may result from adequate cooperation between mathematicians and engineers.

The chief difficulty in the way of developing mathematical physicists appears to lie in the inadequate appreciation of this type of work by contemporary society. Pure mathematics has a prestige of more than twenty centuries behind it, and the practical work of the engineer appeals even to the dullest of intellects; but we have failed thus far, in this country especially, to adequately esteem the worker in the intermediate field. We must look to it that more attention is given to this field in our colleges and universities. Every university should have two or three men eminent in mathematical physics as well as two or three men eminent in pure mathematics. Thus, while I would not advocate the pursuit of pure mathematics or the pursuit of practical engineering less, I would urge the pursuit of mathematical physics more. It is only by the cultivation of this branch of study and investigation that we can keep alive the sources of engineering knowledge. Important and indispensable as the practical work of the engineer is, the cultivation of investigation and discovery in his science is still more important and indispensable. Hence I would urge that when the more pressing questions of elementary instruction in mathematics and engineering have been adjusted, we give attention to the more inspiring and more important questions of the clarification and enlargement of the fundamental ideas of our sciences.

R. S. Woodward

THE CHICAGO ACADEMY OF SCIENCES[1]

In his historical sketch of the academy, published in 1902, Mr. W. K. Higley, late secretary of the academy, divides the history of the institution into three periods, first, that preceding the fire of 1871; second, that between the time of the fire and the erection of the present building in Lincoln Park, and third, the period dating from the occupancy of these new quarters. It is often of interest and value to cast a retrospective glance over a period of years in the history of an institution, in order that a clear idea may be obtained of the value of the operations. It is now thirteen and a half years since the building was first occupied and the intervening years have witnessed a steady growth in the collections and also in the interest of the academy's work among the citizens of the community and of the city. The collections which were turned over to the curator in July, 1894, were comparatively small in number, although containing some very interesting and valuable material. The records show an aggregation of about 55,000 specimens on this date. In the thirteen and a half years this number has been increased fourfold; the number of specimens in the museum January 1, 1908, being 226,781, or an increase of 171,781 specimens. It must be remembered that the majority of these additions were presented by the owners or collectors, as there has been no fund for the purchase of specimens. It must not be forgotten, however, that several members of the academy, like our deceased patron, Mr. George H. Laflin, have from time to time given money for the purchase of material, but the entire amount spent for such purposes has not exceeded $5,000. A part of the collections have been secured by the museum staff while on their vacations.

An analysis of the additions shows that three departments head the list in the number of additions:

Mollusca	89,757
Insects	33,914
Paleontology	21,145

The first named contains several types, a larger number of cotypes and a very extensive series of autotypes and locotypes, as well as many rare species and development series. The same is true of the fossil collection and to a less degree of the insect collection. The

[1] Extracted from the annual report of the secretary.

total collection of Mollusca now numbers over 140,000 specimens.

It is interesting to note that thirteen years ago the main museum floor was supplied with cases which were filled with very indifferent specimens, poorly installed. At the present time three floors are crowded with cases, which are filled with much excellent material, some of which is as good as can be obtained. The old strictly taxonomic system of installation has been replaced by one of a more or less ecological character, which is calculated to educate the visitor along nature-study lines. For this purpose eight large groups and forty-five smaller ones have been constructed, showing to a greater or less degree some of the interesting habits of native animals. The taxidermic work has all been accomplished by Mr. Frank M. Woodruff, with the rarely occasional assistance of an extra taxidermist in large group work. The taxidermist has also filled the positions of ornithologist and photographer, having prepared over 2,600 slides, negatives, etc., in the past seven years. The minerals, rocks, fossils and physiographic collections have been likewise arranged with the educational idea in view.

The library has shown comparatively as large an increase as the museum. Beginning in 1894 with 8,381 books and pamphlets, it has increased in 1907 to 26,821 books and pamphlets, or a growth of 18,440 in thirteen and a half years. It is also noteworthy that the exchange list of foreign and domestic societies has grown from 120 in 1894 to 542 in 1907, or an increase of 422. This increase has been made possible by the continued issue of the publications of the Natural History Survey. The gratitude of the academy is due to the many foreign and domestic societies who have so generously continued sending their large and valuable publications when those of the academy have been so few and their issue so irregular.

The satisfactory labeling and cataloguing of a museum is a subject of no small magnitude and the academy was not able until the year 1900 to secure the assistance and material necessary for the successful carrying on of this important work. At this time a printing outfit was secured and very satisfactory work has been carried on by this department in the eight years of its existence, during which time 20,433 labels have been printed, aggregating 100,000 impressions. In 1903 a new set of registration books was opened, and a card catalogue of the museum begun. During the four intervening years over 26,000 entries have been made. In comparing the work of this department with that of other institutions it must be remembered that it has all been accomplished by one assistant, a lady, whose duties in addition are to send all acknowledgments, typewrite all letters and manuscripts for publication, and attend to other office duties, besides assisting in the care of the library. She also learned to do the printing when that system superseded the old hand-written label.

The value of a museum of natural history is oftentimes measured by the attendance, although a large attendance is frequently due to the advantageous location of a museum, rather than to its interest for the public. It is interesting to note that if classed by its attendance the academy would stand well up among the larger museums of the United States. For a number of years the attendance was accurately kept at the Academy of Sciences, and during five years the smallest attendance was 245,214 and the largest 413,390, or an average of 338,352. It is believed that more than 4,567,000 people have visited the museum during the thirteen and a half years of its occupancy of the building in Lincoln Park. A comparison of the attendance of the larger institutions with that of the academy is significant:

American Museum of Natural History, New York City	467,133
U. S. National Museum and Smithsonian Institution, Washington	360,547
Chicago Academy of Sciences	338,352
Field Museum of Natural History, Chicago	254,516
Brooklyn Institute Museum, including Children's Museum	229,025

A notable feature of the academy's work has been the use of the museum and its staff in

supplementing the nature work of the public schools. In addition to the usual classes which visit the museum as a special holiday occasion, several schools have devised a plan by which the museum exercise becomes a recognized part of the school work and counts in points as does any other part of the curriculum. Classes are taken to the museum in charge of the teachers who provide them with question blanks or direction sheets and allow the pupils a certain length of time for the completion of the work. The notable feature of this class of work is the discipline which prevails.

Several of the high school teachers have given Saturday morning lectures on bird study to their classes, in the lecture hall of the academy and for a time a series of lectures was given for children.

During two years a course of lectures on biology was given for the benefit of teachers interested in nature work. Laboratory and study facilities have also been freely placed at the disposal of those teachers who wished to carry on more extended studies.

Some of the museum collections have been largely used for loan purposes and much of the duplicate material has been freely placed at the disposal of those schools or teachers who expressed a desire to use a small hand collection in the class-room. Lantern slides and other photographic material have also been freely loaned for educational purposes.

It is noteworthy that a large per cent. of the museum visitors are of the more intelligent class of people, who visit the museum from a higher motive than that of mere curiosity, although it is unquestionably true that many visitors are of this latter class.

Since 1895 the academy has conducted yearly a series of popular lectures in addition to its regular monthly meetings. The effort has been made in these lectures to popularize the various branches of science and still keep them up to the highest standard of excellence. These lectures have been given in courses of from six to twelve each, two or three courses being given in a year. Two hundred and seventy-eight such lectures have been given during the past thirteen and a half years, at which the total attendance was 43,856. One hundred and twenty-five regular meetings have been held, at which 6,765 members and their friends listened to the reading and discussion of scientific papers. This phase of the academy's work has proved of great educational value.

A portion of the time of the museum staff has been consumed in the identification of material for other institutions, or for scientific workers, and during the past four years nearly 35,000 specimens have been thus cared for.

In making a retrospective study of an institution much depends upon the resources available in estimating the value of the work accomplished, and the results seem large or small as the income is small or large. For the past thirteen and a half years the only assured income for maintenance has been $5,000 per year, which is given by the commissioners of Lincoln Park for the privilege of having the museum in the park and free to the people at all times. In addition to providing this sum of money the commissioners heat, light and clean the building. This sum of $5,000 has been variously augmented through the generosity of friends of the academy and by the annual membership fees. The income has fluctuated, being the lowest in 1898, when it was $5,321.60, and the highest in 1895, when it rose to $14,190.48. During the thirteen years under consideration the total income has been $96,024.07, or a yearly average of $7,386.46. When compared with the princely incomes of such institutions as the American Museum in New York, the Field Museum in Chicago, or even the smaller Public Museum in Milwaukee, with its nearly $30,000 yearly income, the resources of the academy seem small indeed and it is remarkable that it has been possible to accomplish even the small amount of work herein detailed, with such scanty resources. It is encouraging to reflect that, with the additional endowment provided by the Moses Wilner Bequest, the yearly income will soon amount to $10,000.

In closing this very brief summary of the work accomplished during the past thirteen

years, the fact should be emphasized that it is not so much the number of specimens which have been received nor the amount of detail work which has been accomplished which determines the success or failure of an institution, but rather the impression which may have been made upon the community in inciting to higher ideals of life, and the quality of the contribution to the advancement of science and education which has been made.

FRANK C. BAKER,
Acting Secretary

THE LLOYD LIBRARY AND MUSEUM

THIS institution is legally a stock company, the stock being owned and the institution supported by Curtis G. and John Uri Lloyd, of Cincinnati, Ohio. Mr. C. G. Lloyd has erected the buildings and supports the botanical section, and Professor John Uri Lloyd supports the pharmaceutical department. The buildings and contents are transferred to the stock company, and funds are provided for its continuance when the life work of its builders is finished. It will never be sold, and will always be a free and public institution for the benefit of science.

Building No. 1 was erected by C. G. Lloyd in 1902, and was designed to contain both the books and the specimens, the two upper floors being devoted to the books and the lower floor to the specimens. During the short time that has intervened the library has increased so rapidly that the building is inadequate for its purposes, and during the past winter a new building has been erected to be devoted exclusively to the library. The old building, now known as the Lloyd Museum, will contain the herbarium and the mycological collection. The herbarium of pressed plants is estimated at about thirty thousand specimens, chiefly obtained by exchange by C. G. Lloyd during his earlier years. The mycological department contains many thousand dried specimens of fungi, particularly of the Gastromycetes, estimated at not less than five thousand different collections. There are more specimens of this family ten times over than in all the other museums of the world combined.

Building No. 2 was erected in the winter of 1907 and 1908. It is four stories, 22½ by 72 feet. It is devoted exclusively to botany and pharmacy (with a section on eclectic medicine), and contains a collection of books among the largest on these subjects. The volumes have not been counted, but some idea of the number may be obtained from the following statistics: There are 6,253 linear feet of shelving, and the books now occupy 2,600 linear feet of this space. As a shelf is found to hold on the average 429 books to every 50 linear feet, the estimated number is 22,308 volumes. Cases have been placed in the upper floor, but the other three floors have only wall shelves, with provision made for floor cases in future as the needs of the library may require. When completely filled with shelving the library has a capacity of 11,413 linear feet, sufficient to shelve 98,000 volumes. If the collection of books continues to increase as it has in the past five or six years, the full capacity of this library will be taken in the next twenty years. The founders propose to make the Lloyd Library in time a practically complete library of its subjects.

LEHIGH UNIVERSITY AND THE UNIVERSITY OF LIVERPOOL

On July 3, the University of Liverpool, acting on behalf of Lehigh University, under letters of attorney duly authorizing the act, conferred on Horace Field Parshall, the well-known electrical engineer, of London, the honorary degree of master of science. Mr. Parshall is an American, a graduate of the electrical course at Lehigh University of the year '87.

The letter of Vice Chancellor Dale, of the University of Liverpool, to Dr. Henry S. Drinker, president of Lehigh University, accepting this duty, is pleasing in its hearty expression of international comity. He says:

"The Council and Senate of this University have agreed to act on the suggestions that you make, and to confer formally on Mr. Parshall the honorary degree that has been awarded to him by the University over which you preside.