as a teaching aid for soil texture that its use is suggested for demonstrating other systems composed of two or more variables. For instance, the addition of more hands and a change of labels will allow the demonstration of the various percentages of protein, fat, carbohydrates, ash and water which distinguish our foods. The proximate analysis of coals showing the percentages of moisture, volatile matter, fixed carbon and ash makes classification of coals a very concrete matter when seen on the clock face. Thus visualizing the nutrient values of feeds becomes simple, and so forth.

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SPECIAL ARTICLES

COUPLING OF RESPIRATION AND SYNTHESIS OF PHOSPHATE ESTERS IN HEMOLYZED BLOOD

MAMMALIAN erythrocytes are not able to oxidize carbohydrates but exhibit only glycolysis, the end product being lactic acid. On addition of methylene blue or some other reversibly reducible dye stuff they acquire the property of oxidizing sugar by molecular oxygen as Harrop and Barron have first shown.

On hemolysis, both the faculty of glycolysis and of respiration are lost. Warburg,[1] however, showed that though the hemolyzed blood has no action on glucose or glycogen, it does react with hexose-monophosphate-ester (Robison ester). This carbohydrate ester is oxidized in the air by hemolyzed blood on addition of methylene blue.

It is characteristic of normal respiration that its energy is not entirely liberated as heat but in part utilized for work or chemical synthesis. In the system, hemolyzed blood + Robison ester + methylene blue, however, respiration is not accompanied by any chemical synthesis or work. Runnström, Lennerstrand and Borei[2] found that addition of cozymase from yeast cells to the system mentioned brings about a synthesis of organic phosphate esters coupled with the respiration. We can, now, add the following observation. When pyocyanine is used instead of methylene blue, such a synthesis of phosphate esters takes place without cozymase being necessary.

Though no full insight into the mechanism of this coupled reaction can be obtained as yet, it seems likely that this faculty is correlated with the exceptional property of pyocyanine of accepting either one or two electrons,[3,4] whereas in general dye stuffs can accept only two electrons at once. To be sure, no causal connection between these two properties can be recognized as yet. However, since the reversible two-step oxidation has been recently encountered in other physiologically occurring dye stuffs,[5] especially in Warburg's yellow respiration enzyme, and the flavines or lyochromes, or at least in their prosthetic colored component, according to Kuhn and Wagner-Jauregg,[6] and to Barron and Hastings,[7] the particular behavior of pyocyanine with respect to oxidation and reduction can no longer be considered as a fortuitous property of one special bacterial pigment but as a property of some physiological significance.

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THE EFFECT OF THALLIUM ON PLANT GROWTH

THALLIUM compounds have proven useful in the control of particularly intelligent rodents, such as the rat (*Rattus rattus rattus*), the Zuni prairie dog (*Citellus gunnisoni zuniensis*), and the California ground squirrel (*Citellus beecheyi beecheyi*). The normal occurrence of thallium in the vegetable kingdom has been reported and possibility suggested that plants may take up thallium from the soil.[1,2] Articles have appeared[3,4] suggesting, apparently without any experimental foundation, that "thallium sulfate has potential destructive effects on vegetation which have not received adequate attention from those advocating its use in vermin control," and predicting "enduring sterility of the soil." McMurtrey[5] suggests that thallium produces symptoms similar to "frenching disease" of tobacco and McCool[6] has conducted some

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