see a book giving information on the behavior of the air, for the benefit of airmen. There can be no doubt of the utility of such a volume, and both the editor and Mr. Gregg are to be congratulated on the publication of a book that for the present meets the need. There is no valid reason why every pilot should not be well versed or at least fairly familiar with the more frequent types of air structure, the processes of cloudy condensation, the formation of fogs, ice-storms, hail-storms and thunder-storms, the shift of wind direction with increasing height, the significance of a change in velocity, the nature of a zone of discontinuity and what it portends, the frequency of favoring and unfavoring winds, the average height of clouds, the meaning of each type and its growth or dissipation; and in short, as much as possible of what Sir Napier Shaw calls "The Air and its Ways," with particular emphasis on the "ways." We group them all under the general term aerography—the science of air structure. No land explorer should be without a knowledge of geography, no seaman scorn a knowledge of hydrography, neither should a flier be without a knowledge of aerography.

There have been decided changes in our knowledge of the structure of cyclones and anticyclones. By persistent recurrence to his idea of thermal stratification of the atmosphere, Shaw has brought us to new conceptions of cyclonic structure, and we now rule out former notions of inrushing, rising warm air and the condensation of vapor, as the prime movers in a cyclone, and on the other hands descending dry cold currents as the essential feature of an anticyclone. This old idea of a cyclone, says Dr. Simpson (Address, Section A, British Association for the Advancement of Science, August, 1925) was tersely expressed by Sir Oliver Lodge in a letter to the *Times* last year, as follows:

> A cylindrical vortex with its axis nearly vertical rolling along at a rate conjecturally dependent partly upon the tilt and with an axial uprush of air to fill up a central depression which depression nevertheless was maintained and might be intensified by the whirl, the energy being derived from the condensation of vapor.

But unfortunately for the theory, observation does not sustain it. The air does not move in a continuous spiral, and there are decided discrepancies in the distribution of temperature. Air streams are discontinuous and seem to retain their temperatures. Rain does not fall where it should according to schedule; and so we come to explanations based more upon energy derived from readjustment of the center of gravity of the air mass as a whole, the whole being made up of blocks of air of diverse origins.

Here is where observations in strata one thousand meters and more above the earth become so important, and where knowledge of the vertical structure lets us understand what is really taking place. The diurnal range of temperature, for example, so characteristic of surface readings, fades out at about one kilometer.

Gregg gives with some detail charts showing average temperatures, pressures and densities at the 3 km level, for the United States, east of the Rocky Mountains.

The chapters which most directly bear upon aviation are those on the "Winds" (Chapter IV), and Chapter IX on "Forecasting."

At the surface the air does not flow parallel to the isobars because of friction and viscosity, so that one must rise about five hundred meters to find the gradient wind, or wind parallel to the isobars. But the gradients aloft may be and generally are not in close agreement with surface readings, hence the winds will also change in direction and intensity.

The shifting of winds with altitude into a westerly quarter is shown in detail. With regard to changes in velocity, it is shown that there is a marked increase from the surface up to five hundred meters, then a more gradual increase, and decided seasonal variation in the upper levels.

At usual flying levels the wind factor is 3.5 meters per second; and in the author's opinion it is now possible to fix schedules for aircraft that can be guaranteed any desired percentage of the time—so far as winds are concerned.

There are some good reproductions of cloud photographs. The typography and general make-up reflect credit upon the Ronald Press Company.

ALEXANDER MCADIE

SPECIAL ARTICLES

THE EFFECT OF SODIUM SILICOFLUORIDE SPRAYS ON THE PEACH AND ON THE CONTROL OF BACTERIAL SPOT

SOME preliminary experiments by the writer during the summer of 1925[1,2] indicated that sodium silicofluoride in dilute solution (two pounds to fifty gallons of water) had a decided effect in checking the bacterial spot of peach on the leaves. Unfortunately there was no fruit on the trees, and it was not until the summer of 1926 that the action of this chemical on the fruit could be studied. The results this year confirmed those of 1925 in so far as control of the disease was concerned and interesting information on a unique effect on the fruit was secured.

1 *Phytopath.* 16: 79–80, 1926.
2 Trans. Ill. Hort. Soc. 59: 266–272, 1926.

EFFECT ON FRUIT

Spraying experiments were conducted in two widely separated orchards, one in central Illinois and the other in the extreme south part. The results obtained were quite similar so far as the effect on the foliage and fruit was concerned.

No injurious effect was noted on the fruit until shortly before harvest and even then no burning or marking of the fruit could be seen. It was observed, however, that the fruit on all the sodium silicofluoride plots ripened from four to six days ahead of that on unsprayed plots or on those sprayed with dry-mix lime and sulfur. In addition, the fruit had a higher color and was somewhat smaller. At the tip was an area varying considerably in size and shape with a color range from dark green to yellowish green. These areas were conspicuous in contrast to the deep red and light yellow of the surrounding portion. The taste of the entire fruit was insipid and in some cases rather bitter. Cracking was somewhat more marked on the sodium silicofluoride plots than on the others, but this might have been due in part to the difference in the time of ripening. A similar effect on the peach was observed by Mr. R. L. McMunn, of the Department of Horticulture, in 1924 on some trees sprayed with Flu-Sul. This is a commercial product containing barium fluoride as one of the active ingredients.

EFFECT ON FOLIAGE

The effect of the sprays containing sodium silicofluoride on the leaves varied somewhat throughout the season. On the whole little injury was observed although rather severe burning at the tips and along the edge occurred on some trees. This could not be correlated with temperature or other weather conditions and was never serious enough to cause alarm. At the end of the season the trees, however, were in as good condition as those sprayed with other materials.

CONTROL OF BACTERIAL SPOT

At Urbana, where the spray applications were made at weekly intervals starting June 21 and continuing until July 26, almost perfect control on the fruit was secured. The checks received a "shuck" spray of lead arsenate and lime, but no other sprays. The fruit was harvested the latter part of August and all the peaches were examined from five sprayed trees and three check trees. On the sprayed trees 0.48 per cent. of the fruit was diseased, while on the check 86.7 per cent. showed serious spotting.

At Ozark, Illinois, where the sprays were applied at ten-day intervals, starting with the "shuck" spray, the sprayed trees showed 11.5 per cent. diseased fruit, while an unsprayed check had 69.5 per cent. diseased peaches. On a sulfur-lime-dusted plot the percentage of spotted fruit was even higher than on the check, while on a dry-mix sulfur lime plot 65 per cent. of the fruit was diseased. The control of the disease on the leaves was not as successful as that on the fruit. At Urbana, where careful counts were made, the sprayed trees had 38.3 per cent., while the checks had 84.5 per cent. diseased leaves.

In spite of the fact that both in 1925 and 1926 the southern peach-growing sections suffered from severe droughts during the spring and early summer, leaf spot was unusually severe. This, together with numerous other observations, tends to support the theory that the bacteria are carried to the leaves and fruit in dust particles. It has been proved[3] that the pathogen can survive the winter in dead leaves and that the bacteria are extremely resistant to desiccation. It would seem logical, therefore, to account for the widespread infections in dry seasons by assuming that the dust arising during the process of cultivation and through high winds are responsible for conveying numerous bacteria to the leaves and fruit, where moisture from dew or light rains would give them a chance to enter the stomates and bring about infection.

Sodium silicofluoride sprays in a schedule starting with shuck fall gave much better results than when started a month later, although the disease did not become evident until much later. It seems possible, therefore, that the bacteria in the dust particles may be present for some time on the fruit and leaves without bringing about infection and that the sodium silicofluoride solution kills the bacteria when the particles of dust become moist enough to start the activity of the bacteria.

It is not considered safe for the growers to use any spray containing sodium silicofluoride until further experiments are made as to the effect of different climatic conditions on the amount of injury. Also, further work must be done on determining the chemical changes which take place after the material is applied to the trees.

The sodium silicofluoride used in these experiments was kindly donated by Jungmann and Company, of New York, and was known as their "L & V" commercial sodium silicofluoride. While this material upon analysis proved to be remarkably pure for a commercial product the recent article by Roark[4] indicates that chemical reactions taking place during mixing and application will change the composition

[3] Anderson, H. W., "Overwintering of Bacterium Pruni," *Phytopath.* 16: 55–58, 1926.

[4] Roark, R. C., "Fluorides *vs.* Silicofluorides as Insecticides," SCIENCE 63: 431–432, 1926.

of the substance. No attempt has been made to determine the exact chemical composition of the product after being deposited on the leaves and fruit.

H. W. ANDERSON

UNIVERSITY OF ILLINOIS

A COMPARISON OF THE VISCOSITY AND LIQUEFACTION OF VARIOUS GELATINS

A STUDY of a few brands of gelatin in their relation to the ability of bacteria to liquefy them was undertaken to determine the suitability of the gelatin on the market for use in bacteriological work.

The gelatin media employed consisted of

Peptone (Difco)	0.1 gram
Gelatin	various amounts
Water (distilled)	100 cc.

This was heated at 60 to 65 degrees C. till dissolved, the reaction adjusted to pH 7.4 and sterilized at fifteen pounds for fifteen minutes.

The viscosity of three of these gelatins as shown by the Ostwald viscosimeter was as follows:

Gelatin 2 per cent.	Viscosity (36° C.) Referred to water
No. 1	1.66
No. 2	1.396
No. 3	1.475

Gelatin 10 per cent. in culture tubes was inoculated with one tenth cc of a broth culture of Serratia marcescens and incubated at 20 degrees C. The depth of the liquefaction was measured each day.

Gel no.	Days 1	2	3	4	5	6
	Centimeters					
1	.5	1.	1.2	1.5	1.8	2.4
2	1.	2.4	3.2	4.6	complete liquefaction	
3	.6	.9	1.6	2.2	2.8	3.

The liquefaction of gelatin No. 2 would be rated as rapid, while that of No. 1 would be comparatively slow. This No. 2 gelatin was not less than eighteen years old at the time of the experiment. The Digestive Ferments Company gives the information that the present-day gelatins have considerably more gelation power than those of twenty years ago. The liquefaction of gelatin by bacteria observed twenty years or more ago should be deduced on this basis.

It is generally understood that the age of the gelatin culture medium is a factor in the liquefaction time; that is, a gelatinolytic organism may bring about liquefaction quite rapidly when inoculated into freshly prepared gelatin, and much more slowly if introduced into the same medium sometime later. This is based on the observation that the viscosity of gelatin increases with age.

That the viscosity increase due to age does not affect the liquefaction rate is shown below.

Gelatin culture medium inoculated with one tenth cc of a broth culture of Proteus vulgaris. Incubated at 20 C.

	Gelatin one day old 15 per cent.	10 per cent.	5 per cent.	Gelatin twenty days old 15 per cent.	10 per cent.	5 per cent.
24 hrs. ...	2 mm	2 mm	5 mm	2 mm	2 mm	5 mm
48 hrs. ...	4 mm	5 mm	15 mm	4 mm	5 mm	15 mm
72 hrs. ...	6 mm	8 mm	20 mm	6 mm	8 mm	20 mm

FREDERICK W. SHAW

MEDICAL COLLEGE OF VIRGINIA,
RICHMOND

THE OKLAHOMA ACADEMY OF SCIENCE

THE fifteenth annual meeting of the Oklahoma Academy of Science was held in Stillwater with the Oklahoma A. and M. College, November 26 and 27. This meeting was held under the presidency of J. H. Cloud, professor of physics, O. A. M. C.

One hundred and eleven papers were presented. These included 54 papers in the section of biology, 21 geological papers, 16 papers in physical science and 17 in social science. Three general addresses were also given.

The Oklahoma division of the American Chemical Society met in conjunction with section C, the section of physical sciences.

Officers for the year 1927 were chosen as follows:

President, Charles N. Gould, of Oklahoma Geological Survey.

Assistant Secretary-Treasurer, Herbert Patterson, O. A. M. C.

Vice President, Section A, L. B. Nice, University of Oklahoma.

Assistant Vice President, Section A, Robert Stratton, O. A. M. C.

Vice President, Section B, A. H. Koschmann, O. A. M. C.

Vice President, Section C., F. E. Knowles, Phillips University.

Vice President, Section D, J. Dowd, University of Oklahoma.

The membership at the time of the meeting was 173, of whom 62 are also members of the American Association for the Advancement of Science. At this meeting 95 new members were elected.

The activities of the academy are expanding very rapidly and its influence is of increasing importance.

A. RICHARDS,
Secretary-Treasurer.