Insects, particularly the Colorado beetle or potato bug, have been perhaps the greatest factor in discouraging the growing of henbane. The potato bug apparently prefers henbane to any other plant in the same family. Spraying with Paris green and with lead arsenate have shown that the latter poison is most efficient. A dilute spray (1 : 1000) should be applied to the rows when the plants are about one to two inches tall. During the latter part of July when the ravages of the beetle are most severe, another light spray of lead arsenate is usually necessary. Two applications of the insecticide have been found sufficient to curtail the damage from this source. It is advisable to spray the plants several weeks before harvest, and it is necessary that at least one rain should wash the leaves before they are collected.

In order to ascertain whether any appreciable amount of lead arsenate was present on the leaves of sprayed plants, arsenic was tested for according to the method given in the U. S. P. IX. About 200 grammes of green leaves which had been sprayed ten days earlier, and had received one drenching rain, were collected. The surface of each leaf was thoroughly scrubbed with water. After concentrating the 200 Cc. of water used for washing, several tests were made and in each case the trace of arsenic found would amount to less than 0.002 Gm. in each kilo of dried henbane leaves. The arsenic contamination is, therefore, so small as to be negligible.

The crop of leaves should be cut in fall before frost, taken to the drying house and spread thinly either on the floor or in trays, depending upon the available drying facilities. A small amount of heat and a current of air hastens the drying process, and also preserves the green color of the leaves.

Comparative yields indicate that almost twice as much drug can be obtained from the first year's growth than from a similar area of second year plants.

Chemical assays of the leaves of the second year's growth biennial henbane showed a total of 0.07 percent of alkaloids, while leaves of the first year's growth grown from the same seed gave 0.067 percent of the alkaloids of hyoscyamus. It is evident from these assays that the activity of the drug is about the same whether collected the first or second year.

SYMPOSIUM ON DRUG CULTURE.

W. W. STOCKBERGER.

I availed myself of my opportunity as secretary to use that old principle that it is easier to get somebody else to do your work than to do it yourself, so instead of preparing and presenting a paper I suggested this symposium, and I trust that I shall not fail to be rewarded by having a number of those present deliver my paper for me.

The main thesis which I wish to bring to the attention of the Section has already been enunciated by our old friend Dr. J. U. Lloyd.[1] In his comments following the exhibition of the reel of pictures on drug cultivation you will remember that he, out of his years of wisdom and experience, recognized the importance of fully appreciating the resistance to be overcome in every enterprise. I am fully convinced that the commercial cultivation of drug plants at least is not a romantic adventure, but that it is a practical business proposition. It so happens, by virtue of the position which I occupy, that I learn much of what is going on in this country with respect to drug cultivation. What I wish to emphasize is this: That even among the men who are the leaders, or who ought to be the leaders in this subject, there is the most extreme

[1] These remarks have been omitted because they are in substance repeated by this speaker.

divergence of opinion as to what is and what ought to be done. We all recognize that we can not agree fully and completely, but I do not believe that there is any reason for the great difference of opinion with respect to this matter of drug cultivation, that exists even among the members of this Section; and what I wish to suggest for your consideration has already been foreshadowed by Dr. Lloyd when he said that he wished we might have a circular which would put this matter in concrete, crystallized form, so that uniform information could be sent out by all of us. Now that is the point that I wish we could reach to-day. We ought to agree on a definite general policy. Of course we may not all agree on details because each man wishes to have his own opinion; but the general policy toward drug cultivation I think should be agreed upon.

Now to illustrate: Either there is an opportunity for thousands of people in this country to make enormous profits with little or no work or else that opportunity does not exist. Now which way is it? That is one of the points upon which there is difference of opinion. The opinion has been expressed that we should encourage every individual who expresses an interest in the cultivation of drug plants to go into the business. Even though ninety-nine out of a hundred fail—so this opinion goes—the end justifies the means if one makes a success. Now that is a principle to which personally I am diametrically opposed, because I see no justification for lending our encouragement to ninety-nine failures, with the meagre hope of one success. Moreover, if there is any legitimate place for the future development of drug cultivation, and if we are to approach those ideals which have been so splendidly presented here this morning, according to which the products of drug cultivation will be gathered and handled under controlled conditions and properly tested with respect to their standard of excellence then we cannot afford to jeopardize the development of that side of this proposition by encouraging a large number of people to go into the business if they are going to fail, because that will bring the whole proposition into disrepute. And so it seems to me that this is another point upon which there should be no difference of opinion.

Another point upon which there is disagreement is the opportunity which exists for commercial drug growing. The thought came to me one day when riding on a train to be a little spectacular for once by presenting graphically the contrast between the opportunity for the American people in this enterprise of drug growing and their opportunities with staple crops. For the drug crops I chose belladonna and assumed that the entire requirement of this country could be grown on say, three hundred acres. I chose corn as the staple crop for comparison although I realized that when illustrated graphically, the line representing the acreage of corn would be very much longer that that for the acreage of belladonna. When I came to calculate the length of my two lines I found that if I used one thirty-second of an inch to represent the acreage of belladonna, the line representing the acreage of corn would run down the street for almost half a mile. Now this question of relativity is another one of the important things, it seems to me that we ought to appreciate more fully. The man who publishes a magazine article on drug growing and says to thousands of readers, "Here is an opportunity," may tell the truth, but he misses the important point. What may be an opportunity for a few individuals may be of no significance whatever when addressing the American people, among whom we number our farmers by the millions. Likewise the suggestion that $4000.00 or $5000.00 can be made from a few plants of belladonna or golden seal or ipecac in a back yard, or some such proposition as that, is misleading to say the least, but strange to say there are thousands of people who believe this fiction and straightway set out to secure material to plant, in the hope that they will obtain these great returns for their efforts.

Just a few weeks ago I sent out a circular letter to every person that I could learn of in this country who was growing belladonna, or who was supposed to be growing belladonna commercially. I am not at liberty to give a detailed abstract of the replies received, although I wish I could, for your edification. Suffice to say that out of a long list to whom I sent this inquiry not more than one percent reported that they had any degree of success at all. A very large number reported total failures, and as they had purchased belladonna seed with which to experiment at five dollars an ounce, they were naturally disappointed. Some of us receive hundreds of letters from people who are anxious to increase their income. They have read glowing stories about the wonderful returns from growing medicinal plants, and have invested five or more dollars in belladonna seed, although they possibly never grew any plants in their lives. Their faith would move mountains but it won't grow belladonna.

Another point upon which I think we should agree more closely concerns the marketing of the products of drug cultivation. Much of our talk regarding the commercial cultivation of drugs fails entirely to take into account the question of marketing. It is all well enough to say to the farmer, "grow corn, or cotton, or wheat," because if he gets a crop there is always a market right at hand. But when he grows belladonna how is he going to sell it? He has been told that the druggist or the manufacturing pharmacist will buy it. But his market will be in a distant city, and he will have to advance the freight and then accept whatever price the consignee may choose to pay. Few of these people know how to prepare their drugs to meet the usual market requirements, and to the problem of disposal ninety-five percent of those who are thinking about this enterprise may never have given any thought at all. They assume because staple crops have a ready market that it will also be easy to market their drug products. I do not wish to discredit the worthy motives which actuate many persons who are urging drug growing. All that I ask is that we see both sides of the question; tell the people the truth in the matter and point out the difficulties as well as the attractive side of the proposition.

There has been, as some of you know, a movement on foot for nearly a year to form a National Drug Growers' Association. It is recognized that there is need for those interested in drug growing to get together and adopt a uniform policy. Such an association may be the means by which that may be brought about. I think perhaps it is a question for debate whether we wish at this time to attempt anything so ambitious as a National Association of Drug Growers. I believe that we can do much as an association either through the Scientific Section, or better, a committee of this Section, composed of men who are interested in the cultivation of medicinal plants. Such a committee could formulate a definite policy and secure the necessary publicity for the same. It seems to me that this is one of the questions we should think about very seriously today.

As most of you know, I am very much interested in the subject of medicinal drug gardens. I believe in these gardens thoroughly, and am fully convinced that they are a wonderful educational stimulus. I shall not try to name all the recommendations they have, since I talked upon this subject at the Atlantic City meeting last year. Since then a number of other gardens have been established and some of the older ones have been much extended. We need to encourage these gardens for their educational value, but it appears that the real function of the School of Pharmacy drug garden is misunderstood by a large part of the public at large, and is not looked upon as an aid to education, as a means of stimulating research and furnishing materials for use in solving many of the problems of materia medica, but, on the contrary, they are believed to be established for the purpose of helping people to make money. The commercialism which seems to act as a colored screen before the eyes of some who look at this phase of drug growing should be swept aside and our educational drug gardens viewed in the white light of reality.

Our drug gardens now form a recognized asset of pharmaceutical education and their beneficial effects are very apparent at a number of our educational institutions, but lack of unity of purpose or lack of agreement as to the scope and function of these gardens will sooner or later bring us all into disrepute with the public.

In this rambling way I hope I may have supplemented somewhat the thesis laid down by our venerable colleague, Dr. Lloyd, when he said we ought to crystallize the facts about drug growing in such a way that we can all tell the same story.

EDWARD KREMERS.

I want to second most heartily the suggestions made by Dr. Stockberger. I could weary you with a long list of special illustrations supplementing his excellent remarks, but I shall not do so. I want to emphasize, however, that if we are not boosters we need not necessarily be knockers. Dr. Stockberger certainly is not a pessimist on the subject of the cultivation of medicinal plants. Neither am I. But to hold out hopes which will lead to nothing, but which will injure the entire scheme of the cultivation of medicinal plants in this country, is all wrong.

I need but remind you of the hopes that were held out to the farmers of this country for the production of industrial alcohol. According to the newspaper accounts it was to be possible for any farmer to go to his barnyard and pick up the refuse that the cattle would not touch, and convert that into alcohol with which to illumine his house, and to run his farm machinery—also his Ford. You know that nothing has come of that, and it seems to me we have occasion to

congratulate our country that the person who is looking after the cultivation of medicinal plants at Washington is not guilty of holding out any false hopes to the people.

The subject is so large that it is impossible for me to touch on many phases thereof, but before touching on a single phase let me call your attention to the degree of specialization which has developed in the American Pharmaceutical Association in the last twenty-five years. The growth of our Section is an indication of that degree of specialization. There was a time when the members of the American Pharmaceutical Association came together and all talked about the same subjects. There is no thought of doing that to-day. Now we are confronted with the feasibility of either establishing a new section on the cultivation of medicinal plants, or organizing a committee within this Section that is to look after the cultivation of medicinal plants. The problems that confront us in the cultivation of medicinal plants are so numerous and so special that even the scientists of the American Pharmaceutical Association alone may not hope to cope with them.

I want to emphasize the statement made by Mr. Fuller, namely the need of coöperation. At the large universities the men who are interested in the same lines of work, say chemistry, naturally try to get together for purposes of conference. That is very important. And yet when I think of those who are most helpful to us in the cultivation of medicinal plants and indeed in all of our problems in the pharmaceutical experiment station, I do not necessarily think of the members of our local chemical association who are working in the same building or other buildings on the campus; I do not even necessarily think of some of the members in the school of medicine but the colleagues of whom I think first of all are the professor of experimental plant breeding, of the professor of entomology, of the professors in the horticultural department and those in the plant pathology department. All of these men are coöperating with us and giving us most helpful assistance. Take, for instance, the subject of plant breeding. We have been requested by the Office of Drug-Plant and Poisonous-Plant Investigation in Washington to make a special study of stramonium. We began by studying the literature on the subject, and several years ago we issued a bulletin in which we called attention to all of the previous work as well as our own. We issued that bulletin for the reason that we wanted to put the tombstone, as it were, on all that had been done before, and we started out anew. It was the professor of experimental breeding who with his assistants came to the rescue. They are coöperating with us to-day.

Something has been said about the quality of drugs. Take for instance stramonium. The U. S. P. requirements, I think, came down from 0.35 to 0.25 in the alkaloidal requirements—not the present revision, but the previous revision—because the drug of 0.35 alkaloidal strength could not be obtained. It was a matter of chance that we obtained a plant containing 0.45, or, say, 0.40—whatever figures I select here make no differences; the actual figures on record would not be any more true than any figures I put down here (illustrating on blackboard). We took the seeds of that plant in the hope to get pedigreed material. Suppose we have a thousand seeds from one plant. We sow these seeds, we thin out our plants and we have a hundred plants left. Of these hundred plants we select twenty plants for seed, for purposes of propagation, and we test the leaves of those selected plants. We then find, for instance, that one plant assays 0.41, the next one 0.37, the next one 0.32, the next one less, whatever it is. We find that most of the plants we have assay low, 0.09, or something like that (illustrating). Now first of all the plant from which we have selected seed yielding a drug with 0.40 alkaloid is a composite, with strains of ancestry going back we know not how far. Now what we do is to eliminate some of those strains, and we take, for instance, this plant here with 0.41 percent alkaloid content in its leaf (illustrating). The next year it is again a matter of chance what we get. Out of a thousand seeds we will get possibly a hundred plants. Out of the hundred plants we select possibly twenty for assay.

We may not get a single one as high as 0.5, but again we may take the highest, let it be 0.3 and we propagate. In doing this we eliminate certain ancestries as it were more and more. Whether we can carry the process to a successful conclusion is another question. But I do not want to pose as an expert on the Mendelian law of plant breeding. I simply wish to point out to you how the experimental plant breeder, whether he is trained along plant or animal lines, is helpful to us, and how we, the chemists, have to coöperate with him in connection with our assays in finding out the strains that we want.

Let us next take up the subject of cultivation. I was very glad that you had several illustrations of orchard cultivation illustrated to you. I am not going to dwell on that and how that should be conducted.

Another important matter that might be spoken of is the cultivation of Monarda. After a number of failures we seem to have hit upon the right plan. Under some conditions it will not germinate. However, Prof. Beal demonstrated that the same seeds with which we have been experimenting, develop out in the open in Florida without any cover crop, indeed under conditions, as he told me, that in our latitude would have buried the seed forever. Hence it may be that under other conditions more favorable Monarda may be raised more readily than with us in Wisconsin. Of the several cover crops that we have tried out, winter rye has been most successful. Now after the rye has been harvested, the plants are three or four inches high, thousands of them, on a small piece of ground.

Incidentally you may be interested to know that in connection with the rye cover crop we inoculated the rye field with ergot, and we obtained a very nice crop of this fungus. However, we did not harvest it, not because we did not want to, but because our inexperience with both rye and ergot caused us to lose the entire crop. I thought the rye was not quite mature and wanted to wait until it was mature. So one morning when I came out to the field, with a high wind blowing, the sclerotia of the ergot were being blown off, and by 4.00 o'clock in the afternoon not a single sclerotium was left. But although the patient died the experiment was a success.

Attention has been called to the cultivation of henbane and the difficulties associated therewith. You have been told that the cultivation out in the open has been successful. The additional point that I wish to make in that connection is this: When you sow henbane out in the open you naturally sow many more seeds than you expect plants to harvest. As a matter of fact we have to thin out the plants. Now instead of going into the field with a hoe and cutting out those plants and letting them wilt, we have tried the thinning out by hand, and we are raising young henbane plants as a by-product as it were. The waste plants are not thrown away. Neither are our excess digitalis plants thrown away. Whether they will reveal the same efficiency as the mature plant, I do not yet know. We have here another of those numerous tricks of the trade that you have to learn when you go into the cultivation on an economic scale.

I enjoyed very much indeed the films from the Washington Experiment Station by Mr. Fuller, but I want to caution you against one thing. Certainly if the temperature, as he states, was 120 degrees one day, the workers do not keep up that rate of speed in picking leaves that was indicated on the films. That is a very important economic problem. We have found in picking choice belladonna leaves that the picking is half of the expense.

So when it comes to certain medicinal plants and the drugs to be obtained therefrom, we have to get away from many an old pharmacopeia notion. I remember it was not many decades ago that the U. S. Pharmacopoeia defined oil of peppermint as the oil distilled from peppermint. Then when you looked up what peppermint was in the Pharmacopoeia you found it defined it as such and such a drug. Well, not a pound of peppermint oil was distilled in this country or anywhere else according to that definition. Mr. Allen of London once complained to me that he was trying to distil cinnamon oil from Ceylon cinnamon, as demanded by the British Pharmacopoeia, and that the oil cost him $20.00 or $25.00 a pound or more, to say nothing about the profit. Now some of those ideas we have to get away from and the sooner the Pharmacopoeia gets away from some of them the better.

In the case of digitalis we have had the difficulty that just before harvesting we might have a heavy rain. Our soil contains a very fine clay which is thrown up against the hairy surface of the digitalis leaves, and it is extremely difficult to remove it. You might brush every leaf separately and not remove every particle of clay. You can readily see what such a digitalis leaf would cost if you tried to make it true to the Pharmacopoeia. Digitalis leaf should not contain more than ten percent of ash, but the choice digitalis leaf which we have raised in our garden contained as much as twenty-five percent of ash. That is, the apparent ash content was such. However, only ten percent of this were really ash; the remaining 15 percent were clay. So in supplying an eastern hospital with a No. 20 powder of digitalis, we examined the powder as we obtained it by means of a set of analytical sieves. From a kilo we got about one-half kilo of No. 20 powder. We got, I have forgotten how many grammes, of 30, 40, 50 and 60 powder up

to 100. Whereas our No. 20 powder contained 10 percent—that is, represented the drug with its true ash content—the finer powders contained an increasing amount of ash until the finest powder which consisted of 75 percent clay. Now that is a simple mechanical means of improving a drug. Whether, as our friend, the late Martin Wilbert, suggested, the clay might have an occluding effect on the active constituents as well as act merely as a mechanical diluent, has not been determined. That is a problem that we shall have to work on.

Just one other word and I will stop. So far I have spoken simply about the production of the plants themselves and drugs from the plant. When it comes to the production of medicinal or pharmaceutical chemicals from the plants, we have other problems to contend with. Let me take the illustration of the Monarda again. Monarda usually yields about five-tenths of one percent of volatile oil. A ton of green material therefore will yield about ten pounds of oil. You can therefore imagine how large an area you will require to supply the United States, or simply the Rockefeller foundation with the amount of thymol that it uses in the hook worm campaign. Now that oil assays 50 percent of thymol, according to the assay method. A member of our Association was surprised this morning when I informed him that last year we sent out over 100 pounds of Wisconsin thymol. More than that, he was surprised to learn that none of it had been rejected, but that the purchasers accepted it as A No. 1 thymol. However, we never succeeded in getting the 50 percent of thymol out of that oil. Working with hundreds of pounds we accumulated enough mother liquid from which, by very careful manipulation last winter, using winter temperature, we removed practically all of the thymol. Such effort would not pay commercially, but we wanted to find out what was the cause of our deficiency in manufacture as compared with the assay. We were rewarded by finding considerable carvacrol, an isomer of thymol, which however does not crystallize at room temperature. Here you see we have an illustration of how careful we must go ahead. You may sit down and on the strength of the assay figure out with scientific accuracy, as you think, just how many acres of Monarda you need in order to supply a certain amount of thymol, but when it comes to the practical economic problem, the production of the actual thymol, you may find that you get left.

H. C. FULLER.

There is one thing that seems to be emphasized, and that is the unanimity of opinion and apparently the spirit of coöperation that is manifest. And coöperation can do a great deal.

Mr. Miller's statement about cannabis is specially interesting. He can grow cannabis and allow it to come to maturity and go to seed. He can use it in his own drugs and it is all right, and that is perfectly proper, but if we, as a commercial enterprise, attempt to grow cannabis that way, allow it to come to maturity, let it seed, and try to dispose of it, nobody would buy it from us. In fact, we would be liable to have our shipments seized by the United States Government, because they would not comply with the Pharmacopoeia as regards certain characteristics. The drug may test up to the proper physiological strength but it has too many seeds.

Another thing, in culling out our male plants during the season, I have had them saved from time to time; had them examined by assay, the same as I have done with the female plants, and by simply labeling it "cannabis" the pharmacologist reports back that the male tops are better than the U. S. P. and the female tops are equal to the U. S. P. But I can not sell the male tops for cannabis. Nobody will buy them. Now that is just one instance that touches those of us who are interested seriously in drug growing—and I am really optimistic regarding drug growing if it is properly done. I believe coöperation can do a great deal, but there are many other problems that confront us, and ought to be very seriously considered. There is the question of tariff, the question of the attitude of certain bodies antagonistic to botanical drugs which are used in large quantities in certain medicinals, etc. I am going to make a motion that a committee be appointed from this Section, looking to obtaining closer unanimity of opinion and presentation of information regarding this very important problem, to be a permanent committee composed of sufficient members to be representative, but not too many members to be cumbersome, to handle these various problems which have been presented today so ably by the different speakers.[1]

[1] See December issue, pp. 1097–98, also p. 860, October number, 1917.

R. A. LYMAN.

I want to assure Mr. Fuller that there is in this room a spirit of coöperation, but I can not say that there is a spirit of unanimity. I am going to take just a few minutes of your time to state the position of the educational garden, which I represent.

I also want to call the attention of Mr. Fuller to this fact: He made the statement that it took a botanist to grow good drug plants. In my institution we have a young Englishman who is neither a botanist nor a scientist, and yet he can make things grow like nobody else has ever been able to make them grow.

I am interested in this matter chiefly for this reason, that drug plant cultivation is full of interesting problems, and it furnishes, as I see it, one of the finest avenues to interest young men of brains to enter the profession of pharmacy, and I do not propose to have anybody take that advantage away from me. I recognize the position of the educational garden. It is primarily for the purpose, to begin with, of helping to teach the students the subject of pharmacognosy. It is a laboratory; it has made a living subject out of pharmacognosy and I do not know why it is not perfectly proper for a great educational institution to attack these problems. For my part I do not propose to permit the Department of Agriculture of Nebraska to concern itself with the great problems of agriculture in our state, and not have the opportunity, that my own college of pharmacy in my own state should have, of rendering service to the druggists of Nebraska.

This is an educational garden; it must become a research garden. Just for example, I do not know why I should not be permitted next year to interest myself and my students in the following economic pharmaceutical problems: I have discovered this year that when henbane and potatoes grow side by side, the potato bug leaves the potato every time for the henbane. We in Nebraska raise millions of bushels of potatoes. The insecticides and the labor required for their application costs the farmers of Nebraska thousands of dollars. I do not know of any reason why I shall not next year, as a problem of my institution, have my students work upon an acre of potatoes with a row of henbane around it, and determine the cost of production of that acre of potatoes compared with another acre of potatoes that is not surrounded by henbane. If the potato bugs will leave those potatoes and go to that henbane, the student can apply insecticides to that row of henbane, at much less expense of material and labor. That is my problem.

Now I appreciate the position of everybody who takes the opposite view, that we should not encourage the cultivation of drugs in the way it has been encouraged. I rather admire Dr. Stockberger for taking the position that he has in discouraging the venture without the proper knowledge, because that has saved a lot of people from financial loss. But I must determine what I shall do in the State of Nebraska. None of these men in the Department of Agriculture or any of these other men in gardens over the country can tell me what I can do in Nebraska, because they have told me I could not raise belladonna and I could not raise digitalis, and the very things they told me I could not do, I set out to do and I did it. If anybody wants to stimulate me to get into a particular field, just let them tell me I can't do it.

I have found that young men have become interested, from this garden work, in the growing of drug plants, and every year as these young men go out, some of them graduates and others first year men and second year men, they say, "Dr. Lyman, can I have a few digitalis plants, a few belladonna plants, a few of golden seal, to start in my garden?" I always say yes, and I give them to them, and they take them out and start them. Most of them fail the first year and they come back to me and say, "My plants were no good," and I say "Well, here are my plants," and we talk the matter over and we find out what the difficulty is. Of course, sometimes they have simply stuck them in the ground and thought they would grow like potatoes—and they won't—and so they have tried again, and as the years have gone by I have found these men in different parts of the state growing their own little garden. Now it is of no commercial importance to those fellows, but they enjoy it. And, in addition to that, the people of that community, every one of them, I have found are interested in that young man, because he has got ideas that other people have not, and he is the coming druggist of that locality, and it is the best advertising proposition that was ever put before a community for a particular druggist; and I do not think that the people of Nebraska will lose any money because of the fact that this policy has been conducted in the University. From the efforts of these young men the people

of a community learn that the growing of drug plants is a work requiring endless labor and will undertake no foolish experiments. They learn without expense to themselves that the growing of drug plants does not mean an easy road to a fortune. Two years ago a freshman came to me in the spring and said, "Dr. Lyman, over here in Oak Creek Valley I and another freshman have rented 320 acres of land to raise drug plants. Now I have come to you to see what we shall plant." I said, "You come with me, young man," and out in the garden we went; and when we got through, he said, "Well, it isn't too late to plant corn."

J. U. LLOYD.

It seems to me one feature has been left out, and I think Dr. Stockberger will agree with me that it lies with him to utilize this for the advantage of the American people in the cultivation of drugs. At the meeting of the American Pharmaceutical Association in Kansas City, Mr. J. C. Huber of Fond-du-Lac, Wisconsin, the first man that tried to raise ginseng in America, came to me, I was chairman of the Committee on Papers and Queries, and said, "Professor, I am going to attempt raising ginseng." Now listen, we had depended upon senega from West Virginia, from the mountains of that state, and we had been getting little spindling plants the size of a knitting needle ever since America was discovered, and two years before that they found senega in Wisconsin with tops the size of your fist nearly, so large that we questioned whether it was senega or not. I said to Mr. Huber, "why don't you raise senega? You know senega will grow in Wisconsin; why concern yourself with the growing of ginseng that is native to the forests of Kentucky and Virginia?" Well, he went ahead and failed on ginseng when he could have succeeded with senega. On the old farm in Kentucky there has not been a crop of hemp raised for seventy-five years, and they can't kill it. Every fence corner on the place comes up with hemp. It grows naturally down there; it can be raised elsewhere, but you can not help raise it in Kentucky if you get a start. Out in Washington they raise digitalis, and it is best on the hillside. It has become a weed, and a pest to the farmers on the hillsides of Washington. How can a grower elsewhere compete with that digitalis? When they write to Dr. Stockberger from different parts of the country, he can say to the people in the South, "Yes, you can raise camphor; you can raise so and so down South, but do not trouble about drug plants that grow best in the North." Locate the part of the country where the plants will or do grow, but do not try to raise plants where they do not want to grow. To study the parts of the country where these drugs can best be used and where they will grow naturally will be a great help. I believe that is one of the opportunities in the direction of raising drugs, and there will be found a place in the United States where they can raise henbane but we must find the best locality. Mr. Fuller is the man who can make a success of drug growing. Manufacturers can hire trained men to go to the field, and keep an account of the expense, and probably supply themselves, and be sure of a supply for years to come. But Mr. Fuller, as I understand it, is in the commercial side of the business and he will make a success of it. He is the man who may sometime have a digitalis field out in the State of Washington, a senega field in Wisconsin and a hemp field in Kentucky; just as canners locate their different plants in the sections of the country best suited for growing their supplies.

To this I will add that when I entered the room at the meeting of the American Pharmaceutical Association (1888), in Detroit, Dr. Charles Rice took me by the arm and said: "Lloyd, I want to show you something that is of exceptional interest." He took me to the part of the Exhibition Display, and introduced me to Mr. A. M. Todd, of Ottawa, saying: "Lloyd, I want you to study this peppermint display. Mr. Todd is on the right track. He will make a success of peppermint growing, thus giving to America another home production, improved by cultivation." For several successive years thereafter, Mr. Todd corresponded with me on the subject of the peppermint problem, sent me specimens of the oil, as well as of the menthol obtained therefrom, finally making a magnificent success of the peppermint industry. Now to the text. If these experiments had been made in an inhospitable country, soil and climate, utter failure would have resulted. A magnificent opportunity lies before America, by reason of the fact that we have in America every climate, soil and condition necessary for the introduction of all that America needs;—mountain, valley, rich woodland and desert are at our command. And, all America will profit by such wise guidance as Dr. Stockberger offers and Dr. Fuller supports.

L. E. SAYRE.

I have been obliged to depend upon the United States Government and upon the gentlemen who have interested themselves in raising medicinal plants, in order to get authentic material for experimental work, and I want to say one of the best things which the United States Government has done with regard to that has been to stimulate an interest in this subject and to give us, who are in the educational institutions, material which we can operate with.

Do not be discouraged if ninety-nine percent are failures. I heard a paper read by one of the best business men in the country the other day in which he said that from seventy-five to ninety percent of the business men were failures, and he proved that by statistics. Nevertheless, do not be discouraged. I advised a young man to raise golden seal some five years ago, and to-day on a half-acre farm he is making two thousand dollars a year.

W. W. STOCKBERGER.

I wish to say one more word, I think we must protect from the results of their ignorance the impecunious man or woman who can not afford to invest even five dollars in a small quantity of seed and then get nothing from it. On the other hand, it is the duty of the educational institutions to carry out experimental work in their drug gardens since the facts secured will ultimately have great value for the people in the locality where the garden is located, and thus a double purpose will have been accomplished. I should like to see a great big drug garden in connection with every School of Pharmacy, and to act on Dr. Lloyd's suggestion and begin to work out individual problems. Nobody will try to rob you, Dr. Lyman, of any part of the field of work which you are so splendidly developing and I must say that no word that I have heard for a long time sounds so good to me as Dr. Lyman's statement that the drug garden is the problem of the School of Pharmacy.

WAR EMERGENCY FORMULAS.

Under above caption F. A. Upsher Smith presents, in the *Northwestern Druggist* for February, the timely subject of displacing glycerin and sugar in many of the preparations of the U. S. P. and N. F., and suggests work of investigation relating thereto. The statement made, "that allowing 50 pounds of glycerin and 500 pounds of sugar for each of the 40,000 drug stores per year, we arrive at an estimated yearly consumption of two million pounds of glycerin and twenty million pounds of sugar," is sufficient for emphasizing the possibility of conservation. In the January issue of the JOURNAL OF THE A. PH. A. will be found a related article by Prof. Curt P. Wimmer.

Mr. Smith has brought the matter to the attention of the U. S. P. Revision Committee and the N. F. Committee. A War Emergency Addendum to the *British Pharmaceutical Codex* has been published, containing formulas for the preparations in which glycerin and sugar have wholly or in part been displaced. There are many preparations of the U. S. P. and N. F. in which sugar and glycerin are employed because under normal conditions, no base, solvent or adjuvant is better or more economical; war-time conditions have changed this phase, and the proposition is now presented from the view point of conservation, provided the medicinal value of the active constituents is maintained.

Unfortunately, no one can foretell the duration of the war. France and Italy, before the war, were nearly self-supporting relative to sugar; the United States, Canada and England were importing countries. It has been determined that during this year the United States must cut down its consumption by 15 percent. Relative to glycerin, the situation is perhaps more serious. We lacked in preparedness for the war; we now know that if the war continues the shortage of the two important products mentioned will become more pronounced and presents the timely question of preparation for the emergency. There are question that will be involved in the proposition, namely, official recognition of the *succedenea*, and standards for the same.

The subject should be discussed in Branch meetings, by local associations, and in joint meetings of physicians and pharmacists. Care should be used in selecting substitutes so that no shortage will be created of these products, as this would only be a shift instead of relief.