Acheulean implements, but was made after the formation of the concretionary limestone ('steppe-lime') of Bed 5, that is, is post-Aurignacian.

The samples are being kept for reference in the British Museum (Natural History), South Kensington.

P. G. H. BOSWELL.

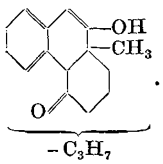
Department of Geology,
Imperial College of Science and Technology,
London, S.W.7, July 29.

[1] NATURE, **129**, 721, May 14, 1932.

Chemical Constitution of the Follicular and Testicular Hormones

Follicular Hormone

IN a paper published recently by Butenandt and his co-workers,[1] the hypothetical formula (I) was developed for the follicle hormone.



. . . . . (I)

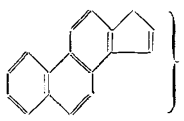
This formula attempted to correlate the X-ray measurements of J. D. Bernal,[2] which made a three-ring system for the hormone probable, with the chemical evidence at that time in hand.

A series of new experiments up to the present have not substantiated formula I, but indicate that in the hormone molecule there are only three aromatic double bonds (a benzene ring) present, that is to say, four rings altogether.

(1) Even by most energetic catalytic hydrogenation, only three double bonds are saturated in the hormone and hormone hydrate molecule. The following derivatives were prepared: Hexa-hydro-hormone-hydrate $C_{18}H_{27}-(OH)_3$ (F.P. 256°), Hexa-hydro-desoxy-hormone-hydrate $C_{18}H_{28}-(OH)_2$ (F.P. 153°), Hexa-hydro-desoxo-hormone $C_{18}H_{29}.OH$ (F.P. 105°). All three alcohols react as completely saturated substances. The hexa-hydro-hormone-hydrate, which was the product most fully investigated, is completely stable towards potassium permanganate, perbenzoic acid, and ozone. As in the case of the other alcohols, it gives no reaction with tetranitromethane.

(2) Careful *molecular refraction measurements* of the hormone hydrate, its acetate, and its methyl ether, as well as of the desoxo-follicle hormone, $C_{18}H_{23}.OH$ (F.P. 133°), give values which completely agree among themselves, and are only compatible with a hormone formula containing three isolated double bonds or one benzene ring. These results are of especial interest, because hormone formula (I) demands increments not only for four double bonds, but also a marked exaltation due to the conjugation of the enolic double bond to the benzene ring.

(3) *Attempts at dehydrogenation* with electrolytic zinc dust produced an aromatic hydrocarbon (F.P. 234°), which is perfectly stable towards potassium permanganate, and, according to the analyses and molecular weight determinations to date, has the formula either $C_{18}H_{14}$ or $C_{17}H_{14}$. This formula points to the existence of four rings (for example, three benzene rings and one five-membered ring).



. . (II)

Inasmuch as a zinc dust distillation should be applied only with the greatest caution to a structural determination, these results are given only as contributory evidence pointing to the existence of a four-ring structure in the hormone molecule.

The discrepancies of these results with the measurements of Bernal[2] and with the 'enolic nature' of one of the three aromatic double bonds[3] must be fully investigated before a decision can be reached regarding the basic skeletal system.[4] The similarity of formula II to the new formula recently suggested by Wieland and Windaus[5] for the sterols, bile acids, and pregnandiol, indicates the possibility that the hormone is closely related to these compounds.

Testicular Hormone

During the past year, four different crystalline products have been isolated from the oily fraction of human male urine which is highly active in the cock's comb test as well as on the vesicular glands of rodents.[6] These products are at present being investigated. The tentative results, which have been carried out on extremely small amounts of substance, give the following picture, the details of which must all be confirmed:

(1) Substance, $C_{18}H_{28}.(OH)_2$, F.P. 232°, isomeric with hexa-hydro-desoxy-follicle-hormone-hydrate; $\alpha = +16{\cdot}6°$; acetate F.P. 112°.

(2) Oxy-ketone, $C_{18}H_{30}O_2$ or $C_{17}H_{28}O_2$, F.P. 163°, $\alpha_D = +76°$, oxime F.P. 216°.

(3) Oxy-ketone, $C_{16}H_{26}O_2$ (?), F.P. 176·5°, $\alpha_D = +89{\cdot}9°$, acetate F.P. 158°, oxime F.P. 215°.

(4) Oxy-ketone, $C_{16}H_{26}O_2$ (?), F.P. 178°, acetate F.P. 160°.

Only the last-mentioned oxy-ketone, F.P. 178°, produces high physiological activity in the smallest doses in the capon test, and is to be considered as the hormone producing comb growth. A total of 1·1·2 γ given in four doses within two days produces a growth effect up to 30-35 per cent in the area.

The remaining crystalline products appear to be completely inactive as regards growth of the comb when they are absolutely pure, even in doses 600 times as strong (detectable activity in the larger doses might be due to traces of the hormone). The physiological activity of the crystals on the genital tract of rodents is at present being investigated.

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[1] *Z. physiol. Chem.*, **208**, 149; 1932.
[2] *Chemistry and Industry*, **51**, No. 12; 1932.
[3] *Z. physiol. Chem.*, **208**, 153; 1932.
[4] Marrian and Haslewood (*Lancet*, Aug. 6) have just put forward evidence which also shows that only three double bonds are present in the molecule. They also suggest a four-ring structure.
[5] Several papers in press by Wieland and by Windaus.
[6] *Z. angew. Chem.*, **44**, 905; 1931.

Gill-Morrell and Barkhausen-Kurz Oscillations

MR. R. COCKBURN has shown that with one vacuum tube he obtained by means of the Barkhausen-Kurz method electromagnetic oscillations of two kinds.[1] These oscillations differed one from the other by the dependence of their wave-length on the length of the oscillating circuit connected with the tube. One of these oscillations he referred to as the *GM*-type and to the other one as the *BK*-type.

The oscillations with similar dependence of the wave-lengths on the length of oscillating circuits as described by Mr. Cockburn were obtained by us several times with different vacuum tubes. These oscillations we obtained by means of a generator of our usual construction[2] which had oscillating circuits in the plate and in the grid circuits of the tube. The oscillations obtained by us, and similar to those referred to by Mr. Cockburn as the *GM*-type, corre-

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