these methods have run to such fantastic figures as over $3,000.00 per gallon. It has been reported that a batch of several hundred gallons of triptane was produced within the past two years for experimental purposes at a reported figure of $40.00 per gallon. Even if the cost did not preclude the use of triptane for war purposes, the consumption of critical materials needed to produce it by previously known methods would not justify its production.

The authors, working with materials at hand and available in quantity, made the discovery which makes possible the commercial production of this fuel. They, together with the technical staff of the Universal Oil Products Company, made possible the production of triptane at an estimated selling price of less than $1.00 per gallon.

The process consists of two steps. The second step of the process involves the formation of triptane from a selected charging stock produced in the first step. Based on the material charged to the second step, liquid recoveries of over 90 per cent. are obtained of which over 50 per cent. is triptane.

The process, when operated to make the largest quantity of triptane available as a blending agent, yields two other valuable hydrocarbons, in themselves of great value in aviation blends. These hydrocarbons, 2,3-dimethylbutane and 2,3-dimethylpentane, are superior to alkylate as blending agents for aviation gasoline.

Table 1 gives the physical properties of individual hydrocarbons produced by this process:

TABLE 1

Compound	B.P., °C.	M.P., °C.	Refractive index. nD^{20}	Specific gravity
2,3-dimethylbutane ..	58.0	−128.8	1.3750	0.6620
2,2,3-trimethylbutane . (triptane)	80.8	− 25.0	1.3894	0.6901
2,3-dimethylpentane ..	89.7	....	1.3920	0.6944

The relatively high freezing point of pure triptane does not preclude its use in aviation fuels. Blends containing up to about 85 per cent. triptane do not freeze above −78° C. (−108° F.).

The product of the reaction is saturated and free of impurities so that no additional refining treatment is necessary to permit its use in aviation fuels. The process has been operated to date for 300 hours in a pilot plant with no indication of decline of catalyst activity.

No new or unusual materials are needed for the reaction or process. The raw materials are condensable gases produced in petroleum refineries as by-products of catalytic and non-catalytic cracking or reforming of petroleum oils. The catalysts are readily available in large quantities. No special equipment or materials used in the process plant are necessary other than regular equipment employed in refineries. The temperatures and pressures employed are well within refinery experience.

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CONCERNING TRANSLATIONS OF GEOLOGICAL TEXTS FOR SOUTH AMERICAN STUDENTS

IN a recent issue of SCIENCE (September 3) there is a letter concerning the translation of American textbooks of geology for use in South America. It would be very fine to have two or three with which I am well acquainted translated, but I would make the suggestion that, if this were done, illustrations from South America be included. That means that some one from one of the South American universities should work in collaboration with the translator.

I also wish to call the attention of those who might be interested in this subject to the fact that there is a very excellent two-volume work on the geology of Argentina by Windhausen, in Spanish. I consider this an excellent book, and I doubt if the people in Argentina would prefer a translation of a North American text to this one.

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SCIENTIFIC BOOKS

CHEMICAL SPECTROSCOPY

Chemical Spectroscopy. By PROFESSOR WALLACE R. BRODE. Second edition. xi + 677 pp. Illustrated. New York: John Wiley & Sons. $6.50.

THE second edition of this book closely follows the general plan of the first. All phases of spectroscopy are considered, as the chapter headings show. The illustrations are very numerous, and some which were indistinct in the first edition are now very satisfactory; *e.g.*, Fig. 3.35, p. 64; Fig. 4.2, p. 71; Fig. 4.7, p. 86. Some of the photographs of apparatus, too, are clearer.

The valuable lists of references have been brought up to date; it is interesting that a total list of 259 references in the first edition is now expanded to 415.

The book will be of particular use to the practical man, and to him it can be warmly recommended. Theoretical discussions are less happily dealt with, however. At the opening of the chapter on "Resonance and Chemical Structure," a preliminary discussion of resonance is given which can convey but very little to those unacquainted with the subject, since no adequate definition or description of resonance is given. After a digression in which the electronic theory of valency is reviewed, a definition of resonance is provided which is open to serious objections.

It is implied—particularly in the use of the expression "equilibrium mixture"—that distinct molecular species corresponding to the extreme electronic formulae of resonating compounds are capable of independent existence.

The word resonance undoubtedly suggests some kind of rapid oscillation or vibration to many people. Nevertheless, no such change, quick or slow, is actually present, and a resonating compound is not a mixture. It seems unfortunate to add to the confusion by using the word "vibrator" (p. 259) for a part of a molecule which is capable of resonance.

The reader is cautioned aginst confusing resonance with tautomerism (p. 137), yet a typical tautomeric equilibrium is given in Fig. 6.11c (p. 143) as an example of resonance. Similar confusion is reflected in Fig. 8.41. In Fig. 6.11c, too, the equation purporting to show resonance within the molecule of quinone is obviously incorrect; the dipolar structure shown has two positive charges.

The relationship implied by the caption for Fig. 9.29 is at variance with the text. If the unsymmetrical dye shows a deviation in λ max., it would absorb at some shorter wave-length than the mean of the values of λ max. of the related symmetrical dyes, whereas the caption is so worded that the unsymmetrical dye appears to absorb at *longer* wave-length than either of the symmetrical dyes. Actually none of these curves is that of a dye which contains a thiazole ring; they are the spectra of 1,1′-diethyl-2,2′-, 2,4′- and 4,4′-carbocyanine iodides, taken in the order A, B, C. Incidentally, the term "degeneracy" is used in Fig. 9.30 where "deviation" is meant.

Aside from these criticisms, however, this volume contains such a wealth of material that it may confidently be expected to appeal to a wide circle of readers.

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TEMPERATURE

Temperature Measurement. By ROBERT L. WEBER. Frontisp., x + 171 + 6 pp.; 3 pls. Ann Arbor, Mich.: Edwards Brothers, Inc. $2.50. 1941.

THE scope of the book is considerably broader than the title indicates; it might better have been called "Heat Measurements." There are chapters on heat transfer, radiation, calorimetry, thermal analysis and elementary thermodynamics. From the outside reader's point of view this is a defect, for none of these subjects can be treated in such brief chapters in more than a very condensed and—for the elementary student—inadequate way. On the other hand, the author, who is on the teaching staff of the School of Chemistry and Physics of Pennsylvania State College, may have found that his students were not getting, from other physics courses, a point of view or insight that he wished them to have on some of these subjects, and may have inserted them for local and practical reasons. Thirty pages are devoted to laboratory experiments intended for instruction.

The chapters that do hew to the line cover expansion thermometry, resistance thermometry, thermo-electric pyrometry, radiation (including optical) pyrometry, special methods of temperature measurement, measurement of extreme temperatures, the International Scale, temperature recorders and temperature control. The chapter on control, six pages long, can hardly do more than tell the student that there is such a thing as automatic control and hint at its complexity. It is a subject still badly in need of a good write-up.

The job of offset printing from typescript copy is quite satisfactory with the exception of illustrations of the half-tone variety, which are not well adapted to this method of reproduction.

This looks like a book that will be useful to any teacher or student concerned with measurements of energy and temperature.

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SPECIAL ARTICLES

DESTHIOBIOTIN[1]

DURING the work leading to the proof of structure of biotin,[2] a procedure devised for the hydrogenolysis of organic sulfides[3] was applied to biotin methyl ester.[4] The resulting product was named *desthiobiotin* methyl ester, and was formed from biotin methyl ester by the replacement of the sulfur atom in the molecule

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[1] The authors wish to thank Dr. R. T. Major and the Research Staff of Merck and Company, Incorporated, for supplies of biotin. The authors also wish to express their appreciation to Dr. J. R. Rachele and R. C. Funk, Jr., for the microanalyses, and to Miss Carol Tompkins and Mrs. Glenn Ellis for technical assistance in the bioassays.

[2] V. du Vigneaud, SCIENCE, 96: 455, 1942.

[3] R. Mozingo, D. E. Wolf, S. A. Harris, and K. Folkers, *Jour. Am. Chem. Soc.*, 65: 1013, 1943.

[4] V. du Vigneaud, D. B. Melville, K. Folkers, D. E. Wolf, R. Mozingo, J. C. Keresztesy and S. A. Harris, *Jour. Biol. Chem.*, 146: 475, 1942.