LETTERS TO THE EDITOR.

Impregnation in the turkey.

WHEN I was a boy, my father used to send me to some of the neighbors with our turkey-hen, and we left her there with the cock a day or so. Either this, or we would borrow a cock for a day or so, and turn him with our hen. This was not only for one year, but our custom; as we never wintered a turkey-cock, and we did raise turkeys by this process. There was no possibility of the turkey-cock getting with our hen after the contact mentioned above. I did not know that this fact was still unknown to people. What is still a question that I should like settled by experiment is, whether the spermatozoids are retained somewhere in the oviduct until the eggs reach a certain stage of development, or whether they at once impregnate the eggs. W. MANN.

Potsdam, N.Y., July 5.

[We give place to the foregoing extract from Mr. Mann's letter, referring to Mr. Shepard's communication in No. 20, p. 576, on the same subject. There are probably many species of birds in which one connection with the male suffices to impregnate a whole batch of eggs. That the turkey, like the common hen, is one of these, is a fact which hardly requires further confirmation. There can be little question that the spermatozoids are retained in the oviduct, as in other animals, and the eggs impregnated as they successively mature.]

Macloskie's Elementary botany.

The review with which you favor my Elementary botany catechises me as to whether I am sure that the seeds of Lepidium emit mucilaginous threads. Permit me to answer that I am sure, having made the experiment a dozen times. Violets, besides the orders cited by the reviewer, prove that the statement as to cymose flowers being actinomorphic requires modification. I sympathize with the objection to the terms 'exotest' and 'endotest;' but the terms 'primine' and 'secundine' are bewildering to authors as well as students, and give priority to the part which is in most cases a result of secondary differentiation; 'tegmen' is obsolete, and the whole subject of the development and structure of the seed-wall requires revision: hence the provisional use of terms which, though hybrid, are easily understood, and not likely to mislead the young. G. MACLOSKIE.

July 10, 1883.

[We conjecture that Professor Macloskie had mixed in his mind, or at least in his statement, two different cases, — one, that in which the wall of the surface-cells of the seed-coat, changed into a substance which swells into mucilage upon wetting, contains a spiral thread, as in Collomia; the other, in which there is no contained thread. According to our observations, the seeds of Lepidium belong to the latter: hence the 'catechism,' which was intended to call attention to a possible oversight. We have to-day verified our observation upon seeds of Lepidium ruderale. Perhaps Professor Macloskie will kindly indicate the species in which he found the threads. — REVIEWER.]

Primitive streak of vertebrates.

Dr. Strahl of Marburg has had the kindness to write to me concerning the abstract of his researches (SCIENCE, i. **521**). A part of his letter contains an explanation which I shall be glad to have published in justice to Dr. Strahl. Translated, the passage is as follows: —

"As regards the esteemed remark at the close of the abstract, — that I have declared erroneous Balfour's comparison between the primitive streak and neurenteric canal on one side, and the blastopore of Amphia and fishes on the other, — the remark may be due to a misunderstanding. So far as known to me from his descriptions, Balfour placed the neurenteric canal at the anterior end of the primitve streak. But, as I have shown in my paper, the neurenteric canal originally lies in the middle of the primitive streak. The object of my demonstration is to show that the premises from which Balfour starts do not agree with the observations: this, I believe, was accomplished. This would also decide the second point made by you, — that my argumentation against Balfour was defective."

I am much indebted to Dr. Strahl for his letter, and I think others will value his short statement of his position. CHARLES SEDGWICK MINOT.

In an Indian grave.

In an Indian grave in Santa Barbara county, Cal., the writer found a beautiful specimen of doubly terminated limpid quartz, with a cavity half an inch long containing water or some other fluid. It was about four feet below the surface, and had been carefully deposited with many other stone implements, and was doubtless highly prized by its aboriginal owner. STEPHEN BOWERS.

WARD'S DYNAMIC SOCIOLOGY.

II.

IT is proposed to show the relation of Mr. Ward's publication to current thought.

The law is composed of the rules of conduct which organized society endeavors to enforce. The law, therefore, represents the quantity and quality of regulation, or, in other words, of government, which the people of the state in their corporate capacity deem necessary for their welfare. With respect to the amount and kind of government (i.e., of regulation, i.e., of law) which the best interests of society require, there is a very wide divergence of opinion between the chief publicists of civilized nations and the people themselves as they are represented by law-making bodies. The publicists tell us we are governed too much; but the people are demanding more government, and, in obedience to this demand, law-making bodies are rapidly extending the scope of law. The careful observer of the progress of government, who is at the same time a careful reader of opinion presented in the larger body of works on state craft, in the more carefully prepared dissertations on this subject appearing in the great reviews, and in many of the best editorials of the daily press, is astonished at the extreme conflict between opinion and practice.

There are two classes of law-making bodies, — courts and legislatures. The growth of law through the courts is almost unrecognized by the people at large; yet its development

by this agency is perhaps more rapid than by legislation. The legal principles enunciated in the decisions of a system of courts such as we have under the general government and in the several states are rapidly developing to meet the demands of the vigorous growth of civilization. Some months ago the public prints announced a decision of the supreme court of California which well illustrates this statement. In more than two-fifths of the area of the United States all agriculture is dependent upon artificial irrigation. In 1866 the Congress of the United States, in order to promote mining industries in this region, and incidentally to promote agriculture, enacted a statute giving to individuals and corporations the right to take the water of the running streams of that country from the natural channels in which they run, and use the same for mining and agricultural purposes. Now, the nature of this use is such that the water itself cannot be returned to the natural channels to be used again; and by this law the antecedent common law relating to riparian rights was repealed. As the agricultural interests of the country were developed, it was soon discovered that all agricultural operations were under the control of water companies; for these companies claimed ownership to the water, and the right to use it themselves or to sell it to whom they pleased. But the decision mentioned above was to the effect that these companies possess only the water-ways, the canals and hydraulic appliances connected therewith; that they are common carriers of water, and are themselves subject to the law relating to common carriers. By reflection it will be perceived that this decision will affect vast interests, and deeply influence the daily life of thousands, and eventually of millions, of people. This serves to illustrate the nature of the court-made law, which is so rapidly growing, and affecting in a multitude of ways the relations of men, and restricting the rights of the few for the benefit of the many, which is in the very nature of law. In the above statement it will be observed that the initial change in the law was the statute of 1866. So the national and state legislatures are constantly engaged in making new laws for the government of the people; and this, in the main, ever in obedience to popular demand.

Such is the practice. The legislature stimulates the court, and legal decisions incite new legislation; and thus it is that the public men of this country and of other civilized nations devote their energies to the development of government by devising new laws for the regulation of conduct, and creating new offices for the administration of law.

Again: in every community there is a body of good and earnest people demanding reform, or devising methods for the improvement of mankind in diverse ways, — for the relief of the unfortunate, for the education of the masses, to diminish suffering, crime, and ignorance; and the energies of these people, exerted everywhere, in season and out of season, create a sentiment that law-making bodies cannot ignore.

Yet, in opposition to all this, the publicists ask for less government, and say, 'Let society alone.' This theoretic opposition to the course of progress, manifest in the development of institutions, arises from the standpoint, or phase of the philosophy of evolution, at which our thinkers have arrived. The laws of biologic evolution are applied to sociology. The philosophy of science, which is but inchoate, is adjudged to be complete, and principles that require restriction are held to be universal.

In biologic evolution the cause of progress is recognized as the survival of the fittest in the struggle for existence; and this has been widely accepted as the cause of sociologic progress, and Herbert Spencer is the prophet of this philosophy. As set forth by him and his large following, progress is secured by an inexorable law of nature, which brooks no interference; and the efforts of mankind to improve the condition of mankind do but retard the natural process; and the proper sphere of government is the direct suppression and punishment of crime, and that only. It is from this postulate that the theorists are antagonizing the practice of all the legislatures and courts of civilization. Though Mr. Ward does not state the problem as above, yet his book is written to controvert the Spencerian and generally accepted theory, to present a new philosophy of society which shall be sufficient warrant for the course pursued by practical statesmen and jurists, and to support the earnest people of the world in their efforts to benefit the race. His postulate, though stated in other terms, is essentially this: that social progress is due to the struggle for happiness, and the adoption of that conduct which secures happiness; and that the process, instead of being natural and genetic, is artificial and teleologic; that men devise methods for securing happiness, and gradually attain their ends.

Mr. Spencer looks upon society as an organism, and in this he is followed by Mr.

Ward; but the former author makes it the central point of his sociology, around which all other facts are gathered, and he elaborates a system of analogies with biologic organization, as if, in fact, they were homologies. It will perhaps be nearer the truth to speak of a state, rather than society at large, as an organism.

The organization of mankind is twofold, — activital and regulative. By the activital organization, which is usually discussed in works on political economy under the title 'division of labor,' the industries and other occupations of mankind are parcelled out to individuals and corporations; so that a man, in working for himself, works for many others, and an interdependence of parts in the social organism is thus established. For the successful operation of the activital organization, the regulative organization is established, which results in govermnent, with its three co-ordinate departments, — executive, legislative, and judicial. Without division of labor and governmental regulation, the individuals of the human race would be entirely discrete; with them, mankind is organized into societies which we call 'states.' In so far as the people of one state are related to the people of another through their industries, there is an inchoate organization of state with state, which can only be completed by the consolidation of such states. Though Mr. Spencer devotes an inordinate space to the demonstration of the organization of society, he fails to discover, that, in so far as organization is accomplished, the method of biologic progress by the survival of the fittest is repealed. In the struggle for existence, state comes into competition with state; and to this extent the biologic law of the survival of the fittest applies. But in the relations of the interdependent parts of states, i.e., the different classes of people existing in a tribe or nation, the law of the survival of the fittest in the struggle for existence no longer applies; the unfit do not succumb; the welfare of each class (i.e., each organ, interdependent part) depends upon the welfare of each other part, — of the whole. There may be a competition for leadership, or for eminence in other respects, but not for existence.

Those who adopt the Spencerian theory believe that they find confirmation of their doctrine in the history of legislation. In modern times, since the differentiation of executive, legislative, and judicial organs and functions in government, legislation has often been unwise, and laws have failed to secure the purposes for which they were enacted. In this branch of human endeavor it would be strange if it were everywhere and at all times characterized by wisdom, when man has so frequently failed in other effort.

But beside the general failure for lack of wisdom, there has been failure for certain special reasons. Early law was common law; later law is in part statutory. In the change from the former to the latter, many great mistakes have been made. The body of law existing in a state, be it tribal or national, is the chief body of the ethics of the people of such state. But among such people there are ethical rules not found in the law, but held by individuals in a greater or less number. These non-legalized ethics are of two kinds, — first, those which have passed from the law, and are yet held in veneration by a part of the people; second, those which the more advanced minds are endeavoring to establish. The first are obsolete; the second, inchoate. Much of the law which Spencerian philosophers have used to illustrate the folly of legislation has been in instances where an attempt has been made to revive obsolete common-law principles by effective statutory law. Mr. Spencer's illustrations are chiefly of this class; and he has been followed by many a writer. This source of disaster can be avoided, not by refusing to legislate, but by a proper knowledge of the course of progress in social evolution. This course of evolution has not been, as Mr. Spencer postulates and elaborately discusses, from more regulation to less, from militancy to industrialism, but from less to more law, and from non-essential to essential regulation. When diseases were believed to be the work of evil spirits, or to result from the practice of sorcery, the relations of men to supposed spiritual beings were regulated, and witchcraft was punished; but, when diseases are discovered to be due to unwholesome conditions of environment, sanitary laws are enacted. And in like manner in every department of government the change is going on. Laws are sociologic inventions, analogous to the technologic inventions of the industries. Along with much failure there is much success. As the progress of industries would cease were no new methods devised, so the progress of society would end if new law were not enacted.

Dynamic sociology, as presented by the author, is the philosophy of human endeavor, and the justification of man in his effort to to improve his condition. Those persons, and they are many, who are actively engaged in the promotion of institutions and regulations for the benefit of mankind, will find in it philosophic hope; while those who are opposed

to the course of practical events appearing in public affairs cannot afford to ignore their strongest opponent.

The evolution which is discovered everywhere in nature, to be properly demonstrated, must have its explanation set forth in three parts. First, it must be explained why there is change, for without change there can be no development; second, it must be shown by what agency change results in progress, for change to inferior or co-ordinate conditions is not evolution; and, third, what is the course of progress, for, if there is progress, it must be in some direction that can be determined, and thus science becomes prophetic.

Of the three departments of sociology, — namely, the causes of social change, the causes of social progress, and the course of social progress, — the work under consideration, as its name indicates, is devoted to but one, — the cause of social progress; though it incidentally discusses many of the subjects of evolution in other branches of science, and the author ultimately reaches the conclusion that education is the chief means to secure social progress, and thus secure human happiness.

SIEMENS' SOLAR ENERGY.

On the conservation of solar energy: a collection of papers and discussions. By C. WILLIAMS SIEMENS, F.R.S., D.C.L. London, *Macmillan & Co.*, 1883. 20+111 p. 8°.

THIS is a collection of the original paper read before the Royal society by Siemens, and the criticisms from Fitzgerald, Faye, Hirn, Archibald, and others, together with the replies of Siemens.

The theory, well summed up on p. 22, supposes that space is filled with aqueous vapor and carbon compounds; that these, at low pressures, are dissociated by the radiant energy of the sun; that the dissociated elements are drawn into the sun at its poles, unite, and generate heat sufficient to give a temperature of about 2,800° C.; and that the aqueous vapor and carbon compounds formed are again thrown off by centrifugal force at the sun's equator.

As evidence of the presence of carbon vapors in space, Siemens refers to the analyses of meteors, which in some cases have proved that hydrocarbons were a component of the meteoric mass, and again to the work of Abney and Langley on the absorption of the radiant energy of the sun.

The dissociation of vapors at low tensions is a point which seems to be well established. One of the earliest proofs is given in Prof. J. Willard Gibbs's paper on the equilibrium of heterogeneous substances.[1] He shows, that in a mixture of gases, as of oxygen, hydrogen, and vapor of water, in which the vapor is formed with a decrease in volume from that of the components, it is possible to assign a value to the tension such that the mixture may be in a state of dissipated energy; i.e., in such a condition that the energy of the system is a minimum for its entropy; and that any change in energy can be brought about only by work done by some outside system and in proportion to that outside work. In such a state, nothing of the nature of an explosion could be caused by an electric spark: the elements would cease to show the phenomenon of chemical affinity. Willard Gibbs writes, "It may, indeed, be true, that at ordinary temperatures, except when the quantity either of hydrogen or of oxygen is very small compared with the quantity of water, the state of dissipated energy is one of such extreme rarefaction as to lie entirely beyond our power of experimental verification." In the formula from which these results are deduced, the ratio occurs of the amounts of the components to that of the compound, these amounts being raised to small powers. This explains the qualification as to the amount of components which may exist in a free state.

This last condition may have an important bearing on the possibility of the truth of Siemens' theory; for, although Gibbs has shown that dissociation may occur in rarefied vapors, still the amount of the dissociation is limited unless the rarefaction be very great.

Some two or three years ago Professor Ogden Rood succeeded in getting experimental evidence of dissociation in rarefied gases at ordinary temperatures, but has never published his results.

Dr. Siemens gives, on p. 13, what evidence he early obtained of dissociation of gases in vacuum tubes under the influence of sunlight. What he has done since may be found from an account of his recent lecture at the Royal institution (*Nature*, May 3). Objections to the theory are well put by Fitzgerald when he asks (p. 41) "how the interplanetary gases near the sun acquire a sufficient radial velocity to prevent their becoming a dense atmosphere round him; why enormous atmospheres have not long ago become attached to the planets, notably to the moon; why the earth has not long ago been deluged when a constant stream of aqueous

[1] Proc. Conn. acad. sc., iii.