yellow oxidation-enzyme. The formation of the enzyme is supposed to occur by combination of the flavine with a colloidal-carrier. In this connection it is very remarkable that we have observed an excellent increase in growth of animals deficient in vitamin-B_2, which have been given well dialyzed preparations of the yellow enzyme.[8] Therefore there exist not only free vitamin-B_2, which dialyzes easily, but also vitamin-B_2 attached to carriers of high molecular weight, which can not be dialyzed—just as in the case of the flavines. The relationship, which has been established, can be seen from the following table:

	Soluble in			Activity as	
	Dialysis	Water	Chloroform	Vitamin	Enzyme
1. Flavo-proteins Flavo-polysaccharides	−	+	−	+	+
2. Flavines	+	+	−	+	−
3. Irradiated flavines	+	+	+	−	−

Following a discussion of flavines as biological hydrogen acceptors, Kuhn concludes:

> . . . the flavines are not only of importance as prosthetic groups and precursors of the yellow enzyme, but they can themselves act as hydrogen acceptors, in other words, as intermediate substances in cell respiration. . . . One may be justified in calling the flavines the ''methylene blue'' of living cells.

Enzymic activity might also appear or become accentuated by the mere aggregation of specific molecules into groups sufficiently large to establish a favorable reduction in the kinetic activity of over-active units. Nor can we overlook the fact that electronic surface areas may arise from such aggregation and also that changes in the milieu (pH, salts, etc.) may exert an effect. Thus The Svedberg[9] has demonstrated the effect of changing pH in forming and in breaking up groups of ultramicroscopic protein units, and Richard Willstätter[10] has shown how adsorption and desorption (*elution*) of enzymes depends upon the milieu, as well as on the physicochemical nature of the adsorbent. The inquiry naturally suggests itself as to whether co-enzymes may not function, in some cases at least, by dispersing or else aggregating the enzyme particles (which may be molecules) to the colloidal state favorable to activity. Co-enzymes may also represent particles (they may be molecules), which, on adsorption, complete an otherwise imperfect prosthetic group. Similarly, anti-enzymes may produce an unfavorable degree of dispersion or may mask or "poison" satisfactory prosthetic areas.

The immense effectiveness of minute quantities of vitamins, of hormones, of antigens and of certain potent substances such as histamine and acetylcholine becomes comprehensible when we realize that one single molecule of a specific substance might, under suitable conditions, form, activate or modify a cellular catalyst, and thus suddenly alter the whole internal economy of a cell.[11] The action of specific drugs (including narcotics), and the ultimate nature of pathological intracellular changes (including such as may be associated with insanity and drug addiction), must, in many cases, be considered in the light of possible interference with or alteration of the normal catalytic syndrome of a few or of many cells, wherein *chemical specificity* and *optimum dispersity* are mutually cooperative factors. At the lower range of the colloidal zone, we have a reconciliation between the "chemical" and "colloid" aspects of living matter.

The importance of the time factor in biological reactions is obvious. The influence of the zone of maximum colloidality in controlling the velocity of chemical reactions has been stated thus:[12]

> A most striking example of optimum dispersion is found in living matter. Figuratively speaking, if all the chemical substances comprising our organism were in true or crystalloid dispersion, reactions would proceed so rapidly that we would, so to say, live ten years in ten minutes. On the other hand, if coarse dispersion prevailed, it would take ten years to live ten minutes. Every organism is dependent upon the coordination of its chemical reactions *in point of time,* and this leisurely procedure depends largely on *degree of dispersion,* which keeps chemical reaction velocities within certain speed limits through its regulation of free surface and kinetic activity. Life lies between lysis and coagulation. The colloidal zone is, as it were, a vital metronome tolling off the tempo of life.

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