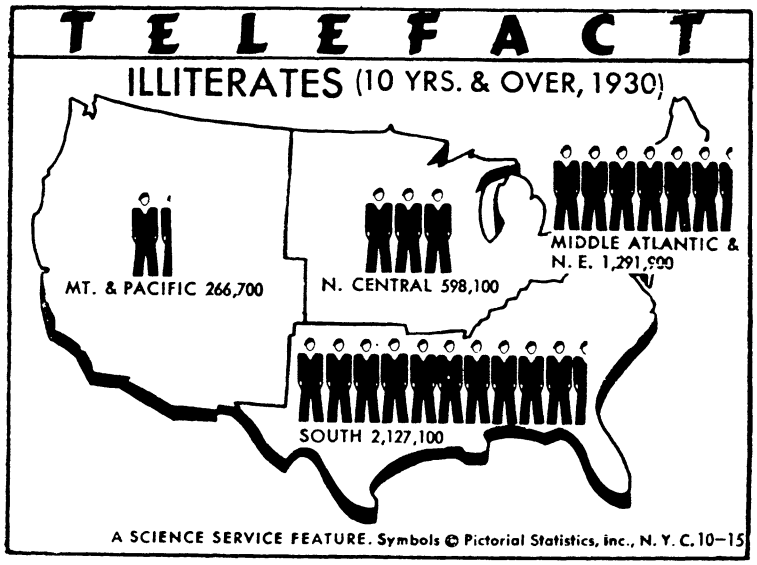
This fact, with bearing on the outcome of radio telepathy tests and the answers given by students in college examinations, was reported by Dr. Louis D. Goodfellow, of Northwestern University.

When a coin is tossed the chances are fifty-fifty that a head will turn up. But the chances that a person will call heads is not .50 but between .76 and .79, Dr. Goodfellow said. Perhaps our habit of saying "heads-tails," never "tails-heads," accounts for this difference.

On the second toss the chances are still .50 that heads will come up, but the probability of a person's calling heads again is about .57.

On the third toss heads have still a .50 chance, despite popular belief, but chances of the individual's calling heads have now dropped to about .44.

So if you are making up an examination and want the answers "yes" or "no" to come in a chance order, use your fingers, not your mind, to flip the coin, Dr. Goodfellow advised.



Girls Not Clairvoyant

CLAIRVOYANCE is apparently not among the talents of the students at Florida State College for Women.

To test ability to tell, without looking, the symbols on the faces of the "ESP" cards which have been used in an attempt to discover clairvoyance at Duke University, 735 Florida girls made a total of 225,000 judgments concerning the order of a shuffled deck containing two of the "ESP" suits.

Details of the test were reported by Drs. J. H. Heinlein and C. P. Heinlein.

When the girls' judgments were compared with those of two electrical spinner-robots "guessing each other," 5,000 times, it was established that these girls are no more clairvoyant than the robots.

As a further test, 300 students were asked to perceive clairvoyantly and in correct order a series of 25 words that had been selected from a college standard dictionary.

In 7,500 judgments, not one student discriminated as much as one single word correctly, the report stated.

Histamine in White Cells

SCIENTISTS seeking to unravel the mysteries of fatal leukemia and of conditions associated with asthma, hay fever and food sensitivity have new clues to follow as a result of recent discoveries about a body chemical, histamine. The studies, by himself and other scientists, were described by Dr. Charles F. Code, of the University of Minnesota Medical School, when he was presented the Theobald Smith Award for research in medical sciences.

One of these discoveries is that histamine is a normal constituent of the white cells of the blood. The particular blood cells known as granular leucocytes are the source of this chemical in the blood.

Relatively enormous quantities of histamine are found in the blood of patients suffering from one type of leukemia, in which these granular leucocytes are present in large numbers. Patients suffering from lymphatic leukemia, on the other hand, have normal amounts of histamine in their blood.

The relationship between high histamine content of the blood and increased

numbers of granular leucocytes is not clear, Dr. Code said, and requires further study.

More than one kind of granular leucocyte is present in blood. When these were tested separately, it was found that the increased quantities of histamine were associated with increased numbers of cells called eosinophils. An association between these cells and diseases like asthma, hay fever and food sensitivity has been previously discovered. Here again, Dr. Code pointed out, scientists do not yet know whether or not there is any causal relationship between the increased quantities of histamine and increased numbers of eosinophils.

When dogs suffer anaphylactic shock, the histamine content of their blood increases sharply as the sensitizing agent causing the shock, like pollen causes hay fever, spreads through the body. Large amounts of histamine appeared in the blood of guinea pigs during the height of bronchial spasm or asthmatic attack, and injections of histamine can bring on anaphylactic shock in these animals.

Blood of horses having anaphylactic shock, with symptoms like those of the condition known as "The Heaves," and blood of calves with "Bloats" was tested. No increase of histamine was found, but this does not mean, Dr. Code said, that histamine was not liberated during the attacks. The results simply show that it did not accumulate in the peripheral blood.

Simplified Literature

SIMPLIFIED and condensed versions of various selections from the classics do not lose the inspirational and informational content of the original, experiments reported by Prof. Francis P. Robinson, Ohio State University psychologist, indicate.

Using extracts from the Bible, the Peace Pact and Gibbons, the tests were made on teachers, college and high school students. Prof. Robinson came to the conclusion that not only are well-written simplifications not inferior but they will in many cases increase the comprehension of its readers.

Meek Hens Made Bullies

THE meekest hen in the chicken yard, picked on by all of her sisters, was turned into a feathered bully who pecked all her erstwhile persecutors, simply by having a little of the male sex hormone, testosterone, injected into her veins. She even crowed.

This phenomenon of the chemical conversion of submission into aggression was brought about not once but several times, in experiments reported by Prof. W. C. Allee and Nicholas Collias of the University of Chicago.

Hens, like other birds, have what is known as a peck order. That is, in every flock, there is one hen who can peck all the others without getting pecked back. There is likely to be one at the bottom, whom all the others can peck and who never pecks back at anyone. Between them are all degrees of pecking and being pecked. By conferring a little temporary maleness on the tail-enders in this peck order, the two zoologists enabled them to assert themselves and rule the roost.

Robin Skin Grafted

BITS of skin from an embryo robin were grafted onto a chick before hatching in a very delicate operation reported by Dr. Mary E. Rawles of the University of Rochester. A square of the eggshell was removed, the tiny oblong of robin skin inserted into an incision made with a glass needle into the developing chick within, and the piece of eggshell replaced and sealed on with paraffin. Incubation was then continued until the chick hatched.

At hatching, the chicks, which were white leghorns, had extensive areas of colored down ranging from blackish brown to pale cinnamon brown. In the one chicken that grew up, the influence of the robin graft was marked in the color of mature feathers. Their shape, however, was typically chicken, not resembling that of robin feathers. Distribution of the pigment in the feathers, also, was characteristic of chicken and not of robin.

Animal Color Changes

ANIMALS that change color were the subjects of reports at a special symposium.

Prof. G. H. Parker of Harvard University opened the discussion by nominating certain fishes, such as flounders, and some of the higher mollusks like octopuses and squid, as among the champion color-changers. Their peculiar ability was known even in ancient times, for Aristotle describes the color changes of a flounder swimming over a mottled bottom in terms so detailed that it seems evident he watched the fish himself.

In modern times it has been discovered that these color changes are due to the expansion, contraction, and migration of certain special cells called chromatophores, and that they are governed by light reaching the eyes of the animals and profoundly influenced by the secretions of certain glands.

That there is a direct quantitative relation between the amount of light received by the eye and the kind and extent of color change by the animal affected was reported by Dr. F. B. Sumner of the Scripps Institution of Oceanography. In a typical experiment, numbers of fish were kept in bowls with five brightnesses of background, ranging from black through three grays to white, under uniform lighting conditions. After several months the fish were killed and subjected to microscopic examination for degrees of color development. A fairly definite relation was found between their light-environment and their color development.

Dr. Dietrich C. Smith of the University of Maryland School of Medicine found that fish scales retained their power to change color for some hours after removal from the fish, if they were kept in the right kind of solution. In this state, they responded to various chemical treatments. When potassium salts were added, the pigment bodies were concentrated, and they scattered on the addition of sodium salts. Adrenalin caused concentration, ergotoxin reversed this effect.

Probe Solar Energy Limits

ANOTHER day of pioneer research in astronomy has been ended, it was disclosed at the scientists' meetings by Dr. Arthur Adel of Lowell Observatory, Flagstaff, Ariz.

For years astronomers have been pushing farther and farther out into the invisible infra-red radiations of the sun searching for comparative intensities at various wavelengths. With each new advance in detecting means the solar energy curve has been pushed further.

Today Dr. Adel announced that for the first time the energy curve of the sun's radiation had been obtained out to the wavelength 14 mu, or 140,000 Angstrom units, where the search must end because beyond that point the atmosphere begins to absorb the rays.

The pattern of the solar energy at these very long wavelengths corresponds to that produced by a black body having a temperature of from 6,000 to 7,000 degrees Kelvin, or over 12,000 degrees Fahrenheit.