strength there; gained forty pounds. Now describes herself to be in good health.

Case 5.—Graves' disease; slight ophthalmos; slight thyroid enlargement; cardiac disturbance and tremor; improvement.—Miss R., aged 25, history good. At 10 years had typhoid fever, at 11 very severe dysentery; long in regaining strength; much headache at 19 years, an illness began by neuralgia in face and marked prostration; noticed rapid breathing; soon eyes were remarked as being "curious looking;" tried to gain strength by exercise in open air. In 1881 again fell ill. In March, 1882, consulted Dr. Seguin, who pronounced unfavorably; at that time had much oedema in legs; ordered digitalis; quiet. Following November grew much better; partly in bed for several months. December, 1883, she saw another physician who relieved the increasing diarrhoea. May, 1881, to May, 1884, menstruated only once; thence irregular till a year ago, since then fairly regular. Weight about 135; skin moist and shiny; beads of sweat on upper lip; tremulous lip and tremor in voice, this seems a constant feature; at times tremor in muscles elsewhere. Exophthalmos slight; von Graefe's sign in both eyes; pupils normal; corneal vessels injected; flushes readily; not pale; heart tumultuous; no valve defect; pulse intermittent, one beat in three or seven, very difficult to count. Thyroid enlarged symmetrically; well-marked thrill; loud bruit in right neck; buzzing in head; sweats almost constantly; respiration 28, sighing; dyspnoea great on slight exertion; cannot lie in bed at night; bowels loose.

Rapidly improved in most respects under treatment by regulated living, digitalis, and belladonna, tonics, iron, etc.; salt sponging; hot hip baths; menstruation more comfortable. In January had an attack of nervousness at night time, sense of great pressure in head and flashes of heat over body; ringing in ears. Eyes were examined by Dr. de Schweinitz, who found slight hypermetropic astigmatism; no fundus lesion. Alternate hot and cold water to nape of neck relieved the sounds in head. Is steadily improving to date.

Case 6.—Miss D., aged 24, family history decidedly neurotic. Mother "queer." At one year scarlet fever followed by water on the brain; soon recovered good health. Menstruated at 15.

August, 1885. Dysentery.

December, 1885. Heart began to alarm her. Vertigo sitting or walking; grew weak, short of breath, and extremely nervous; could not sleep, began to groan loudly in sleep, which continued till recently. Skin itches intolerably; sweats readily on exertion. Roaring noises in the head. Legs swelled, also feet—"the buttons were burst from the shoes."

March, 1886. Neck enlarged. In May the eyes started forward. Appearance: eyes very prominent, sclerotic shows half an inch or more above and below, lids puffed, corneal vessels injected, face bloated and livid, skin greasy. Thyroid enlarged in three directions, most on the right; neck thirteen and three-quarters inches. Heart sounds clear; impulse heaving; slight systolic whirr. Pulse regular,

112 standing. Bowels very loose; tremulous voice. Eyes examined by Dr. Hansell show some accommodative defects, but no fundus lesion. Urine albuminous. Decided delusions. No improvement.

Case 7.—Miss M. D., sister to above, well-grown girl, well till a year ago, when she had "walking typhoid;" afterward very weak; fainting spells; vertigo on walking; sweats readily; constantly chilly; especially the hands and feet. Buzzing in the ears. Menstruated at 13, but extremely irregular; rarely lasts over two days. Eyes showed no lid sign; no exophthalmos. Thyroid enlargement right; neck twelve and three-quarters inches. Heart quick and feeble; muffled sounds; roaring noise over the right clavicle and through the thyroid, also marked thrill. Carotids pulsating visibly. Pulse 128 to 130. Very pale. Is improving.

Case 8.—Mrs. S., aged 46; mother living, a "fidgety" woman, has two children. Fairly good health till 1881, when she had typhoid fever, followed by large abscess in the abdomen, opened in two places. Treated in the Jewish Hospital. After this shortness of breath began. In 1881 a financial blow greatly worried her; she would sit and brood over her troubles then the fever. Exophthalmos began, along with diarrhoea; sweated a great deal on both sides. Buzzing in the ears. Appearance: strongly built woman, weight 130 pounds; skin muddy and dusky. Left eye very prominent, right less so; lid signs of both eyes. Carotids throb moderately. Heart sounds clear and distinct; slight bruit. Has been under treatment for eight or nine months. Digitalis and iron and belladonna. Dyspnoea greatest on cold days. Urine at times profuse; no albumen. Oedema of legs fluctuates. Is steadily recovering, though susceptible to fatigue, cold, and shocks.

I hope to discuss the treatment, on which I have some decided opinions, on another occasion. This consists mainly of rest, judicious feeding, tonics, and carefully selected sedative measures.

Competent glasses, too, are essential; at times sharp counter-irritation, especially diuretic remedies and attention to the emunctories. Galvanism, too, has immense value in some instances, but requires judgment in selection of cases.

In brief, whatever measures tend to repair the tone of the vascular system and allay nervous excitability will best bring about gratifying results.

ELECTRICITY IN MODERN MEDICINE.

Read before the Medical Society of the District of Columbia, December 7, 1887.

BY ROBERT REYBURN, M.D.,

OF WASHINGTON, D. C.,

PROFESSOR OF PHYSIOLOGY AND OF CLINICAL SURGERY IN HOWARD UNIVERSITY.

About one hundred years ago, a Professor in the University of Bologna, named Galvani, was experimenting with the nerves of the lower extremity of a recently killed frog. He found that by placing a piece of zinc under the upper portion of the nerves, and touch-

ing the upper portion of the nerves with a piece of copper wire violent contractions of the thigh muscles would immediately ensue. Very likely others before him had observed the same phenomenon, and had looked upon it with simple curiosity without caring to inquire why this was so. Prof. Galvani, however, was not of this class, and he pondered the matter, as in the presence of his students he over and over again repeated his experiments. His final conclusion was that a mysterious and occult form of animal electricity was produced, having the power to act upon the nerves, and thence to the muscles of the body; and this force has been called, from its discoverer, Galvanism.

Little did Galvani know how far-reaching and wonderful would be the results of the discovery he had made to the comfort, health, and even lives of his fellow-men. Another Professor, in a rival University, that of Pavia, Professor Volta, repeated the experiments of Professor Galvani and confirmed the facts but could not agree with the explanation given. He asserted that the contact of the different metals was the cause of the galvanic current which produced the contractions in the legs of the frog. Hot and furious raged the contest between the partisans of the two theories of galvanism for many years, but we now know with certainty that Professor Volta's theory was more nearly the correct one; to this is due the fact that this force is called, indifferently, galvanic or voltaic electricity. Professor Galvani, the first discoverer, found, like many another man, that his labors to a great extent were simply the scaffolding upon which others climbed to still higher heights of science. Faraday then still farther carried on the theory of galvanic electricity, and showed that the amount of the galvanic current present is directly dependent upon and proportionate to the amount of chemical action. But the time fails me even to mention the names of the many great men who have devoted their lives to the development of electrical science. To Ohm we owe the celebrated law of electricity that has brought it from empiricism to those of exact science, and the labors of Seebeck, Oersted, and Ampère have marvellously aided in its development.

But "*cui bono*," as the Spanish say, is all this history of the progress of galvanism. I now turn to what is a much more interesting topic to the layman as well to the medical man, namely, the application of galvanic or voltaic electricity to the cure of disease. Most persons know that a galvanic battery, so-called, is composed of plates of zinc, copper, or of other metals that are immersed in acids or chemical solutions. The terminal plates have attached to them wires or connecting metallic cords, which are called the negative and positive poles of the battery. When we touch or connect the poles of the battery together we find that a certain force, namely, the galvanic current, so-called, is developed capable of producing certain changes in the body. If the galvanic current is passed through a coil of wire under certain conditions of rapid alterations of the current we have a somewhat disagreeable feeling known by the name of the galvanic shock, which is accompanied by vio-

lent contractions of the muscles of the body. While the galvanic shock is a valuable addition to the armamentarium of the physician in treating cases of paralysis accompanied by atrophy or wasting away of the muscles, or in cases that require a stimulating application, yet, after all, the use of this kind of galvanism is comparatively limited and insignificant compared with the benefits derived from continuous, gentle, yet powerful applications of this wonderful remedial agent. It is found that by placing the two poles of the battery carrying the galvanic current in contact with the external or internal parts of the body, that the most powerful effects may be produced. Tumors and neoplasms of all kinds, for instance, may be dissolved without the use of the knife or caustic destructive agents, or in any way injuring the textures or vital organs of the body.

In order to show that this is possible, I will simply give you a sketch of what has been done by Prof. Apostoli and others for tumors and morbid conditions of the abdomen, more especially in females. In his paper read before the British Medical Association, in Dublin, Aug. 2, 1887, Prof. Apostoli said that during the five years from July, 1882, to July 1887, he had treated 403 patients, and made to these patients 5201 applications of electricity. Two hundred and seventy-eight of these patients suffered from fibroid tumors of the uterus, or uterine hyperplasia of various kinds. Space will not permit me to go into details but the final result is that 95 per cent. of those persons were cured, and restored to a condition of usefulness to their families and to society, and out of the entire number only two died during the treatment. These results so far surpass any other method of treatment ever adopted as to attract the attention of physicians of all countries, and in our own country Drs. Marcy, Newman, Cutter, Martin and Garrett have likewise adopted it with great success.

It will be necessary to explain to those that have not studied the laws of electricity, that when the positive and negative poles or terminals of a galvanic battery are placed in a fluid it is decomposed and the components of the fluid arrange themselves in a certain order around each pole, oxygen, chlorine, iodine, etc., arranging themselves around the positive pole, and hydrogen, the metals, etc., arranging themselves around and in contact with the negative pole. Prof. Apostoli, by the use of very powerful currents of electricity, from 50 to 150 milliampères, and sometimes using even as high as 200 milliampères, actually produced a galvano-caustic and electrolytic effect, which effectually dissolves the tissues of the tumor and causes its disappearance without the use of the knife. He also uses the electro-caustic method.

The objection may be raised that if the powerful galvanic currents can dissolve the substance of tumors why do they not dissolve the healthy tissues? The answer to this probably is, that in the first place morbid growths such as tumors and hyperplasia of vital organs have not the same resisting power or vitality as the healthy parts of the body. A tumor, for instance, is much more easily injured by a blow or other hurt than the healthy organs. It will inflame or even ulcerate by an amount of violence that would

not apparently wound the body in the natural or healthy condition. Another reason for this exemption from injury in the application of these strong currents is the precautions taken in using large electrodes or poles when applying them to the body. As the strength of the current is to a certain extent in proportion to the square surface of the electrodes or poles if, for example, we apply a certain strength of current to an electrode one square inch in area, by increasing the area of the electrode to one hundred square inches we give the current one hundred times as strong with little more disturbance of the parts than when employing the weaker current. In order to prevent injury to the external parts of the body the external electrode is covered with wetted clay, cloth, flannel, wet sponges, etc. The negative pole is usually placed in contact with the tumor and the positive pole on the outer surface of the body adjacent to the tumor or inserted into the substance of the tumor. The positive pole, you will remember, is always the one by which the electric current leaves the battery, and the negative pole the one by which it reënters it. The positive pole has very powerful properties in arresting hæmorrhage from tumors, and hence is frequently applied in that class of cases with very beneficial results.

Dr. Alfred C. Garrett, of Boston, reported to the Ninth International Medical Congress, recently held in Washington, 184 tumors of the breast treated by galvanism, from 1864 to the present time, in his practice. One hundred and fifty-seven of these were cured and disappeared entirely. Several others did not become quite obliterated and a small lump remained that gave no inconvenience. In every case the tumor disappeared or became harmless. He also recommends the use of soft, large poles with currents of from 10 to 50 milliampères.

Dr. Ephraim Cutter reports 400 cases of fibroid tumors treated by electricity, with the greater portion relieved. Dr. F. H. Martin, of Chicago, read a very interesting paper upon the electrical treatment of fibroid tumors, before the Gynecological Section of the Ninth International Medical Congress, and enumerates the following advantages of this method of treatment, viz.:

1. It is entirely free from danger.
2. It is absolutely painless.
3. It invariably checks hæmorrhage.
4. It rapidly reduces the size of tumors.
5. It relieves neuralgic pains.
6. It admits of exact dosage, so that we know exactly how strong a current we are using.

Dr. R. Newman, of New York, reported to the Section on Surgery, American Medical Association, which met in Chicago, June, 1887, his record of 100 cases of stricture, making 200 in all, which have been cured by the galvanic current. The concurrent testimony given, and which might be largely augmented if necessary, shows clearly that we have in galvanic electricity a most potent remedial agent, which is to revolutionize some of the branches of the healing art.

I have mentioned several times the words *ampère* and *milliampère*, and it may be necessary in explana-

tion to state that the ampère is the measure of the strength in intensity of the galvanic current. Let us imagine the galvanic current flowing along the wires connecting the poles like the flow of water in a river. As the water flows along the banks with greater or less friction, the rapidity of the current is retarded or accelerated; just so with the galvanic current. It is retarded in its progress more or less, and this resistance to the current we can measure. The unit of resistance, or rather rate of velocity, is called the *ohm*, from the celebrated scientist, and is composed of a column of mercury one square millimetre in section and 106 centimetres in length. The unit of the intensity of the current is the ampère, from the name of the distinguished French electro-physicist.

To give this concrete expression, it may be stated that an ampère represents the quantity of galvanic electricity generated by the unit of electro-motor force, the volt circulating in a conductor having the unit of resistance the ohm, during the unit of time. The volt is the measure of pressure or difference of potential of the current. It has been ascertained practically that this is the quantity of electricity furnished by a Daniels' battery. Having now obtained a standard, namely, the ampère, we can measure the intensity of our electric current just as accurately and almost as easily as we can measure a distance upon the earth by the use of the English yard or the French metre. The instrument by which this is done I now show you, and it is called the milliamperemètre. As its name implies, it is a measure of the intensity of the electric current, and enables us to know just as exactly the dose of galvanic electricity we are administering as we know the dose of medicine we are giving to a patient. It is capable of measuring from one-tenth of a milliampère to 500 milliampères, and is destined to do as much for the application of electricity to medicine as the use of the clinical thermometer has done in accurately determining the amount of fever present in a patient.

PAPILLOMATOUS CYSTIC TUMOR OF OVARY, WITH A HERNIAL POUCH DEVELOPED IN THE CICA- TRIX OF THE ABDOMINAL WOUND FROM A FORMER OVARIOTOMY.

Read before the St. Louis Medical Society, March 10, 1888,

BY L. H. LAIDLEY, M.D.,

PROFESSOR OF GYNECOLOGY BEAUMONT MEDICAL COLLEGE; SURGEON TO
PROTESTANT HOSPITAL; CONSULTANT TO ST. LOUIS
FEMALE HOSPITAL.

Mrs. C., æt. 39, American, married, had one child which is now eight years old, gave the following history: She was of healthy parents, menstruated at 14 years, was a healthy girl, married at 22. Eight years ago she had an ovarian tumor removed from the left side (it was a large, multilocular, benign ovarian tumor). One year after the operation she was delivered of a child at full term. The recent operation and the pregnancy developed a large hernial pouch, which allowed the bowels to protrude, forming a tumor as large as a child's head at full