the exit; while the less careful worker is likely to attempt to light the gas prematurely.

All possibility of an explosion is removed by a very simple procedure, which is doubtless widely used, but which has not found its way into the manuals. When the air has been completely expelled, the hydrogen will burn tranquilly in the test-tube. The test-tube, containing the burning hydrogen, is, by a quick movement, brought over the escaping hydrogen. One or two trials will be sufficient to ignite the jet. The towel may be dispensed with.

Neither originality nor novelty is claimed for this suggestion. This note is written merely with the hope that some one of the numerous writers of manuals will revise the directions for this particular exercise and discard the time-honored towel.

B. F. Lovelace

University of Alabama,
May 25, 1911

QUOTATIONS

The Administration of the Department of Agriculture

With the testimony yesterday of Dr. Wiley himself, the Moss committee concluded its hearings. President Taft will next be heard from. But conditions have changed since Attorney General Wickersham, after reading a cooked-up case, declared that Dr. Wiley and his associates in guarding the foods and medicines of the people merited "condign punishment." Like thunderbolt the illuminating publication that exposed the doings of the McCabe cabal in the Department of Agriculture must have seemed to Solicitor McCabe and his fellow-conspirators just as they thought their secret charges against the Chief Chemist were accomplishing his ruin. The public now knows that the Food and Drugs Act has been officially disregarded; that scores of important cases against alleged adulterators and misbranders have been deliberately held in abeyance; that department officials did not hesitate to garble the terms of court findings, and that an organized effort was being made, by the cutting down of salaries and "star chamber" proceedings, to drive honest public servants out of the Bureau of Chemistry. It is not imprudent to predict that if, in his decision, President Taft recommends "condign punishment," the recommendation will not be directed against Dr. Wiley and Dr. Rusby.—*The New York Times.*

It is not too much to say that Dr. Wiley, in his first day's testimony before the House committee, absolutely riddled the case against him. The so-called documentary evidence upon which Attorney-General Wickersham so gravely passed, was no evidence at all. Its chief piece was a letter to Dr. Wiley, but it now appears that it was never sent to him nor received by him. He had nothing whatever to do with making the contract with Dr. Rusby, for which offence his resignation was demanded. The whole thing was to be "subject to the approval of the Department"—that is, the Secretary—though these words were omitted by the personnel board when it published a copy of Dr. Rusby's letter. It is evident that the Attorney-General was grievously misled; he ought to make haste to recall his opinion and to apologize to Dr. Wiley. As for the schemers against Dr. Wiley, the investigation has left them in a most unenviable plight. Their stay in the public service ought to be of the briefest. And the inquiry has, it must also be said, shown such an unhappy state of affairs within the Department of Agriculture, which appears to be honeycombed with intrigue and faction, and badly suffering for lack of firm, executive control, as to indicate the need of its reorganization from the top down.—*The N. Y. Evening Post.*

SCIENTIFIC BOOKS

Mendelism. By R. C. Punnett. Third edition, entirely rewritten and much enlarged. Pp. 192, 5 plates and 35 text-figures. New York, The Macmillan Co. 1911. Price $1.25.

Punnett has shown that a scientific book need not be dull. His new treatise on "Mendelism" is a thorough exposition of a difficult and technical subject, yet it is as entertaining

as a novel. It deals with the new science of genetics, "the experimental study of heredity and variation in animals and plants," and contains the clearest and best account of its rise and present condition that has yet been published in any language. It lacks the encyclopedic completeness and the bibliographic features of the work of Bateson and Przibram, and will of course need to be supplemented by them in the hands of the advanced student, but for the beginner or the general reader who wants within moderate compass a sane and well-balanced account of what has been accomplished in this field, the book is almost ideal.

It does not pretend to give an account of all the work done in this field, but of only so much of it as will serve adequately to illustrate the principles involved. The author writes in his preface:

> In choosing typical examples to illustrate the growth of our ideas it was natural that I should give the preference to those with which I was most familiar. For this reason the book is in some measure a record of the work accomplished by the Cambridge School of Genetics, and it is not unfair to say that under the leadership of William Bateson the contributions of this school have been second to none. But it should not be forgotten that workers in other European countries, and especially in America, have amassed a large and valuable body of evidence with which it is impossible to deal in a small volume of this scope.

The illustrative material, however, has been remarkably well selected, and the wide range of questions upon which it bears speaks eloquently of the industry of the workers in "the Cambridge School" and their clear vision of what are the vital problems in genetics. Needless to say this book is an exposition of *orthodox* "Mendelism." Gametes are treated as beyond suspicion "pure," and unit-characters are regarded as immutable. Variation is supposed to occur only by loss of factors, or by the interpolation of new, "modifying," "intensifying" or "inhibiting" factors, but never by a direct change in the factors that before existed. There are Mendelians who are heterodox or at least have inner questionings about some of these assumptions, and are likely to challenge them in the next ten years as they have in the last ten. But the author has wisely omitted controversial points from a general and introductory account of his subject. His account shows that a really great advance has been made in the study of evolution since the rediscovery of Mendel's law and the readoption of the experimental method of studying variation and heredity.

The book opens with a brief statement of "the problem," of the source of new individuals in the gametes, and their part in the life-cycle. This is followed by a likewise brief but well-proportioned historical account of Mendel's work and of that of his predecessors, as well as of the Darwinian period following Mendel's time. The essential points in Mendel's work are shown to be the existence of unit-characters and their segregation, dominance being an incidental matter. The rest of the book is concerned largely with the development of Mendelian ideas since the rediscovery of Mendel's law in 1900.

The "presence and absence" theory is built up with great skill and clearness from an analysis of the inheritance of comb-form in fowls. This theory has all but replaced the earlier idea of Mendel, that the recessive character is something no less real than the dominant one which obscures it in crosses. The presence and absence theory asserts that the recessive character has no objective existence except as the absence of the dominant one. Punnett, however, like most other Mendelians, retains Mendel's original terminology, even though it has lost its original significance. The small letter used to designate a recessive character means, on the presence and absence theory, only that there is nothing there, and it would seem might as well be dropped in the interest of simplicity. But if it can yet be shown that there are cases in which the recessive character is a reality, as Mendel thought, and not a mere negation, the old terminology may reacquire significance and utility.

A chapter devoted to the "interaction of factors" shows how the presence of one unit-character may affect the manifestation of an-

other independent of it in heredity, and how in other cases the joint action of two or more independent factors may be necessary to produce a single visible result. The cognate subject of reversion next comes in for discussion, and is finely illustrated by examples from the breeding of rabbits, sweet-peas and pigeons. Dominance is the subject of the next chapter, and is shown to be imperfect in heterozygous forms like the Andalusian fowl, or, in other cases, of reversed character in the two sexes, as in horns in sheep.

The origin of domesticated varieties from wild forms is next discussed. It is believed to occur by unit-character variation (mutation) but in several different ways as (1) by loss of factors, a method clearly illustrated in the case of sweet-peas both with historical data and data derived from breeding experiments; (2) by the reduplication of factors; (3) by the interpolation of new factors, in some cases unrelated in character, in others inhibiting in action. "Repulsion and coupling of factors" are hypothecated to explain peculiar ratios or the sex-limitation of characters in heredity. In discussing this subject Punnett follows Bateson closely, assuming that each sex possesses a factor not found in the other, and which repels certain sex-limited characters in gametogenesis.

The production of "intermediates" observed in many experimental studies of inheritance is explained with the help of (hypothetical) supplementary and inhibiting factors.

A finely written chapter on "variation and evolution" contrasts with the older views of the Darwinian period the newer views derived from the study of genetics, and shows how the theory of natural selection has been relieved of the burden of explaining the *origin* of new characters, and required only to explain their perpetuation. Protective mimicry is explained as due to parallel mutation rather than to actual imitation.

Another chapter discusses the economic aspects of genetics in the breeding of animals and plants, and the last one is devoted to "man." This delightful chapter is a literary gem, in which the author's power of keen analysis, of vivid imagination, and of clear exposition show to best advantage, not without a spark of genuine humor and a lot of good sense. He reviews the classic cases of Mendelian inheritance in man, of brachydactyly, night blindness, hemophilia, eye-color, etc. He considers the possible interrelations of physical and mental traits and the scientific basis of eugenics in the following passage:

> A discussion of eye-color suggests reflections of another kind. It is difficult to believe that the markedly different states of pigmentation which occur in the same species are not associated with deep-seated chemical differences influencing the character and bent of the individual. May not these differences in pigmentation be coupled with and so become in some measure a guide to mental and temperamental characteristics? In the National Portrait Gallery in London the pictures of celebrated men and women are largely grouped according to the vocations in which they have succeeded. The observant will probably have noticed that there is a tendency for a given type of eye-color to predominate in some of the larger groups. It is rare to find anything but a blue among the soldiers and sailors, while among the actors, preachers and orators the dark eye is predominant, although for the population as a whole it is far scarcer than the light. The facts are suggestive, and it is not impossible that future research may reveal an intimate connection between peculiarities of pigmentation and peculiarities of mind.
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> The inheritance of mental characters is often elusive, for it is frequently difficult to appraise the effects of early environment in determining a man's bent. That ability can be transmitted there is no doubt, for this is borne out by general experience, as well as by the numerous cases of able families brought together by Galton and others. But when we come to inquire more precisely what it is that is transmitted we are baffled. A distinguished son follows in the footsteps of a distinguished father. Is this due to the inheritance of a particular mental aptitude, or is it an instance of general mental ability displayed in a field rendered attractive by early association. We have at present very little definite evidence for supposing that what appear to be special forms of ability may be due to specific factors. Hurst, indeed, has brought forward some facts which suggest that musical sense sometimes behaves as a recessive character, and it is likely that the study

of some clean-cut faculty such as the mathematical one would yield interesting results.

The analysis of mental characters will no doubt be very difficult, and possibly the best line of attack is to search for cases where they are associated with some physical feature such as pigmentation. If an association of this kind be found, and the pigmentation factors be determined, it is evident that we should thereby obtain an insight into the nature of the units upon which mental conditions depend. Nor must it be forgotten that mental qualities, such as quickness, generosity, instability, etc.—qualities which we are accustomed to regard as convenient units in classifying the different minds with which we are daily brought in contact—are not necessarily qualities that correspond to heritable units. Effective mental ability is largely a matter of temperament, and this in turn is quite possibly dependent upon the various secretions produced by the different tissues of the body. Similar nervous systems associated with different livers might conceivably result in individuals upon whose mental ability the world would pass a very different judgment. Indeed, it is not at all impossible that a particular form of mental ability may depend for its manifestation, not so much upon an essential difference in the structure of the nervous system, as upon the production by another tissue of some specific poison which causes the nervous system to react in a definite way. We have mentioned these possibilities merely to indicate how complex the problem may turn out to be. Though there is no doubt that mental ability is inherited, what it is that is transmitted, whether factors involving the quality and structure of the nervous system itself, or factors involving the production of specific poisons by other tissues, or both together, is at present uncertain.

Little as is known to-day of heredity in man, that little is of extraordinary significance. The qualities of men and women, physical and mental, depend primarily upon the inherent properties of the gametes which went to their making. Within limits these qualities are elastic, and can be modified to a greater or lesser extent by influences brought to bear upon the growing zygote, provided always that the necessary basis is present upon which these influences can work. If the mathematical faculty has been carried in by the gamete, the education of the zygote will enable him to make the most of it. But if the basis is not there, no amount of education can transform that zygote into a mathematician. This is a matter of common experience. Neither is there any reason for supposing that the superior education of a mathematical zygote will thereby increase the mathematical propensities of the gametes which live within him. For the gamete recks little of quaternions. It is true that there is progress of a kind in the world, and that this progress is largely due to improvements in education and hygiene. The people of to-day are better fitted to cope with their material surroundings than were the people of even a few thousand years ago. And as time goes on they are able more and more to control the workings of the world around them. But there is no reason for supposing that this is because the effects of education are inherited. Man stores knowledge as a bee stores honey or a squirrel stores nuts. With man, however, the hoard is of a more lasting nature. Each generation in using it sifts, adds, and rejects, and passes it on to the next a little better and a little fuller. When we speak of progress we generally mean that the hoard has been improved, and is of more service to man in his attempts to control the surroundings. Sometimes this hoarded knowledge is spoken of as the inheritance which a generation receives from those who have gone before. This is misleading. The handing on of such knowledge has nothing more to do with heredity in the biological sense than has the handing on from parent to offspring of a picture, or a title, or a pair of boots. All these things are but the transfer from zygote to zygote of something extrinsic to the species. Heredity, on the other hand, deals with the transmission of something intrinsic from gamete to zygote and from zygote to gamete. It is the participation of the gamete in the process that is our criterion of what is and what is not heredity.

Better hygiene and better education, then, are good for the zygote, because they help him to make the fullest use of his inherent qualities. But the qualities themselves remain unchanged in so far as the gamete is concerned, since the gamete pays no heed to the intellectual development of the zygote in whom he happens to dwell. Nevertheless, upon the gamete depend those inherent faculties which enable the zygote to profit by his opportunities, and, unless the zygote has received them from the gamete, the advantages of education are of little worth. If we are bent upon producing a permanent betterment that shall be independent of external circumstances, if we wish the national stock to become inherently more vigorous in mind and body, more free from congenital physical defect and feeble mentality, better able

to assimilate and act upon the stores of knowledge which have been accumulated through the centuries, then it is the gamete that we must consult. The saving grace is with the gamete, and with the gamete alone.

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Plant Physiology, with Special Reference to Plant Production. By Benjamin M. Duggar. 13 × 20 cm. Pp. xv + 516, frontispiece and 144 figures. The Rural Textbook Series. New York, The Macmillan Co. May, 1911. Price $1.60.

The growing realization that a rational agriculture must rest upon the principles of plant physiology finds definite expression in the appearance of Professor B. M. Duggar's new text-book. As the title implies, this book is intended for agricultural students and those primarily interested in "plant production," and it should occupy a very necessary and permanently useful place in American agricultural colleges and experiment stations.

The choice of subject matter is governed by the centering of the entire treatment about the idea of the usefulness of plants in human affairs, so that relatively great importance is accorded those aspects of physiology which enter into present agricultural, horticultural and silvicultural theory and practise. Plant physiologists may be surprised to find that other portions of our present physiological knowledge are often but briefly and summarily treated. Thus, the whole subject of movements due to growth receives only about ten pages, while over twenty-six pages are devoted to variation and heredity, subjects as yet hardly to be considered as more than purely descriptive physiology. Many topics not usually treated under physiology find place here, and many illustrative examples are drawn from agricultural experience, so that the book should serve not only as an introduction to things physiological for those who care mainly for the practical manipulation of plants, but also as a key to many important agricultural points for those to whom etiological physiology is of primary interest. The book should therefore find a considerable use, also, in university laboratories. Enough excellently chosen titles are cited from the literature so that the more thorough-going student may find the book an adequate point of departure in the acquisition of a first-hand knowledge of the deeper aspects of the subject.

The literary style of this treatise is frequently abrupt and fragmentary, sometimes ambiguous. Technical terms are now and again introduced without previous explanation, the reader being left to surmise their meaning from the context; also the paragraph often lacks unity. A few examples of ambiguity may be noted. On page 58, regarding *Tillandsia,* we read that it "is provided with much the same type of water-absorbing hairs which give the entire surface a glistening appearance." Hairs have not been mentioned previously in this section, so that the reference of the word *same* is not evident. A comma should precede *which.* Again, on page 65 we find, "this diffusion is wholly independent of any convection currents due to changes in temperature, and it is true for all such soluble substances as sugar, common salt and the like." Here the personal pronoun is without antecedent. On page 195, in the sentence, "As organic matter so called, this element is linked chiefly with hydrogen," etc., "this element" has been mentioned only in the chapter title, "The intake of carbon," etc.

Some surprising inaccuracies occur, several of which may be mentioned here. At the bottom of page 207 "bioses" is obviously intended to denote *disaccharide hexoses.* The word "hydroscopic," page 245, should be *hygroscopic.* In the last paragraph of page 264 the word "hemlock" is used to refer to *Abies alba,* which it is not. On page 294, *à propos* of certain "roots or root branches which seem to be important in aeration," it is stated that "to these organs the term hydathodes has been applied": this word is applied to certain peculiar foliar openings or water pores, through which guttated liquid escapes. On page 402 barley is mentioned as "almost unknown southward," yet it is one of the main hay crops of the southern portions of Arizona,