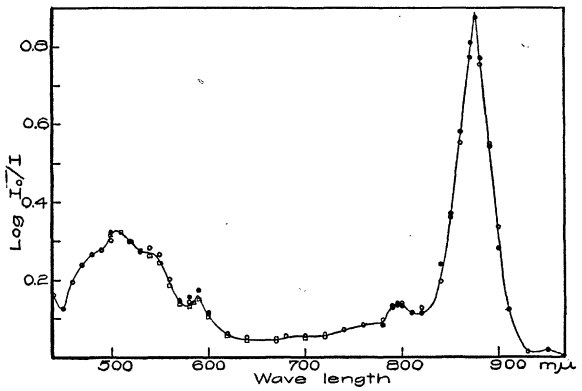

FIG. 1

510 and 480 mμ are due to Spirilloxanthin, a substance prepared in crystalline form from this species by Van Niel and Smith,[11] who found it to be red carotinoid with 15 double bonds. Only light absorbed by the green pigment is used for photosynthesis.

The question is now raised whether this colored extract is the same as the pigment in the intact cells. To test this, the infra red absorption curve of the intact pigment in the cells was measured by using a light scattering control of cells bleached with H_2O_2, and compared with the curve obtained from the supersonic extract. This experiment was done with *Streptococcus varians*; it shows exact agreement in position of the infra red bands in the bacteria and in the extract, and roughly about the same height as indicated in both curves in Table 1. Considering the approximate nature of the scattering control, the height agreement is quite satisfactory. As far as light-absorbing capacity is concerned, the extract is closely similar to the intact pigment which is not true for extracts made with organic solvents.

TABLE 1

RELATIVE ABSORPTION COEFFICIENTS FOR *in vivo* AND EXTRACTED BACTERIA PIGMENT OF *Streptococcus varians*

	795 mμ	855 mμ
Intact pigment	5.8	15.3
Extracted pigment	7.7	18.1

The extract of *Spirillum rubrum* was diluted with buffers of various pH values and the mixtures centrifuged free of precipitate. The absorption of the solutions was then measured at 875 mμ to determine the pigment concentration. There is a region of insolubility between pH 3.0 and 4.5. The pigment is precipitated by 0.5 saturated $(NH_4)_2SO_4$.

As far as I can tell by fractional precipitation and adsorption experiments, both the green bacteriochlorophyll and the red spirilloxanthin are attached to the same or to similar protein molecules, for it has not yet been possible to separate out fractions of different color. Since Stoll's (see footnote 4) name of "chloroplastin" can hardly be applied to pigments from organisms such as bacteria and blue green algae which do not have chloroplasts, I would suggest the term "photosynthin" as a general name for compounds of photosynthetic pigments such as bacteriochlorophyll with protein and use "chloroplastin" specifically for such compounds containing ordinary chlorophyll from higher plants and yellow green algae.

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[11] C. B. van Niel and J. H. C. Smith, *Arch. f. Mikrobiol.*, 6: 219, 1935.

RESPIRATION OF WHEAT INFECTED WITH POWDERY MILDEW

WHEAT seedlings infected with the powdery mildew, *Erysiphe graminis tritici,* soon show visible symptoms of physiological derangement and die in three to four weeks if kept at 18–22° C. This paper reports a preliminary study of respiration in healthy and mildewed wheat.

Control and infected seedlings of Marquis wheat were grown at 20° C. in adjacent compartments of a chamber lighted from above by a 1000-watt Mazda bulb. Inoculation with mildew occurred when the first leaf was fully expanded. Oxygen consumption of healthy and inoculated primary leaves at 20.5° C. was measured by means of Warburg manometers at frequent intervals over a period of three and a half weeks.

Fig. 1 shows that after inoculation the respiration

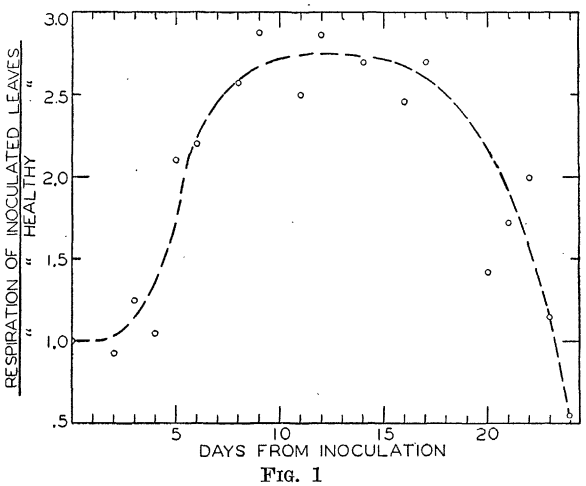

FIG. 1

rate of infected leaves rose rapidly and reached a maximum value 2.5–3.0 times that of the controls in about 9 days. The rate of respiration was maintained at a high value for about a week, and then began to decline, finally falling considerably below that of the controls. Table 1 shows that fungus respiration was

TABLE I

RESPIRATION OF MILDEWED AND HEALTHY WHEAT LEAVES WITH AND WITHOUT SULFUR TREATMENT. TEMPERATURE 20.5° C.

Days after inoc.	C. mm. O_2/cm.²/hr.					
	Mildewed plants			Mildew free plants		
	Sulfur for 0 hrs.	Sulfur for 12 hrs.	Sulfur for 28 hrs.	Sulfur for 0 hrs.	Sulfur for 12 hrs.	Sulfur for 28 hrs.
6–7 ..	8.6	8.4	8.3	4.2	3.8	4.1
12–13 ..	8.5	8.0	8.0	3.2	3.2	3.3

insufficient to account for the increased oxygen consumption of mildewed leaves, since dusting with finely pulverized sulfur, which quickly destroys the mildew, caused little decrease in respiration. Thus, infection of wheat leaves by mildew markedly increased the rate of oxygen consumption by the host tissues. Clover leaflets infected with powdery mildew also respire more rapidly than controls, even when the fungus has been killed by sulfur dust.[1] Although the mildew penetrates only the epidermal cells, Allen and Goddard,[2] in this issue of SCIENCE, show that the increase in respiration occurs principally in the mesophyll tissues of the host.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MICRO-METHOD FOR MEASURING SPECIFIC CONDUCTANCE

RECENT trends in biological research have emphasized the importance of a knowledge of the physical properties of various biological fluids. Unfortunately, although excellent methods for the measurement of specific conductance, surface tension, etc., are known, these generally involve the use of such large quantities of the fluid to be tested that they are impractical for the biologist.

In connection with some as yet unpublished investigations dealing with the specific conductance of the extra-embryonic fluids of the developing chick, the following method was employed. The essential elements of the apparatus are an approved type of alternating current bridge and a special type of conductance cell designed for the measurement of small volumes of fluid. The importance of the type of apparatus used is emphasized and discussed in detail by Jones and Josephs[1] The bridge consists of arms of two matched Ayrton cards (General Radio Co., Cambridge, Mass.) giving an equal-arm, direct-reading bridge. A non-inductively wound resistance box was used (Leeds-Northrup Co. No. 202886). This was equipped with six dials, permitting of measurements to hundredths of an ohm. Connected in parallel with this resistance box was a 45-plate variable air condenser for balancing out the capacitative effects of the conductance cell located in the opposite arm of the bridge. The cell itself will be described below.

The oscillator used was the one specified by Jones and Josephs, and it, together with a three-stage amplifier in the input leads, was encased in a grounded metal filing cabinet drawer, an effective electrostatic shield. Although measurements were possible at frequencies of from 400 to 4,500 cycles, for the sake of convenience a frequency of 1,000 cycles per second was employed.

[1] G. Jones and R. C. Josephs, *Jour. Am. Chem. Soc.*, 50: 1049–1092, 1928.

Inserted between the bridge proper and the telephones was a three-stage amplifier (manufactured by Magnavox). Grounded metal shields separated this piece of apparatus, the resistance box and the variable condenser from the ratio arm of the bridge and from each other. The telephones were grounded in the manner recommended by Jones and Josephs. All the equipment (except the water bath, conductance cell and its leads to the bridge) was placed within a large grounded wire cage, in which the observer stood upon an insulating fiber platform while making readings.

In the designing of the conductance cell, the recommendations of Jones and Bollinger[2] were followed in so far as possible. On account of the small volumes of fluid to be tested, a considerable number of modifications had to be made. It was found necessary to reduce the area of the electrodes and also to shorten the distance between them to permit the measurement of volumes as small as 0.1 cc. The design finally adopted is shown in Fig. 1. A piece of Jena glass tubing, 2 centimeters long and 0.3 centimeter in diameter, was selected for the central portion. The ends were sealed and the filling tubes and tubes for mercury added. The electrodes consist of tight coils of platinum wire, about a square millimeter in area, set a distance of one centimeter apart. The working volume of this cell is approximately 0.07 cubic centimeter. These modifications would theoretically result in an increase in the error due to capacitative shunt, but inasmuch as the liquid under test is run in from one side only, and since it barely fills the central portion of the cell, there will be, at the most, only a thin film of liquid in one filling tube. Whatever small increase this film may produce is easily balanced out by tuning the variable condenser in the opposite arm of the bridge. To control the experimental tem-

[1] C. E. Yarwood, *Jour. Agr. Res.*, 49: 549, 1934.
[2] P. J. Allen and D. R. Goddard, SCIENCE, in press.
[2] G. Jones and G. M. Bollinger, *Jour. Am. Chem. Soc.*, 53: 411–451, 1931.