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LIGHT-WEIGHT AIRCRAFT CONSTRUCTION

IMPROVED airplane designs to take advantage of the already wide choice of strong yet light-weight construction materials should mark the progress of aviation in the next few years, according to Dr. L. B. Tuckerman, assistant chief of the Division of Mechanics and Sound, National Bureau of Standards, who gave the Marburg lecture before the American Society for Testing Materials meeting in Detroit.

As now built, Dr. Tuckerman said, airplanes take advantage of the full strength of the materials already known only in relatively small parts of the plane's structure. Aviation should take better advantage of the materials it already has instead of spending a great deal of effort to develop further stronger light-weight materials.

From purely structural considerations, there is little choice between the three types of aircraft construction now in use: wood, high strength alloy steels and light aluminum alloys. What choice there is must be based upon knowledge of designs which will make use of the greatest possibilities of the material, as well as ease of fabrication and resistance to deterioration.

Dr. Tuckerman pointed out that "with the best designs which have been so far produced it is possible to make full use of the strength of materials already available only in relatively small parts of the structure. The modulus-density ratio is still the limiting property of the material and this ratio is practically unaltered by any treatment which can be given a material. Consequently no radical improvement in light-weight construction is at present to be expected from still further increasing the strength of the materials."

Stressing the point that in better designs would be the greatest improvement, he continued: "There is, however, much room for improvement in the knowledge of the possibility of designing to utilize more fully the strength of materials now available. Systematic series of tests on typical structural elements, covering ranges of materials, over-all dimensions, wall thickness and types of loading, sufficiently wide to determine all the types of instability and plastic yielding which are likely to occur in practical designs, to determine the limiting conditions of each type, and their relations to the stress-strain properties of the material as determined by parallel coupon tests: systematic tests such as these offer present promise of materially improved light-weight construction. Tests of this kind are being carried out in many laboratories, but many more are needed if progress in light-weight construction is to be maintained." In conclusion, research in the field of light-weight construction of aircraft not only benefits the realm of aeronautics, but is being put to practical use in many other types of construction, notably in light-weight railroad trains.

A NATION OF NOMADS ON WHEELS

A PICTURE of the America of the future as a nation of nomads, with part of its population living in automobiles without permanent residence was drawn by O. T. Kreusser, director of the Museum of Science and Industry of Chicago, who spoke at Detroit before the annual meeting of the American Society for Testing Materials.

"It may not be amiss to predict," Mr. Kreusser said, "that if present trends in buying cars or buying homes continue, an increasngly larger portion of our population will live and carry on their home and business pursuits more around the automobile and less around a house as a permanent abode."

"The day may yet come when many of us will solve the family problem of the higher cost of living and the reduced net income by spending the winter in the South, migrating with the birds, and by living on wheels; thus avoiding the existing dual cost and investment of home and automobile."

This would be the result of the continuation of present trends in the housing and automobile industries. According to Mr. Kreusser, in the housing industry during the past twenty-five years, "the quality of material and workmanship has, if anything, declined, in spite of double and trebled increase in cost. On the other hand, the automobile's apparent and actual value per dollar has made it, in the eyes of other industries and by comparison with other man-made products, an enviable acme of accomplishment."

Automobile trends and design are direct products of economic forces giving the tiny European car as an example of an attempt to lessen burdensome taxation. Instead of building smaller and less comfortable automobiles, he thinks that America will pay more attention to increased comfort, speed and general performance and "better utilization of the right materials distributed effectively."

Mr. Kreusser believes possible automotive improvements of the near future are: (1) Full air conditioning for greater comfort in winter and summer driving; (2) lubricating oils that do not evaporate at high temperature; (3) wider application of the "streamlining" principle; (4) light metal alloy body construction; (5) control of traffic by super-sonic or radio signals in the car; (6) improved highways; (7) more easily cleaned upholstery and floor mats that will not warp, shrink or wrinkle; (8) quieter cars by means of increased noise control; (9) continued improvement in brakes to provide higher decelerations without harshness; (10) improved engines and reduced weight.

NOVA HERCULIS

NOVA HERCULIS, the newly discovered nova star, which has caused wide-spread interest within the past few months, is again increasing in brilliance, according to an announcement made by Leon Campbell, of the Harvard College Observatory.

Rallying after it reached its faintest magnitude, 13, early in May, the star has now reached the eighth magnitude, has undergone marked spectrum changes and has

definitely passed into what is usually termed the nebular stage. "It now looks as if the nova has passed through its stages of marked, and irregular, activity and that it will soon settle down to a point where it will slowly, but surely, decrease to the magnitude it was before its sudden outburst in December last. The return to normal may require several years."

The star was discovered on December 13, 1934, by the English meteor observer, J. M. P. Prentice, and at that time was of the third magnitude, having flashed up from the fourteenth magnitude, probably, within a very few days. From then until December 22 the light of the nova steadily increased, with slight fluctuations, and on December 22 the star reached the magnitude of 1.4 and was exceeded in brightness only by brilliant Vega.

Until April 1, the star was easily seen with the naked eye, varying between the second and fourth magnitudes, and then in two days it faded away at the rapid rate of about a magnitude and a half a day. After April 3 the decrease was more gradual, according to Mr. Campbell, until in early May it reached its faintest magnitude, 13, where it was seen only with the greatest difficulty with powerful telescopes. The star is now clearly visible in small telescopes at any time throughout the night, passing through the zenith about midnight.

"Practically all the changes in brightness have been accompanied by changes in spectrum," Mr. Campbell said. "During the early stages, the nova was of a distinctly bluish color, indicating that it was then an extremely hot star. When first photographed, the nova showed a spectrum containing strong absorption lines of hydrogen, with the lines of the metals bordered by intense emission lines. As the nova became brighter the emission lines faded away and the star had a spectrum closely resembling that of the supergiant star, Gamma Cygni. After maximum light was reached, the emission lines flashed forth with customary nova brilliance, this indicating that the nebulous shell surrounding the star had become partially transparent. Later, the well-known green auroral lines appeared as have been found in many other novae. Since the comeback in the star's light, marked spectrum changes have occurred. The nova has definitely passed into what is usually termed the nebular stage. The spectrum is outstanding in many ways, even among novae, and therefore difficult of interpretation at this time. How bright will Nova Herculis get? Judging by its prototype, Nova Aurigae 1891, probably it will not attain naked-eye visibility but it will be visible in moderate-sized telescopes."

At any rate, most of its activity is probably over and it will soon settle down to a point where it will slowly decrease to the magnitude it was before its sudden outburst last December.

LIGHTNING BOLTS

THE enormously high electric voltage which science has always associated with lightning bolts appears to be unnecessary. Lightning progresses through a series of step-like jumps, and each jump requires only a part of the millions of volts potentially necessary to jump from a high cloud to the ground.

Dr. B. F. J. Schonland, D. J. Malan and H. Collins speaking before the Royal Society, London, gave experimental proof upsetting to science's previous conceptions of lightning's behavior.

Sir Charles V. Boys, the eighty-year-old inventor of the special high-speed camera which Dr. Schonland and his colleagues used in the new work, said that the discovery was "An amazing phenomenon which could never have been predicted."

It is found that when a multiple lightning flash occurs there comes first a slow-moving "stepped leader," which precedes the first flash. Compared with subsequent happenings in the lightning stroke, this preliminary "leader" is slow, lasting as long as a fiftieth of a second. It is possible to overlook this action when the Boys camera runs at its fastest speeds.

The leader starts as a small spurt of light covering from twenty to 200 yards at a jump. Its speed is the highest ever observed for a lightning flash—50,000 kilometers a second, or 31,068 miles an hour.

Then the streak disappears entirely for about one fifty-millionth of a second. Next a new dart-like streak starts at the point of cessation of the first streak and travels about as far as the first. Thus, the lightning "leader" reaches the ground in a series of from eighteen to twenty jumps.

With the atmospheric path thus cleared by the leaders, the first real flash occurs, which jumps upward from the ground to the cloud with a velocity of about 31,000 miles a second (one-sixth the velocity of light). This is the flash seen by the eye.

RESEARCH ON CANCER

THE real "cure" of cancer is to be achieved by re-establishing the body's defenses against malignant growth, according to a prediction made by Drs. J. Maisin and Y. Pourbaix, of the Cancer Institute of the University of Louvain. The means of accomplishing this—suitable diet or possibly chemicals obtained from certain animal organs—are indicated by studies just reported in *The American Journal of Cancer*.

For the present cancer patients can not hope to be cured by diet. They must still rely on surgery, x-rays or radium. The work of the Belgian investigators is still in the experimental stage and their results, promising though they seem, have been obtained only with mice suffering from one form of cancer. The studies are not reported as a cure for cancer but as a signpost, pointing what seems to be a logical and promising way to an ultimate cure of cancer.

The report states that "The experimental results recorded may be interpreted as indicating that it is possible to influence the evolution of tar cancer in one direction or the other by diet. The results show unquestionably that chemical factors can be found which protect against cancer or lower the resistance to definite carcinogenic (cancer-producing) substances."

The scientists proceed in the cancer problem on the theory that it is a constitutional disease rather than a local ailment. Consequently they think treatment should be aimed at strengthening the body's defenses, rather

than at destroying the cancerous growth. Cancer in their opinion is the "peculiar response of injured cells" of an animal—mouse or man—that has been intoxicated by organic poisons. These poisons may be certain chemicals, as in tar cancers, or they may possibly be poisons produced by the "germs" of chronic infection, or they may be still other poisons that get into the body.

Rebuild the body's natural defenses and the body will be able itself to destroy and dispose of the cancer, they reason.

"By our experiments," they report, "we have demonstrated that in changing by diet the chemical composition of the organic fluids of an intoxicated animal it is fairly easy to modify its cancer response. It is reasonable to assume that by further studies it will be possible to find organic chemical compounds which, injected or given in the diet, will protect against the poisoning which leads to atypical growth and cancer. We believe, also that in this way it will be possible to make a cancer slowly disappear, by reestablishing the organic defenses which will take care of the growth. Such a cure of cancer seems more logical than a specific remedy with power to kill cancer cells and leave untouched normal cells."

ITEMS

THE new comet in the southern sky discovered by Dr. John Jackson, of the Royal Observatory, Cape of Good Hope, Africa, has been sighted by astronomers at Harvard College Observatory, Dr. Harlow Shapley reports. Dr. Fred L. Whipple and Dr. L. E. Cunningham, of the observatory staff, find that the brightness of the newest comet is diminishing. When first observed in the southern sky just a bit above the star Antares in the constellation of Scorpius, it was of the thirteenth order of magnitude. Now it has dwindled to the fifteenth order. The fainter a stellar object is, the greater is the number assigned to its order of magnitude. Even when first sighted, the Jackson comet was much too weak to be seen with the naked eye.

STILL increasing in brilliance, the planet Venus, which has been shining conspicuously in the western evening sky for several months, set longest after the sun on June 29. Now it will continue to brighten, but is drawing nearer to the sun's direction. On August 2, it will be at its greatest brilliance, nearly twice as bright as at present, but then it will rapidly become fainter. By the end of August it will have vanished from view as an evening star. Venus revolves around the sun once every 225 days, at a distance of 67,200,000 miles, instead of the 92,900,000 miles which separate sun and earth. Just now, a line from Venus to the sun, and one from Venus to earth, would be at right angles, so we see the planet farthest separated from the sun, at the position called "greatest eastern elongation." After this, as Venus comes closer to earth, it also comes more into line with the sun, and sets earlier.

A STRONG ocean bottom earthquake occurred June 24 near the French-owned island of New Caledonia, off the coast of eastern Australia. The epicenter is located at 23 degrees south latitude and 165 degrees east longitude and was calculated by the U. S. Coast and Geodetic Survey from telegraphic data collected by Science Service. This would place the shock center almost in the Tropic of Capricorn, about 800 miles directly east from the Australian coast, and about 900 miles northwest from the tip of New Zealand. The time of the shock was fixed at six hours and 22.2 minutes eastern standard time on June 24.

THE great lake of fire in Halemaumau Pit, in the Kilauea volcano, Honolulu, is expected to burst into eruption at any moment, according to Superintendent Edward G. Wingate, of Hawaii National Park. Volcanologists had predicted an eruption to occur at about the time of the spring equinox, based upon previous cycles of volcanic activity and and current indications such as earth tremors. The expected eruption did not materialize as scheduled, but the great volcanic pit is showing continuous activity and the indications are that the lake of fire may be expected to return soon to the crater. The walls of Halemaumau are sliding daily, sometimes as separate rocks, sometimes in large masses. Meanwhile a solfatara, or small, geyserlike formation at the foot of the west wall, is pouring out blue fumes and is increasing in area and in brilliancy of color. The majority of the tremors recorded on the seismograph of the Volcano Observatory located on the rim of the crater are originating beneath or close to Kilauea. The last eruption began on September 6, 1934. It resulted in the lake of fire remaining in the firepit for over a month. An interesting feature of that activity was the issuance of burning lava from vents in the walls which resulted in fire falls of molten lava cascading down 500 feet of the crater walls.

A NEW operation for bunion in which the foot gets well quickly and the patient can wear ordinary shoes in comfort is reported by Dr. Earl D. McBride, of Oklahoma City. The operation proved satisfactory in thirty-nine consecutive cases. He called it a conservative procedure which tends to restore the normal architecture of the toe. The muscle that pulls the toe inwards is released by the operation. The muscle on the outside is shortened. Thickened tissues are removed and also a small amount of bone if the deformity is severe. The mechanical force causing the deformity is thus corrected. An additional advantage is having the scar underneath, where it is safe from irritation.

A COMBINATION of surgery with radium treatment is the most promising method of treating cancer of the middle ear, it appears from a report by Dr. Leroy A. Schall, of Boston. This kind of cancer was once considered a medical curiosity, but Dr. Schall finds it neither so rare nor so hopeless as formerly thought. Treatment with surgery, radium or x-ray alone is disappointing. Radium treatment following surgery was given to six patients. Four have survived for from two to four years. Of the two who died, one died of pneumonia two years after the treatment, but his cancer had not returned.