The reviewer encounters a degree of difficulty in formulating a systematic evaluation of the subjects included in Yerkes's volume, because the diversity of subject-matter does not lend itself to such treatment. However, the bulk of the research is concerned with the behavior endowment of the chimpanzee, and represents a selection from studies originally reported in monograph form.

The choice of any special group of experiments for special mention merely represents the interests of the reviewer. To him, the symbolic behavior described in the chapter on "Language and Symbolism" is of special value because of its close resemblance to the same type of behavior in humans. These experiments deal with the chimpanzees' ability to use tokens in problem solving.

The book is full of useful information for the practical caretaker of the chimpanzee as well as for the research man. It will, in fact, have a wide appeal even for those engaged in other fields. The specialists in the areas treated will find helpful summaries and useful comments on some of their problems. Any one interested in a book on animal life, written primarily from the personal experience of a man who has spent his professional career in the laboratory, will find it both illuminating and entertaining because of its diversity of scientific interests. The general reader will discover much that is both informative and intrinsically interesting in this volume. There are a number of episodes concerning the relations of the chimps with the caretakers and experimenters which indeed make entertaining reading.

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ORGANIC CHEMISTRY

Organic Reactions. Vol. II. ROGER ADAMS, editor-in-chief; WERNER E. BACHMANN, LOUIS F. FIESER, JOHN R. JOHNSON and H. R. SNYDER. Pp. iv + 461. New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd. 1944. Price, $4.50.

IN the October 2, 1942, issue of SCIENCE, p. 319, Vol. I of this series was reviewed and attention called to the announced intention of its editorial board to issue additional volumes from time to time. This volume thus appears in fulfilment of that promise and will receive the same warm welcome accorded its predecessor, for it too will be of great value to all students and investigators in the very extensive field of synthetic organic chemistry.

The ten chapters included, with their authors and number of pages, are as follows: (1) Claisen Rearrangement (48 pp., D. Stanley Tarbell); (2) Preparation of Aliphatic Fluorine Compounds (45 pp., Albert L. Henne); (3) Cannizzaro Reaction (45 pp., T. A. Geissman); (4) Formation of Cyclic Ketones by Intramolecular Acylation (20 pp., William S. Johnson); (5) Reduction with Aluminum Alkoxides (The Meerwein-Ponndorf-Verley Reduction) (64 pp., A. L. Wilds); (6) Preparation of Unsymmetrical Biaryls by the Diazo Reaction and the Nitrosoacetylamine Reaction (46 pp., Werner E. Bachmann and Roger A. Hoffman); (7) Replacement of the Aromatic Primary Amino Group by Hydrogen (38 pp., Nathan Kornblum); (8) Periodic Acid Oxidation (79 pp., Ernest L. Jackson); (9) Resolution of Alcohols (35 pp., A. W. Ingersoll); (10) Preparation of Aromatic Arsonic and Arsinic Acids by the Bart, Bechamp, and Rosenmund Reactions (39 pp., Cliff S. Hamilton and Jack F. Morgan). The same admirable organization of the subject-matter of each chapter is followed as in Vol. I, with tables of contents, detailed lists of compounds to which the particular reaction has been applied and extensive references to the pertinent literature. In format, paper, binding and typography, it likewise resembles Vol. I.

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SPECIAL ARTICLES

ABNORMAL ALPHA KETOSTEROID EXCRETION IN PATIENTS WITH NEOPLASTIC DISEASE*

PREVIOUSLY reported results of studies made in this laboratory of the 17-ketosteroids extracted from individual urine collections of normal persons and those with leukemia, cancer, adrenal dysfunction and pregnancy, have demonstrated the marked variability in the nature and amounts of the substances excreted and have emphasized the importance of securing as full and detailed information as possible concerning the individual components.[1,2,3,4] In these investigations

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[1] K. Dobriner, E. Gordon, C. P. Rhoads, S. Lieberman and L. F. Fieser, SCIENCE, 95: 534, 1942.

[2] C. P. Rhoads, K. Dobriner, E. Gordon, L. F. Fieser and S. Lieberman, *Trans. Assoc. Am. Phys.*, lvii: 203, 1942.

[3] K. Dobriner, third meeting, Conference on metabolic aspects of convalescence including bone and wound healing, Josiah Macy Jr. Foundation, 184, 1943. (Limited distribution).

[4] S. Lieberman, B. R. Hill, L. F. Fieser, K. Dobriner, H. C. Taylor, Jr., and C. P. Rhoads, *Abstracts*, 107th Meeting, Am. Chem. Soc., Cleveland, April, 1944.

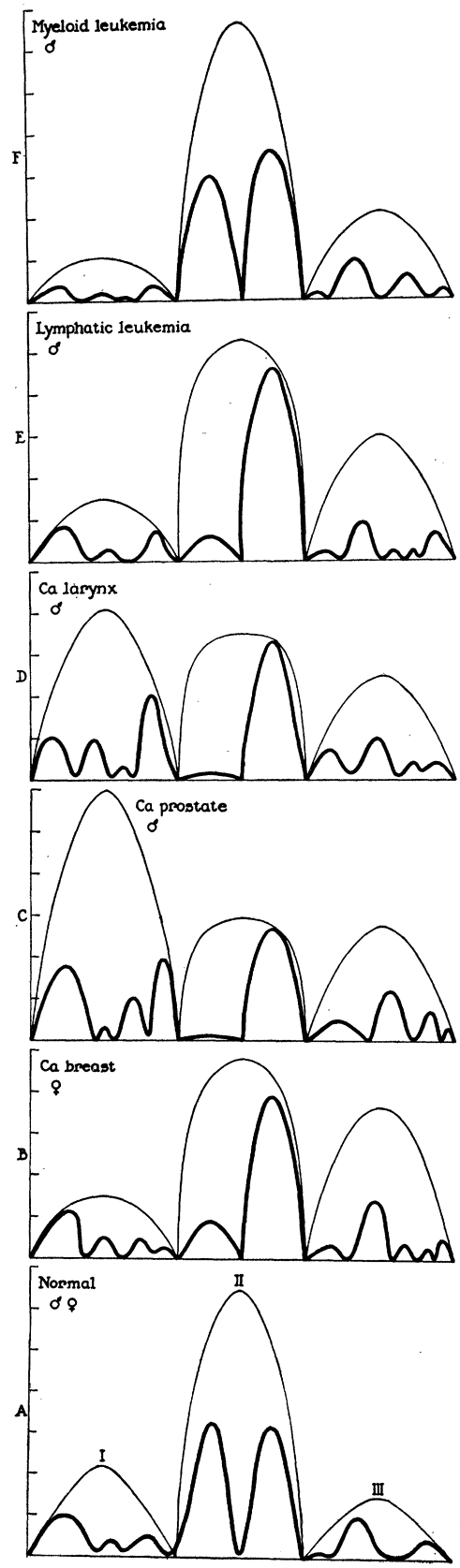
the alpha ketosteroid fraction of each urine has been fractionated systematically by extensive chromatographic adsorption analysis and the various crystalline products encountered have been purified and

TABLE I

Urinary Alpha Ketosteroids

	Name or Melting Point of Compound	Formula	Group
	248 - 252		
	CHLORODEHYDROISOANDROSTERONE	$C_{19}H_{27}OCl$	
*	$\Delta^{3,5}$-ANDROSTADIENONE-17	$C_{19}H_{26}O$	
	135 - 136		
*	Δ^{3}-ANDROSTENONE-17	$C_{19}H_{28}O$	
	ALLOPREGNANDIONE-3,20	$C_{21}H_{32}O_2$	
*	117 - 118	$C_{21}H_{32}O_3$	
*	176 - 178	$C_{21}H_{32}O_3$	I
*	132 - 134		
	117 - 121		
	ALLOPREGNANOL-3α,ONE-20	$C_{21}H_{34}O_2$	
	PREGNANOL-3α,ONE-20	$C_{21}H_{34}O_2$	
	105 - 108		
	120 - 125		
*	ANDROSTERONE	$C_{19}H_{30}O_2$	
*	AETIOCHOLANOLONE	$C_{19}H_{30}O_2$	II
	145 - 148	$C_{21}H_{34}O_2$	
	174 - 175	$C_{21}H_{32}O_3$	
*	188 - 189		
	235 - 237		
	185 - 186	$C_{21}H_{34}O_3$	
	199 - 200	$C_{21}H_{32}O_3$	III
	195 - 196	$C_{21}H_{34}O_3$	
	192 - 194	$C_{21}H_{34}O_3$	
	210 - 212	$C_{21}H_{34}O_3$	
	230 - 233		
	238 - 241		
	201 - 204		
	172 - 176		

characterized as fully as possible. The apparently homogeneous substances thus far isolated are listed in Table 1 in the order in which they are eluted. They are divided arbitrarily into 3 groups. The "early" or first group, consists of all the compounds which are eluted from an aluminum oxide chromatogram



before androsterone. The "middle," or second group, is made up of androsterone and aetiocholanolone; and the "late," or third group, includes all the compounds eluted after aetiocholanolone. Those substances which are obtained regularly from the urine of normal subjects are indicated by asterisks.

The total amounts of alpha ketosteroids present in each of these groups and also the amounts of the individual components were measured by the Callow procedure based upon the Zimmermann color reaction. The results of the assays are represented graphically by the curves in the figure. The amounts of segregated fractions, expressed as the percentage of the total alpha ketosteroid content, are plotted on the ordinates. On the abscissae the principal substances listed in Table 1 are indicated from left to right in the order of their elution.

The percentage of the total alpha ketosteroid fraction made up by the compounds of the first or early group (I) is indicated by the height of the first peak of the light line; the parts represented by the middle (II) and late (III) fractions by the heights of the second and third peaks. The heavy-lined curves within each group represent the amounts of the individual components of that group.

A pattern of the alpha ketosteroid distribution in the urine of a normal person is given in the figure—A. Similar patterns were obtained from 5 normal men and 5 normal women. The curves resemble each other closely and differ only in minor details. The ratio of androsterone to aetiocholanolone (represented in the patterns as the two large, heavy-lined peaks in the middle group) is about 1:1 except in the case of older individuals.

The figure includes the patterns obtained from individual patients with lymphatic leukemia (E) and cancer (B, C, D). They are abnormal. A similarity is apparent between pattern E (lymphatic leukemia) and those from the patients with cancer. Pattern F obtained from a patient with myeloid leukemia shows only minor differences from the normal. The abnormality of the ketosteroid excretion by patients with cancer has been confirmed by the isolation from their urine of compounds so far not obtained from normal individuals or those with the non-neoplastic disorders investigated.

At present no conclusions can be drawn as to whether the abnormalities are specific for the particular disorders studied. The results indicate an abnormal function of the gonads, the adrenals or both, or possibly a disturbed metabolism of the products of these organs. A dysfunction of the adrenal cortex is suggested by the relatively large amounts of material isolated in the late or third fraction. In this fraction are found the highly oxygenated compounds which are assumed to be metabolites of the adrenal cortical hormones.

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THE NATURE OF MYASTHENIA GRAVIS[1]

IN a recent communication Torda and Wolff[2] reported that the formation of acethylcholine (ACh) from incubated frog brain was significantly reduced in the presence of serum of patients with myasthenia gravis. They concluded from this finding that the defect in ACh synthesis in patients with myasthenia gravis probably explains the fatiguability and weakness of the patients.

A possible correlation between the thymus and myasthenia gravis is suggested by the frequent finding of thymic tumors in these patients. Recently it has been shown by Harvey and co-workers[3] that thymectomy in patients with myasthenia gravis eliminates certain differences between these patients and other individuals in the electro-myographic response to intra-arterial prostigmine injections.

On suggestion of Dr. Otto Loewi the synthesis of ACh from minced brain (after Quastel[4]) has been studied in the presence of thymic tissue obtained from a patient who died from myasthenia gravis and in the presence of serum from patients with myasthenia gravis.

Experiments: In order to be able to run controls from the brain of the same animal, rat brain (because of its larger size) seemed to us more suitable than frog brain. Fresh rat brain was minced in eserine Locke solution and the suspension divided with the pipette into four equal portions. Ground pieces of thymoma tissue were added to half of the samples. One sample with and one without thymoma was extracted immediately with hydrochloric acid, the other two were incubated at 37° and extracted after three hours. The total ACh contents of all the samples were then estimated on the frog rectus muscle.

In an attempt to confirm Torda and Wolff's findings rat brain was also incubated in the manner described above in the presence of serum of six patients with myasthenia gravis and in the presence of serum from

[1] From the Department of Pathology, Columbia University, College of Physicians and Surgeons, New York City.
[2] Torda and Wolff, SCIENCE, 98: 225, 1943.
[3] Harvey, Lilienthal and Talbot, *Jour. Clin. Invest.*, 21: 579, 1942.
[4] Quastel, Teemenbaum and Wheatly, *Biochem. Jour.*, 30: 1668, 1937.