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BLOOD RELATIONS IN PLANT FAMILIES

By Dr. Edwin E. Slosson

Plants have no blood, yet a German botanist has found it possible to use their juices to determine their real relationships just as comparative tests on the blood of animals show which are nearest of kin. He has shown by this method of serum diagnosis that, for example, the common milkwort displays affinity with the heather, bittersweet, and horse-chestnut families; the bear-berry with the heather, bittersweet, milkwort, and grape families.

What the test actually shows is merely that the proteins of these plants are similar in composition, but from this an actual family kinship, coming from a common ancestry, may be reasonably inferred. Hitherto, botanists have had no way of ascertaining the family connectings of plants, and so they have classified plants according to their external forms and features, such as the number of the petals, the shape of the leaves, and the like. But this is an uncertain system since plants of recent species may develop close resemblances in appearance and structure when grown under similar climatic conditions. The new chemical method of classification by composition is likely to lead to safer conclusions.

Using the serum test on animals it has been found that the blood of man corresponds more closely to that of the large tailless apes of the Old World than to the smaller tailed monkeys of the New World, while the blood of other animals differs decidedly from human blood.

PICTURES OF CANCER GERMS SHOWN ENLARGED ON SCREEN

(By Watson Davis)

The filter-passing organism held responsible for cancer of the breast was held up for all the world of science to see, at the meeting of the British Association for the Advancement of Science at Southampton, England. J. E. Barnard, co-discoverer with Dr. Gye of the cancer germ, demonstrated the means by which these almost infinitely small objects can be photographed.

The ultra-microscope, the chief weapon in this research, makes use of the invisible, short-length ultra violet rays instead of the longer-length rays of ordinary visible light. These shorter-length waves can pick up objects shorter than the shortest wave-length of visible light, and can be focused on a photographic plate by means of quartz lenses, thus making pictures of things too small to see.

But Mr. Barnard is not content with his present conquests with the ultra-microscope; he is constructing a super-ultra-microscope that will photograph even smaller organisms and probably the non-living molecules-themselves, some of the larger of which are still only one one-hundredth of the size of the invisible cancer germs. This instrument will be equipped with fluorite lenses, and will use Schuman rays, the shortest-length radiations known. It will be operated in a vacuum, to avoid even the slight disturbances due to the presence of air.

Possibilities of getting germs into the "movies" were suggested by Mr. Barnard who has found that by means of the intense cadmium light he can get enlargements up to 3000 diameters in one-tenth of a second. Under these magnifications, the jelly-like agar medium on which bacteria are cultivated shows up as a spongy structure, cut through with liquid-filled canals, like irrigation ditches in a field. In this ultra-microscopic world the germs play the role of cows feeding on the banks.

The Britons were addressed by a noted American physiologist, Dr. Yandell Henderson of Yale. Dr. Henderson stated that the normal human heart pumps one and one-half gallons of blood each minute, while that of a vigorous athlete circulates eight to nine gallons.

LEAD TRANSMUTED INTO MERCURY AND THALLIUM

Further evidence in favor of the transmutation of the elements comes from the experiments of Arthur Smits and A. Karsen of Amsterdam. They followed the general method by which Professor Miethe of Berlin claims to have obtained gold by passing a strong electric current through mercury vapor. The Amsterdam chemists undertook the decomposition of lead instead of mercury. This was more difficult since lead is converted into vapor at much higher temperature, and considerable time was consumed in constructing a practicable ultra violet ray lamp of quartz with lead in place of quicksilver.

The rays given off were examined with a quartz spectroscop. After a current of thirty to thirty-five amperes under a pressure of eight volts had passed through the apparatus for six hours certain lines characteristic of mercury began to appear in the spectrum. These gradually strengthened until after ten hours the entire series of mercury lines and also those of the rare element thallium were perceived in the visible and ultra violet parts of the spectrum.

The lead employed was specially prepared and purified for the purpose by Kahlbaum of Berlin. If the lead was indeed absolutely free from other metals, the experiment appears to prove that lead can be broken up into at least two other elements.

The question of possible impurity of the metal at the start is the basis of the criticism of these alleged transmutations. A new and sharp attack on Miethe's experiments comes from the laboratory of the Berlin University Chemical Institute where E. H. Riesenfeld, Wilhelm Haase, Erich Tiede, Arthur Schlegel and Frieda Goldschmidt find that the process of purification employed by Miethe prior to the passage of the electric current did not altogether remove the traces of gold that occur commonly in mercury. By distilling the mercury three times in a vacuum they were able to obtain mercury that gave no indication of gold, even by the most delicate test, and when this was used in an electric lamp according to Miethe's method, no gold was obtained.

But Professor Miethe says: "My newest method yields an amount of gold far greater than my previous method; in fact enough to permit me to determine gold by the standard chemical tests."

This new and more powerful method has not yet been tried on the Riesenfeld gold-free mercury.

Professor Miethe also found, besides the gold, traces of another metal in the mercury and this he takes to be silver. Professor Nagaoki of Tokyo, who reported getting gold from mercury by electrical action, also found a white metal which he thinks is platinum.

If these experiments are confirmed, chemists have acquired the power of changing lead into mercury and thallium, and then the mercury into gold and silver or platinum. This would open a new era in the sciences, the synthesis of the elements

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SUNLIGHT HELPS INFANTILE PARALYSIS

Another of the dreaded diseases of childhood, infantile paralysis, which, like rickets, graduates large quotas of cripples, has responded to the good influence of the sun's rays. Dr. G. Murray Levick, medical director of the Heritage Craft Schools at Chailey, Sussex, who originated the treatment, said that no other method has ever had as good results as this in the treatment of infantile paralysis.

Dr. Levick first deduced that neurasthenia in grown ups and rickets in the young are due to the same cause. Both these diseases, he claims, are nutritional disturbances of the nerve centers affecting the bones in the young, and the nervous systems in the old. The action of sunlight on the skin forms a substance which is carried into the blood and feeds the nerve centers as well as the bones. His success in treating neurasthenia with sun's rays led him to apply it to cases of infantile paralysis, a disease which is a severe shock to the nervous system and which results in muscular atrophy. Under the action of sunlight a renutrition of nerve centers takes place.

Synthetic sunlight produced by him with an electric arc light of his own invention proved as good as natural sunlight, and could be better regulated to the patient's endurance. He used two distinct kinds of light rays, the short ultra violet rays for nerve nutrition and the long red and infra-red ones for muscle treatment. Red rays, as can be seen when the hand is held up against the sunlight, penetrate the flesh to a considerable extent, and can therefore stimulate the sleeping muscle.

Dr. Levick warns that immediate success must not be expected. He has found constant improvement where daily short treatments were continued over a period of several years. While the method may not be effective in extreme cases, it is nevertheless a test which will soon show after a few treatments whether any rejuvenation of the nerve fibers is taking place.

A Red Cross nurse in Alaska recently visited distant influenza patients by airplane.

LOLLIPOPS HELP MARATHON RUNNERS

Scientists have upset the dope of hard hearted trainers who rule candy off the diet of athletes. Dr. Burgess Gordon and several other physicians of Boston have found as a result of experiments that marathon runners who have lived on a generous carbohydrate diet during the training season and who eat candy before and during the race not only come out ahead but are also in much better physical condition than those who run unsweetened.

The experimenters got the hint that sugar had something to do with the physical condition of runners when a series of blood tests made a year ago after the American marathon race, revealed that those who were most exhausted showed very low blood sugar and others, less exhausted, showed a somewhat higher sugar percentage.

Some extreme cases even presented an appearance similar to that of shock produced in diabetic patients by an overdose of insulin, a substance necessary to the proper disposal of sugar in the blood and which diabetics lack.

Results of blood tests made accordingly, using sugar rations during this years marathon, have just been made public. Runners were placed on high carbohydrate diets before the race, besides being given large doses twenty-four hours before and supplied with candy and oversweetened tea at wayside stations. The blood tests after the race showed normal blood sugars in all cases in contrast to previous results. There was striking improvement in general physical condition and running time was faster in many cases.

DISINFECTANT ACTS BY INVISIBLE RAYS

That sodium hypochlorite, the common disinfectant used in drinking water and swimming pools, does not sterilize by direct contact but by means of germ-destroying invisible rays which it gives off when it comes into contact with organic matter, is the conclusion drawn from experiments made by French chemists, M. Philippe Bunau-Varilla and M. Emile Techoueyre, and communicated to the Academy of Sciences by M. Jean Perrin, Professor of Physical Chemistry at the Sorbonne.

It used to be thought that the purifying power of the compound was due to chemical reaction, as it oxidized organic matter and decomposed itself. But while M. Bunau-Varilla was trying to determine the smallest amount of sodium hypochlorite necessary to sterilize a given amount of drinking water and not leave the usual chlorine taste, he found that the quantity necessary was too small to enter into any appreciable chemical reaction, and this fact suggested his ultra-violet ray theory.

A series of experiments was then devised to prove or disprove the theory. A tube of quartz, which, unlike glass, is transparent to ultra violet rays, was filled with a dilute solution of sodium hypochlorite and placed within a larger tube of quartz. The interspace was filled with water contaminated with colon bacilli, and the combination immersed in a bath of hypochlorite solution. An identical arrangement of quartz tubes, but lacking the surrounding disinfectant was prepared and the sets were allowed to stand 24 hours.

In order to find out if the hypochlorite had really given off death-dealing radiations, drops of the contaminated water were taken out of both tubes and "planted" in dishes of gelatin - a sort of bacterial dinner pail - where they were allowed to grow. The solution containing the most bacteria would grow the largest number of "colonies", and vice versa. In 51 times out of 60 the contaminated water that had been surrounded for 24 hours by the hypochlorite solution grew fewer bacterial colonies than water not so exposed.

It appears from these experiments that the hypochlorite gives off ultra violet rays which, passing through the quartz, destroy the microbes that they reach.

CHANGE CHARACTER BY GLAND-GRAFT

The Voronoff gland graft process is being carried to new lengths by German scientists, who claim revolutionary results in the correction of certain secondary sexual abnormalities.

Dr. Lichtenstein has just published the results of a remarkable series of experiments he has conducted in grafting the glands of a normal subject on patients who, though apparently of the male sex, showed marked feminine characteristics. The result was nothing less than complete character transformation to normality.

It was found that the only suitable glands for such operations were those of living persons or of persons who had died a few hours previously. Preserved human glands proved utter failures, while animal glands, such as monkey's, seemed to cause no change in the psychology of the subject.

The test was applied also to patients in whom the development of the glands had been either totally arrested or retarded, in these cases also with complete success. These experiments have attracted a great deal of attention in German surgical circles, and the operations in question have taken a regular place on the program of the leading German clinics.

SUBMARINES TO BE USED IN STUDY OF EARTH'S CRUST

Submarines are to be used in the near future in a study of the densest and hardest rocks on earth, which are under the sea. This new peacetime use of the former wartime terrors was announced to the British Association for the Advancement of Science, by its president, Prof. Horace Lamb, in his opening address. The new subsea craft is planned by a Dutch scientist, Dr. Victor Meinesz, to carry instruments specially designed for the study of the gravitational effects of the rocks of the ocean bottom, which are as yet very little understood.

Prof. Lamb discussed in his address the physical properties of the interior of the earth, concerning which he is an acknowledged authority. He stated that the old idea of a molten, fiery interior of our planet was long ago discarded by scientists, and that we now know, by studies of the behavior of earthquake waves and by other means, that the earth as a whole is as rigid as steel within. Though the inside of the earth is not molten, it is still very hot, he said, for the outer layers serve as a heat-insulating blanket, just like the asbestos jacket of a steam engine.

At the core of the earth, occupying about one-fourth of its total diameter, is a mass of very dense material whose physical behavior is very peculiar, Prof. Lamb said. It yields slowly, like stiff tar, under long, slow strains; but to sudden shocks like earthquakes, and even to vibrations whose length may be measured in days or weeks, it behaves as though it were quite rigid.

Coming a little closer to the surface, Prof. Lamb told of a viscous stratum about sixty miles down, on which the mountains literally float, like foam on water. It is this semi-fluid layer that permits the face of the earth to change, mountains to fold, and continents to drift.

Another feature of the session was the report of a committee appointed to investigate what is known to scientists as "parthenogenesis", or the production of animals from virgin females. Moths and sawflies had been produced without fathers for thirteen and nine generations, respectively, the committee stated. During all this time no weakness was discovered, and only eight males appeared among two thousand insects produced. The scientists will next extend their experiments to vertebrates, probably using frogs as their first material.

LIMIT TO SIZE OF HUMAN GOLIATHS

Why is an elephant's ankle so thick, and a mouse's so slender? The answer is bound up with the same facts that would make it impossible for a human giant sixty feet tall to take two steps without breaking both his legs. Explanations of some of the riddles of size and proportion in animals were set forth by Dr. J.E.S. Haldane, one of the most famous of English scientists, and author of the well known book of scientific prophecy, "Daedalus", addressing the British Association for the Advancement of Science at Southampton. T

The sixty-foot giant imagined by Dr. Haldane would weigh about a thousand times as much as an ordinary man - say, ten tons - while the space on his thigh bone where muscles could be attached would be increased only a hundred times. The poor ogre would thus be vastly too heavy for his legs, and would infallibly collapse from sheer over-weight. So that when we have a really heavy animal, like an elephant or a rhinoceros, he must have his bones and joints greatly thickened and strengthened to support his weight.

A whale can "get away" with an immense body, because the water buoys up most of it. The indefinite increase in whale-meat that one whale can accumulate, is however, stopped by another thing: the limitations of his digestive tract. He simply can't catch and digest enough food to fill up the ocean with one animal. Insects meet their Waterloo in the growth-competition because their breathing apparatus is faulty. They have no system of forced-draft breathing, like vertebrates, but must depend on the diffusion or drifting of air into the simple tubes that open into their bodies. Hence even the gigantic insects of past geological ages, with wings a foot long, could not grow bodies thicker than a lead pencil.

At the same session, B. K. Das, an Oriental scientist, exhibited a living specimen of the famous climbing perch of India. This fish lives normally in mud, and must have atmospheric air to breathe. If kept under water too long, it actually drowns. Mr. Das stated that there are five species of fish in India that have developed air-breathing apparatus.

The "roast beef of Old England" is giving way to roast pork, a committee on dietary reported. Bacon and eggs still hold their own at the breakfast table, and the demand for fruit tarts continues strong.

EGYPTIAN HISTORY EXTENDED BACK TO 13,000 B.C.

Early Egypt was populated, about 13,000 B.C. by kinsmen of the cave-dwellers of Europe, according to Sir Flinders Petrie, foremost archeologist. He discovered beneath the oldest known previous habitation site a still older settlement, with flint instruments similar to those of European stone age culture known as Solutrean. An ivory statuette links Egypt with Asia at an exceedingly early date. Pottery, finer and thinner than any subsequently made in ancient Egypt, was also found. The culture thus marked has been named the "Badarian", from the place of its discovery, near Asyut. Its antiquity was determined by a study of the record of the floods of the Nile.

The early civilization of Britain was connected with that of the Egypt of Tut-ankh-amen's day by Sir W. Boyd Dawkins, who discovered buried at the famous and mysterious Stonehenge a number of Egyptian beads dating from the reign of Tut-ankh-amen's predecessor and father-in-law, Akhnaton, in 1360 B.C. This is the first clue to the date of these megalithic monuments, which have long been one of the great archeological riddles of the world.

PREHISTORIC MOUNDS REVEAL WORLD'S GREATEST CONSERVATIVES

Living in exactly the same place, with exactly the same customs, for three and a half thousand years, the Indians of the San Francisco Bay region in California take the palm for conservatism. This long and unchanging record has been exposed by excavations of partly submerged prehistoric shell mounds around the bay, which show that the region was inhabited 3,500 years ago by Indians who then lived as their descendants live today, it is announced by Dr. A. L. Kroeber of the University of California through the Smithsonian Institution.

"When Troy was besieged and Solomon was building his temple, at a period when even Greek civilization had not yet taken on the traits that we regard as characteristic, when only a few scattering foundations of specific modern culture were being laid and our own northern ancestors dwelled in unmitigated barbarism," declares Dr. Kroeber, "the native Californian already lived in all essentials like his descendant of today."

"There are few parts of the world, even those inhabited by dark-skinned savages where such a condition can be regarded as established. The permanence of California's culture, therefore is of far more than local interest. It is a fact of significance in the history of civilization.

"If it be objected that the period dealt with is after all conjectural rather than established, the import of our inference may be diminished; but it is not destroyed. Cut the estimate of 3,500 years in half, or even to one-third, we are still back to the time of Charlemagne. The elapsed millennium has witnessed momentous alterations in Europe, in India, in Japan; even the Mohammedan countries, China, Central Asia, and Malaysia, have changed deeply in civilization, while this part of America has stood still."

Dr. Kroeber bases his inferences upon the fact that all classes of objects found in these shell-mounds were unearthened with practically the same frequency from the top, middle, and bottom of the heap and show that the prehistoric people ate the same food, in nearly the same proportions, prepared in the same manner, and sewed skins, rush mats, and coiled baskets similarly to their recent descendants.

"Even their religion was conservative, since the identical charms seem to have been regarded as potent. In a word, the basis of culture remained identical during the whole of the shell mound period," he declares.

The age of the mounds is estimated by the time necessary for the shells to have accumulated, supposing that they represent the debris of a large hamlet of 100 people and allowing 50 mussels a day for every man, woman, and child. Experiments show that five thousand mussel shells crush down to a quarter as many cubic inches.

The population may have averaged more than 100, Dr. Kroeber admits, but this would be a rather high figure for a native California village. It may also have been augmented seasonally by visitors from the interior, but to compensate, its own inhabitants are likely to have spent five or six months of each year away from their mussels. "However the question is approached," he maintains, "3,500 years seems a conservative estimate."

TRANSPARENT STEEL FINDS MANY USES

The new method of making sheets of metal of unprecedented thinness, invented by Dr. Karl Mueller of the Physical Technical Institute of Berlin, seems likely to prove of considerable industrial as well as scientific importance. He has succeeded in producing sheets of steel so thin that they are as transparent as the clearest glass. The test plates used to determine the transparency of optical glass, and ruled with lines one twenty-five hundredth of an inch apart, were photographed through such a metal sheet, and when enlarged to four hundred diameters the scale lines showed distinctly without any distortion. This absence of aberration proves that the structure of the film is perfectly even and equal in all directions. The metal sheets are so thin that atoms will pass through them without impediment. Alpha rays from radium, that consist of streams of the stripped atoms of helium, and are completely blocked by a sheet of paper, are not perceptibly weakened in passing through such metal sheets. It is calculated from the specific gravity of the metal that in these sheets there are not more than thirty layers of atoms in thickness. Yet the sheet of metal is so strong that when fastened in a frame it may be bent out by blowing on it to a sixteenth of an inch without rupture.

Dr. Mueller makes these sheets by depositing an extremely fine film of the metal on a smooth surface by means of the electric current and afterwards separating the film from the foundation on which it was fixed.

Many applications have already been made by scientists and inventors to secure these transparent metal sheets for experimental purposes. They seem likely to serve as semi-permeable membranes for the separation of gases. They may greatly advance the progress of telephotography and television. They also seem likely to prove serviceable in metallurgical research, and in the making of galvanometers, radio receivers, and apparatus for measuring the action of the heart.

INDIAN CHIEF FOUNDS MUSEUM OF HIS OWN

A museum of northwestern Indian art and workmanship, founded and directed by an Indian, is the unique boast of the village of Kitwanga, in the wilds of British Columbia, according to Harlan I. Smith, of the National Museum, of Canada, who has been carrying on researches among the tribes of the Canadian West.

The Museum is the property of John Loknitz, the son of one of the two head chiefs of the Kitwanga Indians. John, who has probably never seen a white man's museum in his life, has assembled in his exhibits numbers of rare Chilkat blankets, ceremonial masks, and other specimens of Indian arts. The blankets, made of mountain goats' wool and red bark, are the most intricately woven fabrics in the world, and are valued at from \$100 to \$500 each. He also possesses a recording phonograph which was presented to him some years ago by C. Harris Barbeau, a student of Indian music. John has made many records of his own, which he plays for the entertainment of visitors. He proposes now to add to his museum a collection of photographs of Indians, showing tribal costumes and ceremonies.

The chief charges no fee to see his museum, but to such tourists as may wish, he rents Indian costumes and blankets in which they have their photographs taken. He also plans to sell duplicates of his Indian photographs, and plaster casts of Indian totem poles and rock sculptures.

PLANTS ON WESTERN PLAINS HAVE MORE ROOTS THAN TOPS

A plant on the western plains growing apparently only two feet high, may have a real height of eighteen or twenty feet, if the great length of its roots is counted in. Its stunted branches may grow only an inch a year, but its roots will grow an inch a day when the soil is moist after a rain, says Prof. J. E. Weaver of the University of Nebraska, who has spent many years investigating the roots of plants in the semi-arid and irrigated regions of the West.

The roots of a single cornstalk may occupy rather thoroughly over 200 cubic feet of soil, Prof. Weaver states. The widely spreading roots of potatoes, after turning downward, elongate at the rate of an inch a day for a period of two or more weeks, and the main vertical roots of corn at the rate of two to two and one-half inches per day, sometimes reaching depths of eight feet.

Prof. Weaver has developed a method of measuring the water-absorbing area of roots as compared with the evaporating surfaces of leaves. He finds that five-weeks-old corn grown in wet soil has 1.2 times as much absorbing as evaporating area; corn of the same age but grown in dry soil had 2.1 times as much root surface as leaf exposure.

Grasshoppers have been found at an altitude of 18,000 feet in Tibet,

The Indian elephant, seen in trained animal acts in circuses, probably originated in the plains of northern Asia.

TABLOID BOOK REVIEW

ANTICSOE OF THE ANTS, and INGENIOUS INSECTS. By Alfred Mark Salyer. 233 pages. New York: LaPlants and Dunklin, 1924

This book is really two books bound in a single cover; the first part is all about ants and the second about the other insects, who are less important people. The method of treatment is unique and effective: first the author quotes from some well-known naturalist, then he proceeds to play upon his theme with clever rimed jingles and still cleverer entomological cartoons. It is a pity the cartoons cannot be quoted here along with samples of the verses:

OLD COMRADE TEST

There's an odor that we like,
When we go out on a hike;
But, it has to be the sort that suits our noses;
You can hardly understand
What it is that ants demand,
It is nothing like your violets and roses.

There's a certain Tribal smell,
Each ant recognizes well,
Men have called it Formic Acid, but, our people
Never hesitate a bit,
If it's ours - well, then, it's IT.
We would know it, from the basement to the steeple.

GLOW-WORM

The Glow-Worm is no worm at all,
But he is not complaining,
So, if he answer to the call,
And has no better training,
That's his affair, and hardly ours -
We take him as we find him.
And thru the summer evening hours,
We chase along behind him,
Until we find it does not pay,
And let him zig-zag on his way.