at least five years in additional study before he commences to see any thing of practice. He should then spend at least three years more in special medical and clinical studies, during one year of which he should, if possible, reside in a hospital. If then his purpose is to become a specialist, an original investigator, and a teacher, it is desirable that he should spend two years more in clinics and laboratories devoted to his special subject, and at least half of this time should, at present, be spent abroad. These are the broad outlines of what I suppose most physicians of the present day would consider a desirable scheme of medical education for an intelligent boy with a fair amount of liking for study, good health, and sufficient means to enable him to go through with it without making undue demands upon his parents or guardians.

You will observe that there are several qualifying clauses in that last sentence. The aphorism that it does not pay to give a five-thousand-dollar education to a five-dollar boy must be constantly borne in mind in considering these questions. On the other hand, it is also to be noted that in the preparation of educational schemes it is not necessary to provide for the demands of youths of extraordinary ability and industry — for men of genus. Beds suitable for giants are not required as part of the stock of an ordinary furniture store, especially if it require giants to make them. Some cases of disease will recover without treatment, though the cure may be hastened by proper management; some will die under any treatment; the result of some depends on the treatment. It is much the same in education. Some will acquire knowledge and power without special training; others will never acquire these things under any training; but the career of many depends, to a large extent, on the training which they receive. The recent announcement of a compulsory four years' course of medical studies by Harvard and the University of Pennsylvania, soon to be followed by a similar announcement from Columbia, looks toward the ideal just indicated.

The number of those who are obtaining a college education as a preparation for medical study has increased, and will still more increase as the competition among an excessive number of physicians becomes fiercer.

From information received from some of our leading medical schools for the present year, it appears that the proportion of students who have taken preliminary degrees before commencing the study of medicine varies from fourteen to forty-three per cent in Eastern schools, from three to twelve per cent in Western schools, and from fifteen to twenty per cent in Southern schools.

Just here comes in a very difficult point. When shall general education cease and special training begin? The answer to this must depend largely on the individual, but it seems to me that the present tendency is to begin to specialize too soon. This early specialization of study and work may lead to more prompt pecuniary success, but not, I think, to so much ultimate happiness and usefulness as the longer continuance of study on broader lines. "For it is in knowledge as it is in plants," as Bacon says. "If you mean to use the plant, it is no matter for the roots; but if you mean to remove it to grow, then it is more assured to rest upon roots than slips. So the delivery of knowledge as it is now used, is of fair bodies of trees without the roots — good for the carpenter but not for the planter. But if you will have science grow, it is less matter for the shaft or body of the tree, so you look well to the taking up of the roots."

In discussions on medical education and the duties of medical schools, we are too apt to lose sight of the fact that the best that the student can do in them is to begin to learn. If he does not study much longer and harder after he graduates than he does before, he will not become a successful physician. Moreover, the great majority of men have different capacities for learning certain things at different ages. They lose receptive power as they grow older.

Permit me to use here a personal illustration, and pardon the apparent egotism of an old gentleman who refers to his youthful days. Thirty-three years ago I began the study of medicine, having obtained the degree of bachelor of arts after the usual classical course of those days. It so happens that the smattering of Latin and Greek which I obtained has been of great use to me, and I may, therefore, be a prejudiced witness; but my acquaintance with many physicians at home and abroad has led me to believe that the ordinary college course in languages, mathematics, and literature is a very good foundation for the study of medicine, and I do not sympathize with those who demand that all who are to enter on this study shall substitute scientific studies for all the Greek and a part of the Latin of the usual course. This change is good for some but not for all. I had attended lectures in physics and chemistry, but had done no laboratory work, and I could read easy French and German. Thus equipped I began to read anatomy, physiology, and the principles of medicine. Nominally I had a preceptor, but I do not think I saw him six times during the year which followed, for I was teaching school in another State. Nevertheless, he told me what books to read, and I read them. The next thing was to attend the prescribed two courses of lectures in a medical college in Cincinnati. Each course lasted about five months, and was precisely the same. There was no laboratory course, and I began to attend clinical lectures the first day of the first course. One result of this was that I had to learn chemical manipulation, the practical use of the microscope, etc., at a later period when it was much more difficult. In fact, I may say that I have been studying ever since to repair the deficiencies in my medical training, and have never been able to catch up.

Probably a large number of physicians over fifty years of age have had much the same experience, and feel that there are certain things, such as the relations of trimethyloxyethylene-ammonium hydroxide in the body, or the causation of muscular contraction by migration of labile material between the inotagmata,— the bearings and beauty of which might as well be left to younger men. Not that these things are specially difficult to understand, but they form part of a new nomenclature which in most cases it is not worth the while of the older men to learn, because it is far more difficult for them to master it than it is for their sons. One of the most comfortable and satisfactory periods of a man's life is that when he first distinctly and clearly recognizes that in certain matters he is a helpless old fogy, and that he is not expected to know anything about them.

(To be continued.)

EXPERIMENTAL POTATO FARMING.

THE question of the influence of different qualities of seed upon the earliness and productiveness of a given variety of potatoes is one that has been much discussed, and the following experimental planting was made at the Ohio Agricultural Experiment Station to test the value of three qualities of seed. The seed of lot I. was grown from a planting made in the middle of March, and harvested and stored in the cellar as they ripened. The potatoes had sprouted badly during the winter, and were a good deal

shrivelled. Lot II. was from the main planting, made in the latter part of April, and dug and stored in September. The tubers were quite firm, and had sprouted but moderately. Lot III. was seed from a second crop grown in 1889 in the following way. A few hills each of several sorts, from the plat which produced the seed of lot I., were dug July 11, and the potatoes planted the same day on ground that had been cleared of early peas. These gave a light yield of tubers of even size and of very fine quality. When taken from the cellar for planting they were as firm and free from sprouts as when stored.

Three pounds of each of the above lots were cut to three-eye pieces, and planted March 18. With one exception, the sorts in lot III. were from five to eight days later than the others in coming up, while between lots I. and II. no difference could be noted.

The vines of lot III., when they came, were much stronger than the others, and in a few weeks overtook and outgrew the other lots, making a much more vigorous and heavy stand.

The date of blooming, though not varying uniformly on the whole, favors the vigorous plants of lot III. for earliness, and shows that the comparatively weak and slender plants of lot I. bloomed later, or in three cases failed to perfect any bloom.

The date at which they afforded potatoes of table quality did not vary appreciably in favor of either, but the product, both in quantity and quality, was largely in favor of lot III.

While the product of lot II. was not, in all cases, much ahead of lot I. in weight, the percentage of marketable tubers was greater, and these were of greater average size.

Summarizing the results of this trial, it seems, first, that nothing is gained in earliness by the use of second-crop seed; second, that there is a positive gain in amount of product, as well as size of tubers, over that of first-crop seed grown in the same locality; third, that firm, well-kept, unsprouted seed is better than that which is sprouted and shrivelled, giving a heavier product and of better size and quality. These inferences may not be conclusive, but seem to be fairly deducible from the above results.

Still further to test the practicability of growing the second crop of potatoes in one season, five pounds of seed of each variety in lot III., as above mentioned, were dug July 23, and planted the same day, cut in halves. These came up rather unevenly, the same fault having been noticed in the previous trial. The product was of unusually fine quality, and the yield a very good one, when it is considered that potatoes of ordinary planting were almost a failure in that section of the country.

ENTOMOLOGICAL OBSERVATIONS AND EXPERIMENTS.

THE reports of the six permanent field agents of the Division of Entomology of the Department of Agriculture are included in a bulletin just issued from the government printing office at Washington. These reports are printed in full, though they are little more than summaries of the work in general performed by each agent. Special reports upon specific subjects have from time to time been sent in by special direction, and those have been published in *Insect Life*.

Mr. Lawrence Bruner, who last year reported upon the insects injurious to young trees on tree claims, has the present season devoted much of his attention to insects affecting, or liable to affect, the sugar-beet, a crop of growing importance in Nebraska, the State in which he is located. Although but one season's collecting has been done, some sixty-four species have been observed to prey upon this crop. As is shown by the report, nearly all of these can be readily kept in subjection by the use of the kerosene emulsion or the arsenites.

Mr. D. W. Coquillett's report, from California, is mainly devoted to methods and apparatus for the destruction of scale-insects by means of fumigation. The experiments were aimed at the red scale, which is one of the most difficult to treat with washes. He describes the simplified tents and the rigging which enables them to be used rapidly, and shows the advantage of excluding the actinic rays of the light. Judging from recent California newspapers, the use of this method of fighting scale-insects is rapidly increasing, and the comparatively expensive apparatus is already owned by a large number of fruit-growers. This improved method is the legitimate outgrowth of experiments which were instituted by the department at Los Angeles in 1887, and possesses the advantage over spraying that it can hardly be done in a slovenly manner. If used at all, its effects are nearly complete.

Mr. Albert Koebele, while reporting upon a number of interesting fruit pests, notably the tent caterpillars of the Pacific slope, and a noctuid larva which destroys the buds of certain fruit trees, devotes most of his report to the description of certain tests, which Professor Riley, the government entomologist, directed him to make with different resin compounds against the grape phylloxera in the Sonoma Valley during September and October of the past year. The results have been fully as satisfactory as were anticipated, and the economy of the process is very striking, labor being practically the only expense.

Miss Mary E. Murtfeldt reports upon the insects of the season in eastern Missouri, and also gives the results of experiments which she has made with certain insecticides submitted to her from the office of Professor Riley for trial. She also presents descriptions of four *Microlepidoptera*, which are new in the *rôle* of feeders upon the apple.

Professor Herbert Osborn reports upon the insects injurious to forage-crops, meadows, and pastures in Iowa. His report last year was mainly taken up with the consideration of the leaf-hoppers, to which he gives some further consideration this year, adding some notes on locusts and crickets. He presents also a series of miscellaneous observations.

Mr. F. M. Webster of Indiana devotes his report mainly to the Hessian fly, discussing the number and development of broods, the effect of the larvæ upon plants, the effect of the weather on the development of the fall brood, and preventive measures. He also gives some notes upon three of the species of plant-lice found commonly upon wheat.

NOTES AND NEWS.

THE Rev. J. Hoskyns-Abrahall writes to *Nature* that on June 10, about 10.30 P.M., near Woodstock (England), he saw what he describes as "a beautiful phenomenon." "Suddenly," he says, "at the zenith, east of the Great Bear, shone forth a yellow globe, like Venus at her brightest. Dropping somewhat slowly, it fell obliquely southward. As it passed in its brilliant career, it lighted up its dusky path with a glorious lustre. When it had descended about half-way down toward the horizon, it burst into a sparkling host of glowing fragments, each dazzlingly shot over with all the hues of the rainbow."

— According to *Industries*, two novel modifications of sulphur have been recently discovered by Engel. The first, like that proved to exist in Wackenröder's solution, is soluble in water and very unstable. The other is crystalline, soluble in carbon disulphide and chloroform, and polymerizes slowly in the cold, and quickly at a temperature of 100° C., but, unlike prismatic sulphur, which changes on keeping into the octahedral variety, it becomes converted into the white insoluble form which commonly constitutes so large a percentage of the material known as "flowers of sulphur."

— In a new process for the manufacture of phosphorus by electricity used by the Phosphorus Company, at Wednesfield, near Wolverhampton, England, says the London *Engineer*, the raw material and coke are all fed into a specially designed furnace, reduced to vapor by electric heat, and the vapor condensed into marketable phosphorus, the elaborate chemical material hitherto needed in dealing with the raw materials before putting them into the furnace thus being dispensed with. The estimated consumption of phosphorus throughout the world is only two thousand tons yer year, used chiefly for match-making. Extensions are contemplated at Wednesfield, which will ultimately, it is anticipated, lead to the company being able to make half this quantity, at that place.

— W. J. Lincoln Adams, editor of the amateur photography department of *Outing*, says in the July number: "The preparations for the twelfth annual convention of the Photographers' Association of America, which will be held this year in Buffalo from July 14 to 17, are actively progressing, and the indications