elsewhere. Photographic copies of it would then be distributed by the B. C. D. exactly as would be done for all other papers. To those requiring full details of the investigation this plan would be of inestimable benefit and to editors of journals it would probably provide a welcome relief from frequent embarrassment.

It may be expected that this curtailment of printed publication would be taken advantage of on an ever-increasing scale and the amount of such unprinted chemical literature eventually would become very great. The cost of distribution in this way would be so much less than by the printed journal that certain of the more theoretical publications could probably be discontinued and many others greatly reduced in size and circulation.

If this plan were put into operation by the American Chemical Society and by similar organizations in other countries the photographic copies of these original unprinted papers would be exchanged by the various Bureaus of Chemical Documentation and thus chemists of all countries would be able to receive copies of them promptly.

Since the pressure of publication in printed journals would be relieved, funds not devoted to that purpose could be diverted to the expansion and improvement of abstract journals. This is especially desirable since it would be principally from these that chemists would gain their knowledge of new work and make out their orders for copies of original papers. The chemical literature needs of a chemist would then be almost completely supplied by his abstract journal and the photographic copies of papers furnished by the B. C. D. Borrowing from and returning journals to libraries would be reduced to such an extent that a considerable saving in service rendered by libraries would result. This is one of perhaps many indirect economies that would result from the wide-spread adoption of a system of photographic reproduction of chemical documents.

If this project should be undertaken by the American Chemical Society it is probable that this service would eventually prove to be the greatest which it renders to our own chemists and those of other nations.

From an international standpoint the Bureaus of Chemical Documentation, established in the various countries, would soon become the centers for the promotion of cooperation in all matters pertaining to chemical publication. Not only would negatives of deposited original unprinted papers be exchanged, but reproductions of occasional and rare documents as well as complete numbers of the current journals. Thus each B. C. D. would rapidly acquire an enormous mass of chemical publications in a compact form and suitable for unlimited reproduction. It would become the most important center of chemical documents in each country.

Such an exchange of material would undoubtedly lead to many other kinds of cooperation. Such details as reference numbering, classification, cataloging, etc., of papers would eventually be reduced to a uniform practise throughout the world. It is even likely that attention would be given to nomenclature, abbreviations, symbols and many other subjects of international concern to chemists.

With the perfection and international adoption of this system of chemical documentation it is reasonable to expect that other branches of science will quickly follow suit. Bureaus of documentation similar to those for chemistry would be organized for other sciences and the same equipment used for the photographic reproduction and the projection of these for reading. Thus the goal described by Mr. Davis would be gradually approached.

It is probable that, owing to the large scale of its production, the cost of the necessary photographic equipment would not be excessive. The perfection of such mechanism is a subject worthy of the intensive study of the foremost apparatus makers of the world. The success of the undertaking depends upon the solution of this initial but largely mechanical problem. There is little doubt that sufficient ingenuity to perfect every detail of the necessary equipment will be forthcoming.

The question of the cost of the operation of such a system of distributing chemical documents should not be a serious one. It is probable that a relatively small proportion of the funds now expended for printing would be sufficient. The resulting economies and advantages to each worker may be expected to be so great that any reasonable expenditure will be largely repaid in the increased productivity of chemists of all nations.

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THE CONTROVERSY CONCERNING THE PHYSIOLOGICAL EFFECT OF TRIHYDROL IN LIQUID WATER

PORTIONS of an article by T. C. Barnes in SCIENCE[1] for May 18, 1934, under the above title might prove somewhat misleading to any one who did not refer to the original literature there cited. It may, therefore, be not inappropriate to set down a few quotations from this article and to add comments.

"Some years ago Baker[2] suggested that association takes place more slowly for liquids than for gases, *i.e.*, water heated at 80° C. for 48 hours (in presence of a catalyst) may exhibit an altered vapor pressure

1 T. C. Barnes, SCIENCE, 79: 455, 1934.
2 Baker, *Jour. Chem. Soc.*, 130: 949, 1927.

which persists for days."[3] In view of more recent work,[4,5] it is very doubtful if any one familiar with the literature would now support Baker in this.

"Menzies expected a greater vapor pressure difference near 0° C. than at 25° C. in spite of the fact that 0° C. is the triple point at which the vapor pressure of ice (almost 100 per cent. trihydrol) and water (37 per cent. trihydrol) are the same (*i.e.*, both 4.579)."[6] What Menzies said[7] was: "In the hope of favoring the persistence of polymerized molecules, the bath in another experiment was maintained at 3.5° C." This hope, not justified by the experimental result, of detecting non-equilibrium values is regarded as not unreasonable by T. C. Barnes himself when he writes: "It is possible that the equilibrium concentration of hydrols in ice water is not instantaneous."

"Menzies previously claimed that water vapor contains no polymers, but this was corrected by Maass and Mennie."[8] These authors state: "It is worth noting that a similar figure is obtained from Menzies' data, if the Clausius-Clapeyron equation be accepted as the more reliable of his methods." As these words indicate, Menzies employed two distinct methods for evaluating the density of water vapor from experimental data taken from the literature. Because the two results were discordant, Menzies drew especial attention to this "notable discrepancy that requires explanation."[9] The excellent work of Maass and Mennie tends to confirm the higher density value (at 73°), and is in harmony with their suggestion of the presence of polymers (dihydrol) to the extent of about one half of one per cent. at this temperature; while the discrepant values computed by Menzies, if averaged, would point to a proportion of polymers negligibly small. In either case, it is difficult to see the relevance of slight association of water in the vapor phase to the present discussion.

There is no *a priori* reason why the positive results by the biological method reported by Barnes may not be correct, for the biological method can be incomparably more sensitive than many of the physical methods. Those of us who have used physical methods with negative results are obliged to report them as they are, although positive results would doubtless have had greater interest because of their very abnormality.

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[3] T. C. Barnes, *loc. cit.*
[4] West and Menzies, *Jour. Phys. Chem.*, 33: 1893, 1929.
[5] Wright and Menzies, *Jour. Am. Chem. Soc.*, 52: 4699, 1930.
[6] T. C. Barnes, *loc. cit.*
[7] Menzies, *Jour. Am. Chem. Soc.*, 43: 851, 1921.
[8] Maass and Mennie, *Proc. Roy. Soc.*, 110A: 198, 1926.
[9] Menzies, *loc. cit.*

LINES OF NEUTRAL SULFUR IN PROCYON

IN connection with the recent paper on S I in the spectrum of the sun by Miss Moore and Babcock[1] the following results obtained from measurements of stellar spectra may be of interest. Three lines measured in Procyon at λλ 6743.52, 6748.69 and 6757.25 can be satisfactorily identified with laboratory lines of neutral sulfur. The first is barely visible, but the other two are quite definite.

Through the kindness of Dr. Morgan, I have been able to examine a three-prism spectrogram of the same star in the ordinary photographic region. Three stellar lines agree with the laboratory lines of sulfur at λλ 4694.13, 4695.45 and 4696.25. These three lines were also measured by Dunham[2] in α Persei but were not identified by him.

The three red lines observed in Procyon are definitely absent in Arcturus, Aldebaran and Betelgeuze, nor can they be seen with certainty on my plates of the sun. However, Miss Moore and Babcock have shown that they are actually faintly present in the sun. This behavior of the lines is entirely consistent with their excitation potential of 7.8 volts.

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ADDITIONAL TRIASSIC DINOSAUR TRACKS FROM PENNSYLVANIA

LAST year W. O. Hickok and the writer reported an occurrence of dinosaur foot tracks in the Triassic red beds near Yocumtown, Pennsylvania.[1] Two species, each belonging to a different genus, were identified. These are *Anchisauripus sillimani* (E. Hitchcock) and *Grallator tenuis* E. Hitchcock. Two additional discoveries have subsequently been made. These are significant because, first, they are new localities for a kind of fossil comparatively rare in Pennsylvania; and, second, they extend the known geologic range of Triassic dinosaurs in the state.

The Triassic of south-central Pennsylvania consists of two formations with subdivisions, thus:

Newark Group (Upper Triassic)	
Gettysburg formation	16,000 feet
Arendtville fanglomerate	
Heidlersburg member	
Lower shales	
New Oxford formation	7,000 "

These beds are more or less closely equivalent to the type Newark series of New Jersey. The Yocumtown tracks came from a zone near the middle of the Gettysburg formation in beds of alternating red shale and sandstone. More precisely they may be thought

[1] *Astrophysical Journal*, 79: 492, 1934.
[2] Contributions from the Princeton University Observatory, No. 9, 1929.
[1] W. O. Hickok and Bradford Willard, "Dinosaur Foot Tracks near Yocumtown, York County, Pennsylvania." *Proceedings, Penna. Acad. Sci.*, Vol. vii, pp. 55–58, 1933.