C—C bonds in the initial state. This view is to some extent supported by the results of de Kreuz⁷ on the dipole moments of organic nitrates. Such a barrier between two nitrate groups should largely disappear in the transition state when one O—N bond is broken, thereby resulting in an appreciable positive entropy of activation.

In the present work it has been shown that the order of stabilities of O—N bonds in the alkyl nitrates is methyl > ethyl > *n*-propyl. This can be explained on the basis of reduction of the O—N bond-energy by the extra resonance-energy of the $RCH_2O\cdot$ radical due to a hyperconjugation effect similar to that postulated by Polanyi and Butler⁸ for the alkyl halides. Thus the $CH_3CH_2O\cdot$ radical has the extra resonance forms

the α -form being more probable than the three extra resonance forms in the corresponding $CH_3O\cdot$ radical because of the difference between the C—C and C—H bond energies. Further structural effects observed by me, for example, the de-stabilizing effect of a second nitrate group and of electro-negative groups, can similarly be explained.

Details of this work, which was carried out during 1941–45, will be published elsewhere together with results of more work now in progress in this field.

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¹ Unpublished work (Scientific Advisory Council Reports).

² Unpublished work (Scientific Advisory Council Reports).

³ Unpublished work (C.R.D.D. Report, Ministry of Supply).

⁴ *Acta Phys. Chem. U.S.S.R.*, 655 (1936).

⁵ *Vide* Roginski, *Phys. Z. Sowjet Union*, 1 (1932).

⁶ "The Theory of Rate Processes", 295.

⁷ *Rec. Trav. Chim.*, 61, 819 (1942).

⁸ *Trans. Farad. Soc.*, 39, 19 (1943).

Reduction of Aniline in Ammonia

IN a recent paper by Watt, Knowles and Morgan¹ on the course of reduction in liquid ammonia the following statement is made: "In view of the results reported by Wooster² it is surprising that reduction of nitrobenzene by the sodium-methanol combination yielded aniline and not dihydroaniline—". Unpublished work by me has shown that aniline is reduced by sodium and methanol in liquid ammonia, as would be expected by analogy with the reduction of dimethylaniline³, which Watt, Knowles and Morgan do not mention. If the reduction is carried out rapidly, the product is a dihydroaniline, probably the 2:5-, since acid hydrolysis leads to cyclohexenone. Slow reduction, however, gives chiefly a tetrahydroaniline, probably the 1:2:5:6-; 3:5-dinitrobenzoyl derivative, m.p. 198° (found: C, 53.3; H, 4.6. $C_{13}H_{13}O_5N_3$ requires C, 53.6; H, 4.5 per cent). Its melting point

is depressed by admixture with the derivative from aniline, m.p. 235°, and it cannot be an enamine since it is stable to mineral acid. There is little reduction of dimethylaniline past the dihydro-stage under the conditions used here, namely, excess of alcohol, so that the further reduction of dihydroaniline is probably due to isomerization of the enamine to the imine:

and reduction of the imino-group, rather than to conjugation of the nuclear bonds and reduction of the conjugated system. The latter reaction should lead in any event to an enamine, which would give on acid hydrolysis cyclohexanone, as is, in fact, the case with dimethylaniline in the presence of excess sodium³. The facile rearrangement of enamines to imines probably explains the formation of, for example, tetrahydroquinoline rather than dihydroquinoline by reduction of quinoline with sodium and alcohol.

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¹ *J. Amer. Chem. Soc.*, 69, 1657 (1947).

² U.S. Patent, 2,182,242 (1939).

³ Birch, *J. Chem. Soc.*, 593 (1946).

White-eyed Mutants of Diptera

Two recent papers^{1,2}, as well as an older one³, compare white-eyed mutants found in *Culex*, *Calliphora* and *Phormica*, respectively, with the white-eyed types long known in *Drosophila*. Since in no *Drosophila* species is more than one single-gene difference known that will give rise to a white eye, it is concluded that these types in other Diptera represent mutations corresponding to the white of *Drosophila*.

There is a special reason why this conclusion cannot be accepted. It has been known for some time that there are two distinct pigments, a red and a brown, in the eye of the wild-type *Drosophila*. The red pigment is absent in the brown mutant; the brown is absent in the vermilion, cinnabar and scarlet mutants; both are absent in white. The results of Becker⁴ show that the red pigment is absent in *Calliphora*—in which, therefore, the wild type is like the brown mutant of *Drosophila*. This appears to be the usual condition in insects; the red pigment is apparently present in all *Drosophilidæ* that I have examined, but seems to be present in only a few of the related families. It should, therefore, not be possible to distinguish the white, vermilion, cinnabar and scarlet mutants in more remote families unless special methods are used.

There is available a method for further differentiation here, namely, the study of the hormones involved in eye-pigment production. As is well known, the white and scarlet mutant types of *Drosophila* are not affected by hormones; but there are two separate hormones involved in the production of the brown pigment, of which vermilion lacks one, cinnabar the other⁵. It has been shown that these hormones are not species-specific in their activity, and cross-tests with *Drosophila* have been made with mutant eye-colours in other insects. In this way it has been shown that the mutant 'ivory' (and its allele 'orange') in the hymenopteron *Habrobracon* is