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THE BINDING INFLUENCE OF A LIBRARY ON A SUBDIVIDING PROFESSION[1]

By Dr. HARVEY CUSHING

> Learning as with water is never more fair, pure and simple than at its source.—*Naudé.*

THE dedication of a library is usually a commonplace event which calls for certain platitudes, perhaps even a prayer. The generosity of the donor is praised, the genius of the architect; the educational needs of the people (other than those present) are recalled and assurance given that they will be met so far as a meagre endowment permits. Attention is next drawn to the novel features of the building and then, with some relief, all adjourn for lunch.

This, ordinarily, is the culminating feature of the programme, for Nature, while providing all alike with a ready impulse to consume food, omitted to equip most of us with an intellectual hunger whose recurrent pangs can be assuaged only by the consumption of books, the invention of which she could scarcely have foreseen.

[1] Address at the dedication of the William H. Welch Medical Library, Baltimore, October 17, 1929.

Meanwhile, no reference has been made to that important official, the librarian, who modestly sits in the background with napkin on knee cogitating over possible ways of developing, on the part of those within the radius of his activity, such conditioned reflexes as would salivate them, no less promptly, at the mere sight of the printed page. A cafeteria system perhaps with appetizing books on view rather than distant and uncertain books ordered *à la carte.*

Too often libraries are but the graveyard of forgotten books whose oblivion is disturbed only by the exigencies of the time which has necessitated their transfer, for lack of space, from a smaller cemetery to a larger, where provision, usually inadequate, is made for books still alive and books yet unborn. There, according to age, family, place of origin or circumstance, their epitaphs renewed and coverings repaired, they are redeposited in burial vaults, soon to be once more as forgotten as were the tablets of Sardanapalus, except by the stray seeker for the curious or the

occasional visitor whose interest lies in the tomb rather than what it holds. To this sad end do books usually come. It is their ultimate destiny, at public or private expense, thus to get interred.

But there is a spirit-world of books, and the ideas they contain wander forth to haunt and torment those whose grasp they can elude, to solace or stimulate those who have learned the secret of their capture. For these fortunate ones, it becomes possible: "To be present as it were in every age—to extend and stretch life backward from the womb." From the spirit that hovers over some obscure volume, of parentage and birthplace unknown, times forgotten may be reconstructed, the sequence of discovery unraveled, the tendencies of thought traced, the relation of yesterday and to-morrow better understood.

This, then, is the true function of the library, to quicken the dormant book so that it may speak again; and with those who treat it lovingly and compassionately, its spirit enters eagerly into communion. To these a library becomes a laboratory for the crystallization of ideas perhaps long expressed, out of which process new ideas have their birth.

Can witchery such as this come from a repository of books that record the bygone happenings and hypotheses of so practical and forward-looking a profession as that of Medicine? Her concepts of one day are antiquated the next and, busy with the accumulation of new facts, she spares little time to integrate them and thinks for the most part only in terms of the present. But philosophers tell us there is no present, that the event of the moment is already history; and, if this be so, what is now taking place may possibly prove to have been one of the most significant of the many important things that have happened here since the formal opening of the neighboring hospital just forty years ago.

Ever since the University itself began to take form under the guidance of Daniel Coit Gilman, this place has been a crucible in which experiments in education have fearlessly been put to the test. There may yet be another that will centre in this building if he whose name it bears can long enough be spared properly to direct its course. Medicine has become so scattered and subdivided that there is crying need for some one to lead it from the wilderness and again bind it together. And whether this can be successfully brought about through the ministration of a Chair of the History of Medicine in close cooperation with a great library depends, like all other things in life, less on principle than on personality. Let us, by looking back, endeavour to follow the steps of our prolific dismemberment.

We know from ancient records that physic "was early fathered upon the Gods," and yet, though the physician in the beginning was half priest, it was not beneath his dignity to put hands as well as thoughts to the therapeutic necessities of his art. Medicine was a compact whole and the Aesculapian disciple heard the master expound the entire subject from authoritative codices. Then the doer was honored no less than the thinker, and though his material was perishable, the doctor in his way might be no less an artist than those who carved with a chisel or painted with a brush or built temples from stone and mortar—indeed he might be both, as once was Imhotep.

Though the story is veiled in great obscurity, we may assume that Medicine was still fairly compact when in the ninth century Constantine the African was supposedly lecturing at the school, founded, legend tells us, by a Greek, a Jew, a Latin and a Saracen, in that little seaside town of Salerno. But ere long, to the great misfortune of the maturing profession, a cleavage took place—the first of an unending series. The thinkers rose superior to manual tasks and for centuries became involved in a metaphysical snarl of therapeutic subtleties which led them nowhere. The leech "try'd ev'ry health restoring Herb and Gum," while the despised doers for the most part became degraded into bone-setters, tooth-pullers or itinerant cutters for stone and the fistula. To anatomize the dead body other than to prepare it for burial was a desecration; to open it during life even for such trifling purposes as the letting of blood was debasing and left to the barber. Not until long after, when the treatment of wounds-by-gunshot made the barber-surgeon more indispensable than ever in time of war, did his professional status, in a measure, come to be so restored that even to this day the army doctor, now mainly a health official, continues to be called surgeon.

All this has been often told, for early medicine had not only its thinkers and doers but also its recorders. From Greek to Arabic to Latin through the Dark Ages the ancient doctrines were transcribed and transmitted, accessible only to the classical scholar. The doer meanwhile, educated for the most part solely in the school of experience, could write, if at all, in the vernacular alone, and in consequence we know less about him, for the simple reason that his fugitive compositions were literally read to pieces.

When in the course of time word went forth through Europe that some learned jurists of Bologna were publicly teaching there the principles of civil and later on canon law, like moths to a beacon, students from both sides of the Alps, ultramontane and citramontane, secular and ecclesiastical, swarmed by thousands to the plains of Emelia. There a scholastic guild, representing the first organized university of scholars to be under civic protection, came into being; and promptly the inevitable cleavage into subsidiary guilds began to take place.

Separation rather than conglomeration, fission rather than fusion, is the natural law, and, what is more, it is a biological principle that all fissions occur with violence and strife. The interrupted motion picture has shown that so simple a process as the division of the single cell occurs with an agonizing wrench after a prolonged and unbelievable turmoil of the chromosomes. Could a similarly spaced picture of medical history, or any history for that matter, pass quickly before one's eyes, it would show countless separatist movements accompanied by remonstrance, strife, even bloodshed.

So the *Giuristi* of Bologna resisted mightily when the artists—the *Artisti*—including the students of letters, of philosophy, of mathematics and of medicine, revolted and broke away from them to start an independent body with a rector of its own. This, then, was the beginning of segregation in the *Studium Generale,* and the process, once started, has acquired in the intervening centuries an ever-accelerating speed.

Out of the swarm of *Artisti,* those students inclining to Medicine soon came to be the most favoured and most flourishing group and, for a time, owing doubtless to the search through nature for influences and substances of possible therapeutic value, other subsidiary and allied arts came into being—the study of the constellations, of fossils, of minerals, of plants, of animals—of everything, in short, formerly embraced in that one of the three philosophies called natural.

One by one each of these studies, grown to its own estate, has come to be wholly separated off from the healing art as no longer strictly pertaining to it, Botany after a lingering contact being the last, to our great loss, to sever its allegiance. So a succession of subjects, born of Medicine, outgrow their therapeutic application, renounce their further relationship to an art that would hold them subservient and ultimately break away to pursue an independent course.

Medicine of those early days, based almost wholly on theory and observation, may be looked upon schematically as having the structure of a pyramid, all its accumulating subdivisions, even that of its first fundamental discipline, anatomy, meeting at the common Hippocratic point of the patient and his besetting ills.

All this, as is well known, came to be greatly altered when questions, by doubters, began to be asked about the meaning and causes of natural phenomena long regarded as an expression of divine will; and soon came the gradual infiltration into the medical art of a novel method of study—no new thing, to be sure, to those who read their Galen thoroughly—but when it led to the discovery that the blood did not simply ebb and flow as had been universally believed, Medicine was shaken to its very foundation.

Slowly but surely, this, the Baconian method of putting the intricate problems of the normal and disordered functions of the body to the test of experiment, made its way, receiving, as time went on, notable accelerations at the hands of such as Gilbert and Galvani, Boyle and Borelli, Mayow and Malpighi, Hunter and Haller, Majendie and Bernard and Pasteur and Cohnheim and a hoard of other originators, followers and imitators. Thus, one by one, the biological sciences based on experimentation were born of Medicine just as were the observational and philosophical sciences of an earlier day.

History repeats itself, and in the comparatively rapid development of a new country like our own, all that had taken place in the long-drawn-out development of Medicine we can see done over in miniature: the early priest-physician; the hereditary cure-mongers and bone-setters; belief in the supernatural, in magic and witchcraft; the art handed on by example from Aesculapian to apprentice; the gradual establishment of schools in which the entire field embraced by physic, surgery and sanitation, with a substratum of anatomy and immature chemistry, might even be covered by a faculty of one as it once was by Nathan Smith at Dartmouth. Even after the experimental method came to have its first exemplar of note in the person of William Beaumont, Medicine remained compact, its attention riveted on the care of the patient as definitely as in those Arabian times when all was comprised in the "Canon" of Avicenna.

But here, as in older countries, the experimental sciences were rapidly coming of age, and by the time this medical school opened its doors certain of these subjects had reached that stage of maturity they were accepted as preliminary essentials to a medical course, equal if not exceeding in importance even the study of anatomy, which from the days of Mundinus in Bologna had thus far held sway as the major premedical discipline.

And so a new educational structure came to be put together on lines quite different from the old pyramidal conception of Medicine at whose therapeutic apex sat doctor and patient. The structure may be said to have assumed a cuboidal form like two sets of boxed books on a shelf, the first set dealing separately with the three newly matured basal sciences, the second set with the three major and time-honoured clinical subjects of physic, surgery and child-bearing, while between the two sets was slipped in the book of pathology as intermediary in subject-matter.

It was a block system, all departments being on an

equality and more independent than interdependent. That each of them, as was natural enough, had an eye on the development of its particular branch of medical science or art and a progressively enlarging blind spot for its relation to the other branches, was probably more apparent to the student-pawn, as he was advanced from one block to another, than to the larger pieces constituting the faculty. To be sure, disadvantages of the system from the standpoint of educating practitioners of Medicine were largely offset in the early days of the School by the intimacy and ardour of a small band of enthusiastic workers, who would have made an educational success of any programme; but that is quite apart from this recital.

It is a matter of unwritten record that some twenty-five years ago, when on Osler's resignation the first break in the original faculty occurred, a revolutionary proposal was made by some of the junior members of the faculty that the structure of the School be reorganized in such a way that the existing departments could be brought together, Hippocratized as it were, by the creation of a *super*-professorship of MEDICINE. It was thought that influences could be brought to radiate through all departments, existing and future, so that, while retaining their former autonomy, they could nevertheless show a united front in attacking some of the greater problems in Medicine which equally concerned them all.

The suggestion, in short, was to pyramidalize the School under the leadership of the one person whose training, experience and personality eminently fitted him for such an apical position, and to whom all would have been eager to render allegiance. It was not solely because he was a pathologist and was thus already in contact with all other existing departments but more because of his broad vision and his wisdom. In our short-sighted and youthful enthusiasm it was felt that a like opportunity for a successful centralizing movement would be unlikely ever to occur again. There was one, and only one, serious difficulty that stood in the way of carrying the project through—the man chiefly concerned, when the matter was broached to him, for reasons of his own, refused the job.

So here and elsewhere during the twenty-five years that have since passed, the old system of progressively increasing decentralization has gone on with a successive splitting off from both preclinical and clinical departments of new groups many of which slowly have attained sufficient strength and dignity to be recognized as independent units.

More and more the preclinical chairs in most of our schools have come to be occupied by men whose scientific interests may be quite unrelated to anything that obviously has to do with Medicine, some of whom, indeed, confess to a feeling that by engaging in problems that have an evident bearing on the healing art they lose caste among their fellows. They have come to have their own societies, separate journals of publication, a scientific lingo foreign to other ears, and are rarely seen in meetings of medical practitioners, with whom they have wholly lost contact.

A distinguished physiologist recently, in commenting unfavourably on the cleavages which have taken place in physiology alone and on the impossibility of one man's keeping pace with the advances in its varied subdivisions, suggests that physiology as applied to Medicine might well enough be recognized as a science distinct from theoretical physiology, an admission, it would seem, that the subject—and the same is probably true no less of other sciences still clustered about Medicine—has outgrown its rôle as a strictly premedical discipline and is preparing for a life apart on the grounds of incompatibility of temperament.

So the independent science of Astronomy emerged from the days when diagnosis was largely a matter of prophecy wrapped up in divination and zodiacal horoscopes, of which we still have trace in the modified emblem of Jupiter that traditionally begins all our prescriptions; the judicial astrologer of old knew nothing of Millikan's cosmic rays but assumed the presence of something akin to them.

So an independent Botany has emerged from the search in all corners of the earth for medicinal herbs that conformed to the therapeutic law of signatures; our medical schools no longer have their physick garden, yet who knows what of value equal to digitalis may still be hidden in plants, were there modern Witherings to look for them?

So Zoology has grown from the search through the animal kingdom for ingredients with which prescriptions were once littered—the blood of the weasel, the droppings of the dove, the horn of the unicorn; and from the hyena alone, according to Pliny, come seventy-nine medicinal substances. We now smile at the idea of *Animalium natura et eorum medica utilitas* as a serious subject ancillary to Medicine, forgetting our present use of the oil of cod's liver, the tendons of the kangaroo, the thyroid of the sheep and much else for which posterity will similarly smile at us.

So modern Chemistry in the hands of Paracelsus began to take form out of earth, water, air and fire and the "black art" of ancient alchemy. So the science of dynamics is inseparably linked with a young medical student named Galileo and the story of the pulse. And so we may expect other sciences bred of Medicine whether essentially observational or experimental, to leave home when they have reached independent maturity. Thus, for better or for worse, the

gap between the medical sciences and clinic, always difficult to bridge, becomes ever widened as their application to diagnosis and the therapeutic art comes less and less to be emphasized in the course of their presentation to students of Medicine.

Slowly but surely, as a reaction to the block system, as described, each of the clinical departments has shown a tendency to become separately pyramidalized in such a way as independently to include in its own organization so much of the experimental sciences as is applicable to its particular interests and necessities —miniature medical schools complete in themselves, each striving for its separate institute, its own several laboratories for experimentation or diagnosis, its own library, separate organs of publication and so on. It would be entirely logical if a university department of medicine or of pediatrics or of psychiatry or neurology, or what you will, came to install its own operating plant and to direct its own surgical therapeutics; or, on the other hand, if out of surgery there should develop an independent school with a substratum representative of all other departments, clinical and preclinical, teaching its own applied anatomy and physiology and chemistry and pathology, similar in organization to that remarkable institution in Rochester, Minnesota, a product of our own time.

The only check to the successive formation of these independent institutes, within our medical schools as now organized, is the capacity of the university purse; the only ties that remain in most places to bind separating departments together are the students, whom as yet they share in common and who for long are at a loss to know what Medicine is all about—its emblematic serpent having become so hydra-headed. Were they not a far more docile body than in those Bolognese days when students elected their own rectors, they would, I fear, pick up their more favoured teachers and swarm in a body to set up a "studium" of their own liking in some convenient new-found place.

And meanwhile, almost too new to mention, still another fission, the entering wedge to which was driven by Pettenkofer a short fifty years ago, has occurred before our very eyes with the development of separate schools of hygiene for the training of public-health officials—schools in which mass prevention in place of individual cure is properly emphasized. It is a movement grown out of that revolutionary maxim that the health of the people is the supreme law; it assures a much safer and more pleasant world to live in; it has greatly increased the expectancy of life and may even serve to prolong the span once allotted to us by the Psalmist. But owing to it, just so many more people will remain longer alive to need at some time or other the personal ministrations of a modern Sydenham for their "vapours," a Cadogan for their diet, a von Graefe for their sight, a Bright for their kidneys and a Lister for much else.

What possible relation, you may well ask, does this rapidly moving account of the cleavages in Medicine, past and apparently on the way, have to the dedication of this library and its inseparable association with the establishment of a chair of the History of Medicine? Will this foundation merely mean still another group of specialists having their own societies, organs of publication, separate places of meeting, separate congresses, national and international, who will also incline to hold aloof from the army of doctors made and in the making? Without lessening the opportunity and encouragement for historical and bibliographical research, on the part of those rare and highly gifted persons capable of it, is there not something far more important for Medicine that can radiate from here?

In the modern development of the physician into a scientist, have we not lost something precious that may without risk of pedantry be brought back to Medicine? Not only has the art of healing, *die Heilkunst,* come more and more to be lost sight of as the doctor arrives at his diagnosis in the laboratory rather than at the bedside, but less and less does he care to be reminded that poetry, history, rhetoric and the humanities once had close kinship with natural philosophy when the *Doctores Medicinae* took the leadership among the *Artisti.*

The doctor, widely speaking, is woefully ignorant of the history of his profession, indeed regards bookishness as a form of swank. Some years ago my friend, E. C. Streeter, and I requisitioned a booth at one of the Atlantic City meetings of the American Medical Association in which we displayed a collection of books, pictures and so on pertaining to André Vesal, known as the father of modern anatomy. Alongside of us were stalls in which infant foods, the latest thing in hygienic corsets, the newest tooth powders, the latest surgical instruments, novel electrical appliances, X-ray machines, lighting devices and so on were being competitively displayed. Streeter was to be on hand to show our wares in the mornings; I in the afternoons. In large letters the display was labeled: VESALIAN EXHIBIT. "How did it go?" I asked my companion eagerly at lunch on the first day. "Was there a large crowd; did you need help?" "Well," said he, "one man stopped long enough to inquire if I had any samples, and when I politely asked to what he referred, he pointed to our sign and said rather tartly, 'Samples of Vaseline, of course.'"

This story, a little overdrawn perhaps, is reminiscent of the common belief that the discovery of listerine was what brought Lister fame. A tube of vase-

line would conceivably have been of more practical use to the enquiring doctor; but I am not so sure of that, and our mistake lay in not having a sample of our exhibit to hand out. It might have made a different man of him.

"I have addressed myself to the Muses," said Gabriel Naudé, "without being too much enamour'd of them; I was pleased with my Studies, but not too addicted to them. . . . Pedantry might have gained something upon my Behaviour and Carriage, during seven or eight Years that I staid in the Colleges, but I can assure myself that it obtained no Advantage over my Spirit." Can something of this old-time spirit of scholarship be recaptured, and is it in any way incompatible with the spirit of research? Can separating departments again be brought together by the tie of a library shared in common, and by the renewed consciousness of a common ancestry and a noble history? Certainly could this happen anywhere, this place, which has been the proving ground of so many experiments in medical education, would seem the most favourable.

A medical historian and one of the world's great bibliographers played a highly important rôle when this medical school was in the making. But curiously enough, that modern Naudé, John Shaw Billings, when his plans for the hospital were drawn, made scant provision for a library. His mind was evidently on larger things—on the general principles of organization and construction of a place where, as he expressed it, the student's knowledge was "not to be acquired from text-books or lectures, but from observation, experiment and personal experience." He doubtless took it for granted that a library would come into being, as it soon did, for books were essential to the activity of that closely knit group of young men, all on the sunny side of forty, who first gathered here.

The story of those days can be easily reconstructed from those incomparable early volumes of the hospital *Bulletin,* a new thing in American medical journalism, so ably directed by that man of many parts, Henry M. Hurd, historian, editor, psychiatrist and hospital administrator, all packed into one frail but scholarly body. The footprints of Osler are seen in the early establishment of a Journal Club which met, each Thursday afternoon in the convenient room soon set apart for a library, to review and discuss articles from the contemporary literature relating to the day's work. And next came the formation of a Hospital Medical Society which, according to an announcement in the first issue of the *Bulletin,* was to gather under the presidency of W. H. Welch on the first and third Mondays of each month.

For one of the early meetings of this society Dr. Billings brought over from Washington forty-four carefully selected volumes, ranging from a fifteenth century manuscript of Rogerius Parmensis down to the first edition of Jenner's "Inquiry," which served to illustrate the discourse he then gave on rare medical books. A surprising number of that early group showed an interest in medical history and we find ere long in the *Bulletin* this announcement:

> The first meeting to organize the Johns Hopkins Hospital Historical Club was called to order by Dr. Osler in the Hospital Library, Monday evening, November 10th, 1890, at 8 o'clock, 30 gentlemen present. Dr. Welch was elected president and Dr. Reese secretary. Dr. Welch made brief introductory remarks to show the value of historical studies to the physician. . . . He presented several histories of medicine and commented upon the merits of the various historians.

The society soon launched itself on a methodical survey of medical history that began bravely enough with a study of the Hippocratic writings. But the next year in the effort to plumb the depths of Galen the Club nearly foundered, proving the wisdom of Garrison's advice that the beginner should back up into the subject rather than start out with its obscure origins. And so the ambitious programme came to be abandoned, the often delightful though desultory papers and essays that characterized the monthly meetings of later days being substituted for it.

Dr. Billings meanwhile had been coming over from Washington to deliver two courses of lectures—and prophetic were his chosen topics. One was on the subject of hygiene, which after an interval of some thirty years attained its majority in the establishment of the great institute across the way. The other course of lectures was on medical history, a subject which now, in turn, will have full opportunity for development under the fostering care of the same person who is reported as having said nigh forty years ago what he doubtless still believes, that "the study of the history of the various medical doctrines broadens a physician's view and liberalizes his conception of his profession."

Dr. Billings' afternoon exercises in those early days, based presumably on his recently delivered Lowell lectures, were, I grieve to say, but slimly attended. Even with his rare gifts it was almost too heavy an historical meal for the undergraduate, and the members of the residential staff had come to find themselves under so heavy a burden of bedside responsibility that their attendance was prevented. So when Billings moved to Philadelphia on his retirement from the Surgeon-General's Library after the completion of the first series of the Index Catalogue, the formal lectures were brought to an end.

They came, however, to be replaced by something far more palatable to the students—the Oslerian method of slowly but surely arousing an historical ap-

petite by the proper touch in each exercise upon the historical bearings of the subject under discussion, whatever it might be,—an eponymic question asked, the original source-books passed around, a paragraph read, a picture shown or an incident related. In this way, by the process of repeated inoculations, many students who unquestionably would have sidestepped a formal course of lectures became unconsciously impregnated with something much more valuable to them in the long run than the acquirement of just a few more facts concerning diagnosis and treatment.

It will be apparent, I hope, from all that has gone before, what is the burden of my theme—a library made useful not as a passive but an active force; one that is "not vocational but cultural, not final but initiative"; one that will serve as a common meeting-ground where the different streams of knowledge may coalesce; one where an interest in the history of our great profession will so flourish as to permeate into all departments of a much-divided school; a place from which the appeal of scholarship free from pedantism will radiate to long generations of future students—a place, in short, where Medicine, the foster-mother of the sciences, once more in close contact with her whole family will imbue them all with the spirit of that ancient phrase, "Where there is love of humanity, there will be love of the profession."

As was true a quarter of a century ago, so is it no less true now that there is but one man who by universal accord has the qualities of a Conciliator needed to bring these possibilities to fruition—a man whose services to his profession and to this School are apotheosized by this building—a man who can see the reasons for things while most of us can but look for the things themselves, and who is aware "that as our own conquests could not have been won without those which our fathers won, so must the future forever rely for help upon the past."

He might have asked to be allowed to approach in quiet the evening of life, content with the many successful parts he has already played, but this was not his way. Few knew how he has laboured during the first sabbatical year he has ever taken, what hours he has spent in cramped, dark and unventilated places personally to select and bring together what are to be the tools of this new institute that bears his name, never a day without work, never a conversation without its direction on something that mattered. In accepting this new and important rôle he stands, to paraphrase some well-known lines, upon the summit of his years: Not bowed beneath their weight, with feet firm planted and soul undaunted, he stands and contemplates what time has wrought, and trembles not for what was, is, or is to be.

THE PLACE OF GEOLOGY AMONG THE SCIENCES[1]

By Dr. JOHN C. MERRIAM

THE CARNEGIE INSTITUTION OF WASHINGTON

IN the early specialization of natural science it seemed relatively easy to give sharp definition to the boundaries of each subject. To-day, as we look upon the continuity of the universe in time and space and action the aspects of knowledge which we call the sciences represent in considerable measure only different points of view.

Seen as a part of the general scheme of things, each so-called science is the point of focus upon which other knowledge is concentrated for a particular purpose. Looking out from the place at which these rays converge it might appear that each subject comprises all the others. So physics may seem the whole of the universe, including life, mankind and human activities. Anthropology, described as man and his works, could compass everything from physics to religion.

Geology, as representing the earth, its structure, its activities, its history, touches science in all phases. It ranges through the physics and chemistry of the earth, its physico-astronomical origin, its expression of current activity, changes of form and face, history of climate and the biological story read from the geological record. Even our basis of judgment regarding the nature of man and his possibilities for the future is indissolubly bound in with the geological story. And yet geology is not all these subjects. It is only that aspect of each expressed in the composition, origin, structure, activities and history of a particular astronomical unit—the earth—upon which we happen to live.

Apart from the centering of attention upon this particular earth, geology possesses marked individuality as a mode of thought, or as the consideration of a special aspect of natural relations, through its expression of the element of time and the significance of movement through it. Lyell described geology as "the science which investigates the successive changes that have taken place in the organic and inorganic kingdoms of nature." It stands out clearly among the sciences as the symbol of time and development. In

[1] Read at the fiftieth anniversary celebration of the United States Geological Survey, Washington, D. C., March 21, 1929.