a different problem from that of their European progenitors. An interest in zoölogy is with us less diffused than is the case abroad, the climate is less favorable for out-of-door recreation, the gardens are at great distances from the centres of population, and the cost of securing many of the larger and more interesting animals is great in proportion as the gardens are removed from the chief places of traffic. The zoölogical garden in this country is not likely ever to be self-supporting. Whether or no the zoölogical garden should have a plan of organization distinct from that of the botanical garden is a mooted point. It would appear that there is nothing inconsistent with the idea that the plan of the learned society or the university might readily embrace that of the management of a collection of living animals. Were such an arrangement practicable, it would enable the garden to be benefited by the use of the general endowment of such bodies, while it would not interfere with the popular uses of the collection.

NOTWITHSTANDING THE FACT that the whole civilized world is interested in the subject of the transfer of ships across the narrow neck of land which separates the Atlantic and Pacific Oceans, by which the long voyage around Cape Horn would be avoided, yet there has been no project proposed or suggested which has met with less favor in the minds of engineers of high standing, at least in this country, than the Panama Canal. The magnitude of the enterprise, the formidable engineering difficulties to be encountered, the unhealthiness of the climate, and the fact that the undertaking is a private one, depending on private subscriptions, constitute obstacles which, when taken together, seem to render success almost hopeless. The recent call for more money to carry on the work, when the most costly and difficult portions have hardly been begun, and after vast sums have already been expended, must awaken grave apprehensions on the part of those who have already invested their money in the enterprise, that the project is beyond the financial abilities of the most powerful syndicates.

AS THE INCOME of the Elizabeth Thompson science fund is already available, the trustees desire to receive applications for appropriations in aid of scientific work. This endowment is not for the benefit of any one department of science, but it is the intention of the trustees to give the preference to those investigations, not already otherwise provided for, which have for their object the advancement of human knowledge, or the benefit of mankind in general, rather than to researches directed to the solution of questions of merely local importance. Applications for assistance from this fund should be forwarded to the secretary of the board of trustees, Dr. C. S. Minot, 25 Mount Vernon Street, Boston, Mass., and should be accompanied by a full statement of the nature of the investigation, of the conditions under which it is to be prosecuted, and of the manner in which the appropriation asked for is to be expended. The first grant will probably be made early in January, 1886. The fund was originally given by Mrs. Thompson, as will be remembered, with the expectation that it would be administered by the officers of the International scientific association proposed at the Philadelphia meeting of the American association. This proposition was to have been brought up at the Aberdeen meeting of the British association; but, so far as known, no action was taken. The fund is now in the charge of the able body of trustees already named, (*Science*, vi. 144), and will doubtless prove a great aid to American science if the best investigators will ask for appropriations from the income. It is a severe comment upon the physicists of the United States that the income of the similar fund established by Rumford for investigations in light and heat should go begging as it does.

THE AGASSIZ MUSEUM AT CAMBRIDGE.

THE day after his twenty-third birthday, Agassiz wrote from Munich to his brother, "The thing I most desire seems to me, at least for the present, farthest from my reach; namely, the direction of a great museum." He lived to see the Museum of comparative zoölogy, which he founded on another continent, the largest collection, covering the whole field of natural history, ever brought together by the endeavors of a single individual. Reckoning from the inauguration of the first section of the building, to-day completes its quarter centennial, and renders appropriate a succinct account of its inception and growth, largely in the words of his son, Dr. Alexander Agassiz, when addressing, last spring, the friends of the institution at the opening of the latest extension of the building.

The recently published 'Life of Agassiz' shows us that his passion for acquisition was enormous from his youth. Wherever he went, his collections in natural history accumulated to a burdensome degree; and, although he left every thing behind him

when he came to this country, ten years had not passed before he had here amassed collections not only from America, but from all parts of the world, which it would stagger many a university to support. Yet his aim was, not to found a museum which should be a mere accumulation, but one that "should have a well-combined and clearly expressed educational value." The bequest of his friend, Mr. Francis C. Gray, in 1858, of fifty thousand dollars, was the initiation of the final enterprise; and when the new institution was inaugurated, two years later, it possessed, besides the Gray fund, a building erected by private subscription to the amount of over $71,000, a fund of $100,000 granted by the state through the personal exertions of Agassiz, and the collections obtained by his indomitable zeal.

The bequest of Mr. Gray, quadrupling itself in two years, did not find Agassiz unprepared. Indeed, it was the knowledge of plans, to the utmost details of which he had devoted years of thought, that had moved the gift of his friend. He would have the museum represent in each department the sum of our information in special zoölogy, comparative anatomy, embryology, paleontology, and zoölogical geography. He would have it illustrate at once the structure and mode of growth of animals, their order of succession in geological times, and their geographical distribution upon the surface of our globe; the relations between the animals of past time and those now living, and between the law of succession in the former, and the laws of growth and distribution in the latter.

"A museum founded upon a comparative study of living and fossil animals in connection with their embryonic changes and their geographical distribution could no longer be called simply a zoölogical museum," said Agassiz in his inaugural address: "ours is a museum of comparative zoölogy."

How large his expectation was may be seen by what he wrote as early as 1858:—

"My hope is that there shall arise upon the grounds of Harvard a museum of natural history which shall compete with the British museum and with the Jardin des plantes. Do not say that it cannot be done, for you cannot suppose that what exists in England and France cannot be reached in America. I hope, even, that we shall found a museum which will be based upon a more suitable foundation, and better qualified to advance the highest interests of science, than these institutions of the old world."

By a strange coincidence, the foundation of the museum dates from the publication of Darwin's 'Origin of species.' Of course, so powerful a movement in the scientific thought of the time could not fail to modify the problems which the institution was intended to illustrate and to solve. Yet the usefulness of the plans laid down for the museum remains unimpaired by the new methods of treating questions of affinity, of origin, of geographical and geological distribution. Should the synoptic, the systematic, the faunal, and the paleontological collections cease to bear the interpretation given to them by the founder, their interest and importance, even for the advocates of the new biology, would not be one whit lessened. If the anatomical, embryological, synthetic, and other series presented by the pupil of Cuvier from his point of view, are differently considered to-day by the followers of Darwin, they may, for this very reason, have gained a general interest they did not formerly possess.

The plans of the founder have been realized, perhaps, far beyond his most sanguine expectations; and it has been reserved for his immediate successor to see the establishment of a prosperous school of natural history, amply provided with laboratories, connected with a university, and recognizing in the administration of its trusts the claims of the college and of the advanced students, as well as those of the original investigator. Nor has it neglected the interests of specialists, but has accumulated extensive collections, conveniently stored, and easily accessible to all who are able to make a proper use of this material.

The publications of the museum (eleven volumes of bulletins, and thirteen of memoirs) give, with the addition of the monographs thus far issued by workers at the museum, a fair idea of the field covered by its various departments, though they do not sufficiently represent the original work done by the teaching staff of the university and its students.

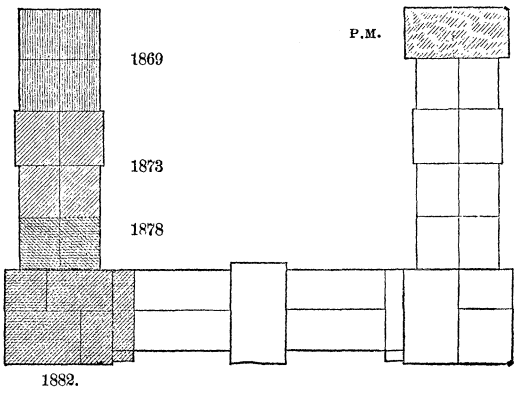
The library has grown from a few hundred volumes to an important collection of biological works, numbering over 17,000 volumes, exclusive of pamphlets and of the Whitney library.

In 1860 the building covered a space eighty by sixty feet, and it contained, in all, sixteen rooms, used as lecture-room, laboratories, store-rooms, and exhibition-rooms. A visitor to the museum in those early days would now find it difficult to recognize the rooms or their contents in the present arrangement. During the early years of the institution, every thing had to be sacrificed to the exigencies of the rapidly accumulating collections. But the difficulties involved in so large an undertaking prevented Professor Agassiz from fairly developing his schemes; and it became evident at the time of his death that only a radical rearrangement of the collections could give distinct expression to his plans.

The ground covered by the building as it stands to-day is five times as great as in 1860. There are no less than eighteen exhibition-rooms, with their corresponding galleries, of which eleven are open to the public. Thirty-two rooms are used for storage and quarters for special students and assistants. There are also a lecture-room twice the size of the former, a curator's room and office, eleven laboratories of biology and geology for college and advanced students, four rooms devoted to the library, and in the basement, in addition to boiler space, rooms intended as an aquarium and vivarium and for receiving freight; making, in all, seventy-one rooms and twelve galleries. These rooms are all comparatively small, mostly 30 by 40 feet, no attempt being made at exhibition-rooms imposing from their size. All are not yet complete, but the space now devoted to the different classes of the animal kingdom, zoölogically arranged, contains all that will be given for public exhibition, no matter how extensive the collections may become; for limited collections carefully assorted are far more intelligible to the general visitor than larger and more indiscriminate ones; the visitor sees only one thing at a time, and is not bewildered by room after room or case after case of specimens which seem to him to have no meaning.

In the 'synoptic' room, centrally placed, a favorite scheme of Professor Agassiz, the visitor will get an excellent idea of the great types of the animal kingdom, unencumbered by a mass of detail. He may pass thence to one of the 'systematic' rooms, of which there are five, devoted one each to mammals, birds, fishes, mollusks, and to radiates and protozoa, with their galleries devoted to reptiles, insects, and crustacea. Following these, he will turn to the 'faunal' rooms, — one each for North America, South America, Africa, India, Australia, and Europe-Siberia. To study the birds, for instance, he will visit not only the room devoted to the illustration of their zoölogical affinities, but the several faunal rooms, where he will find the birds characteristic of each province, repetitions being as far as possible avoided. This plan obviates the crowding together into one space of the whole collection of birds, which merely satiates the visitor, and teaches him little. Two other rooms, not yet opened, will be devoted to the marine faunas, where the geographical and bathymetric distribution of the animals of the Atlantic and Pacific will be shown. A similar double plan is contemplated for the fossils, to which four exhibition-rooms will be devoted.

The original plan of the museum contemplated a main building 364 feet long by 64 feet wide, with wings 205 feet long and of the same width, built as in the accompanying plan, in which the section in vertical lines represents that first constructed; that in oblique lines, the portion added before the death of Agassiz; and that in crossed lines, the



additions at two successive periods since. The portion on the right, in broken lines, was given over to the Peabody museum of archeology. At the time of the death of Professor Agassiz, the buildings and collections represented an expenditure of about $200,000, and the invested funds amounted to about $185,000. The invested funds now amount to more than $580,000, while the additions to the building and collections since that time represent an additional expenditure, besides the running expenses of the museum, of more than $500,000, — an amount very largely due to the unstinted generosity and filial devotion of the present director.

Witnessing this enormous growth, Mr. Agassiz looks at the future with no small concern. He would hold fast to what has been gained, but hesitates to commit himself to any further rapid advance in the same direction, believing that the limits of a university organization for such an institution have already been reached. While it is undoubtedly capable of indefinite expansion in the way of endowments for special professorships and assistants, it is doubtful if it be wise to expect or aim at any expansion beyond that which naturally comes from the demands of endowed chairs in a university. Original investigation has always been best promoted in connection with educational institutions; and museums should grow in conformity with their demands, and no faster, unless they are to become mere unwieldy and meaningless accumulations.

If the material growth of the past is to continue, the resources of the institution, large as they are, will soon be entirely inadequate. An attempt has therefore been made to combine the work of assistants and that of investigation, in order that the resources of the museum may keep pace with

the ever-increasing specialization in the different branches of natural history. More than that, the conditions and opportunities for special work have greatly altered in this country within recent years. Other large museums have been founded or more abundantly endowed, while a large part of the original investigation of to-day must be carried on in the field on fresh material which no museum can furnish from its stores. It therefore becomes wiser to abandon the accumulation of vast collections, excepting such as may be cared for at small expense, wherever these are certain to be duplicated elsewhere; and to expend the income from the funds rather in fostering such work as may most efficiently be conducted by the professors holding endowed chairs in the university, and by the assistants in the various departments of the museum.

The boldness and decision with which Mr. Agassiz here advocates a policy utterly at variance with that which has been heretofore pursued, is worthy of the most careful attention of all who have to deal with museums. From his position at the head of an extensive establishment, in which he has complete control, and which he has himself largely endowed, he occupies an unequalled vantage ground. He has cut completely adrift from the traditional notions of what a great museum should be, while adhering rigorously to the exhibitional features impressed upon the museum by his father. In this we believe he has struck the keynote of what is needed for a university museum in this country, and what the requirements of modern science demand. We commend his views to all who have to deal with the expensive problem which natural history museums force upon the attention.

ANSWERS TO CHARGES AFFECTING THE GEOLOGICAL SURVEY.

Secretary Lamar has received from Major J. W. Powell, director of the geological survey, a letter, of which the following are the most important portions:—

Various charges affecting discreditably the administration of the geological survey have been current in the newspapers of the country for the past four months, and I deem it my duty to call your attention to the same, and to append brief statements to them severally, that you may see how baseless and absurd they appear in the presence of the truth.

It is charged that the survey has been extended into the eastern portion of the United States in violation of law. The law specifically provides that the survey shall extend over the entire United States, and the law was passed after repeated and lengthy debate in congress by an overwhelming majority.

It is charged that the geological survey is duplicating the work of the coast survey and of state geological surveys. There is no truth or color of truth in the statement.

It is charged that a corrupt conspiracy existed in the National academy of sciences to break down the old organization for geographical and geological surveys in order to create the new; that the National academy itself had little to do with this, but that the conspiracy was the work of a corrupt committee. In an act of congress approved June 20, 1878, the academy was required to report to congress a plan for making a topographic and geologic survey. Such plan was reported, and the present geological survey exists in pursuance of that plan, under specific statutes passed by congress. The committee of the academy that considered the subject was composed of Profs. O. C. Marsh, James D. Dana, William B. Rogers, J. S. Newberry, W. P. Trowbridge, Simon Newcomb, and Alexander Agassiz. The plan was reported by the committee at a meeting of the academy called for the purpose of hearing the report, and was discussed at length in the academy, and adopted unanimously.

It is charged that the scientific men of the National academy of sciences, in wicked collusion with Major Powell, "proposed to wipe out the lines which now fix the limits of all lands sold from the public domain of the entire country, and introduce a new system." There is no truth and no color of truth in the statements; its falsity is equalled only by its absurdity.

It is charged that Major Powell was elected a member of the National academy of sciences by corruptly distributing patronage to its members. Major Powell was elected to membership in the academy prior to his appointment as director of the U. S. geological survey, and at a time when he had no patronage under his control to be used with the members of the National academy.

It is charged that the publication of the geological survey is not germane to its work, and Packard's 'Report on geometrid moths' is given as an illustration; and it is stated that nearly all the publications of the survey are of the same class. This work of Dr. Packard's was not published by the U. S. geological survey, but by what was known as the Hayden survey years ago. The law now prohibits the publication of general works on natural history by the survey, and confines the publication to works germane to geology and geography.

It is charged that "Major Powell has a fondness for state geologists. Now, if Powell can give a