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Correspondence, Colombia, 1892-1894.

WARE MC14

Thursday, a.m.

April 28, 1892.

Dear Mr Van Amringe,

It was hardly worth while to take your time to listen to my long screed yesterday and if I had had a chance to read it over, after writing it, and so to discover how irrelevant it seemed, I should not have done so. Still, you seemed to sympathize with my main points, the scheme of anticipating cases of actual application, the substitution of problems for ~~theorems~~, and the introduction of historical and theoretical matter. This I hardly reached, but I mean, for example, giving all these theories of differentiation, and discussing the "metaphysical difficulty." I

think this is due to intelligent creatures. But Mechanics of course affords a better field for history and philosophy than does Mathematics.

All this however is, as you say, a discussion of how not of how much shall be attempted. But really that is the thing I care most about, for my minimum scheme. It is a great deal more important that these men shall enter into and understand and appreciate and enjoy, than that they should know a little more or a little less. This being so, I do not think, after all, that the subject was taken up wrong end foremost. The question is not how to find time for what it is necessary to do, but how best to fill the time that can be afforded. I come back accordingly to the original inquiry. Given

two hours a week for two years how would you and Mr. Goodwin propose to fill them, in accordance with the general notion of a minimum programme. Then we come to see if there is anything we should want to omit, so as to make place for a more humane treatment of the subject.

Then upon this ground we can build our Mechanics and Engineering, a considerable part of this ground being covered, for our purpose, by a descriptive study of the facts, if the mathematical preparation anywhere fails to support an analytical discussion of them. Indeed my men complain in both Mechanics and Engineering that they can "do the sums" and get the right answers, but have no proper idea of the phenomena they are computing. This however

may be remedied by establishing some  
sort of relations between the department  
of Physics and the others, and this  
would prevent vain repetitions. The  
present fourth year men tell me that  
they have had some subjects taught  
them four times over, as Mechanics  
Physics, Chemistry (applied,) and  
Engineering.

Yours truly, (and respectfully)  
(signed) W. R. Ware.  
Sunday.

Report.

May 28, 1892.

The Committee appointed to consider the relations of the Scientific Studies taught in the School of Mines to the Course in Architecture beg to report as follows:—

The Scientific Studies in Question, Comprise first the Studies in pure and applied Mathematics, including Analytical Geometry, the Calculus, Mechanics and Engineering, with Graphical Statics and Engineering Design, and secondly the so-called Natural Sciences, such as Physics, Chemistry, Mineralogy and Geology.

As to the mathematical studies, the establishment by vote of the Faculty in May 1891, of elective or optional studies in the fourth year of the Course in Architecture, by pursuing which those students who so choose may specially fit themselves to become Architectural

Engineers, renders it unnecessary to oblige the rest of the men to carry these studies any further than is <sup>pertinent to</sup> necessary for the ordinary practice of the architectural profession. It appears that this involves, as might be expected, considerably less Mathematics and Engineering than is needed in the Engineering courses, but more than is needed in the Courses in Chemistry, Metallurgy and Geology. Two hours a week for Analytic and the Calculus in the First Year, the same for Mechanics in the Second Year, and the same for Engineering in the Third Year, promise to furnish all that is needed in these branches, to which may be added so much of Graphical Statics and Engineering Design as ~~is necessary~~ <sup>there may be found time for.</sup>

Such a curriculum would be arranged, necessarily, quite independently of the instruction given in

the Engineering Courses, not only as being more limited in its range, but as being specialized in kind, so as to meet the special needs of the profession. This special instruction can obviously be best given by the men who have an architectural training and can take it up from an architectural point of view. We recommend, accordingly, that these subjects be taught as far as possible by instructors within the Department. This is the more desirable, in as much as the corresponding classes in the Engineering Courses are greatly overcrowded and their teachers overtaxed.

The Class which will enter the School next October is of course the first one that can fully profit by this scheme. The classes now in the School can enter into it only in part.

In the coming year the Fourth year Students can do little else than what has been done by pre-



and at the same  
time

under the title of Architectural Engineering, comprising <sup>3</sup> ~~the~~  
their second and third years, give  
two or three hours a week to a some  
what limited course of ~~of~~ Mechanics,  
~~especially adapted to their needs.~~  
Engineering, Graphical Statics and  
Engineering Design, specially adapted  
to their needs. This will suffice for  
the majority. Those whose tastes and  
capacities incline them to a more serious  
study of these topics can then take the  
Elective Course in Architectural En-  
gineering in the Fourth Year.

As to the Natural Sciences,  
Physics, Chemistry, Mineralogy  
and Geology, we have ~~at present~~ ~~no~~  
no recommendations to make,  
specially affecting the Course in  
Architecture. Instruction in Miner-  
ology and Geology for these students  
alone, has already been arranged  
for, and it is not impossible that  
at some future day part of the work  
in Physics and Chemistry, Hygiene

Resolution:

That the arrangements  
for the instruction in Math-  
ematics & Painting Supervising  
for the Students in Course -  
Architecture recommended  
in this report & partially  
submitted in the proposed  
scheme of 'Afternoon' be  
approved & adopted.

=

Approved -

vicious classes. But we propose that the Engineering and Engineering Design shall be transferred from the Department of Engineering to that of Architecture, which will be more convenient for both.

In the Third Year we propose that the Mechanics shall be taught by Prof. Pupin, in the same manner, as to students in the School of Arts, ~~being given at the same time~~ special instruction in Architectural Engineering being given <sup>within the Department.</sup> at the same time. It not being convenient for the Department of Mathematics to arrange for the two hours a week in the Calculus and its applications, which it is desirable to give the Second Year men, this also will have to be done within the Department, an arrangement that can easily be made. <sup>In the first year</sup> Mr. Goodwin can, it appears, take the students in Architecture as a separate division, as at present, and give them in two hours a week all the Analytics and Calculus they need. We propose that this class, and all future classes, shall during

and Sanitary Engineering may need to be similarly specialized. But at present the requirements of the students in Architecture demand no changes not equally demanded by students in other courses.

In our study of the special needs of these students there have, however, been brought to our notice several things of equal concern to all the departments, to which it seems reasonable to draw the attention of the Faculty.

1. The first of these is the repetition of subjects in the School, the same topic being treated in substantially the same way by different teachers in different departments. It is said that some things are taught three or four times over to the same students, as Physics, Mechanics, Engineering and Graphical Statics, or as Chemistry, Physics, Sanitary Engineering and Hygiene. This evil undoubtedly exists to a very considerable extent, causing waste of time and much vexation.

among the men.

2. A similar evil is the repetition within the School of subjects required for entrance. This is naturally felt as a hardship. Those who have taken us at our word and learned what they were told to before they came, feel as if they were being sacrificed for the advantage of those who failed to do so.

3. The knowledge of French and German that it is practicable to exact for entrance into the School is not sufficient to enable the students to use these languages in their studies. To condition men in these subjects and require them to be made up during term time is to impose extra burdens upon the men least able to bear them. It is difficult under these circumstances to treat these subjects seriously, and most men go through the School without any useful acquaintance with these <sup>languages</sup> of the entrance examinations.

in French and German as well as in Physics and Chemistry were made really severe, and men given the following Summer in which to make them up, it would be possible to exact real proficiency in them.

4. Our inquiries also lead us to believe that the so-called quizzes required in Chemistry, Hygiene and are worse than useless. A voluntary exercise of this sort, such as obtains in the Medical School, is a useful institution. But it is the unanimous testimony in regard to the obligatory quizzes in our own School that they are an absolute waste of time.

As the result of our examinations of the subject committed to us, we recommend the following passage of the following resolutions:—

155 That the arrangements for the instruction in Mathematics and

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Engineering of the students in Arch-  
itecture recommended in this report  
and partially embodied in the pro-  
posed Scheme of Attendance for next  
term, be approved and adopted.

2<sup>nd</sup> That Quizzes in Chemistry,  
Hygiene and he dis-  
continued.

3<sup>rd</sup> That the first year instruction  
in Physics and Chemistry be so  
modified as to begin where the  
studies required to enter the School  
leave off.

4<sup>th</sup> That the heads of the several  
departments be requested to confer  
with one another so as to prevent  
the same instruction being given  
by different instructors under dif-  
ferent heads.

5<sup>th</sup> That the entrance examinations  
in French, German, Physics and  
Chemistry be made more severe, so  
as really to exact a sufficient ac-  
quaintance with these subjects, and  
that conditions in them be made



up during the following Summer,  
not in term time.

W. R. W.

Department of Architecture.

School of Mines,

Jan. 30, 1893.

President Low,

Dear Sir:

The appropriation for salaries in this Department for the year 1892.-1893, which was \$500 less than was asked for, proved to be inadequate, not only by this amount, which was made up by gift, but by an additional sum of \$500 which became necessary through unexpected increase in numbers, and which was taken from the appropriation for the current expenses of the Department.

The requirements for next year under this head can hardly be less than for the present year. But they are not likely to be greater, inasmuch as any further increase of numbers is in our present quarters impracticable.

The appropriation of \$1250. for current expenses, which was \$750 less than in previous years has also proved inadequate. Indeed the \$2000 appropriated for the year 1891.-'92, did not quite suffice to carry it through, and the items that thus lay over and the expenses of the Travelling Scholarship, which were now charged to this account, reduced the sum really available to about \$1,000. Since \$500 of this was taken for the salary of an additional assistant required as has been said by increase of numbers, only about \$500 was left for this year's expenses as against \$2,000 for previous years. This sum was exhausted early in the winter.

An appropriation of \$3,000 for the current expenses of the year 1893, '94 will accordingly be necessary. The chief items of this account are sundry personal services in the care of the collections, and in making diagrams and drawings, the rebinding of books, and the purchase of prints, photographs, models and other apparatus of instructions.

These expenses are largely incident to the expansion of the work of the department. This has arisen partly from the natural development and improvement of our methods, partly from the establishment of University work, and from the accession of a large number of University Students, partly from the transference to this department of the work in scientific construction. This work was formerly done by our men in common with the classes of Mechanical and Civil Engineering, but it is now carried on by ourselves under the name of Architectural Engineering.

The result of these changes is to give five years of strictly professional work in place of the three years with which we started, a large part of which was given to study only indirectly related to our needs; we are now occupying new fields and need new apparatus and extra help.

I am very respectfully yours -

G. P. W.

P. of A.

SUPPLEMENTARY NOTE.

It may be reasonable to set forth these points somewhat in detail at the present time, instead of waiting until the end of the year to explain just what we have been doing.

1. Under the first head, that of the development and improvement of our methods, the instruction in Ancient, Mediaeval, and Modern History has been transferred from the second, third and fourth years, <sup>to the first second and third,</sup> and the instruction in Historical Ornament, which formerly occupied two years, has been expanded over three, so as to accompany and illustrate <sup>the architecture of</sup> these three historical periods.

Besides the photographs, lantern slides and drawings illustrative of these studies, and which require constant additions, we have formed a classified collection of miscellaneous prints and engravings which proves of great practical value. The time of the Curator is now mainly taken up in helping the students find what they want among these things and in the books, so that the clerical and mechanical duties of his office have to be delegated to others.

The work in Design, which formerly occupied the third and fourth years, now occupies the first, second and third, the devices by which it was made practicable to begin the study of Architectural Composition <sup>at the beginning of the course,</sup> having proved perfectly satisfactory. Except that too little time <sup>is</sup> found for free hand drawing, this part of the work is now on a good footing.

The establishment at the Metropolitan Museum of Elementary classes in Architectural Drawing which pursue exactly

our own methods, promises to furnish us with students already conversant with much that we now have to include in our first year's work. This points to the time when, as in foreign architectural schools, we may require some technical attainments on admission, and gain further time for more advanced studies.

We have also this year been able to introduce into all the classes stated exercises in the writing of English, more or less directly related to matters in hand. In the lower classes these have taken the form of ten-minute compositions written in the class room once a week; with, however, more or less of mental preparation in advance. The Fourth year men, in conjunction with the University students, have had more serious exercises both in writing and in reading, making very full abstracts in the form of a Table of Contents, of such essays or chapters as were assigned to them, and writing a brief review or criticism of the same. The examination and criticism of these papers has been laborious, but it has been worth the trouble. All the classes have highly appreciated these opportunities and have entered heartily into the work. I think they have felt, what I have myself felt very distinctly, that it has raised the intellectual tone of the department and given it something of the character or a place of liberal culture.

2. The announcement of our University Course in History and Design, in the spring of 1891, brought in last year four students. Three of these had just graduated

in this department, and they received the degree of Master of Arts in due course at the last Commencement. The fourth was a Special Student who having spent three or four years in an architect's office was considered qualified to pursue these studies.

The success of his experiment was so marked and the advantage, both to the school and the profession of opening our instruction to mature men <sup>of</sup> approved skill and capacity was so great that a lively interest was excited among this class of young men, and this year a dozen special students have presented themselves under these conditions, nine in the University Course of History and Design, three in the University Course of Construction and Practice. Work has been assigned to each according to his choice and his previous attainments, and they have largely profited by the permission given them to occupy such time as they could command in attending other exercises within the department. They have as might have been expected shown great diligence and made rapid progress. The presence in the school of so large a body of men who have relinquished office work in order to learn what offices cannot teach, cannot fail to give a more serious and manly tone to our whole society.

Under the title of Special Students in the University Course of History and Design, we have this year ventured to admit also three or four graduates of colleges or scientific schools who have had no special architectural training but whose general education and personal culture seem to qualify them to pursue it, thus meeting the requirements of the statute. There has been no reason to regret this interpretation of the rules and will probably be best to

follow this precedent with discretion in the future. These men have been among our most satisfactory students.

Meantime the process of pushing back into the first three years the work formerly done in the last three, is now nearly completed. The class which graduates in 1894 is the last one whose fourth year will be occupied with elementary studies in History, Engineering and Design. Their successors will enter freely into the enjoyment of the Elective Courses, in History and Design and in Construction and Practice, which were authorized in May, 1891. These parallel courses will be identical with the University courses in these subjects established at the same time. The upshot of this will be as stated in the Circular of Information, what is virtually a five years' course. A student will then graduate at the end of four years, either in Design or <sup>in</sup> Construction, according as he may have elected one course or another in his fourth year, and may then take a second degree as Master of Arts whenever he shall have added a fifth year in either department of study.

Under these conditions the fourth and fifth years will be comparatively free from stated exercises and a real atelier may become established. The students, both of Construction and of Design will be free to give their problems the consecutive time and attention without which serious studies cannot be profitably undertaken. Both, moreover, will have leisure in which to profit by the unequalled opportunities for the study of buildings, both without and within, whether completed or in process of exe-

cution, which the city offers. The good will of architects, builders and owners, of which we have constant evidence, puts these opportunities freely at our command, but hitherto we have had no leisure in which to profit by them.

3. The chief reason for giving instruction in Architecture in Schools of Science is the facilities they offer for teaching Scientific Construction. But the mechanics and Engineering needed by architects are not the same as those needed by Civil and Mechanical Engineers, and a relation which is at first a help presently becomes a hindrance. When, accordingly, in April last, the Department of Engineering asked to be relieved of the duty of teaching Engineering, Graphical Studies and Engineering Design to the students of Architecture, I was very glad to take these subjects in hand and organize a special course of Mechanics and Engineering strictly adapted for the requirements of the profession. This I have now been able to do under the name of Architectural Engineering, occupying two or three hours a week during the second and third years, and following a special course of Analytics and Calculus which the Department of Mathematics has arranged and which occupies two hours a week during the first year. It is this substitution of two or three hours a week during three years, for three or four hours a week during four years, that has enabled us to expand and improve the more strictly professional branches.



like this strictly adapted to the special needs of the profession, will not<sup>only</sup> be of more practical service than the course hitherto pursued, but that it will give the men a better understanding of the scientific principles involved and thus be of more value as a matter of general education and intellectual training. In this I am sustained by the opinions of all the architects and all the teachers of architecture whom I have been able to consult as well as by the example of those schools which have been able to establish such specialized instruction and by the growing dissatisfaction of those which have not.

Such a course is sufficient for all the requirements of the ordinary practitioner. At the same time the University Course in Construction and Practice, and the Elective Course in the Fourth year, which are identical with it, will afford to men who wish to become specialists in Architectural Engineering an opportunity to do so. Instead of lowering the standard of our scientific instruction these modifications distinctly raise it, and they greatly increase our own labor and responsibility.

The next step will be to introduce the systematic study of the building arts and the establishment of that Architectural Laboratory which was projected ten years ago in aid of such studies. But this will require more space than we can at present command.

This detailed statement will suffice to show that the work of the regular instructors in the Department is and constantly increasing, that to enable them to carry it on as it should be carried on, there is needed not only a constant addition to the apparatus of instruction, but a considerable auxiliary personal force..

Milton, Mass., Sept. 12th, 1892.

My Dear Mr. Low:-

The most important and difficult work to be done in my own department this Winter is the development and administration of the practical and scientific branches. The work in history and design is now fully developed, and though it will be better organized and administered this Winter than hitherto, we know what we want to do and have only to profit by the lessons of our own experience. Except that I wish to introduce, in the more advanced classes at least, some systematic work in writing and reading, there is nothing <sup>of</sup> ~~is~~ novelty to be undertaken in these fields. Even this is not exact a novelty, as I tried a very satisfactory experiment of this sort last Winter with the small class of University students. This will serve as a guide for more extended operations.

But the practical and scientific side of the subject opens a new field, and one of greatest <sup>r</sup> ~~t~~ difficulty. In the practical problem, to be sure, we are not entirely without experience, and after a number of somewhat unsatisfactory experiments, including three years' trial of Mr. Auchmuty's trade schools, I have come back to a plan which I used at the Institute of Technology, as on the whole the most promising. This was to prepare a sort of model Specification, and to spend an hour a week reading and explaining it to the men, with such blackboard and other illustrations as I

could command. To this end I condensed thirty or forty specifications into a single form, while the men copied into hand-books, leaving space for the future additions. I find that these books have proved invaluable to their owners. But the New England formulas of twenty years ago would not serve our present needs, and as we have all been too busy in meeting the more urgent requirements of the Course to supply their place with more suitable material, I have meantime, as I have said, undertaken various alternative methods, thinking that possibly some of them might work better. These experiments have been satisfactory in this, at least, that they have confirmed my judgment that the old way was the best. I have accordingly this Summer employed Mr. C. P. Warner, one of our graduates of two years ago and one of our new Masters of Art, to overhaul my old material, adding to it whatever of new and different the present usages in New York have to contribute. The active and friendly interest that the profession take in all our operations has made it practicable to obtain from the best architects whatever we need in the way of documents, with the print and the MS. and they either send illustration drawings or permit us to copy or trace those in their portfolios. The mechanics and contractors have shown themselves equally ready to serve us. To make the illustration complete, of course, so that these lessons may be "object-lessons," we need not only working drawings but explanatory diagrams, and, so far as may be specimens or new sets of the things mentioned. These we are collecting.

We have begun with the most distinctive and novel topic,

and the one in which our previous lack of material was most conspicuous, that of constructive iron work, and shall make this the subject of this Winter's study. This will be followed by Carpenters and Joiners next Winter, with Painting and Glazing, and the following year by Excavation, Masonry, Stove-work, Plastering and Roofing. By thus extending the course over these years we can cover the ground by giving only an hour a week to it, taking the three classes together. The scheme of attendance for next year accordingly assigns an hour in the first year to these studies. Indeed for this Winter all four classes will take them together, not to deprive the graduating class of their birthright.

Having thus gone over all the ground in three years the men who elect the work in Construction and Practise for the Fourth year will be in condition to take up the study of Superintendence, the point in which the profession <sup>as a whole</sup> ~~has a hold~~ is the weakest and in which it suffers most in public estimation. At present it is purely a matter of accident whether an architect gets any proper training of this sort. A thorough training can come only of course by practise, but the subject is only suited to academic methods, and it would be a great advantage to the profession and to the community to have it systematically taught. An essential auxiliary will be an architectural library, in which demonstration will be made of building processes. This was recognized ten years ago as a chief consideration, and it formed a subject for memorandum which I sent to Dr. Barnard when I first came to the college. Space was allowed for it in planning the rooms we now occupy. But this space was soon needed for other uses, and indeed it is not until now,

and not now until this University Course is begun, that any of our men can have time for these special studies.

This one of the things for which so much additional space is needed at Bloomingdale.

To recast the Scientific Course in Construction, so as, under the name of Architectural Engineering, to give our men the knowledge they need in the shape in which they need it, is a more novel and more difficult undertaking. All the Architectural Schools in this Country have been established in connection with schools of Engineering. This connection though a greater advantage in starting is soon felt to be a hindrance, but our own school is the first that has undertaken to put this work on an independent and purely professional basis. In doing this we shall have to rely mainly upon ourselves. This course of instruction will have to be created almost entirely out of our own experience and that of our friends, for the work of this sort that has been done in Germany and France is not done as we need to do it, and the English example so useful, but so little in shape, for school use, as to serve rather as raw material for our own work and as a model copy.

The division which we made however, between the elementary studies of this sort which shall be required of all our students, and the more advanced work which shall be taken by only those who, in the Fourth Year or in the University Course, elect the course in Construction and Practise, enables us to undertake the task with reasonable confidence. We have this Winter only to develop and

administer the former, but at the same time preparing the more advanced work for next year.

This work I shall look after myself, in general and in particular, and Mr. Sherman's familiarity with the course as hitherto administered, and especially with the mathematical questions involved will be of essential service. But the bulk of the work and the chief responsibility will become upon Mr. Snelling, as appears from the new Scheme of Attendance. For this is training and experience of given him an excellent training preparation, running through a dozen years since he first took up these studies under Prof. Lanza at the Institute of Technology, and took part with him in his experiments on Strength of Materials. He afterwards I think you will know followed the full course of Construction at the Ecole Des Eaux Arts under Prof. Drume, who had just remodelled and greatly improved it, and adapted it to modern professional requirements. Meanwhile he was with Mr. Haight a number of years, giving his time chiefly to Superintendence, and just after entering our service he was offered by Mr. Hunt the charge of the buildings he was erecting for the Government at West Point, the work which his duties at school obliged him to decline. To these qualifications he adds, what is still more exceptional, a real fondness for teaching, and, though this is not so uncommon, the proper professional feeling that leads him not to count the cost himself of any effort necessary to the end in view.

The magnitude of this work has considerably increased since I first wrote you about it, the Engineering Department having relinquished control of it more completely than was at first proposed.

As the charge of the Third Year working Design still remains in Mr. Snelling's hands, so that the work of which I am speaking is additional to what he was previously doing, it seems to him and it seems to me that his salary for this next year of \$2,000., in place of the \$1,200. he has hitherto received, will be a proper compensation. I think the Trustees will see so plainly that this is reasonable that there will be no occasion to urge that it is necessary. When next year the University Course in Construction and Practice is set on foot, I shall if this years success warrants our continuing the work in his hands, recommend a still further increase. His task will be as novel, difficult and important as any work that we do.

If the number of students in the Department this year is as great as is now promised, we shall need to make some provision for auxiliary service in the drawing rooms. But that can wait until the term opens. Happily the additional expense involved in near numbers is more than covered by the additional fees.

I am very respectfully yours,



From S. J. Suedley,

New York, Jan. 31, 1894.

My dear Mr. Ware:-

In view of the fact that my appointment as Instructor in Architecture, in the Department, will expire on the 1st of next July, it is fitting, as you have suggested, that some account of the work that I have in hand should be submitted to you with a view to determining the question of continuing me in the service of the College yet another year, and of defining the nature of the service.

My first connection with the school was in the winter of 1882-83, - shortly after my graduation from the Institute of Technology, - when I came into informal relations with the Department as your draughtsman, secretary and general assistant. In the spring of 1883, when you went to Europe, I went into the employ of the Health Department as an Assistant Engineer, in which capacity I was put in charge of the Hospital for Contagious Diseases then in course of erection on North Brother Island. This position I left to go to Paris in the fall of 1884, to study in the Architectural Section of the Ecole des Beaux-Arts. While pursuing my studies at the School I worked during what time I could command in the offices of different architects, and at one time at the Hotel de Ville, in the employment of the city, as a perspector in

the Department of the Conservation du Plan de Paris. I remained in Paris until the early part of the year 1889, when I returned to New York to accept a position with Mr. Charles C. Haight as superintendent of building operations, having under my charge the construction of Mr. H. O. Havermeyer's house, at the corner of 66th St. and Fifth Avenue, the addition to the Skin and Cancer Hospital, at 105th street and 8th Ave., the new Leake & Watts Orphan Asylum, at Yonkers, and the new Christ Church, at the corner of 71st St. and the Boulevard, besides several smaller houses and alterations. I was employed in this manner in the spring of 1889, when the Trustees tendered me the appointment of Assistant in Architecture, which I accepted.

During my first year of service (while you were absent abroad) I taught Specifications and Practice, (treating of Carpentry) Greek Archeology, in French, Perspective, and Composition and Design to the Third Year Class.

The following year I was advanced to the grade of Tutor without increase of salary. You returned from Europe in the autumn of 1890 and resumed your lectures in Perspective and I at the same time passed over the instruction in French to Mr. Kress, still continuing, however, my lectures on Specifications and Practice, treating that year of Masonry, as well as keeping up my criticisms and corrections in the Third Year

Drawing Room in the afternoon.

The winter of 91-92 was practically a repetition of the preceeding one, save that my subject in Specifications was again Carpentry. At this time the instruction in Engineering was given to the architects by General Trowbridge. General Trowbridge died during the summer of 1892, but it had been determined, previous to his death, and at his suggestion, that the instruction in this subject should be given within the Department. He agreed with you that what Engineering was needed by an Architect was of a special nature and should, for this reason, be taught by an architect, and not by an engineer. My own experience confirms this view. Although while I was at the Institute of Technology it was not so apparent to me, I came to realize later that excellent and exhaustive as was the course in this subject given by Prof. Lanza to the architects, it was over-burdened with extraneous matter of no practical value. In great contrast to this, was the excellent series of lectures delivered by the late Mr. Emmanuel Brune at the School in Paris. I had the great good fortune to sit under Mr. Brune the last time he delivered them. There could not be a better model of the instruction in Scientific Construction that an architect needs.

When, accordingly, you asked me at this time to undertake such a course of lectures, I was glad to do so. But as the

field was an entirely new one, at least in this country, I realized that in order to do the subject any justice it would be necessary for me to give it more time than I could afford under the existing arrangements. The work in Specifications was therefore passed over to Mr. Warren, a graduate of the Department in 1890. The manner in which he has conducted the course has amply justified the confidence placed in him. Besides giving this instruction in Engineering, I continued in charge of the Third Year Design. I was this year advanced by the Trustees to the grade of Instructor.

During the present year my work has been practically the same as last year; namely, Architectural Engineering with the Third and Fourth Year classes, and architectural composition and Design with the Third Year class. This work has occupied, for the lectures, from one to five hours a week during the morning hours, besides three afternoons in the Drawing Room.

During the winter of 1892-93 I discussed very thoroughly with the Fourth Year Class the theory of Flexure and the solution of all cases of floor beams. More I was unable to do, as the work for the graduating class extends through only one term. This Class, however, had had one year of Engineering with Professor Trowbridge.

With the present Fourth Year Class, then in their Third

Year, I began at the beginning and lectured successively on Tension, Compression, (including Foundations) Bearing Power of Soils, Footing Courses; Shear, including Rivets, Timber Joints, Bolts, &c; Uniformly varying Stress; and The Theory of Beams, both analytically and graphically. This year they have had Roof Trusses; Arches and Retaining Walls.

The chief difficulty I have met in administering this instruction has been the small amount of time allotted to it, making it impossible to give out practical examples for the men to work out, and so to fix firmly in their minds the formulas and theories propounded in the lectures. But this has not worried me as much as it otherwise would, for it was agreed that the work of the Third Year students should be mainly a summary review of the subject, largely descriptive and dealing with *principles* and methods, rather than with absolute calculations of stresses and strains, such calculations being reserved for the advanced work to be given hereafter to University Students and to the undergraduates who in their Fourth year shall take the elective course in Construction.

In the Circular of Information to be published this year such an advanced elective course is provided for. The men who propose to follow it will be expected to devote their entire time to the work. This will permit Mr. Warren and myself to develop this work upon the lines along which the sub-

ject is pursued in the School in Paris, lines, as I said a moment ago, admirably chosen, and productive of most excellent results.

In this elective course, for the Fourth Year and the University students, it is my intention to lecture three times a week throughout the entire year, on the Strength of Materials, and upon Mathematical and Theoretical Construction, say, on Mondays, Wednesdays and Fridays, while Mr. Warren will also lecture three times a week, on the alternate days, treating of Specifications and Practical Construction, and we shall arrange our subjects, as far as possible, so that one will treat of the same subject from a practical point of view, while the other treats of it from a theoretical one. At the same time numerous practical examples, of which we now begin to have quite a collection, can be given out in the form of problems to be solved. These the students will be able to discuss thoroughly, as they will devote their entire time to the course.

Short projects, one in stone, one in wooden and one in iron construction will then be given out, each occupying, say, a month. For example, the students will be requested to design a small triumphal arch, and to work out all the calculations for its stability, &c., making all the working and detail drawings, and writing the specifications. I should

propose to conduct the mathematical part of the work myself, and to have Mr. Warren occupy himself with the detail drawings and the specifications, and the study of actual buildings. The same scheme will be followed with the Wooden & Iron Projects.

Finally, towards the end of the year, a large project will be given out, in which all the points and questions treated of during the year will be taken up. At least three months should be allotted to this design, the students being expected to work it out in all its details both of engineering and of practical construction, just as if it were to be built.

The student who shall have completed this course satisfactorily will, I feel sure, be in a position to carry through successively any piece of work that may be intrusted to him, a position which, up to this time, the graduates of the department have not been able to fill until some years after leaving the School.

That such equipment on the part of our graduates would be greatly appreciated by the architects in the City into whose offices our young men go, I know by conversations I have had with them, and by their generous response to your requests and my own for material to equip such a course.

In order to carry out these plans efficiently there would be needed a considerable apparatus of drawings, diagrams

and models, of which I have already among my notes a long list which I have not been able to have made. Besides the advanced work with the Fourth Year and the University students I should propose to repeat for the Third Year men the ground covered by this year's lectures.

This ground is entirely new. No text book exists, at least in this country, which treats at all of the subject in the manner, or along the lines which, in conjunction with Mr. Sherman's work in Mechanics, in the second year, I have been endeavoring to follow. What works do exist, such as Mr. Berg's on Safe Building, are in no way applicable to our needs, as they look at the subject from the unmathematical point of view of the ordinary hack draughtsman, and lay down merely empirical rules and formulas, without pretending to demonstrate or deduce them. Such a discussion of the problems involved may be sufficient for the class of men for whom such books are written, but it certainly would be out of place in an Institution of learning. Even the admirable work of Mr. Brune, which I referred to a moment ago, is adapted to students entirely unfamiliar with the Differential and Integral Calculus. This makes many of his demonstrations unnecessarily long and cumbersome. Since the Calculus is taught to our men in their First Year, it would be foolish not to profit by it so as to present the subject matter of the course in as concise a form as possible.



In order to do this has required on my part an enormous amount of labor in searching through Engineering works to find demonstrations suitable for our needs, which search in a large majority of cases has ended by my having to devise original demonstrations of my own. If the advanced courses outlined above are given next year, a still greater amount of this work will have to be done.

But the material thus collected will be of inestimable value, and I have it in mind ultimately, in collaboration with Mr. Warren to condense it into a text book, a text book which shall treat of the entire subject of architectural construction in a scientific, rational and practical manner. The book would naturally be divided into two parts, just as our work is divided; the first part to contain all the mathematics of construction, while the second should discuss the practical application of the theories demonstrated in the first part; the whole to be illustrated by numerous examples and construction plates taken from actual buildings. As I have said, the greater part of the material for such a work is already in our hands, and all we need is the leisure and a sufficient amount of encouragement, to put it into shape. Occupied, however, as I am at present with the supervision of the Third Year Design, any such leisure would be out of the question, and I should be glad to be relieved of this work,

and to be permitted to devote all my energies to the development of the courses in Architectural Engineering.

This change, while increasing the number of my lectures, and the importance of my work, would make it unnecessary for me to be in attendance at the School during the afternoon. The amount of time my present duties require I have found to be incompatible with other duties and interests, and I shall be glad of an arrangement which, while enabling me as I to render more valuable service than at present, will leave more time at my command for the preparation of this work and for my professional avocations.

I fear, my dear Mr. Ware, that I have already trespassed too much upon your time and good nature, but I cannot refrain from asking your indulgence yet a moment to express to you all the gratitude I feel for the uniform kindness that you have always shown me in all our relations throughout the ten or a dozen years that we have been thrown together, partly as professor and student, and partly as co-laborers in the field of architectural education, a kindness which has encouraged me to speak as freely and openly as I have in this letter regarding my work and future prospects.

*Gerritt Temple Helling.*

126 East 28<sup>th</sup> Street

May 22, 1895-

Dear Dr. Chandler,

What your letter suggests is what I should really prefer - and yet not exactly that either. The most desirable thing from my own point of view would be a two years course on building materials & appliances running through the First & Second Years, the two Classes taking it together. It would take up the different subjects of Stone work, iron work, brick work, wood work, one after the other, treating each

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from every point of view,  
expounding the physical and  
chemical properties & relations  
which had to do with its strength  
and decay as well as processes  
of manufacture & value from  
a structural & decorative point  
of view. It was something  
of this sort that I had in  
mind in speaking to you and  
Mr. Rood a month ago, and  
I have since made some  
progress in laying out a  
sort of syllabus of such  
a course. But it seemed  
a little formidable to under-  
take all this all at once,  
and as your Applied Chem-  
istry already covers part of

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this ground it seemed more  
sensible to continue to avail  
ourselves of it as it stands,  
at least for a year or two longer.  
If it were practicable to put  
this course for my men into  
the first year it would give  
a twelve-month in which to  
prepare for this new instruction  
and still leave the question  
open whether to make a two  
year course of it, founded upon  
the elementary notions with  
which the men enter the School,  
or, to confine it to the second  
year letting the Applied Chemistry  
continue to occupy the first  
year.

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This seems to me an experiment  
worth trying, especially as it  
offers alternatives which we can  
choose between by and bye better  
than now. Moreover, it is the  
minimum of change and only  
involves letting my First-Year  
<sup>men</sup> try Applied Chemistry for one  
winter

Nothing, apparently, could be  
more unsatisfactory than the  
present condition of things, the  
results of which, as you state  
them, are deplorable. My men  
work hard enough and do them-  
selves credit in things they are  
interested in, and are easily  
enough interested when they  
see the bearing of studies upon  
the main object in view. This

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pertinence to their professional work  
This would be obvious enough  
with such a course of mixed  
Physics, Chemistry & Practice,  
as I have been projecting.  
It is not <sup>so</sup> ~~at all~~ obvious to them  
with the Physics & Chemistry of  
the First Year, which <sup>they are convinced</sup> seems to be  
~~do not take to kindly~~ & which <sup>is pretty much</sup> ~~is~~ thrown away upon them,  
And it is not worth while  
to continue to sacrifice so much  
time to so little purpose.  
But the Applied Chemistry,  
though only a part of it, im-  
mediately concerns them, and  
some topics specially important  
to them are necessarily omitted  
is <sup>all of it</sup> interesting & instructive,  
and I should be very glad

if it could be arranged that  
my men should have the benefit  
of it for at least a year or  
two longer. By that time I  
should hope to have found, by  
means of a tentative & experi-  
mental course in Building  
materials, a perfectly satisfac-  
tory solution of these questions.

We seem to be agreed at any  
rate in this, that the present  
condition of things is entirely  
unsatisfactory, and I do not see  
that there is any way of making  
the present arrangements work  
any better than they do. Your  
letter shows that the results  
are more discouraging than  
I had supposed. To drop  
Chemistry altogether may, as

you suggest, be the only prac-  
ticable step. But this I should  
like to defer this conclusion  
until next year, and mean-  
while, if you do not very much  
object, to try the experiment,  
for one year at least, that  
my letter suggested. The worst  
that would happen would be  
that the first-year men would  
find a part of the Applied  
Chemistry flying over their  
heads.

The alternative, to drop  
Chemistry altogether, would oblige  
us immediately to set on foot  
our instruction in Building  
materials. This I should be  
sorry to have to do at such  
short notice. Still, we will

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undertake it, if necessary,  
as, a month ago, I was  
about ready to propose.

I hope to be down again  
before the end of the week,  
and then we can perhaps reach  
some conclusion. I suppose  
the Faculty <sup>will agree to anything</sup> that you & I agree  
upon.

Yours always,

Dictated. W. R. Ware  
H. W.

To/  
Dr. Chandler.

May 22 1895.



SCHOOL OF MINES, COLUMBIA COLLEGE

41 EAST FORTY-NINTH STREET

NEW YORK May 20th, 189 5

My dear Professor Ware:

I am very sorry to hear that you are ill; should have much preferred having a chat with you to writing you a letter in reply to your communication of last week with regard to instruction in physics and chemistry, and in building materials and appliances. Your arguments are very good, and if they were founded upon sound premises would be conclusive, but unfortunately the edifice which you have constructed has absolutely no foundations. In the first place, the students when they enter the School of Mines do not pass a satisfactory examination on elementary chemistry, the schools do not give adequate instruction in the subject, they have no chemists to give the instruction, and they have no apparatus to illustrate the instruction. My examination is extremely easy, and a large proportion of the class know hardly anything<sup>about it</sup> when they enter. Now with regard to their work after they enter. The architectural students make the poorest showing of all the students who attend my lectures. They seem to come to my lectures unwillingly with a feeling that it is an imposition upon them that they have to study the subject, and they evidently do as little studying as possible. I do not know where they got such an idea; whether they inherited it or whether they hear it discussed or

*Dr. Chamberlain's letter -*

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not I do not know. At the semi-annual examination last February 16 of the students in the course of architecture in the first class failed to pass the examination, 3 succeeded in passing it; one had a mark of 6.2, one a mark of 6.3, and the other a mark of 7.4. The rest of the architects stayed away or else did not hand in any paper. This shows how little knowledge of elementary chemistry the young men possess. I should be in favor of either excusing the architects entirely from studying chemistry in the School of Mines, or else give them to understand that it is just as necessary for them to learn their chemistry as it is for them to learn anything else that they study. Now with regard to the applied chemistry in the second year. They do manifest a little more interest in this subject than they do in general chemistry. At the semi-annual examination 8 of the architects passed, the marks being as follows: 6.0, 6.0, 6.0, 6.2, 6.2, 6.2, 6.5, and 6.5; that is they just got through and no more. The other 8 students <sup>in arch</sup> who attended the examination failed to pass it. You see the idea that the students already know so much chemistry that it is not necessary for them to attend my first year instruction is entirely contrary to the facts. They do not know any chemistry when come here, and they inherit in some way the idea that it is not necessary

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for them to learn any after they get here. With regard to the proposition of excusing them from first year chemistry and allowing them to take applied chemistry in place of it, that is entirely impracticable; they could not attend the second year instruction in applied chemistry with any advantage unless they attended in the first year the first year instruction in general chemistry.

I am very sorry that I can not agree with you, but the facts are entirely against your proposition. Why don't you bring the matter up before the faculty as to whether chemistry should be required at all of architects?

Sincerely yours,

*C. F. Chandler*