find the velocity at any subsequent time, by adding the vector gt vertically downward to the original vector velocity. The second statement assumes, so far as I can see, a knowledge of one of the quantities we need to calculate. I should very much like to see Dr. Hering's "applied" mathematics applied to this simple problem. So far as I can see, though the first statement simplifies the mathematics, the second abolishes it.

Scientific terminology is like a sharp knife used for the dissection of a problem, and unequaled for its intended purpose. It is an odd coincidence that the very number of SCIENCE which contains Dr. Hering's letter contains also an address by Dr. Gray of Edinburgh, in which the sharpness of this particular knife, the term acceleration in its strict sense, is specially noted. Dr. Hering's proposal is as if one should say, "I find your razor good for sharpening pencils, please shave with something else."

Surely the ends, neither of science nor engineering will be furthered by any such change as Dr. Hering recommends. The question is not one of simplified mathematics, but of clearness of thought.

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NOTES ON METEOROLOGY AND CLIMATOLOGY

AEROLOGICAL WORK—WINDS

AFTER the signing of the armistice had liberated much information that had been held as confidential, it became possible to assemble a group of papers on aerological work describing the pilot balloon methods used by the Weather Bureau, Signal Corps, and Navy for observing winds at various levels, and presenting the results of various lines of research.[1] The use of thousands of two-theodolite pilot balloon runs established an empirical formula for the ascensional rate of pilot balloons which tallied remarkably well with the formula derived from theoretical considerations. This formula is

$$V = 71(l/L^{2/3})^{5/8} = 71(l^3/L^2)^{.208},$$

in which V represents velocity, l the actual lifting power of the balloon ("free-lift"), *i. e.*, the weight it will support, and L the total lift (free-lift plus weight of balloon). Surprising as it is, pilot balloons ascend at a nearly constant rate, once they are above the more or less turbulent surface layer of air. Thus, single theodolite observations of angular altitude and azimuth of a balloon once a minute, when used in conjunction with the computed ascensional rate will yield reliable information as to the actual positions of the balloon, and, therefore, of the direction and velocities of the wind at all levels from the surface to the height at which it becomes lost to view. At the Aberdeen Proving Ground, temperatures for computing the densities of the air in the several altitude zones have been obtained by daily airplane ascents to a height of 10,000 feet. The score of pilot balloon stations in the United States east of the Rockies telegraph free-air wind data to the Weather Bureau in Washington twice daily, where they are used not only for aeronautical forecasting, but also as an auxiliary in making surface weather forecasts.

Meteorological kite flights are now being made at six stations daily (except when winds are light) for recording winds, relatively humidities, and temperatures aloft. The results are telegraphed to Washington daily, and later are published in *Monthly Weather Review Supplements*, where they become available for detailed investigation.[2]

The movements of dust, smoke and clouds are useful as well as balloons and kites for determining the movements of the free air. Dustfalls which occasionally occur in the northeastern United States have been traced

[1] *Mo. Weather Rev.*, April, 1919, Vol. 47, pp. 205–231. Separates of these are still available: apply to Chief, U. S. Weather Bureau, Washington, D. C.

[2] See, for instance, V. E. Jakl, "Some observations on temperatures and winds at moderate elevations above the ground," *Mo. Weather Rev.*, June, 1919, pp. 367–373. Separates of these are still available: apply to Chief, U. S. Weather Bureau, Washington, D. C.

back to the arid portions of the southern Great Plains.[3] Observations of forest-fire smoke also give reliable information of air movements over long distances, as in October, 1918, when Minnesota smoke was observed throughout the eastern half of the United States except along the gulf and south Atlantic coasts.[4] Observations on clouds may be complementary to those on pilot balloons, for the usefulness of pilot balloons decreases as the cloudiness increases. How cloud movements may be used in local weather forecasting has been discussed by A. H. Palmer for San Francisco, M. L. Fuller for Peoria, Ill., and H. H. Martin for Columbus, O.[5]

AIRPLANES AND THE WEATHER

An article on the "Effect of winds and other weather conditions on the flight of airplanes"[6] is a rather extensive, though by no means complete, compilation and discussion of aviators' meteorological experiences. To quote from the synopsis:

The disturbances of the air due to daytime convection are one of the prime sources of bumpiness. Especially on hot summer days do strong, rapidly rising currents of air penetrate to great altitudes and, where encountered, jolt the airplane. Where the cooler air is descending, the effect is similar to that of falling into a "hole." The height to which the effects of surface roughness extend when the wind is blowing depends upon the speed of the surface wind and the height of the obstruction.

In the free air, aviators' observations show how the layers of air flow over one another, the interface sometimes being marked by clouds and sometimes entirely invisible. At such levels are encountered billows or waves, and considerable difficulty is sometimes experienced in flying through such regions. Clouds, rain and fog all contribute to the discomfort and danger of flying.

Perhaps the most interesting are the experiences in the thunderstorms and the up-and-down winds which accompany such storms. As the driving wedge of cold air at the surface advances ahead of the storm, the air into which the storm is moving is forced upward. The maximum turbulence is found in the region of the squall cloud, but the force of the rising air ahead of the storm is sufficient to carry up an airplane considerably, in spite of the efforts of the pilots to keep the nose of the plane down. The dangers from lightning and hail, are also quite as important as those from the capricious winds.

There is an annotated bibliography at the end. This article bound with two on ballooning and with reviews of Y. Henderson's "Physiology of the aviator," and H. Luckeish's "High lights of air travel," may be had on application to the Chief, U. S. Weather Bureau.

Charles F. Brooks

[3] See Winchell and Miller, *Mo. Weather Rev.*, November, 1918, Vol. 46, pp. 502–506.

[4] *Mo. Weather Rev.*, November, 1918, pp. 506–509.

[5] *Mo. Weather Rev.*, September, 1918, pp. 407–413; July, 1919, pp. 473–474, and August, 1919, pp. 567–570. A limited supply of separates is held by each of the authors named: address, "Weather Bureau Office" at cities named.

[6] *Mo. Weather Rev.*, August, 1919, pp. 523–532, 10 figs.

SPECIAL ARTICLES

A PRELIMINARY NOTE ON FOOT-ROT OF CEREALS IN THE NORTHWEST

During the first half of May, 1918, the Station Entomologist was called to Olympia, Wash., to consult with the farmers and county agent concerning an outbreak of aphis on wheat. He found that the aphids were not responsible for the whole trouble and submitted samples of wheat from the unthrifty fields to the station plant pathologist for diagnosis. Subsequently specimens showing the same disease were submitted from this and other localities in western Washington through the county agents of the respective counties.

Among the first lot of plants were some showing lesions at the base of the stem. These lesions were elliptical, light-centered, penetrating the leaf-sheath and the surface of the stem. Plants with these lesions and others with a general blackening of the lower nodes showed death of the roots at the first node, the plant attempting to make good this loss by putting out roots at the second node. In some plants two sets of roots had been successively killed and roots had been put out at the third