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## REPORT

THE ASSOCIATION

FOR THE

# ADVANCEMENT OF WOMEN.

1877

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# REPORT.

THE Fifth Annual Congress of the Association for the Advancement of Women, met at Cleveland, Ohio, Oct. 10th, 11th and 12th, 1877. The President, Mrs. Julia Ward Howe, being in Europe, Miss Abby W. May, of Boston, was called to the chair. At the opening session the Association was cordially welcomed to the city by Mayor Rose.

Nine public sessions were held, at which papers on Educational, Literary and Social topics were presented; many of them were ably Literary and Social topics were presented; many of them were ably discussed by members. The audiences were large, no less than one thousand reported at the day sessions, and three times that number thousand reported at the day sessions, and three times that number crowding the hall in the evening, till the doors were locked, as a precautionary measure by the Insurance agent's officials.

The Cleveland School Board adjourned the schools on Friday, that teachers and older pupils could attend. The courtesies of the citizens were full and able.

Were tunstinted, and the reports of the press were full and able.

The daily papers reported that "the Women's Congress, which closes its sessions in this city to-day, has been characterized by closes its sessions in this city to-day, has been characterized by intelligence, dignity and harmony, and has signally proven the fact intelligence, dignity and harmony, and has signally proven the fact intelligence, dignity and come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible women can come together in the interests of their sex that sensible

"The proceedings have been marked for dignity and earnestness."

Most of the ladies who have spoken have a decidedly pleasing address, what are very eloquent. Whatever opinion any one and not a few of them are very eloquent. Whatever opinion any one and have as to the wisdom of women participating in such movements, may have as to the wisdom of women participating in such movements, which are usually considered as belonging to men alone, no one can fail which are usually considered as belonging to men alone, no one can fail to admire the manner in which these deliberations have been conducted. The debates have been characterized by moderation and judgment, and The debates have been advanced well worthy the attention of male scientists ideas have been advanced well worthy the attention of male scientists and philosophers. When these ladies return to their homes, they will have left a most pleasing impression on our citizens."

The Sixth Congress of Women assembled at Providence, R. I., Oct. 9th, 1879, at 10 A.M., at Low's Opera House.

There were three executive sessions of members of the Association, six public sessions, to three of which an admittance fee was charged. Members from eleven States and District of Columbia were present, Mrs. K. N. Doggett in the Chair.

The opening address of the President set forth cogently the Educational, Industrial, Civil and Political necessity for such an Association. It was followed by papers and essays on "Dress;" "A plea for the study of Botany in our Primary Schools;" "Co-Education;" "Women's Clubs;" "Motherhood, physiologically considered;" "Women in the Grange;" "Journalism;" "Where do we get our characters?" "The importance of National Training in Domestic Economy;" "Bee Culture;" "Our Deadly Friend; or, our False Methods in Education;" "Harvard Examinations as a Test;" "An astronomer's view of the Eclipse at Denver;" "Leonardo da Vinci."

Interesting reports from the committees, and from the Vice-Presidents of States, and District of Columbia, were presented.

Foreign letters from members were read.

As in other cities where the Association has met, the Public Schools were adjourned for a day, that the teachers and older pupils might attend the sessions of the Congress. Here, as elsewhere, most cordial hospitality was extended to members, as well as to the officers of the Association. The recognition of the Press was uniformly appreciative. The Providence Journal regarded the Congress "as notable in wise and bright thought, and practical suggestions."

The Providence Bulletin summarized the three days' work as follows :-

"It was equally creditable to the good citizens of Providence, and to the women from abroad who have come among us as teachers, that Low's Opera House was so completely filled yesterday afternoon by an audience attentive, intelligent and appreciative. There were vigor, purpose and plan on the platform; respect and an almost thou-pursuadestme feeling on the floor. In one matter, at any rate, the speakers were worthy of imitation by all who address the public; they were brief, pointed, explicit; they knew what they wanted to say, said it and stopped. When a woman who reminds one of the ideal female Quaker preacher, with a low, soft voice, denounces a given practice as 'senseless, tasteless, vulgar and extravagant, and each word impinges the intellect as being exactly appropriate and entirely true, it is worth while to listen. Nor was there wanting the lighter graces of rhetoric, nor the subtle sarcasm wreathed in but not hidden by a charming utterance

and a lively wit. Yet if one were to characterize the sayings of the afternoon, one would simply say they were marked by common sense, the most uncommon of all things in a mass meeting. The subjects discussed were important, of general interest, and so diversified as to retain attention, and there were no vain repetitions nor wild extravagancies. As a purely literary entertainment, the hearers were treated to high thought, expressed in pure and forcible English, and as a means for the advancement of women, this meeting must be held to be a healthful, elevating, suggestive and potent agency."

The Congress was made the topic of pulpit discourse on the succeeding Sunday. The Rev. Mr. Staples said, "Those who have attended the Woman's Congress, which has just closed, must have felt that here was a company of noble women, striving earnestly to do what they could for the elevation of life, and the best interests of the race; women of large views and large culture, having no poor ambition for notoriety, but with seriousness of heart, with a solemn sense of responsibility to God, studying the great evils that afflict society, striving to alleviate and cure them.

"No one could have heard or read the papers on the sources of character, and the causes that are making education a deadly peril to the health of the body, without believing that these women comprehend the dangers, and earnestly propose to overcome them; that they have an intelligent perception of what education should be, and of the sources of national power and glory. These papers deserve to be read and pondered by all our people. There is no man or woman who will not be wiser for their counsel, none who would not be nobler and more Christian for their spirit.

"This Congress carries inspiration to pure living into any community where it meets. While such a band of cultured and consecrated souls are dealing with the great questions of moral and social evil, and working for a higher civilization, every patriot, philanthropist and Christian has reason to thank God and take courage."

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#### THE NEED OF WOMEN IN SCIENCE.

#### BY MARIA MITCHELL.

In our inquiries in regard to the opportunities afforded to women for the study of science, we are not surprised to find them meagre and unsatisfactory. Nor, with one exception, are we surprised at the localities in which the little culture of science is found; they have the range of latitude and longitude which we expected. The light shading on the map of the world which in the old school books used to divide the enlightened from the barbarian countries, might be used to-day to designate the scientific and the unscientific.

Taking our whole country into consideration, there is very little attention paid to science. The same influences which deter men in scientific research, operate only more forcibly upon women; the want of leisure, and the unremunerative character of intellectual pursuits. And yet the fact that a few women give themselves so determinedly to scientific studies, and that so many make a beginning, would seem to show that they have a decided fitness for its demand. Young girls almost all study the natural sciences in schools, and quite a moiety of them take up the abstract sciences. I do not believe it is because the science of the ordinary schools requires little brain work, although that is true, but because it is the work to which they instinctively incline. I should like to urge upon young women a course of solid scientific study in some one direction for two reasons.

First. The needs of science.

Second. Their own needs.

The needs of science. For the very reason that a woman's methods are different from those of a man, are women needed in scientific work. All her nice perceptions of minute details, all her delicate observation of color, of form, of shape, of change, and her capability of patient routine would be of immense value in the collection of scientific facts.

When I see a woman put an exquisitely fine needle at exactly the same distance from the last stitch which that last stitch was from its predecessor, I think what a capacity she has for an astronomical observer; unknowingly, she is using a micrometer—unconsciously, she is graduating circles. And the eye which has been trained in the matching of worsteds is specially fitted for the use of prism and spectroscope. Persons who are in charge of the scientific departments of colleges are always mourning over the scarcity of trained assistants. The directors of observatories and museums not infrequently do an enormous amount of routine work which they would gladly relinquish; their time and strength are wasted on labor which students could do equally well, if students could be found who would be ready to make science a life work.

Women are needed too, as lecturers in schools; it needs only the supply, and the demand will come.

Persons who are known to be in a line of scientific work, are continually besieged with applications to give lectures, to write short articles for periodicals, to translate foreign works. Such lectures and such articles would do little directly for the advance, but much indirectly in forming taste and arousing interest.

I am far from the intention of encouraging young women to scientific study on account of its outward utility; at best, its wages to-day are little above those of manual labor, and were they those of royal revenues, I should still raise the objection that it

within the sphere of our perception, is subject.

To discover and establish the natural laws which lie at the basis of all our forms

Up to within a comparatively recent date, nothing definite was known of the oriting and development of the sounds of the human voice, and the most conflicting gin and development of the sounds of the phenomenon. The first attempts to bring views have been held in regard to this phenomenon. The first and independently that the chart of the musicians, for they had been accustomed to keep only to the ideal view of art, and had considered by most of therefore. But to repeat what I have said in my book, "The series as opposed thereto. But to repeat what I have said in my book, "The as it is to be made present to the perception of others, requires a form which, in its as it is to be made present to the perception of others, requires a form which, in its material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure, may be more or less perfect; but it can never material as well as in its structure.

life, have exerted a deteriorating influence upon the voice. Some singing teachers and scientists, however, have refused to accept this convenient theory, rightly ascribing the decline of Vocal Art to an improper treatment of the

The causes of the decline of Vocal Art have been frequently discussed, and the conclusion has been reached that our advanced civilization and advanced mode of

### BY MADAME SEILER.

# THE KNOWLEDGE OF THE HUMAN VOICE. DISCOVERIES MADE IN THE LAST TWENTY YEARS IN

Mrs. Julia Ward Howe spoke briefly on the topics suggested by the preceding papers. She made an eloquent plea for the higher education of women, and deprecated the levity which greeted girls who had studies the "ologies" when they left school. She believed that girls should not give themselves up to the frivolities of modern society, but should have a higher motive, and should, having gained a school knowledge of higher studies, pursue them farther in after life.

If it could be feeling understood that they have other uses besides those of show-rooms and architectural monuments, there is no doubt that abundant money would be furnished for their uses; and society needing just such opportunities as the museums could give, would supply means for making those opportunities available.

comparison can be made between them.

Our churches, colleges and asylums are generously supported; why should not our museums be also?

ing with European museums, and that something is endowment.

How long must we wait? In this country society gives voluntarily what in older countries is given by the government and the people are taxed for, so that no fair

That our museums are destined to become more useful is abundantly shown by the dissatisfaction of many of the members of the societies concerning their present status; but, very little can be done while the only feeling of society towards them is status; but, very little can be done while the only feeling of society towards them is one of ignorant curiosity. Something is needed to put them near on an equal footing with European museums, and that something is endowment.

would be marvellous. The story of Penikese tells something of the hunger among

THE HUMAN VOICE.

## ASSOCIATION FOR THE ADVANCEMENT OF WOMAN.

Aside from the giants, who are bound to progress from their own vis viva, there are many others who need the advantages which musenms should provide. Those fiving in the country or in country towns have limitless chances for the study of nature, but they do not know how to work. A few months' study and work under the direction of a master would give them a start, and, apart from training up a class of scientific workers, many would be taught habits of accurate and intelligent observation of ordinary phenomena.

Elementary instruction in science can be gained in schools and colleges. Something further is needed, and we look to the museums to supply the demand. It is time they were a more active power.

At present there is a superficial stratum of science over all society, deposited by the popular writings of English and German Scientists. There never was a better time to fix a permanent interest in its benefits. All museums should be free, and there should be free popular lectures, interesting ones too, on science; but, besides these, let there be rooms, specimens, apparatus and encouragement for the student, whether he be fresh college-graduate or grey-headed worker in the field of science.

In the appreciation of scientific discoveries to the useful arts America has much to be proud of, but it has given very little encouragement to the pioneer and quiet student.

Private beneficence has done much, and perhaps from that source will come the greatest help for many years, still, it would seem as though state and general government might aid scientific investigations. It is far from commendable in the city and state governments of Philadelphia and Pennsylvania that they have neither given, nor granted on petition, any aid to their grand Academy of Natural Sciences, except the remission of taxes. Society pays men for fighting battles, making laws and teaching religion. It is heavily taxed for political freedom and slavery, but for that which advances and clevates a nation faster than anything else, it would pay nothing.

It may be that the want of interest in and the stagnation in regard to museums comes more from an ignorance of their condition and possibility, than from any undervaluing of scientific research. Those who have money to bestow do not care to offer it to institutions that seem, wealthy and flourishing, nor do they know in what manner to give it so that society may be most benefited. Sinking part of a fortune in the common funds of a society is not pleasant for a man who has worked hard to earn it. The endowing of professorships and scholarships, which might forever bear the name of the founder, and do endless good, would obviate this difficulty. The Academy at Philadelphia has made a step in the right direction by arranging for professors to care for its collections, and to give lectures and limited instruction.

But at present there are no endowments, and until there are means to pay the professors they must be volunteer workers. Would that some of the many women of means would be pioneers in the good work of endowing professorships, and scholarships in the museums of Boston, New York, Philadelphia and Washington; but may no woman limit her gift to women. They should be first to do away with the narrow-guage principle of restricting any good gift to one sex only. I speak of foundations for the museums of these four cities, because they are older, and richer in specimens, and their libraries are furnished with rare and valuable works. Already these cities are scientific centers. Let it become known that there are abundant opportunities for study, and but slight government aid in the way of prizes, and a few scholarships in their museums, and the impulse given to science in this country

There is more hope for the poor young woman, For her, there is work. But in her poverty there are the elements of destruction. She is, perhaps, a lover of nature and dreams of a life devoted to study—she is a horn investigator and knows that she has special power as well as peculiar trates—she stilles her longings and enters upon special power as well as peculiar trates—she stilles her longings and enters upon

"Suffers, recoils; then, thirsty and despairing Of what she would, descends and sips the nearest draught."

aus 'sassa

For such young women there is only the slow change of the ages; the conversion of public sentiment, or a struggle to which almost no one is equal. In most

If there is any class of women for whom I have a deep compassion, it is the unmarried and unoccupied daughters of rich men; all the more do I pity them, if, as often happens, they are born with a good deal of brain power. I shudder as I recall the speech of the editor of a widely read newspaper: "The first duty of a woman is to be ornamental in the parlor." That is, she is to be the marble Clyte or Psyche that stands on the bracket!

The young woman who leaves college, belongs to one of two classes. She must either enter at once upon some business which shall enable her to be self-supporting, or she must accept parental support.

it as she would some deformity."

The young woman who leaves college, belongs to one of two classes. She must

"If an unfortunate female should happen to possess a lurking fondness for any special scientific or literary pursuit, she is careful (if of any social position) to hide

It will be easier to reform the in-school work than to take young women over the next years, when they leave the class rooms and college, but it will be less difficult, if, in the class room, they have learned to think for themselves and to plan their own lives. What lies before the true lover of nature, if she be a woman, when she leaves college? Almost always entire renunciation of her own wishes. An account which comes to me from one of the large cities of New York, must be too strongly expressed, and yet it is somewhat true of any town. The writer says:

board, placed in array upon a table, or arranged upon shelves,—the facts of science may be taught by such means—the spirit of science, which is the love of investigation, they cannot arouse. It science can be developed at all in school-rooms, it must be by debate; free thought, and free inquiry are the very first steps in the path of science. Only the "hard pan" of scientific truths should be accepted, and scarcely that. I should have more hope of a girl who questioned if three angles of a triangle equalled two right angles, than of one who learned the demonstration and accepted it in a few minutes.

by hearing recitations. There is a touch of the absurd, in a teacher's asking any but a very young person a question, the answer to which he ahready knows. In the old-fashioned books the dialogue method is better used; the pupil asks and the teacher anisoned books the dialogue method is better used; the pupil asks and the teacher then asks how this was found out, and Tutor explains.

The method of teaching science by lectures is questionable; it is liable to the objection that the lecturer impresses bimself and his views upon the listener, rather than nature and her ways. It is a feeble kind of science which can be put upon a black-

gold, than study its rocks for pay.

But, for themselves, for young women who have a love of mature and a longing to study her laws, how shall the taste be developed and how shall they be encouraged?

We must have a different kind of teaching. It must not be text-book teaching. I doubt if science can be taught in school-rooms at all. Certainly it cannot be taught

is an ignoble following of nature, which looks for gain. Better dig in the earth for

VESOCIVLION LOW THE ADVANCEMENT OF WOMAN.

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work—distasteful work—work which is fettering—because the home needs her and there are younger ones to be aided. I question if a young woman who knows she has peculiar gifts, who can say of nature, "Her Priest I am, her holy fillets wear," has any right to turn aside from this call of God. That self-abnegation is not a virtue, which urges the nearest, and, on the whole, the easiest, rather than the highest duty. The woman who has a definite line marked out for her in her natural gifts,

has a duty as imperative as that which the family tie imposes.

For these cases of rarely gifted souls, we should care. Does any one suppose that any woman in all the ages has had a fair chance to show what she could do in science? Let me bring before you two cases—one is Tycho Brahe of the sixteenth, and the other is Caroline Herschel of the eighteenth century.

Sixteenth Century: Tycho Brahe. King Frederic, of Denmark, gave him a delightful island for his habitation, large enough for him not to feel imprisoned, (the circumference being about five miles) yet little enough for him to feel as much at home as in a high walled park. He built a great house in the midst of the isle, a palace of art and science. Uniting the ease of a rich nobleman's existence with every aid to science, he lived far enough from Copenhagen to enjoy the most perfect tranquility, yet near enough to escape the consequences of too absolute isolation. Aided in all that he undertook by a staff of assistants that he himself had trained, supported in his labor by the encouragement of his sovereign, he led the ideal intellectual life.

Journal of Caroline Herschel, Eighteenth Century.

At fourteen years. With my constant attendance at church and school, and besides, the time I was employed in doing the drudgery of the scullery, it was but seldom I could make one in the group when the family were assembled together.

At twenty years. For my brother I knit as many cotton stockings as would last two years.

At thirty-seven years. A salary of £50 a year was settled on me as assistant to my brother, and in October I received £12.10s, being the eighteenth quarterly payment, and the first money I ever in all my life-time thought myself to be at liberty to spend to my own liking.

For a certain class of students there are the summer schools, like that of Penikese—and there is the "society to encourage home studies," at present almost entirely literary in its aims. For a smaller and more decided type of women, we should become a Bureau of Advice, and also originators of ways and means. Young women should be encouraged to state their case, and our committee should be able to suggest methods—ways of increasing facilities—perhaps to find opportunities for work in science. But what a scientist most needs is leisure—time to think. We ought to be able to give aids, in the shape of a year's residence near large libraries, museums, laboratories or observatories. How eagerly such opportunities would be sought, we all know.

The laws of nature are not discovered by accidents—theories do not come by chance, even to the greatest minds; they are not born of the hurry and worry of daily toil; they are diligently sought, they are patiently waited for, they are received with cautious reserve, they are accepted with reverence and awe. And until able women have given their lives to investigation, it is idle to discuss the question of their capacity for original work.

### OUR MUSEUMS AND OUR INVESTIGATORS.

BY SARAH P. MONKS.

In every important city, from Boston to San Francisco, there is a Scientific Museum or Academy of Natural Sciences. These vary in contents from the promiscuous collection of stuffed skins, stones and curiosities brought home by sailors, to the valuable array of type specimens, and representatives of all branches of the animal kingdom, stored in the rich cabinets of Boston, New York, Philadelphia and Washington.

The chief museums, founded many years ago,—that of Philadelphia, dating back to 1812—have accumulated materials, which naturalists from all parts of the world are eager to see and study.

All these museums, I believe, are open to the public, most of them freely, very few charging any admittance fee; and they are generally under the control of a society which meets regularly and publishes scientific papers and periodicals.

The good influence of such institutions cannot be calculated, and every year increases their value by adding to their collections. The item of instruction and amusement which the general public gets, would be sufficient warrant for their support and continuance without considering the amount of knowledge given to the world through their proceedings.

The collections are generally contained in fine buildings, the specimens are beyond price, many of the members of the societies are able and earnest; still, very grave fault can be found with our museums. They are at a stand still. They are behind the age—they are huge giants stupefied, not able to do to the fullest extent the great work of which they are capable. They are not educational enough. Either from fault of management or want of means their influence is very limited. Too much space is taken up for exhibition, and none is left for work-rooms. Connected with our museums, there are no organized classes, no instruction, no lectures, and in many cases no facilities for study except from books. There are no study or dissecting-rooms where the vast collections can be freely examined and studied, or, if there are a few unsuitable rooms, there is no provision made for such study, and no professor to aid the student. There are no endowed professorships, and, as far as I know, only one scholarship, and that yields four hundred dollars a year and supports two students. In fact, our museums are brilliant in negative virtues.

For the student, especially the young student, they are places of longing and inspiration, not of work. The cases are closed. If a member of the society, or very much in earnest, he may get permission to examine the specimen under the eye of an officer. If he has done good scientific work, or brings good credentials, he may have the as they can be, are helpful and generous. But, it is rare that a student begins scientific studies with a full-blown scientific reputation, or is born with accurate anatomical knowledge, so that, too often, his "open sesame" to the museums is too late and times, the specimens are not named, and rarely is there an attempt made to educate wanting as educators of the people, and sadly wanting in furnishing advantages for These are contents.

These places wherein are stored the riches of nature from all lands, should be centers for the radiation of scientific knowledge—places where investigators could spend, their whole lives, if need be, in the discovery of truth.

Every encouragement to original research should be given in the way of rooms and apparatus. Germany and England can afford to pay investigators,—why cannot America?

Were our museums of more use, we would not have to look in vain for an American Darwin, Huxley, or Herbert Spencer. True, we need not be ashamed of such names as Cope, Leidy, Draper, and a host of others, who stand fair as scientists; but who is to be praised for it? Only the men themselves, not our museums for offering opportunites; not our government for encouragement,—not our society for saying "seek for us, for you are worthy."

Connected with all the scientific societies are men who are true investigators; who are so "infested" with what Huxley calls "the endless malady of thought" that without aid they have made themselves famous. They have found ways and means, but the world has lost so much in actual results as they have expended in overcoming obstacles. These men give freely with a generous hand to the young student. Never have I found a scientific man who has not been kind, polite and helpful, and never have I met one who has not cheerfully given me abundant aid and information. But the work they have done is often the result of hours snatched from the duties of a busy life. Our best workers cannot choose. They must do as they can. The work at hand must become the pleasantest. And "virtue is its own reward;" but often the virtuous would feel happier, if, in addition, he was not compelled to wear a rusty coat.

When a person has the ability and range of experience necessary for correct investigation of nature, it is waste of time and talent that he must, for bread-and-butter reasons, drudge in the college, or university, or the ordinary routine of professional service. Other men could do that as well. He should be devoted to an original research and to helping others to investigation.

There should be endowed life-professorships for those who are worthy. It is useless to try to enumerate the many ways that are open for investigation.

The solving of those purely practical questions of fungoid growth in vegetables, diseases of domestic animals, as "pip" and "gapes" in chickens, and cattle epidemics; and the so-called malaria or miasma that devastate certain regions; and of countless other common plagues, whose causes are unknown, would save the nation millions of dollars yearly. Then, too, there are those studies and experiments in pure science, so dear to the heart of the worker, which bear no immediate practical result, but which, sooner or later, send down their golden roots of life into the heart of everyday affairs.

There is an abundance of work—more than can be exhausted by many workers. Our houses are badly built and ventilated; our cities are badly drained; we are a scientific people, and still our waste products are causing death and disease instead of adding to our wealth.

We suffer countless ills because of our ignorance. We shut our eyes, or give our pittance to avoid some ugly fact, and wonder at the mysterious ways of Providence, when the whole trouble might be removed by the application of scientific knowledge.

The United States Government is doing some good for science in developing its territorial resources. Much more could be done if, each year, sums were appropriated for the discovery of some useful and important fact. Mediocrity would not compete for the prize. Compel good work and pay a good price, and the successful competitor would be no charlatan. Aid should be given in the way of ample paying of expenses during the experiments and a suitable reward if the results were commendable.

To fashion and control these forms and animate them with a soul, is the task of art.

Music has of all arts, the most subtle and ethereal form. It consists in tones which must be beautiful and sonorous, in order to be fitted for the expression of every variation of feeling. To set forth the natural laws by which such tones are produced is the business of science, and thus science is an indispensable aid to the art of music.

If a singer, inspired by the most delicate and ideal emotion, endeavors to give expression to it by disagreeable tones; i.e., in a bad form, he will surely fail to produce an artistic effect, as he would by singing without expression and animation, with tones of the greatest beauty and cultivation.

What science has done of late for the knowledge of the human voice, and its management and development, it is my object here to explain as fully as time will permit.

Through the laryngoscope it became possible to observe and determine the mechanism of the human voice and the natural limits of the registers or tone groups into which the voice is divided. With every one of these registers the *modus operandi* of the vocal organs undergoes a change, which change the singer can easily feel, and an educated ear can detect by the difference in the timbre or quality of sound, which is most striking in the transition from chest to falsetto in the male voice.

In the female voice there have been found five such registers and in the male voice four, of which only the two or three lower ones are used in singing. In consequence of the male larnyx being one-third larger than the female larnyx, its registers have a larger extent.

Observation proves moreover, that a visible and sensible strain shows itself in the vocal organs, as soon as a singer attempts to transgress the upper limits of a register in ascending the scale. The fact that, in the writings of the old celebrated singing-masters, the limit of the chest register is placed much higher in the scale, and that our present singers can only with the greatest effort and with much harm to their voices, reach those limits, have led to closer investigation of a fact which had up to a recent time almost entirely escaped notice. This fact is, that because of the better sound of the stringed instruments when tuned higher, the orchestra pitch has gradually risen, until at present the a, which is taken as a standard, has between 454 and 459 vibrations, while at the time when vocal art was at its height, it had only 400 vibrations per second. It is therefore some 50 vibrations higher now.

But the human voice is still expected to sing this a with the chest register as it was when the pitch was more than a whole tone lower. And people are astonished when it succumbs in consequence of the continued strain,

The mechanism of the first four registers had been known a long time before that of the head tones, the highest register in the female voice, was discovered. This discovery, over which the scientists had studied in vain for the last century, was made in 1860, and finished the complete knowledge of the physiology of the human voice.

I may further remark, that the knowledge of the mechanism of the head tones led to the discovery of a pair of cartileges and small muscles, which had formerly not been noticed by anatomists. It is strange that this discovery, which is of no direct advantage to the voice, created a greater sensation among scientists than others of much more importance. The reason may be that this discovery in anatomy was made in a more familiar field.

When we hear the remark made that our best vocal artists, as well as the old singing-masters, knew nothing about the physiology of the voice and, nevertheless, could

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