far from the attainment of this ideal, for, as Parker says (p. 180), "The real difficulty lies in the fact that the numerous receptors that we now recognize have undergone varying degrees of differentiation and hence their mutual affinities are extremely diverse."

On the morphological side the difficulties are even greater, and the various attempts which have been made to determine which of the various anatomical patterns of end-organs are more primitive seem rather futile. Protoplasm in general seems to be sensitive to all of the three kinds of stimuli of Parker's classification and morphologically homologous organs seem capable of transgressing our artificial biological laws and "uniformities" in fashion most disquieting to the systematist. This is illustrated by Whitman's description (since confirmed by Hachloy) of the cutaneous sensillæ of leeches, which are tactile in function on the body but in the head become gradually metamorphosed into visual organs, and also by the way in which both olfactory and gustatory organs may serve on occasion as either interoceptors or exteroceptors, with characteristically different central connections and reaction types in the two cases.

No better summary of this phase of the matter can be given than the concluding sentences of Parker's book: "It is because of the repeated differentiations that characterize the evolution not only of the chemoreceptors but of the other groups of like organs that a classification of them or even a simple enumeration proves to be so unsatisfactory. For they are not unitary elements that can be counted like the fingers on the hand nor are they sufficiently co-ordinated to make classifications easy and natural. They are like the whole organism itself in that they exhibit that kind of diversity that characterizes evolutionary flux."

C. JUDSON HERRICK

SPECIAL ARTICLES

PERIGENESIS

I AM presenting here a short preliminary account of the results of a study of the division figures in *Tradescantia virginica* L.

With the methods used, the structure of the chromosome is that of an achromatic cylinder of jelly-like consistency as described by Vejdovsky (1912) in which the chromatin, however, is imbedded in the form of chromomeres rather than a spiral. These bodies are so distinct that in any one optical plane, they can be counted.

They are made up of flocculated chromatin particles which associate together in rather dense masses which are arranged inside of the periphery of the linin cylinder in such a manner that there results a central core of achromatic substance.

The relationships of the chromomeres one to the other seem to be somewhat variable although the chromosome often shows a quadripartite cross-section as figured by Merriman (1904), Bonnevie (1908), and by Nawaschin (1910).

The effect of fixing, imbedding, and staining this structure gives appearances which have doubtless led to the interpretation that it is longitudinally split.

The arrangement of the chromatin particles within the achromatic cylinder may be traced back, in the vegetative stages especially, to the earliest prophases and I do not find anywhere, either in the vegetative or reduction divisions, any further evidence of a longitudinal split so that for the reductions, I agree with Meves and others that there is no side by side pairing of the chromosomes in these stages.

I find as did Suessenguth (1921), in spite of the recent evidence in favor of a parallel conjugation, that the continuous prophase spireme is constricted into the chromosomes in end to end relationships.

Muller (1921), in discussing the work of Troland (1917) says, "If he is right, each different portion of the gene structure must—like a crystal—attract to itself from the protoplasm, materials of a similar kind thus moulding next to the original gene another structure of similar parts, identically arranged, which then become bound together to form another gene, a replica of the first."

From the phenomena in all metaphase figures, inasmuch as I find the separation is not by longitudinal division, I would limit the above quoted process to the stages beginning with

the close of the telophase and closing with the first tendency towards the formation of the spireme or, in other words, to the so-called resting condition.

E. Haeckel described such a process of growth as the *perigenesis of the plastidules* though perigenesis as described by Haeckel is not referred to by Muller.

The sporophyte cell, from the end of the telophase to the beginning of the next prophase, would therefore become, normally, a tetraploid unit with the chromatic contents merely in need of distribution in the case of the vegetative division or, in the case of the reduction division, of random segregation. Actual return to the gametophytic condition is not accomplished till the second division since dyads are separated on the first or so-called heterotypic spindle.

It is assumed that the genes after the genesis of their like, reassemble in such a fashion that they form a continuous prophase spireme thread. It is during this reassembling of the genes, this reorganization of the nucleus, that the phenomena of crossing over may occur as well as perhaps some mutations not due to such factors as non-disjunction, re-duplication, deficiency, etc.

My material was examined in the living condition, by special staining methods of the living cells in sugar suspensions, by *intravitam* staining, and, as a check, by the standard fixing, hardening, and imbedding methods.

Detailed descriptions, drawings, and photographs will be published in the near future.

HAROLD C. SANDS

COLUMBIA UNIVERSITY

THE AMERICAN CHEMICAL SOCIETY

(Continued)

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Effect of certain tread pigments on temperature developed in pneumatic tires: D. F. CRAVER. The paper is a short description of tread compounds used, stress-strain curves of same, theoretical conductivity as calculated by Williams formula, and the actual heating up of tire built with such treads when run on the road, temperatures being taken by means of thermo couple inserted by the awl which was devised by the research department of the New Jersey Zinc Company.

Disubstituted guanidines: WINFIELD SCOTT. Disubsubstituted guanidines function as accelerators as amines and belong to the class of hydrosulfide accelerators only. Diphenylguanidine reacts with hydrogen sulfide and carbon bisulfide to form a trithiocarbonate, with aniline and carbon bisulfide to form a dithiocarbamate and with carbodiphenylimide to form tetraphenylbiguanide. The effect of small amounts of zinc oxide and zinc carbonate on the tensile strength of rubber cured with disubstituted guanidines is quite marked. The relative curing powers of di-p-tolylguanidine, di-o-tolylguanidine and diphenylguanidine are in the order named, the first being the most efficient. It requires 25 per cent. more diphenylguanidine than di-o-tolylguanidine to produce the same acceleration.

Studies in hysteresis of rubber compounds: W. W. VOGT.

Thermal changes during vulcanization: IRA WILLIAMS and D. J. BEAVER. The measurement of the temperature developed in the center of a cylinder of rubber sulfur mixture which is immersed in a constant temperature bath shows that heat is liberated during the first stages of the reaction. An absorption of heat is indicated during the later stages. The extent of these thermal changes has been estimated when stocks of different sulfur and accelerator content were