the yellow (Y) skin, whether the fruits are red or yellow in flesh color. In other words, there is a significant tendency for the F_2 fruits to vary towards the parental types as regards both skin color and weight, since the large parent (Golden Beauty) contributed the y factor, and the smaller parent (Red Cherry) the Y factor. The differences noted above are statistically significant, because the one between the two sorts of red fruits is 8 times its probable error, and the other difference is 4.3 times its probable error.

Verification for this relation between skin color and weight factors was afforded by two series of backcrosses of the same F_1 plant used to produce the F_2. In the backcross to the pure Golden Beauty parent, the same four color types appeared in the progenies, but in approximately equal numbers. The mean weights (in grams) for the four colors of this backcross and its reciprocal are as follows:

	Red Fruits—R		*Yellow Fruits—r*	
	Y	y	Y	y
Backcross to				
G. B. parent	50.4 ± 2.9	84.1 ± 4.5	52.6 ± 2.3	75.3 ± 3.2
Differences—	33.7 ± 5.3		22.7 ± 3.9	

Here, likewise, the tendency for the y type of fruit to be heavier than the Y class is apparent. Among both the red and yellow fruits, the differences in weight between the skin color classes are statistically significant, being approximately 6 times their respective probable errors of the difference.

Another backcross to the same F_1 plant gives further evidence. In this case the Yellow Peach variety was used reciprocally on the F_1 of Red Cherry × Golden Beauty with the following results:

	Red Fruits—R		*Yellow Fruits—r*	
	Y	y	Y	y
Backcross to				
Y. P. Variety	28.5 ± 0.9	45.3 ± 1.6	31.1 ± 1.3	41.0 ± 1.7
Differences—	16.8 ± 1.8		9.9 ± 2.1	

When it is recalled that the Yellow Peach variety used in this backcross was in no way related to the parents or F_1, it becomes evident that the situation is perhaps general and not specific for the particular varieties of the cross.

Accordingly, the evidence from three distinct sources admits of the same conclusion that the color factor pair Yy is closely linked with genetic factors for weight of fruit. On the modern theory of inheritance the same chromosome that carries y in the Golden Beauty variety also bears a major factor for a greater weight of fruit.

It is interesting to note that red and yellow flesh color, dependent on genes R and r, seem to be independent of weight. This is true not only for the varieties noted above, but also for a large series of crosses involving the well-known varieties, Bonny Best and Yellow Cherry. The details of these crosses are reserved for a future report when larger progenies will be available so that small differences might be detected and checked biometrically.

It might be added that the number of seed locules also exhibits a linkage with the Yy color factors but to a somewhat lessened degree. This is to be expected, however, since weight and number of locules in the F_2 generation show a high correlation ($r = .6056 \pm .0427$). The same general relation exists between Yy and time of flowering, although in this case the correlation between weight and time of flowering is not very high, r having a value of $.2799 \pm .0622$. These evidences of a linkage between the color genes Yy, and both time of flowering and number of seed locules merely afford other sources of verification for the situation proved with respect to weight of fruit.

A final proof for the general situation rests with a cross between a small variety with colorless skin and a larger variety with yellow skin, the reverse of the Golden Beauty × Red Cherry cross. If the *small* size of fruit is then found to be linked with the y color factor, the case is complete. Such a cross has been made, involving the Yellow Peach and Bonny Best varieties, but at least two generations of plants are still required to obtain the adequate data. Meanwhile, it is hoped that other investigators may test this linkage with different varieties of tomatoes under other conditions. It opens a fertile field of research for testing the fundamental relation between genetic linkages involving quantitative characters and those correlations so conveniently studied by multiple correlation methods with their path coefficients and coefficients of determination.

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THE ELECTROMAGNETIC NATURE OF COLLOIDAL, ENZYME AND CATALYTIC ACTION AND ITS SIGNIFICANCE

IT is well known that when a colloidal solution of platinum is mixed with a solution of peroxide of hydrogen, there occurs an evolution of oxygen gas, set free from the peroxide of hydrogen molecule.

If, instead of mixing these two solutions, the peroxide of hydrogen solution is put in a fermentation tube, and in a test tube is put a solution of colloidal platinum, and the two solutions are then connected by an electrical conductor, such as a copper, iron or preferably a platinum wire, there occurs a well-marked evolution of gas in the fermentation tube.

If there is inserted in this conducting line the primary coil of an induction coil, and if from one pole of the secondary induction circuit a metallic conductor is run to another fermentation tube filled with peroxide of hydrogen, an evolution of oxygen gas occurs which is much greater than in fermentation tubes connected with the primary coil or in those connected directly with the colloidal solution without the intervention of an induction coil.

Such a simple experiment may suggest interesting interpretations and result in far-reaching consequences.

As there has been no mixing of the two solutions there has been no "direct" chemical action.

As there has been no metallic circuit there can have been no galvanic current with its electrolytic effect. Yet the effect which has been transmitted over the wire must be an electrical one of some sort.

It is well known that a constant, direct, uninterrupted electrical current has no inductive effect; and yet in the experiment cited a well-marked inductive action is shown.

It would seem, then, that the electrical effect passing through the metallic conductor must be an interrupted or oscillating one.

This experiment may be repeated successfully with a variety of colloidal substances, such as colloidal solutions of ferric hydroxide, nickel hydroxide and albumen in dilute sodium carbonate solution.

A marked effect is obtained when a .01 per cent. solution of freshly prepared unprotected colloidal platinum in equal parts of a .3 per cent. sodium carbonate solution is used.

When small detached pieces of platinum, copper or iron wire are immersed in peroxide of hydrogen solution, there is a slow evolution of gas, but when such controls are used it is found that the evolution of gas in the experimental tubes—especially those connected with the secondary induction coil—is far more copious.

Potassium permanganate solutions, although not colloidal, seem to have a somewhat similar effect in releasing oxygen from the hydrogen peroxide solution when the latter is connected with the secondary induction coil.

That enzymes have a similar action is shown by the following experiment:

In a test tube is placed some pancreatin in a .3 per cent. solution of sodium carbonate. A wire is run from this solution, through the induction coil, to a fermentation tube containing peroxide of hydrogen solution. In the tube connected with the secondary coil there is a copious evolution of gas.

The following experiment bears upon pancreatic digestion of proteids:

In a beaker is placed some pancreatin in a .3 per cent. solution of sodium carbonate. During the course of the experiment, fresh solution is used from time to time. Electrodes, immersed in this solution, are connected with the primary coil of an induction coil. From the primary and secondary coils are run wires terminating in electrodes immersed in beakers containing solutions of egg albumen in .3 per cent. sodium carbonate solution. Bacterial action is adequately prevented and a similar albumen solution, not connected with this series, is used as a control. After three months the appearance of peptone was detected in the two experimental solutions—most markedly in the solution connected with the secondary induction coil, while the control albumen solution showed no peptone.

We have here, then, the process of pancreatic digestion by an enzyme, pancreatin, which can have occurred only through the agency of an interrupted or oscillating electrical action or electrical vibrations.

That the action of enzymes or zymogens may be "vibrational" in character is suggested by an experiment reported by Green (Fermentation—page 413).

"By exposing the zymogen of saliva to red rays of the spectrum its activity is increased 53 per cent., while its action is diminished 15 per cent. by exposure to the green rays."

Such an effect is very suggestive of "sympathetic" vibration or resonance on the part of the zymogenic molecule toward the red rays, and an interference toward the green rays.

The specific action of enzymes is well known. If, then, their action is due to electromagnetic wave vibrations, their specificity must depend upon their production of a definite wave length—different for each enzyme.

The similarity of action of colloids, enzymes, catalyzers and anti-toxins has long been recognized.

Ehrlich's theory of the specificity of anti-toxin action implied the analogy of the fitting of a key to a lock. It may be found, however, that the specificity of anti-toxin action is dependent upon their possession of a definite electromagnetic wave length.

If such processes of digestion and antitoxin activity are controlled by electromagnetic wave vibrations, similar forms of control may be found to influence the processes of growth and reproduction and other metabolic phenomena.

Such consequences are of the most far-reaching importance, and will fully justify further inquiry along the lines here suggested.

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