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EXPERIMENTUM PERICULOSUM; JUDICIUM DIFFICILE[1]

IT is probably forgotten that the two of us who are to conclude the exercises of this auspicious day have previously been called upon to give some public statement of Yale's relation to medicine—Dr. Welch fully in 1901 as part of the Bicentennial Celebration of the founding of the college, and I briefly fifteen years later for the "Book of the Pageant" celebrating the move to New Haven.

If not forgotten, it may be that we are now asked to take part in the dedication of these magnificent laboratories for a particular reason. Any one, who might happen upon the printed statements, will find that, up to the time of those celebrations, there had been more to say of the contributions to medicine made by Yale graduates in general than of any great influence on our profession, exerted by Yale herself through the agency of this, in point of years, her oldest professional school. The appeal with which Dr. Welch closed his address, namely, that the next Jubilee might find medicine holding here the high position to which it is entitled, has been answered sooner than the most optimistic among us could have expected.

Though the act, passed by the General Assembly in 1810, creating a "Medical Institution" for the college, was the first step toward Yale's development into a university, for the next hundred years the department was allowed to shift largely for itself. The collegians, whose life centered round "the Fence" and the old "Brick Row," hardly knew of its existence; those who did apologized for it; a few warmly advocated the abandonment of a local department which by no possibility could ever compete with the schools of a metropolitan city near at hand where hospitals and clinical facilities existed in abundance. There was a time, indeed, when this recommendation, seriously proposed by certain influential alumni, came dangerously near being followed.

In the want of a hospital under university control, wherein the professors of the school might do their clinical teaching, lay the crux of the situation. The essential importance of such an arrangement was first made clear by certain happenings in Baltimore, where a short fifty years ago a wealthy merchant had left what for the time was a princely sum, partly to found a university, partly to build a hospital. And Johns

[1] An address at the dedication of the Sterling Hall of Medicine, Yale University, February 23, 1925.

Hopkins was shrewd enough to appreciate what so often has been pointed out, that a university and a hospital are likely to be the two most enduring of human institutions. Political boundaries change; forms of government undergo revolution; but the people remain and there will always be those in search of education, always the sick and maimed in need of care.

Before that time, hospitals almost without exception were independent foundations whose controlling boards, though permitting students to attend lectures in an amphitheater, looked askance upon their admission to the wards. But the example set in Baltimore in the 90's soon made itself widely felt, and those who had been drawn there for periods of study became inoculated with the idea of a university teaching-hospital, in which students could get their practical training actually at the bedside, and carried this principle to the ends of the country. Two of them, to whom I would like to pay passing tribute, were by an earthquake dislodged from the university positions they were holding and brought here at a time when this school was in the doldrums; and to the patience and persistence of George Blumer and Joseph Marshall Flint, during the trying decade which followed, we may well ascribe the rescue of the Yale Medical School through the establishment of a definite university alliance with the General Hospital Society of Connecticut.

And now in the short span since the war, a truly amazing renaissance has taken place, culminating in the erection of this Sterling Hall of Medicine and justifying all the efforts of the previous century on the part of the faithful, much neglected and nigh forgotten teachers who, under financial difficulties unbelievable, maintained a high standard and held the school together from the time of its foundation till the dawn of this new era. It is to the men of the older faculties—to men like William Henry Carmalt, happily here with us, and Herbert Eugene Smith, for twenty-five years professor of chemistry and dean of the school, that we must give thanks for making this day possible. And I am glad to learn that a message to this effect has been sent to Dean Smith on his distant ranch at Los Gatos, California, so that he may rejoice with the rest of us who, holding the welfare and reputation of Yale at heart, have long felt that medicine should be strongly represented among her faculties.

We are living in an amazing epoch, too near for us to get other than a blurred picture of its full significance. Probably all people, from the beginning, have regarded their particular time as the most remarkable in history. Yet, in principle, so far as the profession of medicine is concerned, what, four centuries before Christ was so cogently expressed in a familiar aphorism remains unbettered. We can not too often hear the lines repeated:

> LIFE IS SHORT AND THE ART LONG; THE OCCASION FLEETING; EXPERIENCE FALLACIOUS, AND JUDGMENT DIFFICULT. THE PHYSICIAN MUST NOT ONLY BE PREPARED TO DO WHAT IS RIGHT HIMSELF, BUT ALSO TO MAKE THE PATIENTS, THE ATTENDANTS, AND EXTERNALS COOPERATE.

Experience is no less fallacious to-day: judgment no less difficult. The mental processes of that peculiar animal man, our sometime patient, are the same now as then. He has strange and unaccountable reactions. He conducts a great war to end all wars and constructs a peace to end all peace. Incidentally, it was learned that it is not the pen but propaganda and publicity that are mightier than the sword. Advertising, which is but propaganda undisguised, is anathema to the ethical code of the physician whose standards, if he is to justify the trust humanity has long placed in him, should be on a plane above business. Yet one of our universities proposes to elevate business to the rank of a profession. Whether this example will improve the code of business or lower that of the learned professions should they, as would be consistent, come to regard advertising along with other business methods as justifiable, remains to be seen. The temptation is great; it is not unresisted by highly respected institutions, some of which actually employ publicity agents; but it is lamentable when a great medical school takes to horn-blowing and sets thereby a bad example to other schools and the profession individually.

It may be said of course that the people at large do not evaluate for themselves. While our profession studiously employs the methods of science to catch the truth in medicine, new sects arise and the therapeutic doctrines of the Abramite spread over the land. While Saurian eggs are being discovered in Manchuria, our state legislatures introduce, even pass, bills prohibiting the teaching of evolution. While electro-physicists are perfecting the miracle of wireless communication, the lecture halls are filled with educated persons whose curiosity is more aroused by a discussion of ectoplasm. While the astronomer with near exactitude announces a solar eclipse, the Seventh Day Adventists with no less assurance predict the end of the world. While sanitarians are conquering pestilence, the antivivisection and antivaccination societies receive large gifts wherewith to oppose the very measures which make such things possible. While nations are stewing in their post-bellum troubles, jazz, the "movie" and the *thé dansant* engage the thoughts of the masses. The only common ground on which the interests of all appear to meet is the crossword puzzle. What we need perhaps as much

as anything in our institutions of higher learning is the scientific study of human reactions and behavior.

One might suppose that faith could be pinned on the time-honored professions as a steadying influence. And well it may, though "Modernism" temporarily rocks the church and the law seems more interested in technicalities than justice. Medicine, too, is undergoing severe criticism for its imperfections, though no one of us doubts that it still carries high the banner of service; that it strives to bring the day nearer when there will be less ill health in the world and consequently less for the doctor to do.

You energetic young men who happily comprise the faculty of this newborn institution will have to decide for yourselves, without help from outside sources, just what is the form of service that can best be rendered the profession, the community and mankind through the medium of this new and perfect instrument placed in your hands. It opens wide the door of opportunity and there are many things you will wish to accomplish. For their fulfillment not alone imagination and industry are needed but in addition what is known as the spirit of team-play, unselfish loyalty to one another and to your common purposes and objects.

There are certain things you will set out to do in the tradition of your predecessors in this school. You will in the first place not fail to keep in sympathetic contact with the profession of the state as represented by the venerable Connecticut Medical Association whose ranks you should continue to recruit by men better equipped than ever before to make the doctor perhaps the most valued member of his community. No easy times lie ahead of you. You will long be regarded as interlopers, as cuckoos in a hedge-sparrow's nest. Man is by nature *chauvinistic*, and the medical man perhaps more than others is prone to look with jealous eyes upon a foreign transplant to his bailiwick. Only by dint of proving your superior worth will you be forgiven your trespass.

That you will know your subjects well, that you will strive to contribute to knowledge, that you will be faithful teachers, are taken for granted, but whether the patients in the hospital over the way will appreciate your worth will depend as much on how you approach them as human beings as on your scientific attainments. For though some have expressed doubt on the subject, the art, which takes so long to acquire, can be practiced and taught in a hospital no less than in a home, but hardly in one where the wrecks of humanity are known by bed numbers—as No. 23 in Ward F—rather than by their personal names.

As teachers you will beware of educational fads. Many cure-alls are advocated; some even put into practice. System, however, counts far less than the native ability to awaken interest and spur curiosity to action. Significant curricular improvements have, no doubt, progressively been introduced into our peculiarly American medical course, but the material in teacher and student continues to average much the same; and the conjunction of a stimulating instructor and a receptive student produces results whatever be the educational system or apparent lack of system. One or two men who possess this rare gift of inseminating other minds may spread the reputation of a school far and wide.

Those of us who must sit on administrative boards spend much needless time in the vain effort to discover a philosopher's stone whereby to drive off the impurities from our methods of teaching, of grading, of examining and at the same time of stimulating students. Our predecessors did likewise and theirs before them. But then, we appear to have more ground to cover than did they, and so the modern scholastic machine becomes more complicated. Meanwhile, we encrust our cylinders by pouring in too many pupils, who represent the oil; we feed in too much preparatory instruction, which is perhaps the gas; and when we find the car does not run smoothly we timorously juggle with the curriculum, a sort of institutional carbureter better left alone unless we are willing to face the prospect of a complete overhauling. Such an overhauling the machine has just had and the engine has acquired a new and unfamiliar "knock." It is returned to us as a far better car than ever before, but it is vastly more expensive to run, and its presumed primary function of providing the community with a sufficient number of capable practitioners seems to have been lost.[2]

But while this is a general complaint each institution has its individual problems to face. In this school you have already taken steps to greatly restrict your possible numbers. Bigness has its disadvantages and the country is strewn with institutional dinosaurs too unwieldy for survival. A small unit is often more effective even if proportionately less economical than a large one. But even with small classes there is a danger you will certainly avoid—what some wag has called the convoy system of education, whereby progress is measured by the speed of the slowest ship. Let us hope, too, that you will hold in due proportion the proper values of the science courses to be taught

[2] The sanitarian tells us that what we need is not doctors but public health officials who have put the country doctor quite out of business. There is some truth in this; but the garbage can and the water supply apply only to infection. The public health official would be doubly welcomed in town or village if he at the same time was a good doctor. Meanwhile the chiropractor thrives.

in this hall and the practical courses in the clinics near by, which some of us feel have of late years been over-much neglected. So much neglected in fact, that certain schools are on record as desiring only those students who are prospective medical scientists; as though, after all, there could be any higher aim than to turn out the highest type of general practitioner. With this as our aim, there will always be a certain percentage of esoterics to be admitted to the inner circle and who by preference will devote their lives to investigation and teaching. By hothousing an entire student body, we are not likely either to increase in number or to make more vigorous those who naturally comprise this rare and highly prized group.

Fortunate is the school that keeps such an even balance between the art and the science of medicine that they go hand in hand through the four years; and even though clinic and laboratory be equally represented in their allotment of time, fortunate, too, is the school in which from the outset teaching is in terms of the future patient rather than of the present frog and guinea pig. But we clinicians, particularly those on the surgical side, begin to be a little doubtful of the existing program. We find that the two preliminary years of training in laboratory methods, conducted by teachers who themselves have had no clinical experience, fail to provide the student with the information, resourcefulness and observational training that would be most useful to him in his later semesters. And since two years of anticipatory science are required before matriculation, the prospective doctor must have determined upon his career four years at least before he ever comes in contact with a patient at the bedside.

Science and practice are by no means contradictory. Observation, reflection and the testing by experiment are qualities required for each; and the art, which is so long, demands experiences the laboratories can not give: the ability to properly elicit a telling clinical history, to satisfy the importunings of the family, to gain a patient's confidence, to make him comfortable in mind and body regardless of what is wrong. These things are not by any means incompatible with the most intense scientific interest as to the cause, nature and extent of his malady, but they demand judgment of quite a different order. Refinements of laboratory procedure in the diagnosis of many disorders have outstripped any possible use we may make of them in treatment; and it is the art which alone tells the wise physician where scientific study must give way to, or at least be supplemented by, common sense.

Lest I be misunderstood, may I tell a story? In a hospital, distinguished for its highly scientific methods, special studies were being made of renal function for which a number of aged nephritics in the wards provided the necessary material. A fourth-year student, who happened to be a reformed osteopath, was at the time acting as a clinical clerk. Observing that there was no special treatment prescribed for these cases, he asked if he might see what he could do. He might, of course. So that evening, after the ward was smoothly tucked in for the night, he went to the bedside of a man in whom the disease was advanced and said, "John, what do you really complain of anyway?" "Backache, and I can't sleep," said John. "That's easily fixed," said the student. "Your spine's out of joint. Turn over on your face." So the immaculate coverlets were disarranged while John's back was given some deep massage. The next morning after an unusually comfortable night he told the somewhat annoyed head nurse that at last he had found a doctor who could do something for him. We are all in agreement that the German curricular system of the last fifty years has been far more disposed to the advance of medical science than has been, let us say, the British system; but there is one question rarely heard asked on the continent, though commonly put at the conclusion of a bedside examination in an English hospital—"And now, Mary, how do you feel in yourself?"

The pendulum has swung far—so far in fact that one is led to inquire, Can there, by any possibility, be such a thing as too good a preparation for medicine? It depends of course on what we are going to use it for. Some months ago I was shown the massive concrete foundations, three stories deep and five years in building, which have been laid in the expectation that some day they would support the nave of a great place of worship. At present, they serve to carry a flimsy canvas-covered framework to keep off the weather. Are we not perhaps doing this sort of thing in the case of our medical students, many of whom will be incapable of erecting much of anything upon the expensive reinforced foundation we lay for them and in which they become set and unresourceful?

Better, you will say, than to build on foundations of rubble a top-heavy clinical superstructure which must be continually shored up in later years lest it collapse. But since education is a lifelong process, we are all conscious of persistently shoring up to atone for educational deficiencies which could not possibly have been anticipated. Between these two extremes, a happy medium must be found. And there is no better goal, I think, than to aim from the beginning to make of every student a capable practitioner. In this process, as well as in any other, the exceptional men will come to the top; those gifted with a scientific imagination will feel the appeal of a life devoted to investigation; the majority, meanwhile, will find themselves prepared for a profes-

sional career no less rich in opportunities both for service and for research. Harvey and Hunter and Jenner, Koch and Lister, all made their great contributions while so engaged. It was a young and unknown orthopedic surgeon who recently startled the world by a discovery, made, in the pursuit of an idea, under circumstances which might well have discouraged a more highly trained laboratory investigator. Is there not some reason to ask whether our present system of forcing students into too long a preparatory mould, may not inhibit the more fertile minds rather than provoke them, with freshness of conception, to grapple some one of the many great problems that lie unsolved about us?

There can be no doubt but that each of us, science teacher or clinical teacher, feels some pride in the perpetuation of our individual species. It gratifies the physician or surgeon, no less than the physiologist or teacher of hygiene, if the students with exceptional abilities catch the appeal of his particular kind of work and become disciples. But a really good student, given a succession of stimulating instructors, invariably feels, or should feel, that he could be quite happy to continue for his life's work in the immediate subject at hand. In this, the clinicians have the advantage, for they get the students last; and if the teachers of the preclinical sciences feel themselves at a disadvantage, there could be no better way, as I have once before suggested, than to reverse our entire system: to regard the clinic as basic and subsequently to send to the experimental laboratories those capable of profiting by advanced and supplementary instruction. As many—perhaps more—students than at present might thus be inspired to devote their lives to science.

This is an utterly impracticable suggestion, I am quite aware, but after all, is it not the correct method of presenting the natural history of disease? In botany, for example, we begin with the identification of the flower or plant, with its variations and habitat, and subsequently dissect it in order to study the finer structure and function of its parts. In medicine, we have come to reverse this process—to begin with the pieces and to build up a picture of disease long before an illustrative example has ever been seen. Thus may a student glibly and fully enumerate the symptoms, let us say, of typhoid fever—but presented with a patient showing a few of these symptoms which he must himself learn to detect at the bedside, he can't for the life of him reverse his mental processes and construct typhoid fever out of what plainly lies before him.

If I were setting out to make a doctor of a young man entering a medical school where he could do what he chose, I would say spend your four years in three places—the anatomical dissecting room, the dead house and the clinic. In these three places (provided the anatomist is not prohibited from a consideration of function) you will hear spoken of or see illustrated at some time or other in your course all that is vital in our present-day medical knowledge. These places represent the workshops of the three fundamental subjects from which all others have branched off; and yet they have come to be perhaps the most neglected in some of our greater schools in which the confused and somewhat restive student is passed through a mill which, in great part, has no apparent relation to his ultimate goal.

Even when the relation is obvious, it would seem to be a needlessly long and uninteresting process. The anatomist describes the form and situation of the pancreas; the embryologist shows how it buds off from the gut; the histologist in turn points out the acini and the islets; the physiologist presents the accepted theories of the manifold functions of the normal organ; the biochemist discloses the complicated ways of detecting and of quantitating the various sugars; the pharmacologist perhaps demonstrates the action of the newly discovered insulin and explains how it is prepared; the pathologist, getting down to more solid ground, shows in turn the diseased organ; and finally after two years of this, the student first sees a patient with symptomatic evidences of pancreatic disease, possibly brought to light by a carbuncle or a gangrenous toe.

How much simpler to have shown the patient first, to have briefly explained how diabetes came to be recognized and what its complications may be, how step by step the mysteries of carbohydrate metabolism have partly been unravelled and the principles of our present-day treatment established—in short, the solid facts of the matter in the order in which they were discovered. Is not this the logical method of presenting our increasingly complex subject? Are we not, in short, putting our educational structure upside down; and even if not quite so bad as this, should not our foundation stones at least be cemented by a clinical mortar? Could science be prevailed upon to concede to the clinic from the beginning of the course a single hour a day, if necessary from eight to nine in the morning, for a series of carefully graded exercises, with chief stress on the training of observation but in terms of the patient, the average run of students would certainly face their subsequent laboratory hours not only with greater interest but with a clearer appreciation of why it is necessary to get the best possible scientific grounding for their future career.

I am inclined to think that the really great teachers, could we recall them, would regard this as the most

natural approach to the teaching of the fundamentals. Our scientific instruments are better, of better material, more numerous and more precise. We can not only see further, hear deeper, measure finer, travel faster and all that; but the scientific imagination and powers of generalization of the men behind the instruments is no different or better than a century, indeed twenty centuries ago.

These were qualities, possessed, I imagine, in their highest form by the founder of this medical school, Nathan Smith, who was professor of theory and practice of physic, surgery and obstetrics—a title of Hippocratic comprehensiveness. But the other members of that first faculty of four were perhaps no less eminent. The Nestor of American science, Benjamin Silliman, taught chemistry and pharmacy; Eli Ives, materia-medica and botany; and Johnathan Knight, of blessed memory, who served this school for half a century, began as professor of anatomy. If a comparable quartet of teachers could be gathered anywhere to-day, what father would not regard his son about to enter medicine as fortunate could he be apprenticed to them for a two years' course. Imagine the opportunities given those first small classes to become imbued with a scientific spirit and to enjoy a preceptorial system at its best!

May I briefly sketch the career of the man who is said to have been the first to matriculate in this school —one Jared Potter Kirtland. Not a college graduate, he received his medical degree here in 1815, promptly married and entered practice in Wallingford, whence, after three years, he moved to Durham on invitation from the town officials. There he became widely known as a successful doctor who nevertheless found time to gratify the taste for natural science which Silliman's lectures had awakened. Owing to the death of his wife in 1823, when thirty years of age, he migrated to Ohio to join his father, who was one of the early Connecticut "Reservists." There in the hamlet of Poland he not only built up another extensive practice, but served his community in other ways, being sent in 1827 as representative to the state legislature to which he was several times reelected. As a teacher of medicine he was much sought after for a period of thirty years. In 1835 he was elected professor of the theory and practice of medicine in one of the Cincinnati medical schools founded by Daniel Drake. In 1841 he accepted a similar chair in the newly established school at Willoughby. Five years later he was one of the founders of the Western Reserve Medical School in Cleveland and taught there until 1864. Meanwhile, beside being active in organizing a State Medical Society, of which he became president, he served on the first geological survey of the state and his collection of specimens made at that time was the basis of the first Museum of Natural History in Cleveland, for which he made a great ornithological collection. He found time to make a thorough study of the native wild plants. He examined and described all the fish of the lake and rivers of the locality. He was an eminent conchologist and made important contributions to the knowledge of the subject. When the National Academy of Sciences was founded in 1863 he was chosen one of the early members. His later years were passed upon a farm where he investigated the habits of bees and devoted himself to experimental agriculture, studying the fertilization of the soil, selecting the grains, grapes and fruits of various kinds best suited for the climate, the best breeds of cattle, sheep and hogs. He was a man as remarkable in his way as the late Jonathan Hutchinson. Educated to be a doctor, successful in practice and beloved of his patients, a renowned teacher, a most public-spirited citizen whose native abilities as a student of natural science were fully employed for the benefit of his community. Could there have been a better rounded-out life, or one which more effectively confounds our educational theories?

There was another early graduate of this school whose career I would like for a moment to dwell upon, since one of my earliest recollections is connected with him. As far back as I can remember, there hung above the desk in my father's office an engraving which showed a man in an out-of-doors clinic surrounded by a group of Orientals with bandaged eyes. One of them seated before him seems about to be couched for cataract. Through this picture I first learned of the Rev. Peter Parker, M.D., who went to the Far East as a medical missionary, founded at Canton the first hospital in China, made a great reputation chiefly as an ophthalmic surgeon, became secretary of the American Legation and finally minister to China, in which post he served with great distinction. Somewhere among your possessions is a series of remarkable canvases painted by Chinese artists showing many of the rare conditions of disease that Parker had observed in the Orient. When he entered Yale College, nearly a hundred years ago, he wrote in his diary:

> I am much pleased with President Day. I expect to serve as a waiter in the dining hall and this will pay my board. I have purchased me a bedstead and a mattress of moss for $4.25 and my bedding is furnished by a benevolent society. I know nothing about my class but I presume I shall like it.

There are potential Kirtlands and Parkers among your present students—men no less capable of success in one or more of the many walks for which a medical education should prepare them, whether it be as practitioner or specialist, as scientist or public

servant. Can the Nathan Smiths and Benjamin Sillimans of our present-day faculties make any better produce of the raw material in their hands?

So while we rejoice that the Yale Medical School through the erection of this new Sterling Hall is at last provided with laboratories admirably equipped not only for research but also for the instruction of students in the methods of science, let us hope that from the outset these preclinical subjects will so far as possible be presented in terms of the ill or maimed patient across the way. There far more than here, where normal structure and function is largely dealt with, is experience found fallacious and judgment difficult.

HARVEY CUSHING

HARVARD UNIVERSITY

THE CAUSES AND PREDICTION OF EARTHQUAKES

EARTHQUAKES can be predicted as to time and place but the strength of the quake is uncertain, the element of time is long and the place is large. We may say with some certainty that there will be an earthquake in California during the next week and it is practically certain that it will occur. This statement is based on the fact that there has been, each week during past years, a recorded earthquake shock, or at least one would have been recorded had there been a sufficient number of recording stations in the state of California. These earthquakes vary greatly in intensity. In 1906 an earthquake occurred near San Francisco causing great destruction of property. Within the last two years an earthquake occurred in southern California which caused some damage. Many earthquakes have occurred which were felt by man but which caused no material damage. However, by far the greater number of earthquakes have not been felt by human beings but have been recorded on the very delicate instrument called the seismograph.

We may predict that, within the next century, a heavy destructive earthquake is likely to occur along the Atlantic coast. This is a logical deduction from the fact that, in the early part of the last century, there was a destructive earthquake in New England, and in 1886 there was a destructive earthquake in Charleston, South Carolina. We may predict, however, with reasonable certainty of fulfillment that there will be an earthquake on the Atlantic coast within the next year or within the next five years; this is based on the evidence that many earthquakes have occurred along the Atlantic coast during recent decades, some of which have been felt but most have only been discovered by the seismograph records.

It also seems to be reasonably certain that we shall have a heavy earthquake during the coming century in the Mississippi valley, for, in 1811, there was a very destructive earthquake in the vicinity of New Madrid, Mo.

Scarcely a day passes without there having been recorded on a seismograph, located at one of the many stations of the world, an earthquake with some degree of severity. The newspapers are giving attention to this subject as is indicated by their frequent notices of earthquakes.

A few such notices are:

December 1, 1923, dispatch from London. A severe earthquake shock was felt in the Ceprano district, Rome Province, during the night.

December 3, 1923, dispatch from Tokyo, Japan. A sudden and severe earthquake which lasted 40 seconds was felt at Nagoya, 171 miles southwest of Tokyo, on the island of Bondo at 10:18 o'clock last night according to advices received here. Residents of the city were badly frightened but no damage was done.

December 15, 1923, dispatch from Bogota, Colombia. Many persons have been killed and many injured by an earthquake which to-day destroyed two small towns in the region of Ipiales, near the Colombia-Ecuadorian frontier. The report has it that 85 dead have been recovered from the ruins of Cumball which with the town of Chile suffered most severely from the effects of the shocks, according to report received.

December 20, 1923, report from Douglas, Arizona. According to a report received by the president of Agua Prieta the Mexican towns of Granados, Huasabas and Oporto were razed by an earthquake about nine o'clock last night. Many were killed and injured according to the reports.

December 22, 1923, Guayaquil, Ecuador. Three new earthquake shocks have been felt in Tulcan.

The short space of time during which the above mentioned earthquakes took place gives some indication of the great number of rather severe earthquakes which occur over the earth's surface during the course of a year. Many severe earthquakes occur in regions where there are few or no inhabitants and again in other places where communication is so difficult that reports are not received concerning them.

While we may predict an earthquake for a certain general region, it is a very much more difficult matter to make a prediction for a small area such as that covered by a city or even a county. In fact, one would be rather bold who would say that any one city in the United States is likely to have an earthquake of a destructive nature within any given period of years no matter how great.

The earth's surface has changed its elevation greatly in various places during geological time. It has been