outlet like that in the cylinder *A* and falling into a platinum funnel like that directly below *A*. I charged the cylinder *A* with a large negative charge from a static machine and this charge remained on the cylinder, which was well insulated. Consequently, every drop of copper sulfate which dropped carried an induced positive charge and delivered it to the funnel *b*, which was earthed. This excess positive charge would of course be in the form of copper ions which would be deposited on the platinum in the process of neutralization of the drop. After running the apparatus for an hour or so, I looked at the platinum cylinder to see whether I could see any copper deposited on its inside and finding none I set the apparatus going in the late afternoon and let it run automatically until the following morning. Again examining the funnel, I found no deposit of copper and, somewhat surprised, I sat down to figure. I soon discovered that the copper would be present in far too small a quantity to detect. In fact, if every drop were charged with the largest amount of electricity which it could carry without losing it by corona to the surrounding air, and if the drops had fallen as fast as possible beginning with the time of Christ, I would by this time have collected barely enough copper to be shown by the most sensitive known chemical test. This little experience illustrates the vast difference in magnitude between the kind of currents that we are accustomed to deal with in electromagnetic induction devices, dynamos and motors, and these relatively very feeble currents of electrostatics. These drops were charged with high electrostatic voltage and the device was a fairly efficient electrostatic generator, and yet two thousand years would have been required to deposit an amount of copper such as would appear in a fraction of a second with only a moderate current of the type which we ordinarily use in electromagnetic instruments.

In recent years an interesting development of the Kelvin water-dropper has been proposed by Dr. Swann, of the Bartol Research Laboratory, in which the water drops are replaced by steel balls which fall under the action of gravity, and in order to make the process continuous, there is the suggestion whereby these balls may be carried back again to the upper container by means of magnetic control. In this way, the succession of falling balls behaves somewhat like a continuous belt containing metal sections separated by insulated regions of air and driven by gravity. In the absence of leakage this kind of a generator should be capable of developing such a high voltage that the electrostatic attraction of the falling balls would just compensate gravity. This would be an extremely high voltage such as could be obtained only if the apparatus were operating in a vacuum, and in fact Dr. Swann suggests that it may be operated in this manner.

*(To be concluded)*

# IN HONOR OF PROFESSOR ELIHU THOMSON

By Dr. HARVEY CUSHING

I HAVE been requested to speak in behalf of the professions other than Engineering. This is embarrassing for a doctor, for though Medicine has been said to be the mother of the sciences, they have usually left her, when grown up, to make their own independent way in the world. The best she can do under the circumstances is to breed more; and being prolific, this she continues to do. Meanwhile, being busily engaged in what is more an Art than a Science, she scarcely pretends to know how her scientifically minded descendents have grouped themselves, much less what mischief they are up to under their individual names.

There are those twins, for example, that have just been here, one terrestrially minded, the other stratospheric—but just which one is Auguste and which one Jean she is not quite sure. And then there are the Comptons whom she has learned to differentiate as H. V. and C. R.—High Voltage Compton and Cosmic Ray Compton—and this, after all, is not so difficult for her to remember. But when it comes to identifying all the Elihus, mostly surnamed Thomson but sometimes Thomson-Houston, that's another kettle of fish altogether.

What may be the relation of E.W. (Electric Welder) to E.L. (Electric Lighter) to C.T. (Current Transformer) to P.T. (Power Transmitter) to Q.F. (Quartz Fuser) and to Aurora B. and M.I.T. Thomson, to mention but a few of them, it's now impossible for almost any one to say. To one of this superfluous lot, sometimes known as H.F.A.C. Thomson, mention will subsequently be made if advancing time and contracting space permit. The only thing known about the Thomsons as a clan is that in memory of Roger Bacon's tutor, Peter Perigrinus, who is the family saint, every newborn child cuts his teeth on a loadstone or a spool of wire or both at the same time, and as a consequence the continued activity of the U. S. Patent Office is easily explained.

[1] Address at the dinner given in honor of Dr. Elihu Thomson on the occasion of his eightieth birthday, at the Massachusetts Institute of Technology, May 1, 1933.

Who the original three-coil and biphase Thomas or Thom may have been whose sons have so often inherited these same spool-of-wire tendencies is unrecorded, but I strongly suspect the gene is traceable to that particular lowland valley which breeds more natural philosophers and engineers to the square inch than any other—namely, the valley of the Clyde, whence Manchester can be reached in what for a Scot is a mere two days' walk. But these sons of the first Thomas have scattered farther afield than that, and it doesn't take a paleontologist to identify specimens in most remote parts of the world.

Even in such a surprising place as Woburn, Massachusetts, there cropped up a certain Benjamin who during a life dedicated to the relation of heat and friction, changed his name to Rumford, established the Royal Institution, picked out Humphrey Davy to run it, and found it more comfortable to abide there with him than to keep house with Lavoisier's widow, who proved too frictionable even for Benjamin. Another who similarly changed his cognomen was William of Glasgow, simply bursting—as would be expected from his chosen place of nativity—with heat, electricity and magnetism; but in course of time, in order to differentiate himself from his no less gifted and highly charged brother James, he felt obliged to adopt the name of Kelvin.

And there was Charles Wyville of the Challenger deep-sea expedition, Jocelyn Home the electrical engineer, James the mathematician, James Park the geographer, Robert who first made use of india rubber for tyres, and Thomas the chemist, and John Miller another, and Joseph John of Cambridge whose son George Paget of Aberdeen could not be pacified with a spool of wire so he was taught to pass electricity through gasses instead. And later on the same (now Sir) J.J. discovered a small negatively charged particle in the atom—with which the speaker at this moment feels in perfect accord. In short, there appear to have been no end to these Thomsons—and when they weren't natural philosophers, they were poets or musicians or something else—even doctors.

Still, I strongly suspect that after all there may not have been so many of them as would appear. For they may well enough have assumed different names when variously occupied. And this may conceivably account for all these local Elihus who some day may come to be conveniently expressed in a single formula—such, for example, as Baron of Lynn and Swampscott. This suggestion at least was made both by Count Rumford and Lord Kelvin when they passed their family medals on to him. And when Michael Faraday in turn bequeathed his medal to the Elihu of a given epoch, he admitted privately that his own name was Thomson back on the distaff side; for how else could he legitimately have come by that easily recognizable spool-of-wire gene?

And not to be forgotten in this genealogical survey is the late Sylvanus P., who is more addicted to p's than most Thomsons, but the fact that he produced sundry technical works on electricity including a treatise on dynamo-electric machinery and the electromagnet, beside writing a life both of Faraday and of Kelvin, serves unmistakably to identify him with the clan. The reason he should not be overlooked by the representative of the professions other than engineering, who chances to address you, is because he has taken pains to point out that the sire of the twin sciences of electricity and magnetism happened to be a doctor.

For William Gilbert of Colchester, Physician to Queen Elizabeth and much else, was almost the first to cultivate the method of experiment and reasoning from observation. He has been justly called the Father of Electric Science for his discovery that the power of a loadstone could be augmented by "arming" or capping it with soft iron, which he called the *armatura.* And after a life-time of experiments, just 333 years ago, and shortly before his death from the plague, he finally published the results of his studies in that epochal book in which the novel idea was first advanced that the globe of the earth is itself a great magnet. And while he spoke of electrifiable bodies as *electrics,* it was another doctor, Sir Thomas Browne, who for the first time forty-six years later coined and used the word *electricities.*

So the mention of Sylvanus P. Thompson brings us back again to Medicine, the mother of the sciences, and to a certain High Frequency Alternating Current Thomson already mentioned. That this might be the same Thomson under some other initials to whom Medicine was already in debt for his contributions a generation ago to the new science of Röntgenology seemed likely enough. But as there was some uncertainty about this, a letter was addressed to H.F.A.C. Thomson, Esq., of Lynn, Massachusetts, telling him that he might be interested in the application of various cutting, dehydrating and coagulating currents to the art of surgery, more particularly as facilitants to operations on the brain.

The sender ventured to say that he ordinarily did not permit laymen to witness operations. Only once had this rule knowingly been broken, in the case of the poet, Walter de la Mare, who was curious to see what the living brain of a conscious patient looked like when exposed to view. No wheels or bats were demonstrable in that particular attic, only a tumor, and the poet, while politely attentive, had shown by his attitude a certain measure of disappointment in what resembled a vascularized piece of dough.

But the electrical engineer who was partly responsible for what is called electro-surgery might well feel differently about it, and he was welcome to have a private look if he desired. The letter was returned from Lynn saying that there was no H.F.A.C. Thomson there any longer. There was a Q.F. Thomson who was busy squirting molten quartz on a mirror and who said he didn't recall H.F.A.C's address—only knew him slightly and never thought much of him anyhow.

So you can easily see how difficult it is for a person "representing all the other professions" to speak intelligently and authoritatively of the manifold and shifting interests of an electrical engineer, particularly when his name is Thomson—as it usually is and always should be—and more especially when he alternates from one field of research to another with such astonishingly high frequency. And also how embarrassing it is for an after-dinner speaker to realize that one of these Elihus—quite possibly the one here—not only is familiar with more types of gas than will be turned on to-night, but also invented the first muffler or silencer which by this time he probably wishes he'd brought with him.

But when we actually come to fuse all these Thomsons of our immediate vicinity and to get a composite picture of them, it becomes quite evident that the resultant Elihu is one of those rare men who transcend their own chosen walk in life and who belong to us all. It is not their genius alone which is responsible for this, however rare a gift genius may be and however much it may be envied and admired. It is only when genius is combined with those equally precious qualities of modesty, unselfishness and simplicity—the imponderables of high character and lovable personality—that there emerges from the common herd, from time to time, an occasional man whose life symbolizes for the rest of us, whatever be our profession, something as nearly perfect as one could hope to attain in this fallen world.

# A HISTORY OF THE NATIONAL RESEARCH COUNCIL 1919--1933

## VI. DIVISION OF MEDICAL SCIENCES[1]

By Professor STANHOPE BAYNE-JONES
CHAIRMAN

WHEN the National Research Council was organized in 1916 the medical sciences were at first represented by two committees: one on Medicine and Hygiene, and one on Research. These committees, like the National Research Council in general, constituted a part of the Division of Science and Research of the Council of National Defense. In February, 1918, a Medical Division was organized in the National Research Council.

During the war the division promoted and aided some forty investigations of industrial and medico-military problems. Although the division had certain funds at its disposal, chief reliance was placed upon the volunteer services of investigators, who patriotically devoted their efforts and facilities to research on problems of immediate interest in connection with the nation's conduct of the war.

After the war, in December, 1918, the division anticipated that its future functions would be: to take part in the correlation of research, to further research directly through grants obtained for the support of selected investigations, to aid the Army, Navy and Public Health Service in the solution of medical problems, and to promote the study of problems of industrial medicine. During the past fourteen years, the actual work of the division has been along the first two lines of anticipated activity. Since the Army, Navy and Public Health Service are provided with their own facilities and have qualified investigators on their staffs, they have not brought their problems to the division. Nevertheless, close and mutually beneficial relations have been maintained between these Services and the Division, providing a valuable exchange of information and a channel for cooperative endeavor whenever the need for it arises. The investigation of problems of industrial medicine and hygiene has not figured as largely in the activities of the Division as was anticipated.

The membership of the Division of Medical Sciences has been composed of the representatives of some fifteen scientific societies in the field of medicine and six or eight members at large. Through them the scientific medical organizations of the country have had a voice in the deliberations of the division and have had a direct influence upon its activities. This relationship with organized associations of scientists has been an important factor in the life of the division.

[1] This is the sixth of a series of ten articles prepared to describe briefly the nature of the activities with which the National Research Council has been engaged during the past fourteen years.