In this round of organic life there is no loss or destruction of material. Plants take their C. H. O. N. from the inorganic world, and having utilized the elements restore them again to the source whence they were originally obtained, either through the processes of decay, or through the processes of animal life. So in like manner it is demonstrable that in the round of life there is no loss of energy. The heat, the light, the electric force, which plants, as it were, absorb to carry on their life, are not lost—they are, like the material elements, transmuted into other forms—into mechanical motion and chemical motion; but the very compounds in the manufacture of which the chemical action is expended—sugar, starch, fats, and oils—are the main sources of the heat of animals, the very compounds by the absorption and reduction of which animals are enabled to maintain a temperature above that of the circumambient atmosphere. So, also, animals which possess a nervous system evolve electricity. Our brain is a galvanic battery; our nerves are telegraph wires, conveying messages to and fro between the external world and our consciousness, which, as it were, sits behind the operating machine—the brain—receiving and sending messages, manipulating the machinery, just as a telegraphist does with the ordinary telegraphic apparatus.

In this outline sketch, which I have endeavoured to lay before you, of life and its physical correlatives, you will perceive that we have had to deal with nothing but ordinary chemical elements, and ordinary physical forces. As I said before, life is not an energy, it is not a force, it is not an entity. When we analyse its processes we see nothing more than a series of actions and re-actions produced by heat, light, and electricity, within a mutable, unstable combination of carbon, hydrogen, oxygen, and nitrogen.

Art. IX.—*Watershed Districts. County or other Division of the Country to be determined by the Area of the Watershed.*

By. J. Rees George.

[*Read before the Wellington Philosophical Society, 10th October,* 1880.]

The subdivision of the country for representation and local government purposes is a question that with politicians is generally decided in some haphazard manner, and chiefly by taking the nearest river-bed as a boundary, but is one that should receive more scientific treatment, and is therefore fairly open for discussion at the meetings of the Wellington Philosophical Society; and I propose, as shortly as possible, to show that the area of the watershed of any district is the boundary that should determine such divisions both for local government and representation purposes.

Navigation, drainage and water supply, the prevention of pollution, and the improvement of the rivers of the colony, greatly interest all residents and property-owners, and the system which now obtains of making the centre of a river-bed the political division of counties, road districts, and municipalities, is one eminently calculated to render impossible any systematic method of carrying out works connected with these subjects.

The rivers of the Colony are, as a rule, but little else than mountain torrents, in some cases navigable, with difficulty, a few miles from their outlets; and therefore greater reasons exist that the control of such navigation should be placed under a central administration; the whole country, in fact, should be mapped out into watershed districts, each containing one or more river basins;—this would appear, at first sight, to involve a large amount of work, but the information requisite for the purpose already exists, and in mapping out the country for local government and representation purposes, the ridges would form the natural boundaries, in place of the river-beds which, as a rule, are adopted.

Drainage and prevention of floods could frequently be dealt with, and great improvements effected at a small cost, were it not that local jealousies (from each river bank being under a separate system of government) prevent anything being done.

A general system of water-supply could be decided upon,—and erected at such times as might be required to supply the population,—without incurring the excessive outlay now required to supply each small village and district with a separate water-supply system of its own.

The central authority of the district could undertake the removal of obstructions to the navigation of rivers, protecting the banks, and such-like works, without the necessity of the creation of Harbour Boards, whose chief object is to spend borrowed money in the district, whether required or not; and, as a rule, interfere with, and quarrel with, the neighbouring authorities, and do more harm than good. With the exception, perhaps, of the Lyttelton Board, the works carried out under their supervision have generally had the most mischievous effect in place of effecting improvement—the Timaru works being an example.

The present County Councils could, by a slight amendment of the law, become the governing authorities of the watershed district, so far as all works affecting the surface of the ground are concerned. Road Boards, Municipalities, and Harbour Boards should only be allowed to carry out such works as might be approved by the central authority; and in sparsely populated districts these last-named governing bodies could be dispensed with altogether.

The election to such a body would be sought after by men of the highest

class, and there would be every inducement offered to the officers to lay out works on a comprehensive system, leading in the end to great economy in administration, and dispensing with the services of a large body of officials now necessarily employed by every petty authority.

It is impossible, within the limits of a paper of this character, to discuss the various interests that would be affected by the proposals, and the details as to monetary matters, rating, and expenditure. The object of the paper will be attained if the attention of those in authority is directed to the advantages that would arise to the community by adopting the boundaries of watersheds as political boundaries.

The river Thames, in England, is perhaps the strongest case that exists to show the advantages that would arise by a central authority controlling a watershed. At every few miles along the river-bank a different local government prevails, each with a separate system of management, of drainage, and of methods of polluting the river. The Metropolitan Board of Works, the River Conservators, the Thames Valley Main Drainage Board, the Lower Thames Valley Drainage Board, the Board of Works, and various other authorities, make feeble and abortive attempts to control these local governments. Isolated improvements are carried out, but there is no general system, and the result is that more money is wasted by abortive works and law proceedings than would suffice under systematic management to perform all necessary works.

The river Manawatu, in the colony of New Zealand, is one where the advantage of one authority controlling the whole watershed is apparent. The river drains a large extent of country beyond the near dividing range of mountains, and frequently heavy rains on the eastern or Wairarapa side of the hills cause disastrous floods throughout the Manawatu district. There is no doubt that a comprehensive system of works on the eastern side, with the gradually deepening and straightening of the course of the river on the western side, would materially prevent damage from floods. In the course of time the eastern side may become thickly populated; offensive drainage may arise from manufacturing or mining pursuits, to the damage of those on the western side; which no authority, except the General Government of the colony, can prevent.

The alteration, above proposed, in the present method of defining political districts, is one that can at the present time be carried out without much inconvenience, but every year creates vested interests, and renders an improvement in the system more difficult and costly.
