

WINTER MEETING.
INDIANAPOLIS, DEC. 28, 29, 1892.

PRESIDENT'S ADDRESS.

THE INTERDEPENDENCE OF LIBERAL PURSUITS.

J. L. CAMPBELL, CRAWFORDSVILLE.

The crowning group in stone for the new library building in Indianapolis, by Richard W. Bock, of Chicago, is composed of three figures, representing Literature, Science and Art.

The central figure, sixteen feet in height, represents Science, holding in his right hand stretched upward the torch of enlightenment, and in his left a palm, the reward of victory.

In a sitting posture to the right a female figure represents Literature. She holds a book in the left hand resting on the knee, and with uplifted pen in the right hand she is presented at the inspired moment—write.

The third figure, representing Art, is also a woman. She holds a drawing board upon which she is about to produce a design.

This group suggests the topic for discussion, and the subject may be entitled the Interdependence of the Liberal Pursuits, or in the spirit of the times, the need of an intellectual trust, whereby the interests of science, literature and art may be better cared for, and under its fostering care there may be developed higher art, purer literature and nobler science.

The group in stone is a unit, and my plea will be for the unity of these liberal pursuits.

The distinguishing characteristic of our day is devotion to specialties, and this devotion has made us strangers to each other.

A critical examination of the productions in the various departments of literature and science will disclose many defects, which may be traced chiefly to the want of interchange of thought.

The scientific treatises often are defective in style and expression, and the literary works frequently are laughably absurd in their scientific by-plays.

The scientific man waves aside with contempt the latest novel, and the novelist returns the compliment by pitying the devotion of the discoverer of an unclassified bug or a fresh compound.

A more generous fellowship is needed for mutual benefit.

This criticism is not intended to be censorious nor unjust; neither is it directed against earnest work in specialties. There can be no valuable results except by loving and exclusive efforts along chosen lines.

It is not asked that the chemist by his compounds should seek for poetry in his crucible: nor that the biologist with his dissecting tools create the life which his search destroys, much less reproduce the higher life of thought, of passion, and of hope, which breathe in the works of the dramatist and in the pages of the writer of fiction.

But outside of our laboratories of books and blowpipes, in our hours of ease, if you please, may not profitable relaxation be found in a better acquaintance with our neighbors.

The poet takes his walks alone that his communion with nature may not be disturbed, but it is possible that he might find valuable assistance in his translation of the "books in brooks" in the "drawing rooms" of the hydraulic engineer.

The geologist no less than the poet may find "sermons in stones," and each may be benefited by contact with the other.

Is it not possible to secure better results by the union of science and literature than are now gotten by their separation and their too narrow circle of fellowship?

Listen to this wail from the Editor's Study in Harper's Magazine for September, 1892, and tell us what does it portend?

"Books are being replaced by newspapers and periodicals. A book shop used to be an intelligent center where readers met not only to keep the run of the thought of the world, but to exchange ideas about it. Few are so now. Book stalls have become shops of notions, of stationery, of newspapers, of artists' materials, of various bric a brac, with an only occasional real book that has attained exceptional notoriety.

"It is no longer profitable to keep a stock of general literature, and many of the brightest and best trained minds now are giving their entire time and energy to the daily and weekly press.

"In its swelling bulk the daily newspaper has become a magazine, and the magazine in a generation that must run as it reads takes the place of the book."

From the scientific side of book making also comes remarkable confessions of weakness. From the testimony of the writers themselves the books of yesterday already have been consigned to the top shelf, where indeed moth and dust do corrupt, but where thieves do not break through

to steal. while the books of to-day will be in the waste basket to-morrow. True, the language used is somewhat different from the above, but the meaning is essentially the same.

The claim is that so rapid are the advances in science that the text book of yesterday is antiquated, or in their illiterate lingo, "not up to the times," and so the butterfly products sport only their brief day and die.

Is it a necessity that books shall have this ephemeral existence? Is this a love that must so soon grow cold; a youth that without years must be old; a life that almost begins with death?

"I paint for immortality" was the inspired utterance of the greatest of artists, and is there to be no second Shakespeare whose writings will be immortal? Is there not an unentered field of research where we may discover the hidden qualities of the few books which endure?

With the confession of weakness and partial failure comes the question of possible increase of strength and more complete success. If there is a balm in Gilead let us seek for it, and if there is a physician anywhere who can cure let us search for him.

And for this purpose let us call a congress of all parties interested for mutual counsel, and, if found practicable, for mutual aid.

If the weakness is real in all departments of thought, and is discovered in all varieties of thought products, let the invitation to this congress of thinkers be general; let the workmen come from every separate shop to the great council chamber; the representatives of art, literature and science of every kind to the symposium of mind.

In this assembly let the historian and the physicist sit together; the biologist and the biographer; the poet and the chemist; the botanist and the linguist. Let the mathematician take counsel with the song writer, and the astronomer and the wanderer in the shoreless realms of fiction discuss the things common to both.

Then the new companionship would beget new inspiration; a better fellowship would lead to a broader culture; "know thyself" would yield to the more generous "know each other," and a fuller answer would be given to the greatest question, "how can men best fulfill their allotted destiny?"

With this liberal view of intellectual fellowship necessarily would come more liberal methods in the preparatory as well as in the wage earning period of life.

It is not the purpose of this lecture to enter upon the much discussed and never to be settled questions relating to the studies to be selected and

the methods to be pursued in the undergraduate part of preparatory training.

Without dispute broad general culture is the point and the essential requirement.

The deep foundations must be of stone, whatever is to be the superstructure.

My earnest plea is for more room in the elementary period for training in the branches which are extra. or rather pre-professional, and which must be mastered before any one can lay claim to a *liberal* education.

* * * * * * *

If we were permitted to interpret Shakespeare's seven stages of life, his third would conclude with the undergraduate course, while the fourth, who enters as the "lover sighing like furnace with a woful ballad made to his mistress' eyebrow," would mean that devotion to professional study which is more than that of the lover and an attention more exacting than that of the most jealous mistress.

In the preparation for professional life no exclusiveness can be too exclusive, no labor or painstaking within the severest limits can be too exacting.

All that the most ardent advocate for specialties is accepted, and if presented to our great congress of thinkers would be unanimously adopted.

This is the time in life when the student should be lost to the world, when the claims of social life may be ignored, when culture even may be suspended in the eager search for facts.

If the chosen profession be science, the laboratory should be alike shop and parlor; if literature, to quote again from the Editor's Study, books only, "those unfailing faithful companions which stand mute and waiting on the shelves, in whose hearts are preserved the thought, the aspiration, the despair, the love, the heroism, the emotion, the tragedy, the immortal beauty, the bewitching loveliness of the ages."

So oblivious to outer things should be the professional student, that a casual glance at the daily newspaper could scarcely be allowed to keep him informed whether or not he himself has not died.

The usual commencement benediction welcomes the graduate to the great world of letters, but this welcome should be to the retirement and not to the activities of this realm of thought, and the interpretation should be that he has studied to be somebody, now let him learn to do something. A Paul even found it necessary to retire three years into Arabia

for this preparation for the work of directing religious thought for all after ages.

The generous, or rather general qualities of mind and heart, which necessarily have been but little called into activity during the years of professional study, are likely never to be revived, and so the years of active professional life usually are passed within the narrow limits of single professions. Lawyers prefer lawyers, and chemists, chemists. Doctors care only to talk with doctors, and preachers prefer to confine their attentions to the cloth. In the literary professions there is even more exclusiveness, for nothing is so dull and unattractive to writers of this class as the fields of science. Dynamite is greatly preferred by them for the intruder who would try to discuss a dynamo.

The cure for all this is better fellowship.

The Academy of Science purposes at the present session to cultivate this liberalizing of different pursuits within the range of the general purpose of the association. Instead of carrying out our programme by sections as heretofore, our desire is that the members may become interested in the work of others than those in the same specialty. The biologist must listen to the physicist, the chemist to the geologist, the archaeologist to the botanist, each for the time being esteeming the work of another better than his own. Thus within the limits of the sciences we are trying the interchange of thought for the better developing of thinking.

If this experiment proves successful may we not hope for a wider association of thinkers in some new organization, which will include all liberal pursuits?



The pleasant duty remains to me to extend fraternal greetings to the members of the Indiana Academy of Science.

This Academy is yet young in years, but the success already attained and the recognition secured among associations of kindred character are most gratifying to those of us who have been active members from the beginning. The new names added to our list year by year give cheering assurance of a prosperous future.

We meet this year in the closing days of an epoch of four hundred years of the world's history, dating from the birth of a hemisphere, and from this holiday ending of the old extend our happy new era greeting to the centuries to come.

Next year we will celebrate this fourth century date at the marble city

by the lake. The international exposition of 1893 will epitomize in material form the progress of the world for the centuries, and to no Mecca can the devotee of science turn with more reverent steps.

The interdependence of the liberal pursuits there will have practical illustrations of the most instructive character. The best thought of the centuries will be realized on canvass, in marble, in bronze, in exquisite fabrics, in jewels and ornaments of silver and gold, in the whirr of machinery and the flashes of electricity.

There may we study things, and there may we in profitable intercourse meet men. This will be the academy of science of the world.

PAPERS READ.

ON THE CONSTRUCTION OF A SENSITIVE GALVANOMETER. By BENJ. W. SNOW.

TESTS OF THE TORSIONAL STRENGTH OF A STEEL SHAFT. By THOS. GRAY.

ANALYTICAL AND QUATERNION TREATMENTS OF THE PROBLEM OF SUN AND PLANET.
By A. S. HATHAWAY.

INTRODUCTION.

The object of the paper is to show the greater simplicity of quaternions over analytics. For the purpose of comparison, the most condensed analytical treatment possible is adopted. This turns out to be precisely analogous to the quaternion treatment. Three equations, such as $m a = a'$, $m b = b'$, $m c = c'$ are written $m (a, b, c) = (a', b', c')$. By multiplying these equations by (x, y, z) is understood the result of multiplying the first by x , the second by y , the third by z , and adding, giving $m (a x + b y + c z) = (a' x + b' y + c' z)$. This corresponds to scalar multiplication in quaternions. By forming corresponding determinants with