

has been laboriously brought together by students in other fields ever since pharmacy first became a science.

No one association, representing one of the contributing sciences, and not having its major interest in the field as a whole, can be expected to make the generous provisions, nor offer the broad-minded administration or direction, which such a foundation requires. I believe most emphatically that if the United States is to have an institute of drug research, it should be all that the name implies, and should be controlled, or at least feel the guiding hand of, that group which will finally be obliged to accept or reject and be governed in every sense by its findings.

There is only one organization in the United States which has the broad foundation necessary and is so organized as to contain within its membership students from every associated field. That organization is the American Pharmaceutical Association. It has already asserted its right to be the promoter of drug research and has done more than any other organization of the country toward this purpose by the creation of its research committee and by the establishment of a fund for its development out of the sole earnings of the Association.

This sum might be made the nucleus for a large fund to be obtained by donation from those most interested in the promotion of pharmaceutical knowledge. Much will depend upon the attitude to be taken by corporation members, but the Association should not look to those alone. The interests of the foundation should be the interests of each member, and an investment in the foundation cannot fail to return dividends to all of those coöperating in its creation. Most institutions must have small beginnings, but if it is the will of the members of the American Pharmaceutical Association that the Association continue to recognize and forward research, their determination will result in an establishment which will remain for all time as a monument to the ideals of the Association.

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THE TACK IN THE TIRE.*

BY W. L. SCOVILLE.

This is the automobile age; an age of speed, of rapid changes, of swift development. Five years ago—just a little more than the space of a college course—the world was at peace. The road was clear and smooth and the weather was fine. Riding was good. Then suddenly just around a curve the German machine viciously struck the Belgian car, telescoped it, and rushed into the French car coupled with a low-powered British. These stood the shock without collapsing, but were driven back until the German machine realized that it, too, was seriously damaged. Then began a struggle for the roadway which lasted four and a quarter years, which developed ways and means of powers, of repairs and of efficiency with startling rapidity. And because men of science, of skill, of thought, and of dexterity set themselves wholeheartedly to the task of clearing the road and making it "safe for democracy" the struggle is now over and the rebuilding is begun.

* Read at the One Hundredth meeting of the Chicago Branch, A. Ph. A., February 21, 1919.

But it is a new world. Speed records have been broken, and the speed of living and of accomplishment is advanced. The "flivver" of to-day can beat not merely the star trotter of yesterday in speed but can beat a hundred of him in endurance. Not only speed but the standard of distance is increased.

Now increased speed and longer distances bring new and varied scenes into view. The vision is broadened and the rural fields, where life begins, attract the sight. The world has ridden out into the fields of science, has seen men of science perfect almost in a day the aeroplane, design the tank, evolve means of protection from noxious gases and invent new gaseous poisons, perfect foods, find improved methods of healing wounds and make whole men out of men with parts missing. The world has learned that back of the operators are the scientists who have discovered what and how to operate. That back of the factory is the place of learning, and that the college is but the commencement of learning. That every branch of material things leads back to a small place of experiment, of investigation, of testing and of decision. That science underlies most of the material things of life, and that men of science have played a fundamental and important part in ending the titanic struggle in which the odds were first with the heaviest machine. Science has come to the front, and is destined to wear honor decorations. It will receive new homage and be accorded a new place in the vision of the peoples.

Where will pharmacy come in? Will it get a recognition as a branch of science? Will it pose as an observer or as one of the observed? The answer is not flattering. In the great war struggle pharmacy was classed as a non-essential vocation. It was denied leadership and initiative. Why? Is it not because pharmacy has been riding in the tonneau instead of driving? Because it has been content to be a passenger in the car of chemistry or of medicine instead of driving its own car? There is a world of difference between driving a car and being a passenger therein. The passenger keeps up with the pace, gets all of the view and most of the enjoyment, but the driver picks the road, is alert for obstacles or chances, makes quick decisions and is responsible. He sees less, but he sees the essentials and achieves them. His eyes are always ahead, and he is working with hands and feet and head to get there. He follows or sets the pace as opportunity offers and he is alert to opportunity. And he gets the credit for the pace and accomplishments of the car.

II.

Now under the simile of the automobile I have suggested that pharmacy lacks influence in the scientific and professional world because we have been regarded as adjuncts to chemistry or of medicine rather than as a branch of those sciences with problems and utilities of our own.

We have not impressed the world with the idea that we are a real branch of science, although pharmacy has been an important factor in the development of chemistry and medicine.

Chemistry started in the laboratory of the apothecary, and we are proud of our Scheele and Liebig and those pharmacists of the early days who laid the foundations of chemistry. And medicine too owes a lot to such pharmacists as Sertürner, Pelletier, Goulard and many others who helped to establish therapeutics

on a sound basis. But we cannot live in the past, our eyes should now be to the front, and our pride be delegated to our apprentices. Is pharmacy to be swallowed up in other sciences and lose its identity, or will it find a new place for itself by search—or research? Is there nothing of value to mankind that pharmacy should develop, not already known?

Our Association has already laid the foundation for funds to support research, and other funds are available when the need and the worker can be offered. But research depends more upon a spirit than upon an opportunity. It starts in the mind and the ambitions of men, not in the treasury. And it is fundamentally an individual question. Results will be of collective value, but the initiation of the results must be individual.

A profession is advertised through its leaders, not through the rank and file. So if pharmacy is to become known to the public, it will be through the achievements of its leaders. Affiliations of interests within pharmacy may help to develop leaders, but it cannot create them. Furthermore, the qualities which make political leaders rarely develop scientific leaders.

The development of research in pharmacy must depend upon the few rather than the many: upon those who are interested in the professional and scientific aspects. This means the colleges and a few manufacturers or manufacturing pharmacists. But it is to the colleges that we must look in large measure for research, for not only is the atmosphere of the college most favorable but research is itself a valuable form of teaching. If the research is done by the professor and instructors, the students will get some of the spirit and enthusiasm. But there is also opportunity for research by the students, under proper direction. That they are not qualified for the advanced work is plain, but there are many questions in which student aid is valuable.

In the perfecting of formulas their very inexperience is an advantage. And in the development of facts which require repeated experiments they can do much of the work without sacrificing anything of the educational training.

I have wondered whether the long list of standard preparations and prescriptions which students are called upon to prepare in the college laboratory is wise. Repetition is necessary in education, and each preparation may involve some new or modified principle which is valuable for teaching. But is an exclusive technical training on these lines the most valuable outlook for their future work? Is the trend of the times demanding more training in pharmaceutical manufacturing or prescription practice? If it is not, the question may be asked whether our education has been looking ahead. Whether we have not been so interested in the history and development of pharmacy that we have forgotten to prepare for its future. Whether our attention has not been too much to the satisfactions of the past, and not enough to future developments.

Labarraque's Solution, for instance, has been a familiar preparation for many years, but no pharmacist thought—constructively at least—that its caustic properties prevented its development as a therapeutic agent. When an urgent need for such a preparation sprang up, the problem of adapting it to its purpose was not beyond the ability of some of our students.

There has been a great development in iron preparations in recent years,

but whether the popularity of certain forms, as Blaud's pills, is due to an advantage in that particular salt of iron or mainly to its chemical sensitiveness, as contrasted with more stable salts of iron, has not yet been shown. Are still more chemically-active forms of iron available which have not yet been tried out?

Have we been too empirical and superficial in our pharmaceutical problems?

When the war demanded almost our full resources of glycerin, and the question was asked whether pharmacy could not reduce its use of this article, who was in a position to pass sound judgment on the question? Who knows what is the real function of glycerin in pharmacy? That it hinders or prevents precipitation in many preparations has been repeatedly observed. But whether it owes this property to its solvent action or to a protective quality has not been determined. If its chief value in pharmacy is as a solvent, then it is a necessary adjunct. But if it acts as a protective agent, preventing oxidation or reduction, or simply increasing density, then there are other and more economical agents which can take its place. We have been far too content with the observation of results, and too little concerned with the principles by which the results are obtained, and so we lack a scientific foundation upon which to build our applications.

The wave of prohibition now just commencing finds pharmacy ill-prepared to judge just how important is alcohol in medicinal preparations. We know how much is needed to prevent fermentation, and how much is required for extraction and reasonable permanency in solution, but the function of alcohol in preventing chemical and therapeutic deterioration is yet but little understood. Yet this is one of its most important functions. Modern pharmacy is very largely a development from the infusions, vinegars and wines of the older days to the more permanent and reliable alcoholic menstrua of to-day, and we should be qualified to give a better answer to-day to the questions regarding the necessity of alcohol in medical preparations, entirely aside from its therapeutic value, than we are now able to give. And because we lack much of specific information in this regard we are threatened with a return to obsolete and unreliable medication through the zealous efforts of prohibitionists. We need to appreciate more the value of alcohol in preserving medicinal activity as well as in preventing putrefactive changes and precipitation, aside from its solvent function.

The medical agents of the future must be more reliable than those of the past or present. Standardization must grow. There are still a number of alkaloidal drugs and preparations in the Pharmacopoeia (as Lobelia, Veratrum, Gelsemium, Sanguinaria, Gossypium, etc.), for which no assay process has been evolved that is satisfactory. The time will come when cathartic drugs, astringent drugs and the bitters, and their preparations will be standardized. Reliability is the watchword in pharmaceuticals.

Pepsin is now standardized, but little attention has thus far been paid to the reliability of liquid preparations of pepsin—in which form by far the largest quantity of pepsin is administered.

The above are but suggestions. There is no lack of subjects for research in pharmacy, some fundamental and some perfective. And the variety is sufficient to furnish work for several grades of equipment and training.

III.

Research is primarily an attitude. It is a search for the undiscovered. An interest in the future.

Education is the development for the future. It implies instruction in the arts and sciences of the present and a preparation for that to come. An education which covers thoroughly instruction in past and present conditions but neglects questions as to the future, lacks virility. It is interesting but not progressive. It may make animate encyclopedias but it cannot claim credit for constructive men.

Is not this the main difficulty in our pharmacy schools? Men and women are graduated who understand the whys and wherefores of the pharmaceutical art and science of the past, but who have no definite idea of the tendencies and needs of the future. Pharmaceutical operations and preparations are taught as though they were finalities instead of progressive. Labarraque's Solution was a finality for two generations, but when it was found lacking in an important quality it quickly became the parent of a new and modernly useful preparation. And the history of this may be paralleled by many other pharmaceutical preparations in the future. For if pharmacy has attained to the limit of perfection even in standard preparations, we must soon prepare for the obsequies. But it is for us to say whether pharmacy is senile or is still growing.

Does it make no difference in teaching the subject of pills, for instance, whether we simply teach three forms of pills—hard, friable, and soft mass—and several forms of coatings, as though it were all merely a matter of choice, or whether we begin with the hard-mass pill, and develop it through its series of coatings, designed to prevent taste, then come to the friable pill, developed to improve solubility, and then discuss the soft-mass pills as a further evolution, and finally leave the student with the question in his mind, evolved rather than suggested, whether we have yet attained the possible perfection of pills? Would it be any better pedagogy to teach the tincture as an evolution of the vinegar and wine—and possibly of the infusion and decoction—and to point out the constant tendency to increase the alcoholic strength in order to obtain therapeutic stability?

So may all the preparations be presented as stages in the evolution of pharmacy, and an interest in future developments created in the mind of the students. Then after a period of postgraduate practice there might be found less tendency to complain that there is so little use for the science of pharmacy as taught in our colleges, and more interest displayed in using that science for the perfection of pharmaceuticals and the meeting of modern needs.

The business end of pharmacy has developed largely through the incentive to experiment. Old business methods that were good enough for our fathers are not good enough for us, and the proprietor experiments on new methods. Some succeed and some do not, but the essential difference between business and scientific research is that the former brings quicker results. The business man must constantly look ahead, try new things, plan new appeals, hold whatever is good of the old but prove all things. This is essentially the research spirit. Cannot our pharmacy schools fit some of that into the scientific end of pharmacy? Instead of dwelling long and minutely upon the preparations on the lists, preparing a large number of them in the laboratory, and creating the impression in

the mind of the student that the preparations of a generation ago, still in demand, are typical of to-day, should we not devote less time to the details or modifications of pharmaceuticals and train them a part of the time through experimenting on improvements or on new things? What they may discover will be of far less value than the inquisitive mind and the forward look which they may develop. To graduate them with clear and definite ideas of the imperfections and possibilities of their profession is to create a new courage and determination to improve it.

If research is to develop in pharmacy it must derive its spirit from the colleges. What research the professors and instructors, with or without the help of students, can do will be valuable. But beyond that the manufacturers and institutions must look to the colleges not only for the training but for the scientific spirit. So must we have the research spirit before the research laboratory. The latter will come after the spirit is shown to utilize it. When a single individual responds to the need for a local new college building with a construction and equipment aggregating nearly a million dollars, it is plain that an equal need for an institution of more than local need must only be recognized to be met. But recognition includes a preparation for its use as well as a use for its results.

IV.

There are two incentives to research. The desire for discoveries that shall bring direct financial results, and for discoveries that shall be of permanent service to our vocation and the world, and shall bring us satisfaction.

I suppose that in all cases of research, both motives exist, but one will predominate in any given case. Both motives are desirable. The commercial motive in its pure form tends to obtain and apply results quickly, but it inclines to be satisfied with results that, though superficial, meet present conditions. The altruistic motive aims further, but tends to supersatisfaction with discoveries already made and to accept as final whatever seems good from an altruistic standpoint. Each motive is impatient with the other. One is too eager for the new, the other too content with present foundations. One tends to develop greed, the other pride. But neither greed nor pride are a sound basis for progress. And since human nature tends to one or the other, counteraction is desirable.

This is the essential difficulty with the special research laboratory. It usually demands the right to pass final judgment on questions which it has worked out, because its results are "scientific." And finality of judgment is more often the foe to progress than may seem.

Judges in law are trained to weigh evidence and decide on the merits; and they find it easier to weigh than to get the full evidence. So in science. We need all the incentives to get full evidence before we can come to sound and lasting judgment. "Impartial judgment" is an attractive phrase, but it more often means impatient than impartial. It inclines to base judgments upon present knowledge, pride and prejudice rather than upon all possible evidence. To give undue weight to what is known and to refuse it reasonable limitations.

Thus even in research, we need the stimulus of rivalry and opposition to secure fairness. It is but human to search out the evidence that justifies our bent, and to be content with that.

So if special research laboratories are to be established for the working out of Pharmacopoeia and National Formulary problems, or for coöperation in commercial problems, these should not be made final. There should be other courts of appeal. Altruistic labor has this advantage, that while it is usually less thorough in its work, it is more open in its acceptance of evidence.

The special and the coöperative research laboratories are very desirable. We can accomplish much through them. We should not distrust them nor cultivate a critical spirit, but we must not lose sight of the fact that science is the interpretation of known facts, and that all facts are not yet known, and that interpretations may not be infallible.

Commercial laboratories are doing much of unselfish altruistic work in research, and college professors are not lacking in sympathy and understanding of commercial conditions. This favors coöperation. It is a factor which the technical industries are beginning to develop systematically. Technical students are being delegated to industrial shops for a part of their college course, such experience being a part of the curriculum, required for graduation. And the industries are turning over some of their problems to the college laboratory for research. Such conditions are to be encouraged.

We shall arrive at more satisfactory and lasting conclusions by developing both motives in research than by trying to establish a single laboratory, however well equipped with men and tools, which shall pass final judgment on scientific questions.

BALLOTA HIRSUTA, BENTH.

AN ADULTERANT OF HOREHOUND (*Marrubium vulgare* L.).

BY CLARE OLIN EWING AND JOSEPH F. CLEVINGER.

Within the past two years a number of shipments of "Horehound," *Marrubium vulgare* L. offered for entry proved to consist entirely of the young herb of a spurious species, which was identified in this laboratory as *Ballota hirsuta* Benth. This finding was announced in Service and Regulatory Announcements, Chemistry 20, Item 212(1917), although no details were given, since at the time the Bureau had not adopted its present policy of including descriptive paragraphs regarding adulterants found in crude drugs. More recently there has come to our attention a shipment of horehound in interstate commerce which proved to contain approximately 25 percent of material from this same species. A sample was referred by the commercial firm interested to a consulting analyst, who erroneously pronounced it to be *Ballota acetabulosa* Benth., and not *Ballota hirsuta*. The two species resemble each other closely, and both so nearly resemble true horehound that it is not easy to point out striking macroscopic distinguishing characteristics, which are especially difficult to detect in the dried and crushed condition in which the material is imported. In view of the instance of confusion of the *Ballota* species above cited, as well as because of the substitution of a spurious product for horehound, it is thought that a brief statement of the chief differential charac-