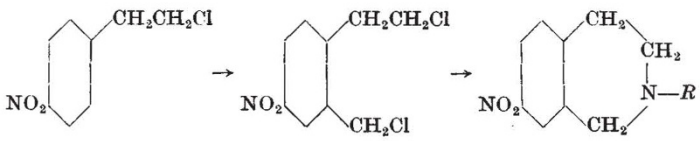
this has apparently been the only known method for the synthesis of 2-aryl-*iso*-quinolines of type (II), it has one serious disadvantage, namely, that for various reasons it does not lend itself to the preparation of *iso*-quinolines of this type having substituent groups in the benzene ring. The presence of such groups may be essential if the tetrahydro-*iso*-quinoline is to possess marked physiological action. To overcome this difficulty we have developed the following synthesis.



III IV V

2-Phenyl-ethyl chloride on nitration affords *p*-nitrophenyl-ethyl chloride[2] (III), which we find undergoes ready chloromethylation to the crystalline 5-nitro-2(2-chloroethyl)-benzyl chloride (IV). We have condensed this compound with several primary amines to obtain in each case the corresponding 7-nitro-2-aryl-1 : 2 : 3 : 4-tetrahydro-*iso*-quinoline (V). These *iso*-quinolines have in turn been converted to their 7-amino, 7-acetamido and other derivatives. The preparation of the dichloride (IV) is much simpler than that of the dibromide (I), and thus affords a ready route to these 7-substituted-*iso*-quinoline derivatives.

2-Phenyl-ethyl bromide can be similarly nitrated and then bromomethylated to form 5-nitro-2(2-bromoethyl)-benzyl bromide, which also readily gives the above cyclization with primary amines.

We are now investigating the synthesis of the phosphorus and arsenic analogues of compounds of type (V).

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[1] Holliman and Mann, *J. Chem. Soc.*, 34 (1945).
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Tryptochrome : a Pigment Derived from Tryptophan

When 5 ml. of a very dilute (*c.* 0·05 per cent) solution of tryptophan in 60–80 per cent acetic acid is treated with a drop of 1 per cent aqueous potassium iodate, and warmed to boiling, a violet-pink colour develops, and an intense greenish-orange fluorescence. On dilution with two volumes of water, the pigment gradually separates, and can be extracted with *iso*butyl alcohol or with chloroform, in which solvent it shows a strong absorption band at λ 565–555 mμ, and a weak band at λ 520–515 mμ. Pigment formation requires a large excess of acetic acid, otherwise the mixture turns brown, and an iodotryptophan is precipitated, from which the pigment cannot be generated. The pigment is stable in acid solution, and both tint and fluorescence survive exposure to air and light for months.

The iodate can be replaced by hypochlorite bromate, or free bromine; but the pigment is less pure, and is very easily destroyed by a slight excess of the reagent. Chlorate, peroxide, persulphate, perborate, manganese dioxide, ferricyanide and ferric iron are ineffective for colour production.

The name 'tryptochrome' is suggested for the pigment, since it closely resembles, and may be identical with, the pigment formed in the well-known protein-ochrome reaction, obtained when tryptophan or a trypsin digest of protein is treated with bromine water, and extracted with amyl alcohol. The tryptochrome test will show free tryptophan in dilutions down to about 1 in 100,000. None of the other common amino-acids gives the reaction. On prolonged boiling with sufficient iodate, indole forms a mixture of pigments, including what appear to be indirubin and isatin; but the conditions are much more drastic than those required for tryptochrome, and persulphate is more effective than iodate. Addition of iodate to a faintly acid solution of adrenaline leads to formation at room temperature of an iodoadrenochrome[1]. Under such conditions, tryptophan gives no colour. Adrenochrome closely resembles tryptochrome in tint, but neither it nor indirubin shows the orange fluorescence characteristic of tryptochrome.

Structure of tryptochrome. (1) Analysis of the product crystallized from a mixture of chloroform and light petroleum gives the percentage composition : C, 69·9; H, 4·6; N, 13·9, corresponding to the formula $C_{17}H_{14}O_2N_3$. (2) The reaction requires the free α-amino-group of the tryptophan. It is not given by unhydrolysed proteins, or by β-indolepropionic acid, or by tryptophan after treatment with nitrous acid or formaldehyde. (3) The reaction requires an unsubstituted α-carbon in the pyrrole ring. (4) Reduction in acetic acid by magnesium or zinc yields a leuco-product that gives no catechol reaction with molybdate or phenolic reaction with iron. The leuco-product slowly reoxidizes to tryptochrome on aeration. Hence it is concluded that tryptochrome, unlike adrenochrome, is not a quinone.

The evidence now obtained suggests that tryptochrome is an indirubinoid derivative.

The preparation and properties of tryptochrome are being investigated in the Chemical Department of this University by Mr. W. A. Boggust, aided by a grant from the Medical Research Council of Ireland. I am very grateful to Prof. Wesley Cocker for these facilities and for the interest he has taken in the work.

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Alkaline Phosphatase and Tumour Inhibition

In the course of bioassays of extracts of normal male urine[1,2] for tumour-inhibiting properties, we have investigated their effect on alkaline phosphatase present in certain tumours by Gomori's histological technique. Similar examinations were carried out using other tumour-inhibitory substances, namely, stilbœstrol[3] and colchicine[4,5].

For the purpose of denoting the quantity of alkaline phosphatase in the tissues under investigation, we have used mouse kidney tissue as a comparative standard. All tissues, treated and untreated tumours and kidney, were incubated in the same jar and their further treatment carried out under identical condi-