

## STS Winner Writes

"Not until the past year have I acquired sufficient mathematical background to approach with any degree of understanding the classical works in mathematical physics. My studies have been for the most part confined to work parallel with Eddington's fine treatise, *THE MATHEMATICAL THEORY OF RELATIVITY*. Recently, I have also been studying Weyl's discussion of gravitation and electromagnetic fields in *SPACE—TIME—MATTER*, a translation of his *MATHEMATISCHE ZEITSCHRIFT*. Naturally enough, with my necessarily limited knowledge of physics and higher mathematics, I have as of yet been incapable of much original work. However, there are problems which have occurred to me during my present studies which I have tentatively contemplated as to method of approach, and which I intend to attack in the future, after I have been reinforced by university training in mathematics. . . .

"After a general study of the various phases in Einstein's work, e.g., the law of gravitation, electro-magnetic phenomena, curvature of space and time, relativity mechanics, and so on, I did some conjecturing on my own account. For one thing, a complete theory of relativity constrains us to produce an expression for the phenomenon of atomicity, that is, the tendency of matter to aggregate into particles, leaving relatively large regions of the universe devoid of matter. To the best of my knowledge no such result has been obtained as yet. This problem intrigues me.—From the essay of Caroline Stuart Littlejohn.

The basic tube consists of an electron gun, an input cavity which is connected to a power source and an output cavity which is connected to a load and a collector. These cavities are adjacent and are tuned to the cyclotron frequency of a magnetic field which is parallel to their axis of alignment. They have the property, when excited, of introducing an alternating electric field normal to the magnetic field. The electron beam passes through both cavities. It absorbs the radio frequency power in the input cavity, and delivers this power to the output cavity and load or to the collector.

The power transfer may be controlled by varying either the beam current or the electron transit time in the output cavity. Electron couplers capable of transferring several hundred watts at 800 megacycles with a power efficiency of 70% have been built and operated, they said.

As an ultra-high frequency modulator tube, the electron coupler is a radical departure from more conventional modulation techniques since it makes the modulation system independent of the power generator, and thus permits the most efficient and practical design of the generator.

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**SHOCK WAVES**—At 2.6 times the speed of sound, shock waves slant back sharply from edge of wedge-shaped model in test chamber of the University of California's new low pressure supersonic wind tunnel. Pressure at time of photograph was about one ten-thousandth of the atmospheric pressure at sea level.

### AERONAUTICS

## Near-Vacuum Wind Tunnel

➤ NEAR-VACUUM flight conditions, encountered by rockets from 50 to 80 miles above the earth, are to be studied under man-made conditions in a new type of wind tunnel installed at the University of California at Berkeley.

The ordinary wind tunnels of the world, now countable by the dozens, yield scientific flight data from subsonic to supersonic under conditions at sea level. They give little information of value in determining conditions in the far above atmosphere regions reached by modern rockets. Even the data obtained from rocket-borne instruments sent high aloft are not reliable, because the effects of the conditions on instruments at such altitudes are not accurately known.

These high-up conditions are duplicated in the five-by-seven foot test chamber of the new tunnel by powerful steam jet vacuum pumps. When the vacuum reaches the condition 80 miles above the earth, a molecule in motion in the chamber has a chance of bumping into another molecule every 10 feet. At sea level, molecules in the free air would strike another every one ten-thousandth of an inch.

When the vacuum in the test chamber of this new tunnel has been created, air or gas is poured into a four-inch test section which contains the model. Nitrogen, helium or other gases can be used for special studies. The gases are accelerated to supersonic speeds by a special nozzle.

This tunnel was designed by Dr. R. G.

Folsom and E. D. Kane with assistance by other members of the university's staff. In addition to use in determining flight factors in the regions through which rockets will travel, it may also have some industrial applications, such as those concerned with the drying of blood plasma, food processing, and the distillation of vitamins from fish oils.

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### GENERAL SCIENCE

## Canadian Soldiers Soon To Be in "Well-Dressed" Class

➤ Canadian soldiers of the future will be in the "well-dressed" class, both "on duty" and "off parade."

In addition to smart uniforms, of both winter and summer weight, the soldiers will receive bedroom slippers and broad-cloth pajamas between now and the spring of 1950. Bath towels, white cotton handkerchiefs and zippered overshoes are also to be issued to them.

Other new items of clothing planned include black fleece-lined gloves, brown leather waist belts, gabardine raincoats and new gymnasium suits. The soldiers will also benefit immediately by an increase in the present issue of underclothing, shirts, ties and socks.

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