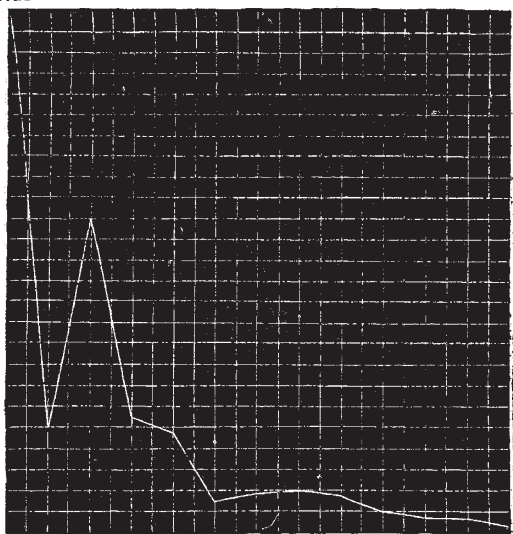


tial pole.<sup>1</sup> The region examined lies about  $27^\circ$  from the zone of the Milky Way, but is nearly reached by a faint extension from it. Since only one eighth magnitude star, and none brighter, are included in it, the study of distribution, for which it offers some materials, may be said to begin with the ninth magnitude. A single glance at the synoptical table suffices to show that the numerical representation of the higher magnitudes is inadequate. The small stars are overwhelmingly too few for the space they must occupy if of average brightness; and they are too few in a constantly increasing ratio. Either, then, the diminishing orders form part of a heterogeneous collection of stars of all sizes at nearly the same distance from us (about that corresponding to ninth magnitude); or they belong to attenuated star-layers stretching to a much vaster distance. A criterion might be supplied by Prof. Holden's plan<sup>2</sup> of charting separately stars of successive magnitudes over the same area, and judging of their connection or disconnection by the agreement or disagreement in the forms of their groupings.

#### DENSITIES



Distribution of 934 stars within  $1^\circ$  of the pole, showing the ratio of numbers to space for each half-magnitude.

The accompanying diagram shows graphically the decrease of density outward, deducible from Prof. Pickering's numbers on the sole supposition of the equal average lustre of each class of stars. Those of the ninth are the most closely scattered; the intervals between star and star widen rapidly and continuously (for the sudden dip at 9.5 magnitude is evidently accidental) down to 11.5 magnitude, when a slight recovery, lasting to the thirteenth magnitude, sets in. How far these changes are of a systematic character, can only be decided from far wider surveys.

A. M. CLERKE.

### TWO AMERICAN INSTITUTIONS.

#### I.—THE SMITHSONIAN INSTITUTION.

IN 1826, Mr. James Smithson, F.R.S., an English gentleman (a natural son of the first Duke of Northumberland), in a fit of pique at the action of the Committee of the Royal Society, who had declined to accept a scientific paper he had submitted, bequeathed to

the United States of America a large sum of money, (£105,000), "to found at Washington under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men."

The question of how knowledge might be best increased and diffused with £105,000 then arose for discussion.

The President of the United States applied to a number of persons, "versed in science and familiar with the subject of public education, for their views as to the mode of disposing of the fund best calculated to meet the intentions of Smithson and be most beneficial to mankind."

The President of Brown University (Prof. Wayland) proposed a University to teach languages, law, and mental philosophy (Arts), without Science. Dr. Thomas Cooper, of South Carolina, proposed a University to teach science only, and to exclude Latin and Greek, literature, law, and medicine. Mr. Richard Rush proposed a Museum with grounds attached sufficient to reproduce seeds and plants for distribution; a press to print lectures, &c., and courses of lectures on physical and moral science, and on government and public law. The Hon. John Quincy Adams proposed the establishment of an astronomical Observatory, with instruments, and a small library. Prof. W. B. Johnson proposed the establishment of an institution for experimental research in physical science. Mr. Charles L. Fleischman proposed the establishment of an agricultural school and farm. The Hon. Asher Robbins proposed a literary and scientific institution; and memorials were presented to Congress in favour of appropriating the fund for annual prizes for the best original essays on the various subjects of the physical sciences; for the establishment of a system of simultaneous meteorological observations throughout the Union; for a National Museum; and for a Library.

For ten years the Congress of the United States wrestled with the interpretation of the words "the increase and diffusion of knowledge among men." The discussions were numerous and irritating; and it was repeatedly proposed to send the money back to England. Finally Congress was wise enough to acknowledge its own ignorance, and authorized a body of men to find some one who knew how to settle the question. Joseph Henry was chosen. His idea was accepted and acted upon. "To increase knowledge men were to be stimulated to original research by the offer of rewards for original memoirs on all subjects of investigation; to diffuse knowledge the results of such research were to be published;" and in addition it was decided to issue a series of reports giving an account of new discoveries in science, and of the changes made from year to year in all branches of knowledge not strictly professional; as well as to publish occasionally separate treatises of general interest; and all these were to be distributed amongst the public institutions of the world.

In the result the Smithsonian Institution was established for the promotion of original research, and the diffusion of the same, and it now distributes to 3700 public institutions in Europe, Asia, Africa, and America, the following publications:—

"The Smithsonian Contributions to Knowledge," of which twenty-six volumes in a quarto series have been issued, comprising memoirs and records of original investigations; researches in what are believed to be new truths; efforts to increase human knowledge. "The Smithsonian Miscellaneous Collections," an octavo series, already numbering thirty-four volumes, containing reports on the present state of our knowledge of particular branches of science; instructions for digesting and collecting facts and materials for research; lists and synopses of species of the organic and inorganic world; reports of explorations; aids to bibliographical investigations, &c. "The Annual Reports of the Board of Regents of the

<sup>1</sup> *Harvard Annals*, vol. xviii, p. 138.

<sup>2</sup> Recommended in the *Century Magazine* for September 1838, as well as "Washburn Publications," vol. ii, p. 113.

Smithsonian Institution" (thirty-two volumes), containing also very valuable records, catalogues, and memoirs.

Another part of the income was applied in accordance with the requirements of the Act of Congress to the gradual formation of a library and a museum. But in 1866 the library was amalgamated with the Library of Congress and lodged in the Capitol. The Library, however is, open throughout the year with equal facilities for students, including the free use of the books of both collections. In 1852, Mr. Henry established what is known as the "Smithsonian system of exchanges," whereby, in exchange for those of America, the scientific publications of Societies and individuals throughout the civilized world are made accessible without cost to the students of science in America. This system has added to the Library almost complete series of the Transactions of many of the older Societies of England, France, and Germany, which it would now be difficult if not impossible to replace. They comprise hundreds of works which, like those of the Societies in question, can be obtained in no other way than by exchange. The collection is now the best in existence.

In his evidence before the Royal Commission on Scientific Instruction (English), June 1870, Mr. Henry said:—

"This is considered a very important part of the plan of operations. Not only are books distributed, but the Institution has commenced the practice of distributing specimens of natural history over the world and getting others in exchange. As an interesting fact in connection with this system, I may mention that all the lines of steamers convey the Smithsonian packages free of cost, and also that they are admitted through all Custom houses without being opened, and free from all duties in all countries."

This generous system is still in operation, and has been very much extended.

In 1858 the United States Government transferred the National Museum (established 1842) to the custody of the Smithsonian Institution with the same amount of annual appropriation (\$4000) which had been granted to the United States Patent Office when in charge of it; but this annual appropriation has now been increased to about \$40,000. A new Museum was built at a cost of \$350,000.00, and at the last session of Congress a Bill appropriating \$500,000.00 for the construction of a second Museum building passed the Senate, but was not brought to vote in the House of Representatives. The Secretary has no doubt, however, but that in a year or two a building much larger than the present one will be supplied.

The National Museum is in three divisions—the Museum of Record, the Museum of Research, and the Educational Museum—and there are departments, with twenty-four curators and sub-curators, of arts and industries, ethnology, antiquities, mammals, birds, fishes, comparative anatomy, mollusks, insects, marine invertebrates, invertebrate fossils, plants, minerals, lithology and physical geology, metallurgy and economic geology. There are, in addition, chemical and natural history laboratories, and a bureau of ethnology.

"So rapidly were the treasures of the Museum increased by the gathered fruits of various Government explorations and surveys, as well as by the voluntary contributions of the numerous and widespread tributaries of the Institution, that the policy was early adopted of freely distributing duplicate specimens to other institutions where they would be most appreciated and most usefully applied. And in this way the Smithsonian became a valuable centre of diffusion of the means of investigation. The clear foresight which announced that the Museum must soon outgrow the entire capacity of the Smithsonian resources was amply vindicated; but the strong desire of Joseph Henry to see established in Washington a *National Museum* he did not live to see gratified" ("Memorial of

Joseph Henry," discourse of W. B. Taylor, p. 285). He died May 13, 1878.

An extensive system of meteorological observations was instituted in 1849. About six hundred observers, scattered over the United States and the Territories, became voluntary correspondents of the Institution. This department was transferred in 1872 to the newly-established Meteorological Department established by the Government under the Signal Office of the War Department. The digested observations have been published in the "Contributions to Knowledge."

The memoirs in the quarto volumes of the "Contributions to Knowledge" (over 120) are universally recognized as valuable original authorities on their respective topics. There is no restriction as to the subject of research, and they consist of archæological, anthropological, botanical, geological, palæontological, meteorological, magnetical, physical, physiological, and philological observations, investigations on the solar system, the laws of atmospheric circulation, and systems of consanguinity and affinity. They have undoubtedly tended "to increase and diffuse knowledge."

The thirty-odd volumes of the "Smithsonian Miscellaneous Collections" are of a more technical character than the "Contributions," including systematic and statistical compilations, scientific summaries, and valuable accessions of tabular "constants." Scientific men generally have applauded the value and acknowledged their indebtedness to publications comprised in this series, which include such scientific classics as Clark's "Constants of Nature," Guyot's "Meteorological and Physical Tables," Watson's "North American Botany," Binney and Tryon's "Land and Fresh-water Shells of North America"; North American "Coleoptera" by Le Conte, "Diptera" by Loew, "Lepidoptera" by Morris, and "Neuroptera" by Hagen.

All these are distributed over every portion of the civilized and colonized world, and constitute a monument to the memory of James Smithson, such as never before was built on the foundation of one hundred thousand pounds.

## II.—THE JOHNS HOPKINS UNIVERSITY, BALTIMORE.

Johns Hopkins, a merchant of Baltimore, who died in 1873, in the seventy-ninth year of his age, bequeathed a large part of his fortune to two institutions which perpetuate his name—the Johns Hopkins University and the Johns Hopkins Hospital. Each foundation received an endowment of not far from three and a half million dollars, or about £700,000. The two institutions are separate corporations, but are closely affiliated. The University has just concluded its thirteenth year of work. Since its opening, in 1876, it has issued frequent statements of the development of its plans in the form of Annual Reports.

The Johns Hopkins University is an unsectarian foundation. There is no test for the assent of students or Professors. This is the especial privilege of the new institutions for higher education that have sprung up of late years. "No hungry tradition treads them down." They approach the problem of education untrammelled by customary practice; yet, utilizing the experience gained by the older Universities, they make more independent and original attempts at its solution.

Universities as a rule have grown from an aggregation of Colleges; the University, in process of time, being evolved as a supplement to collegiate training. The Johns Hopkins University is an exception to this rule. In accordance with the terms of the gifts, the institution started with the idea of the University, in the higher conception of that word, as a universal school and a fostering mother. Not merely a place in which degrees are granted in the Faculties of Arts, Sciences, Divinity, Law, or Medicine, but as an organized force for the education

of the community of the district in which it is placed, for deepening, purifying, and strengthening all good influences on the men, and the alliance of the men with the institutions. Institutions remain, but the men pass away—

“The individual withers, and the world is more and more.”

According to the thirteenth Annual Report of the University (September 1887 to September 1888), it appears that the academic staff included 57 Professors, Associate Professors, and Lecturers. There were 420 students; 199 were residents of Maryland, 196 came from other States of the Union, and 25 from foreign countries; 231 had already graduated, 127 had matriculated for the degree of B.A., and 62 were admitted as special students to pursue courses of study for which they seemed fitted, without reference to graduation. The University does not provide lodging or board.

There are seven distinct and parallel courses of College instruction adapted for matriculation, and the various elective groups for the degree examinations in the University. The subjects of the Professors and Lecturers last session were: history, political economy, mathematics, astronomy, physics, chemistry, mineralogy, geology, biology, psychology, pedagogics, pathology, Greek, Latin, Sanskrit, Indo-European philology, Shemitic languages, Romance languages, Teutonic languages, Anglo-Saxon, and English. The large and well-appointed physical, chemical, and biological laboratories of the University have already been detailed in NATURE (vol. xxxiii. p. 237).

Two degrees only are granted—the Bachelor of Arts and the Doctor of Philosophy; and since degrees were first conferred in 1878, 177 have attained the Baccalaureate degree, and 131 have been advanced to the degree of Doctor of Philosophy.

There are twenty Fellowships of \$500 each. The examination for these is, in a certain sense, competitive, but not with uniform tests, nor by formal questions submitted to the candidates. The applicants' previous record, and the Professors' record, is taken into consideration.

“Those who are appointed are expected to proceed to the degree of Doctor of Philosophy. The appointments are not made as rewards for good work already done, but as aids and incentives to good work in the future; in other words, the Fellowships are not so much honour and prizes bestowed for past achievements, as helps to further progress and stepping-stones to honourable intellectual careers. They are not offered to those who are definitely looking forward to the practice of any one of the three learned professions (though such persons are not formally excluded from the competition), but are bestowed almost exclusively on young men desirous of becoming teachers of science or literature, or proposing to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician, or the minister. Appointments are rarely, if ever, made of graduates of more than five years' standing.”

There are also twenty graduate scholarships of \$200 each for those who have taken the baccalaureate degree. There are also thirty-eight ordinary and honorary Hopkins Scholarships (\$250 annually and free tuition) for promising young men.

Courses of public lectures, designed primarily for the members of the University, and supplementary to the regular class-room work, are given each session. The admission of the public is by ticket, to be previously obtained free. The courses for 1887-88 included: ten lectures on some of the problems of great cities; six lectures on the local study of natural history; nine lectures on the history of the science of electricity and magnetism; eleven lectures on the causes which led to the French

Revolution; four lectures on Greek lyric poetry; eight lectures on the topography of Athens.

The University Library consists of 35,000 volumes. And it is lately reported that the valuable scientific collection of the Maryland Academy of Sciences has been presented to the University.

But the great point of this institution is its efforts in the direction of the endowment of scientific research. Prof. Newcomb, one of the Professors of the University, said in 1876 of America what is very true of Great Britain: “We are deficient in the number of men actively devoted to scientific research of the higher types; in public recognition of the labours of those who are so engaged; in the machinery for making the public acquainted with their labours and their wants; and in the preliminary means for publishing their researches.” The Johns Hopkins University has encouraged scientific research, and the publication of its results, to a large extent; not only by training young men in the methods of exact science, and fitting them for the scientific service of the Government, for scientific and technical laboratories, and for the teaching profession, but also by the publication of journals and monographs detailing the results of scientific study. The trustees, determining to encourage the heads of departments and other qualified scholars to contribute each in his own way to the advancement of the science which he professed, started five periodicals, conducted by Professors and graduates, and aided by the University chest, namely: *The American Journal of Mathematics*, 10 vols., edited by Prof. Newcomb; *The American Chemical Journal*, 10 vols., edited by Prof. Remsen; *The American Journal of Philology*, 9 vols., edited by Prof. Gildersleeve; *Studies from the Biological Laboratory*, 4 vols., edited by Prof. Martin and Dr. Brooks; and the *Johns Hopkins University Studies in Historical and Political Science*, edited by Prof. H. B. Adams, the seventh series of which is in progress. All of these publications are considered on both sides of the Atlantic to be of the greatest value. *The American Journal of Psychology*, *Modern Language Notes*, and *Contributions to the Study of Archaeology*, are also edited by members of the academic staff, and there are University Societies on all these subjects.

The University also publishes *University Circulars* monthly, containing scientific notes in biology, chemistry, history, political science, mathematics, physics, philology, philosophy, logic, &c., besides the usual Annual Reports and special publications, such as the “Reports of the Chesapeake Zoological Laboratory.” This is a laboratory of about fifty individuals at ten stations, and the results of their work at the sea-shore, in the study of natural laws in their simplest manifestations, from 1879 to 1886 include ninety-nine titles.

Dr. Gilman, the President of the University, reported at the tenth anniversary that 176 former students were known to be engaged in the work of teaching, mostly in colleges; and that among the former pupils are eighty physicians, thirty-eight ministers, and thirty-four lawyers. There were no exact statistics of those engaged in scientific pursuits.

Such are the beginnings of the Johns Hopkins University. Those engaged in the work of higher education in this country will appreciate fully the fortunate circumstances in the inception of the institution: a benefaction of £700,000 for endowment; carefully selected trustees, to whose wisdom, moderation, and far-sightedness much is due; a wisely organized constitution; able Professors and teachers, gauged by the standard of work done and success achieved; and foundations to assist all these contributed by a critical and discerning public. The institution started full of promise, and it is redeeming its promise with a rapidity unparalleled in the history of academic institutions.

J. TAYLOR KAY.