again during fructification. These circumstances can be of physiological significance.

4. Citrulline which is present in noticeable amounts in the leaves of *Alnus* and in large amounts in the leaves of *Corylus* could not be found in pollen. In other investigated plants citrulline does not occur, except in *Betula* where a small amount of it was found both in leaves and in pollen.

5. The amount of free basic amino acids is much higher in the pollen than in the leaves of many plants, as in *Betula*, *Populus tremula*, *Quercus*, and *Pinus*. A noticeable increase in amides (asparagine or glutamine or both) is also often found in pollen. When comparing the free amino acid fraction in pollen and in the green parts of plants it seems that the decrease in acidity of this fraction (*via* ringformation, formation of amides, increase in basic amino acids) is characteristic for the pollen of wind-pollinated plants.

Of the pollen of insect-pollinated plants only the free amino acids in the pollen of *Amaryllis* and *Lilium tigrinum* have been investigated. In these plants no typical differences between the amino acids in the pollen and in the green parts of the plants could be found. Because of the scantiness of the material no general conclusions can, however, be drawn about the free amino acids in the pollen of insect-pollinated plants.

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Dissociation Constants in the Yeast Alcohol Dehydrogenase System, calculated from overall Reaction Velocities

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As shown recently [1], the overall data obtained for yeast alcohol dehydrogenase ** (ADH) are consistent with the formation of a ternary complex where all equilibria are adjusted rapidly except for the transformation of the ternary complex (step 5).

For this scheme, Alberty [2] has shown that K_3, the dissociation constant of the third step, is identical with the Michaelis constant of DPN, K_4 the Michaelis constant of EtOH etc. Furthermore, the new kinetic constant introduced by Alberty [2],

$$K_{\mathrm{EtOH \cdot DPN}} = K_1 \cdot K_3 = K_2 \cdot K_4 \text{ and}$$
$$K_{\mathrm{AldD \cdot PNH}} = K_6 \cdot K_8 = K_7 \cdot K_9.$$

From these relationships the dissociation constants of ADH · EtOH ($= K_1$), of ADH · DPN ($= K_2$) etc. can be calculated. In Table 1 are shown the data obtained using the kinetic constants of the previous work [1]. Although the conditions of

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** The following abbreviations are used: ADH, yeast alcohol dehydrogenase; DPN, diphosphopyridine nucleotide; DPNH, reduced diphosphopyridine nucleotide; EtOH, ethyl alcohol; Ald, acetaldehyde.

1. ADH + EtOH $\rightleftharpoons$ ADH · EtOH
2. ADH + DPN $\rightleftharpoons$ ADH · DPN
3. ADH · EtOH + DPN $\rightleftharpoons$ ADH · EtOH·DPN
4. ADH · DPN + EtOH $\rightleftharpoons$ ADH·EtOH·DPN
5. ADH · EtOH · DPN $\rightleftharpoons$ ADH · Ald · DPNH
6. ADH · Ald · DPNH $\rightleftharpoons$ ADH · Ald + DPNH
7. ADH · Ald · DPNH $\rightleftharpoons$ ADH · DPNH + Ald
8. ADH · Ald $\rightleftharpoons$ ADH + Ald
9. ADH · DPNH $\rightleftharpoons$ ADH + DPNH

Table 1. Dissociation constants obtained from overall reaction velocities compared with those obtained by Hayes and Velick[3] by direct measurements.

	From overall reaction velocities		By direct measurements[3]
	23° C pH 6.0	23° C pH 7.15	0—4° C pH 7.8
K_1, ADH · EtOH	0.10	0.074	—
K_2, ADH · DPN	1.6×10^{-4}	2.3×10^{-4}	2.6×10^{-4}
K_8, ADH · Ald	0.54×10^{-4}	1.4×10^{-4}	1.8×10^{-4}
K_9, ADH · DPNH	0.43×10^{-5}	1.0×10^{-5}	1.3×10^{-5}

the experiments were somewhat different, there is a fair agreement with the dissociation constants which Hayes and Velick[3] obtained by their ultracentrifugal method. The results add evidence to the proposed reaction mechanism for yeast alcohol dehydrogenase.

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