president of the union and by the chairman and vice-chairman of the Section of Hydrology on the objectives of the section and on the general scientific and national and international aspects and relations of its field. In the following sessions the papers related to consumptive use and return-flow, rainfall and runoff, physics of soil-moisture, dynamics of streams and underground waters. The two sessions of June 22 were held jointly with the Society of American Foresters, and the nine papers presented will be published in the official organ of that Society. The session on the afternoon of June 24 was devoted to attendance at the symposium of the Ecological Society of America on "The Scientific Aspects of the Control of Drifting Soils." The session during the morning of June 25 and the two sessions of June 26 constituted the South Continental Divide Snow-Survey Conference, concluding with a movie film of snow-surveying and a round-table presentation of experiences and problems in snow-surveying.

TRANSACTIONS

The proceedings of both the annual and regional meetings have been edited by the general secretary for publication by the offset method in two volumes of *Transactions,* the first volume being devoted to papers presented at the general assembly and at the meetings of the Sections of Geodesy, Seismology, Meteorology, Terrestrial Magnetism and Electricity, Oceanography and Volcanology. The second volume is devoted to papers and reports submitted before the Section of Hydrology at the eighteenth annual meetings and at the Denver regional meeting. The *Transactions* include 138 papers and reports, either in full or in abstract, presented at the eighteenth annual meetings, and some 35 papers and reports, not elsewhere published, presented during the meetings at Denver of the Section of Hydrology and of the South Continental Divide Snow-Survey Conference.

These annual and regional meetings afford abundant evidence of the vital scientific and economic importance of geophysics. They further point out many new applications and problems of large immediate and potential value. As a pioneer in the dissemination of information regarding American progress in current geophysical research so vital to human activities, the continued publication of the *Transactions* of the union is an important agency—one which serves to emphasize the urgent need of finding additional suitable means of prompt publication.

JNO. A. FLEMING,
General Secretary

SPECIAL ARTICLES

DETERMINATION OF ULTRA-VIOLET LIGHT ABSORPTION BY CERTAIN BACTERIOPHAGES

SEVERAL workers[1, 2, 3, 4] have recorded quantitative data on the ultra-violet light absorption of various organic materials, proteins, amino acids, nucleic acids, etc. Because such data may eventually throw light on the nature of such materials, it seemed desirable to measure the absorption of ultra-violet light by bacteriophage. This preliminary paper reports the findings of such observations.

The bacteriophages employed, C13, C16 and C36, came from Burnet's collection through the courtesy of Dr. C. H. Andrewes. They were prepared in 2 per cent. peptone (Bacto) water with strain No. 229 (Tittsler) of *Escherichia communior.* Bacteriophage C13 was purified by the modification of the Kligler-Olitzki technique previously reported.[5] Certain pertinent characteristics of these bacteriophages are given in Table 1.

TABLE I

CHARACTERISTICS OF BACTERIOPHAGES AND CONTROL MATERIALS

Bacteriophage	Particle size* in mμ	Plaque size* in mm	Filter exponent of Base 10	Mgm nitrogen per 10 cc
C13	15–20	8–12	9	33.5
C36	20–30	2–6	7	33.2
C16	50–75	0.1–1.2	10	32.9
C13 purified		5–8	12	0.2
2 per cent. peptone water				33.8
Non-lytic filtrate .				34.8

* With the exception of the purified bacteriophage, these values are those recorded by Elford and Andrewes, *Brit. Jour. Exp. Path.,* 13 : 446, 1932.

The absorption of ultra-violet light by the preparations of bacteriophage, by the sterile medium and by a filtrate of a young culture of the test organism, was determined by the well-known method of match-point spectrophotometry. Many determinations were made on the same and on different batches of each material that was tested, so that the values reported here represent the averages of not less than five photospectrograms.

The results are recorded in Fig. 1, where the logarithm of the absorption (*i.e.,* the "photographic density") is plotted as a function of wave-length. Although each crude bacteriophage contained practi-

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[1] F. L. Gates, *Jour. Gen. Physiol.,* 17: 797, 1933.

[2] J. R. Loofbourow, *Bull. Basic Sc. Res.,* 5: 13, 33, 46, 1933.

[3] C. Hicks and H. Holden, *Australian Jour. Exp. Biol. and Med. Sc.,* 12: 91, 1934.

[4] C. Coulter, F. Stone and E. Kabat, *Jour. Gen. Physiol.,* 19: 739, 1936.

[5] L. A. Sandholzer, *Jour. Bact.,* 32: 358, 1936.

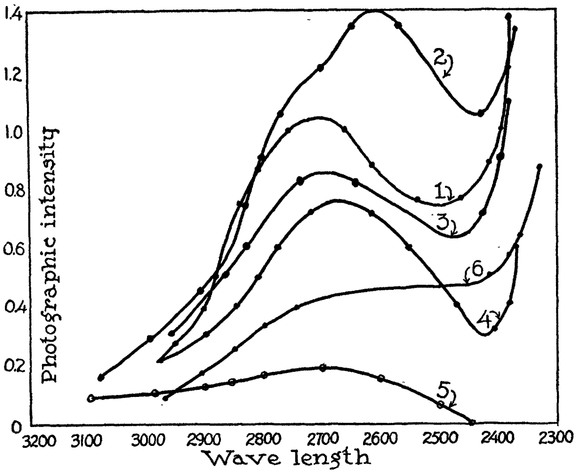

FIG. 1. Absorption of ultra-violet light by bacteriophages and control materials. Bacteriophages were all prepared with *Escherichia communior* grown in 2 per cent. peptone water. (1) Non-lytic filtrate of host organism. (2) Bacteriophage C16. (3) Bacteriophage C36. (4) Bacteriophage C13. (5) Bacteriophage C13 purified by modified Kligler-Olitzki technique. (6) Sterile 2 per cent. peptone water.

cally the same amount of nitrogen and had roughly the same titer, the relative degree of absorption was distinct for each one. All the maxima, however, were found to lie between 2,600–2,700 Å and the minima to fall at about 2,450 Å. The findings suggested that absorption parallels particle size. It will be noted, however, that an exception occurred with the non-lytic filtrate, which fell midway between bacteriophages C16 and C36.

There was significant difference in the quantitative absorption between the crude and purified bacteriophage C13. No change in the wave-length of maximum absorption occurred with the loss of extraneous nitrogenous material.

The determinations with the sterile medium were not entirely satisfactory for technical reasons, but the curve indicates that less ultra-violet was absorbed by it than by the filtrates.

No correlation between the titers of the bacteriophage preparations and their absorption spectra was apparent. Absorption, also, seemed to be independent of nitrogen content, which, with the exception of the purified bacteriophage, was practically constant.

SUMMARY

The absorption of ultra-violet light by three bacteriophages C13, C16 and C36, prepared with a strain of *Escherichia communior* has been determined. Each bacteriophage preparation showed a characteristic absorption curve, when the wave-length was plotted against the photographic density. Crude bacteriophage preparations absorbed more light than one such preparation obtained in a purer state, but the wave-length of maximum absorption remained the same.

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THE CHEMICAL CONSTITUTION OF BENZOYL GLUCURONIC ACID

THE chemical constitution of benzoyl glucuronic acid has been a subject of controversy ever since the compound was first isolated in the form of the sodium salt by Magnus Levy[1] in 1907. The benzoyl derivative of glucuronic acid is excreted in the urine in relatively large quantities when dogs are fed benzoic acid. Conjugation of aromatic acids with glucuronic acid is one of the important detoxicating mechanisms of man and certain mammals. Benzoyl glucuronic acid itself has been studied more extensively perhaps than any of the other conjugated glucuronides, yet its chemical constitution has never been definitely established.

Magnus Levy believed the derivative to be an ester in which the benzoyl radical is attached to the first or aldehydic carbon atom of the uronic acid. This explanation was generally accepted until 1926, when Quick[2] first isolated the conjugated derivative as the free acid. On the basis of certain polarimetric changes which benzoyl glucuronic acid underwent in faintly alkaline solution, or in the presence of sodium cyanide solution, Quick objected to the formula assigned by Magnus Levy and suggested that the compound is a benzoyl ester substituted not on the first, but on one of the remaining carbon atoms of the uronic acid. This postulation has since been questioned by Pryde and Williams[3] who maintain that the structural formula of Magnus Levy is the more probable. The suggestion, however, is not accepted by Quick[4] with the result that the exact constitution of this biologically important substance still remains uncertain.

The preparation of 1 bromo, 2, 3, 4, triacetyl glucuronic acid methyl ester by the author[5] has made possible the laboratory synthesis both of conjugated glucuronides and of other derivatives of glucuronic acid substituted on the first, or aldehydic carbon atom. If, therefore, the naturally occurring benzoyl glucuronic acid is a β ester substituted in position one as supposed by Magnus Levy, the triacetyl methyl ester derivative of the naturally occurring substance should be identical with the synthetic derivative prepared by

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[1] A. Magnus Levy, *Biochem. Zeit.*, 6: 502, 1907.

[2] A. Quick, *Jour. Biol. Chem.*, 69: 549, 1926.

[3] J. Pryde and R. T. Williams, *Biochem., Jour.*, 27: 1210, 1933.

[4] A. Quick., *ibid.*, 28: 403, 1934.

[5] W. F. Goebel and F. H. Babers, *Jour. Biol. Chem.*, 111: 347, 1935.