$1,056,406,208, which seems to show that the revenue which went to reduce the national debt has been diverted to local improvements, and has become a wealth-producing power.

Comparing, now, the average increase by decades since 1850, we find population at about 30 per cent per decade; hay, except for 1883 and 1884, 36 per cent; cotton, 40 per cent; grain, 42 per cent; railway mileage, 115 per cent; improved land, 37 per cent; agricultural implements, 40 per cent; Irish potatoes, 38 per cent; butter, 26 per cent; live-stock, 47 per cent; assessed valuation, 40 per cent; while rice, sweet-potatoes, and cheese have decreased 50 per cent, 14 per cent, 74 per cent, tobacco is as in 1860, and our debts have simply changed form. This statement of average increases per decade shows how closely together the various values have kept for thirty-five years. The great advance since 1865 has now about brought us up to the place we should expect had the war not interrupted our development. Production has advanced only a little faster than population, and this is probably due to improved implements, improved methods, greater demand, and more facilities for handling the crops, i.e., railways.

C. H. LEETE.

New York, Jan. 22.

Professor Newberry on earthquakes.

In his notice of my article on earthquakes, in *Science* of Jan. 7, Mr. Everett Hayden intimates that I am not warranted in my statements in reference to the cause of earthquakes and the condition of the interior of the earth, citing the diversity of opinion which is on record, and the authority of great names opposed to me, as a reason why I should exhibit greater modesty.

I am sorry that I cannot see the matter from Mr. Hayden's stand-point. If he has any facts or arguments to offer which militate against the statements I have made, I shall be most happy to consider them, and I shall be convinced by them if they are convincing; but, without facts or new arguments, we may well be spared the appeal to authority. A blind deference to the utterances of great men has done geology much harm. Sir William Thomson has no more sincere admirer than myself, both for his genius and his nobility of character; and yet I do not hesitate to say, that by his unwarranted statements in regard to the condition of the interior of the earth, a matter in which his mathematical genius and learning give him no fitness to speak authoritatively, he has seriously retarded the progress of geological knowledge. From the phenomena of the tides and the precession of the equinoxes, he has inferred and asserted that the figure of the earth is as inflexible as though it were composed of glass or steel. There is, however, a doubt in the minds of many physicists whether the tides and the precession of the equinoxes afford such delicate and quantitative tests of the constancy of the earth's figure as to warrant these conclusions. Hennesy and Delaunay have shown that the argument from the precession of the equinoxes, at least, is weak; but, even if the fact of the constancy of the earth's figure be conceded, the inference that it is because of a rigidity of the earth's material equal to that of glass or steel, is certainly unwarranted. The argument proves too much: we all know that the materials composing the earth's mass are *not* as rigid as steel. The facts connected with earthquakes, volcanoes, mountain-chains, and the oscillations of the level of coasts, which I briefly cited in my article, show conclusively that the earth is not an unyielding solid; and I have suggested that the want of homogeneity in the materials composing it, — partly solid, partly viscous, partly fluid, — under varying conditions of pressure, may neutralize the tendency to distortion from the changing attractions of the sun and moon. The facts cited by geologists as disproving the absolute rigidity of the earth are unquestionable, and their arguments are cumulative and unanswerable. Hence astronomers must find some other explanation of the constancy of the figure of the earth — if that be proved — than a solid interior.

I am only exercising my inalienable right, am defending my hearth and home, when I protest against the invasion of our field of research by masters in other departments of science, however gifted, who, with imperfect knowledge, hurry to conclusions incompatible with those which geologists have reached by lifelong study. That Sir William Thomson did not give to the geological facts due consideration when he uttered his dictum, is shown in his original paper read before the Geological society of Glasgow in 1879. Here in advocating the theory that the earth is solid, and that the solidification began at the centre, the result of the cooling and sinking of an external crust, he states that most substances are denser when cooled to solidification than when fused. In a footnote to p. 40 of the volume of the Transactions of the geological society of Glasgow which contains Sir William Thomson's address, is given a report of later experiments made to test this question by Mr. Joseph Whitley of Leeds, England, who found that iron, copper, brass, whinstone, and granite, the only materials he tested, were all less dense when solid than liquid.

This is not the only instance where men of deserved eminence in their own departments of science, without taking pains to inform themselves in regard to the facts of geology, have sought to teach geologists lessons which they have not themselves fully learned.

Sir Robert Ball, astronomer royal of Ireland, an able and distinguished man, whose merits have been suitably recognized in the office he holds, and the title conferred upon him, in his eloquent address entitled 'Glimpses through the corridors of time,' has proposed a theory, which, if accepted, would not only revolutionize all geological history, but would discredit the teachings of the most eminent geologists. In the circumstances, I have felt called upon to protest against this invasion of our domain, and have shown that the geological record affords conclusive evidence against this theory.

So Mendelieff, one of the most eminent of chemists, has proclaimed the inorganic origin of the Pennsylvania petroleum from an inferred absence of organic matter from which it could be generated. Here, also, I have ventured to show that a better knowledge of the geological structure of western Pennsylvania would have revealed to him the true source of the petroleum in enormous underlying organic deposits, and would have prevented the promulgation of a geological heresy.

Those only are capable of intelligently discussing and deciding these difficult problems in geology, who, with special tastes and abilities, have devoted lives

to their study. And I respectfully submit that no one should accept the geological generalizations of chemists, astronomers, and physicists until their utterances have been approved and accepted by those whom we recognize as the ablest and most authoritative expounders of our science. As regards origin of earthquakes and the condition of the interior of the earth, as well as the other questions I have mentioned, I must decline to retract the opinions I have advanced until they shall be met with new facts or better arguments than any yet offered.

J. S. NEWBERRY.

New York, Jan. 14.

A card to American geologists.

A meeting of the American committee of the International congress of geologists will be held in Albany from April 6 to April 9, 1887.

The object of this meeting is to perfect a scheme embodying the thoughts of American geologists on the questions of classification, nomenclature, coloration, etc., entering into the system of unification of geological science, which is the object of the International congress.

In order that the committee may represent the views of all geologists in the United States, it hereby invites from all, their individual opinions on any subjects likely to arise in the congress. Those who will meet the American committee in Albany are requested to send to the undersigned a note of the topic or topics they propose to treat, and the time which they will require. In cases where it is not convenient for them to go to Albany, they are requested to forward a statement of their views to the undersigned in writing before April 1, for presentation to the committee.

For information as to the kind of questions to be discussed, attention is called to the 'Report of the American committee,' published last spring, in which the debates in the third session of the International congress are reported.

The following are the sub-committees of the American committee: archean, Hunt, Hitchcock, Winchell, Pumpelly; lower paleozoic, Hall, Winchell, Lesley; upper paleozoic, Hall, Lesley, Newberry, Stevenson, Williams; mesozoic, Newberry, Cook, Cope, Powell; cainozoic (marine), Smith, Newberry; cainozoic (interior), Cope; quaternary, recent, archeology, Powell, Winchell, Cook.

PERSIFOR FRAZER, *Secretary.*

Philadelphia, Jan. 22.

Loco-weed.

In your note on the 'loco-weed,' on p. 32 of *Science* for Jan. 14, reference is made to the belief of the Indians that an insect is the cause of the disease supposed to be produced in horses and cattle by eating this weed. In western Kansas there are two plants called 'loco' by the ranchmen. These are Oxytropis lamberti, Pursh, and Astragalus mollissimus, Torr. Specimens of the latter plant were brought to me a few days ago, whose lower stems were abundantly occupied by a stalk-boring insect larva. These insects are believed, not by Indians but by a certain physician, to be the cause of the 'loco' disease in horses by producing 'bots.' Moreover, this physician has frequently seen the horse bot-fly deposit its eggs upon the leaves of the Astragalus Henceforth let elementary entomology be added to the courses of study in our medical schools.

I may add, that Prof. L. E. Sayre, of the department of pharmacy of the University of Kansas, is making an exhaustive study of the 'loco' problem.

FRANCIS H. SNOW.

Lawrence, Kan., Jan. 16.

Spiders and the electric light.

Some disadvantage or evil appears to be attendant upon every invention, and the electric light is not an exception in this respect. In this city they have been placed in positions with a view of illuminating the buildings, notably the treasury, and a fine and striking effect is produced. At the same time, a species of spider has discovered that game is plentiful in their vicinity, and that he can ply his craft both day and night. In consequence, their webs are so thick and numerous that portions of the architectural ornamentation are no longer visible, and when torn down by the wind, or when they fall from decay, the refuse gives a dingy and dirty appearance to every thing it comes in contact with. Not only this, but these adventurers take possession of the portion of the ceiling of any room which receives the illumination.

It would be of interest to know whether this spider is confined to a certain latitude, and at what seasons of the year or temperature we can indulge in our illumination. G. THOMPSON.

Washington, D.C., Jan. 24.

A pineal eye in the mesozoic Mammalia.

Among the large number of mesozoic genera which have been determined by Owen, Marsh, and others, only one genus has any considerable portion of the skull preserved. This is Tritylodon, a comparatively large animal from the upper triassic of South Africa, described and figured by Professor Owen in the *Quarterly journal* of the Geological society in 1884. In describing the cranium, he writes (p. 146), "A short anterior divarication [of the parietals] bounds a small vacuity exposing matrix which has filled the cerebral cavity; which vacuity is completed anteriorly by a similar divarication of the mid and hind angles of the frontal bones, the mid suture of which is unobliterated. The above vacuity, *v*, if natural, represents a fontanelle, or it may be interpreted as a pineal or parietal foramen; it may, however, be due to posthumous injury."

Now that the meaning of the pineal gland has been made clear, this observation is of very great interest and importance. Tritylodon is one of a large and widely spread group of mammals, represented by Triglyphus, from the triassic bone-bed near Stuttgart; Bolodon, from the English Purbeck (Jurassic); Allodon, from the American upper Jurassic; and Polymastodon, from the American lowest eocene, or 'Puerco.' From the large size of the parietal foramen in Tritylodon, which greatly exceeds that of any of the recent lizards in relative diameter, and compares with that of the labyrinthodonts and saurians, we may safely infer that the primitive Mammalia, of this family at least, had a pineal eye of some functional size and value. HENRY F. OSBORN.

Princeton, N.J., Jan. 24.