and organic chemistry respectively, completed in 1877 the long and valuable series.

The honorable career of this standard work reminds us of that other remarkable handbook, the '*Cours de chymie*' of Nicolas Lemery, of which the first edition appeared in 1675, and the fourteenth, greatly enlarged by Baron, in 1756, eighty-one years after.

The new work by Henry Watts is confessedly "founded on the well-known manual of chemistry of the late Professor Fownes;" and, such being its origin, we are not surprised to find that it wears the garb of a familiar friend. The learned editor of 'A dictionary of chemistry' has in this manual dropped the name 'Fownes' from the titlepage, and given us a revised edition bearing his own name. And this he undoubtedly has a right to do, if one takes into consideration the great alterations and additions made in the preceding editions with which his name was associated, together with the improvements in the one before us.

The present volume commences with a short sketch of the more important elementary bodies, the principal laws of chemical combination, the principles of nomenclature, and the representation of the constitution and reactions of bodies by symbolic notation. In the preceding edition (twelfth) of Fownes the three topics last named were treated at p. 123 of the volume: here they appear at p. 7.

This introduction is followed by a section on chemical physics which has always occupied a prominent place in the several editions of Fownes. The next section contains a description of the non-metallic elements in the following order: hydrogen, chlorine and its analogues, oxygen, sulphur and its analogues, nitrogen, phosphorus, arsenic, boron, silicon, and carbon. This is succeeded by a fuller consideration of the general principles of chemical philosophy, embracing sections on quantivalence, the periodic law, crystallization, and chemical affinity. At this point is introduced the subjects of electro-chemical decomposition, or electrolysis, and the chemistry of the voltaic pile, which are thus divorced from their rational connection with the chemical physics in the earlier portion of the work. The latter half of the volume treats of the metals in their usual systematic order.

Watts's chemistry, on the whole, differs more from its predecessor in the arrangement of material than in the introduction of novelties; still, we find new paragraphs here and there, embodying late discoveries. The work shows evidences of having been rather hastily prepared. Thus, while the newly announced elements, scandium, decipium, ytterbium, and samarium, are briefly described in their proper connection (pp. 458 to 463), only two of them (Sc and Yb) obtain positions in the list of elementary bodies on p. 3. Again: under oxygen we find no mention of its liquefaction, though in the section on chemical physics the experiments of Cailletet and Pictet are, far too briefly, chronicled. Ozone fares very badly, obtaining no recognition whatever in the body of the work, and being relegated to a single page (584) at the very close of the appendix; and there it is very inadequately treated. Its liquefaction by Hautefeuille and Chappuis is not mentioned. The page is a simple condensation of the two pages given to the subject in the preceding edition of Fownes, without the addition of a single new fact. The atomic weight of antimony still appears as 122, notwithstanding the great weight of evidence in favor of 120. Meyer and Seubert make Sb = 119.6.

The well-worn woodcuts, too familiar and never very attractive, still do service in illustration. The volume contains thirty-four pages more than the English edition of the last issue of Fownes. In spite of some blemishes, however, Watts's Chemistry sustains the high reputation of its lineal ancestor, and well deserves a large patronage.

INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

GOVERNMENT ORGANIZATIONS.

Geological survey.

Topographical work in North Carolina. — Party No. 1 of the Appalachian division was in charge of Mr. Charles M. Yeates, topographer, and, during the seasons of 1882 and 1883, surveyed the area lying between the Blue Ridge and the Tennessee line in North Carolina, with the exception of Watauga, Ashe, and Alleghany counties. This area lies between the 35th and 36th parallels, and extends from the 82d to the 84th degree of longitude, including the most mountainous portion of the state, and that which is usually designated as western North Carolina.

The state line separating North Carolina and Tennessee follows the summit of the Alleghany Range, which, in its different parts, has received various specific names; such as the 'Unaka,' the 'Bald,' and

the 'Smoky' Mountains. These names are applied to the portions that lie between terminal points where the rivers intersect it. Other local names have been applied to minor subdivisions and to summits; but the most prominent portions are known to the native population by names which agree with those used on the existing published maps of the region.

The Alleghany Range and the Blue Ridge are in general parallel to each other. The greatest distance between them is across Haywood and Transylvania counties, where they are fifty-five miles apart; while where they are closest they are only eight miles apart. They are also parallel with the coast-line; and a contour map of the state will show that it is crossed from south-west to north-east by a series of parallel ridges from a point within four miles of the coast to the Blue Ridge. The first of the ridges reaches an elevation of between seventy and eighty feet; and the succeeding ones increase in height, one after the other, until they culminate in the mountains of the western part of the state, where the general elevation is from 4,000 to 6,000 feet.

The Blue Ridge in this section is of peculiar interest, because in its details its course is very crooked. It is entirely unlike the long, straight ridges of eastern Tennessee. It enters the state from Virginia with an elevation of 4,000 feet above sea-level, and reaches its maximum height of about 6,000 feet at Grandfather Mountain, which is the highest summit in the ridge; although hitherto, High Pinnacle, near the Black Mountains, has enjoyed that reputation. The next highest point to the southward is Sugar Mountain, with an elevation of 5,200 feet. From the latter point the range drops to low summits, that do not usually exceed 3,600 feet above sea-level. These continue southward to Humpback Mountain, a distance of fifteen miles, when there is a rise to 4,800 feet; and from here to Bear Wallow Mountain the range is of a quite respectable elevation. At High Pinnacle, where the ridge joins the Black Mountains, the height is 5,600 feet. From Bear Wallow southward, the range is comparatively insignificant; but, as the state line is approached, it once more rises, and is of considerable importance as it passes from the state.

South and east of the Blue Ridge are the lowlands, while to the westward is the high plateau section. The difference in elevation between the two is generally about 1,000 feet in a distance of some two or three miles. The difference in seasons, between the two sections, is from two to three weeks. A view of the ridge from the west, at many points, would give an idea of insignificant elevation; whereas the same section, seen from the east, would be quite imposing. This peculiarity of the ridge is characteristic in North Carolina, with the exception of the section lying between Humpback Mountain and Sugar Mountain, in which the eastern and western descents are about equal.

North Carolina, west of the Blue Ridge, contains about 75,000 square miles, of which some 5,500 have already been surveyed, — 4,000 by Mr. Yeates's party, and 1,000 by Mr. Bien. The remaining portion will be surveyed by Mr. Yeates during the next season. The map will be on a scale of two miles to the inch, with contours two hundred feet apart vertically, which will show the country in considerable detail. The existing maps of the region have all been generalized, and are more or less indefinite.

The topographical features of the region are entirely dissimilar to those of the adjacent portions of Virginia and Tennessee. In the latter the strong orographical features of West Virginia and south-western Virginia gradually die out, while in North Carolina there appears to be no regular system when compared with the other states. The only resemblance is, that the Blue Ridge and the Alleghany Range are in general parallel with the ranges of East Tennessee. The distinctive topographical feature in North Carolina is the existence of cross-ranges which connect the Blue Ridge with the Alleghany Range, making immense drainage-basins, whose outlets are through the latter to the western river-systems. These cross-ranges, with the exception of the Great Smoky Mountains, are of more importance than the ranges which they connect; as they generally have a greater altitude, many of the summits reaching a height of more than 5,000 feet. The principal ones are the Rich Mountains, the Cockscomb Range, the Newfound Mountains, the Great Balsam Mountains, the Cowee Mountains, and the Nantehaleh Mountains. The Balsam Mountains share with the Smoky and Black Mountains of North Carolina, and the White Mountains of New Hampshire, the distinction of being the highest mountain masses in the eastern United States. The spurs of the cross-ranges form an intricate maze of drainage and topographical details.

The Black Mountains, a range ten miles in length, with seventeen summits, are neither one of the cross-ranges nor one of the transverse ranges, but a spur from the Blue Ridge, with which they are parallel. The highest point is Mitchell's High Peak, which is the highest summit east of the Rocky Mountains. Mr. Yeates, by barometrical measurement, obtained for it a height of 6,717 feet, which is six feet higher than any previous measurement. The coast and geodetic survey, by means of vertical angles, fixed its height at 6,688 feet above sea-level. The elevation given by Professor Guyot is 6,707 feet. Major James W. Wilson, chief engineer of the W. N. C. R.R., at the request of Gov. Swain of North Carolina, ascertained its height by means of levels, and fixed it at 6,711 feet.

The French Broad River is the principal stream of western North Carolina, and is a stream of much beauty, flowing through a valley of great fertility. Its course in the Transylvania valley is very sinuous, and its flow sluggish. The Indians designated this portion of its course 'sleeping serpent.' From Dunn's rock, a precipice that overlooks it, thirty-six bends can be counted as the river winds in its tortuous course through the farms in the valley below. Almost all the small streams, as well as the large rivers, of the section, have good water-powers, which must eventually be utilized for manufacturing purposes.

The timber-lands of the region form immense unbroken forests, exceptionally fine both as to density of growth and the character of the timber. Among the varieties of wood are maple, poplar, linden, balsam, cedar, hickory, ash, beech, birch, cherry, black walnut, and many varieties of oak. Some of the trees grow to an enormous size; and many men in this section, who a few years ago considered themselves poor because they possessed only a wilderness of forest, are beginning to realize that they are comparatively rich, the sale of a few individual trees frequently sufficing to give them an income for a considerable time. These trees are bought by speculators, who, in turn, sell them to other speculators, who may dispose of them to third parties, until finally a portable saw-mill is brought into the region, and the timber is prepared for market. A view from one of the cleared summits impresses one with the extent of the forests, which are, of course, broken here and there by many dots of cultivated land, both in the valleys and on the mountain sides. The country, however, is comparatively undeveloped. The soil is good, but farming is carried on in a primitive way and on a contracted scale. There is plenty of good grazing-land, and cattle are raised to a considerable extent. They are allowed to run wild among the mountain ridges; and the cost of keeping them is small, as they are allowed to find subsistence for themselves.

The mineral wealth of the region is well known. In fact, it has been said that almost every mineral or ore found within the limits of the United States can be found in North Carolina. The gold-mines east of the Blue Ridge have produced millions of dollars, notwithstanding the hinderances of swindlers and speculators. Mica-mining is one of the profitable industries of the region mapped by Mr. Yeates, and is carried on in nearly all of the counties west of the Blue Ridge. Kaoline and corundum mines are also worked, and a large deposit of talc is attracting considerable attention, while tin is the latest discovery.

PUBLIC AND PRIVATE INSTITUTIONS.

Peabody academy of science, Salem, Mass.

The director's trip to Japan. — Professor Morse left Salem early in the spring of 1882 for the purpose of visiting Japan and China, and reached Japan in May. On his arrival in that country he had several interviews with Mr. Kato, the director of the Imperial university, and told him that his time was to be divided between collecting ethnological material for the museum of the academy, and the study of ethnology and archeology, and specially the ceramic art. A suite of rooms in a little house near the astronomical observatory was fitted up for him by the university, and given to him free of cost during his entire stay. Rooms and closets in other college-buildings were given to him for storage purposes; and, indeed, every thing was done by the Japanese authorities to facilitate his work, without which assistance little progress could have been made in the task he had planned.

In return for the collections of corals sent out by the academy for the educational museum, the educational museum presented to the academy a large collection of tools illustrating the trades of Japan. Great credit is due Mr. Tejima, the director of the educational museum, for the thorough way in which this collection was brought together. Not only were the various implements collected; but in many cases partially completed specimens of the work, as well as colored sketches, accompanied the tools.

Through the influence of Dr. W. S. Bigelow, the academy is indebted for the remarkable collection of weapons which were presented by a famous sword-merchant, Mr. Machida Heikichi. Having explained to Mr. Machida the objects of the academy, and the nature of its museum, Mr. Machida, with great pains, and at his own expense, brought together the invaluable collection of swords, spears, bows and arrows, and other weapons which now enrich the academy's museum, and presented them outright, properly labelled and prepared for shipment.

Mr. Takanaka Hachitaro supplied the Japanese names for all the objects collected. He also presented many objects of household use, and clothing. Professor Mitsukuri, at great trouble, sought out the proper person to whom was intrusted the making of the large figures which now adorn the museum, and personally superintended their dressing and arrangement.

Korean collections. — Through Capt. Hammond Professor Morse was made acquainted with Count von Mollendorff, then on his way to Korea as special commissioner for China. He authorized him to spend a limited sum for purchases of ethnological materials in that country, and gave him a brief list of desirable objects. The results of his work, filling four cases, have already been received and unpacked. They arrived in fair condition; and as far as he knows, this is the first collection of Korean objects ever sent from that country. In this connection it is proper to mention, that members of the Korean embassy who visited this country last year presented a number of objects to the academy; and one of their suite, Mr. Yu Kil Chun, who remained in this country, and who is now living in Salem, presented his entire suit of clothing, and other objects, to the museum.

Accessions to the museum. — These have been more numerous and more valuable than during any year, perhaps, since the foundation of the East India marine collection in 1799. The principal ones are as follows: —

Morse collection, Japan, 680 numbers; Morse collection, elsewhere, 141; William Dolan, China, 50 specimens. Additions to county collections: plants, 54; mammals, 50; and archeology (85 lots), 322 specimens (this last includes about 15 lots, 50 specimens outside); botanical, 200; other accessions, 300; models of boats, 12.

Visitors to the museum. — Thirty-six thousand and fifty-six persons have visited the museum during the year. The greatest numbers on single days were: Feb. 22, 440; July 4, 182; April 5 (Fast), 346; Sept. 25 (first day of cattle-show), 384; Sept. 26 (second day of cattle-show), 936; Nov. 29 (Thanksgiving),

336. July 4 is mentioned to show how few persons are often at the museum on holidays now, as compared with the attendance on such days in former years, especially in summer, when 'attractions' are offered at the 'Willows,' 'Point of Pines,' and other popular resorts in the neighborhood.

The above figures are undoubtedly under the actual numbers. There is a steady increase, each year of late, in the regular daily attendance, and a corresponding decrease on popular holidays.

The specimens which seem to be of most interest to the general public are the life-size figures from China, Japan, India, and other countries; the general collection of mammals and birds; the Essex county animals and woods; and, perhaps more than any thing else, the human skeletons and crania. The carving 'Heaven and the day of judgment' of course holds the first place for the seeker after the curious and wonderful.

RECENT PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Ottawa field-naturalists' club, Canada.

March 13. — Mr. W. P. Lett read a paper on the deer of the Ottawa valley. Of these, the most important as regards size is the moose, or American elk (Alce americanus), which unfortunately, owing to indiscriminate slaughter and illegal hunting, is rapidly becoming very rare, except in remote districts along the northern tributaries of the Ottawa. The woodland caribou, or reindeer (Rangifer caribou), formerly frequented the whole country on the north side of the river, but was only an occasional straggler on the opposite shore. Like the moose, it has been driven northward, and much diminished in numbers, although sometimes still found on the Des Licores River, fifty or sixty miles from its mouth, on the upper Gatineau, and to the north of Lake Nippissing. It is the swiftest and wildest of all deer; and the only successful method of capturing it is by still-hunting. The magnificent wapiti, or great stag (Cervus canadensis), falsely called the American elk, was, within the memory of persons still living, an inhabitant of the great hardwood forests along the Ottawa, and was seen within four miles of the spot where the city now is. Fragments of its enormous antlers are still turned up by the plough in various localities, but the stately monarch of the forest has retired to the far northwest territories. The common red or Virginian deer (Coriacus virginianus) is still found within a few miles of Ottawa, but owing to pot-hunting and slaughtering during the winter, when the snow is deep, is becoming annually less plentiful. Not many years ago immense yards, containing hundreds of deer, existed along the various tributaries; but, except in remote districts, the yards are now scattered and small, and the deer confined chiefly to the large swamps. Reference was made by the lecturer to the variety of this species known as the 'spikehorn,' and to interesting piebald and white specimens which had been observed by him. A fine collection of heads and antlers of the several species was shown, including some abnormal antlers from old red bucks.

Society of arts, Boston.

March 13. — Mr. P. B. Delany of New York gave the first public exhibition and description of his new system of synchronous, multiplex telegraphy, — the result of inventions by Mr. P. La Cour (1878), Mr. E. A. Callahan of New York, and himself (1883). By this system any number, up to twelve, of fast Morse circuits can be simultaneously worked over a single wire, the messages going in either direction on any circuit; also a greater number of slow Morse circuits, and as many as seventy-two printing-circuits.

At each end of the main line a drum, called a distributer, is maintained in uniform rotation about a vertical axis by the intermittent attraction of an electro-magnet on the toothed circumference of a horizontal circular plate carried by the drum. A tuning-fork, vibrated electrically (about eighty-five vibrations), opens the motor circuit at each vibration, and thus produces the intermittence in the motor magnet driving the distributer. If the forks at either end of the line were in absolute unison, and the toothed circumference had the same number of teeth each, the drums would rotate synchronously. The impossibility of absolute and continued unison is met by automatic regulation of the rate of the forks, the principle involved being an automatic shunting of a resistance-coil which is normally in the circuit driving the fork; thus increasing the current in that circuit, and hence amplifying the excursion of the prongs, intensifying the field of magnetic force in which this vibration occurs, and thus diminishing (by even five per cent) the rate of the fork. This slowing-down of the fork would immediately result in a corresponding lessening of the speed of rotation of the distributer at that end of the line.

The main principle of the multiplex use of the single line consists in giving the line synchronously, and in sufficiently rapid succession, to the corresponding instruments or circuits at the opposite ends of the line. In the apparatus shown, the rotating drum or distributer carried a brush which trailed over a circular series of eighty-four narrow, insulated, radial plates or segments of metal. Of these, twelve were utilized for the synchronizing arrangement, and the remaining seventy-two were divided among six circuits; the terminus of the same circuit being thus connected to twelve equi-distant segments, each circuit containing merely the ordinary polarized relay, reversing key and ground; the relay serving to close the local circuit through a sounder, as usual. Thus, when the brushes at both ends of the line make contact at the same instant with any one of the twelve segments of the same circuit, that circuit, and no