ON POPULARIZING SCIENCE.

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The Constitution of the Illinois State Academy of Science provides that it shall be one of the duties of the President to prepare an address to be delivered before the Academy at the Annual Meeting. This provision undoubtedly contemplates an eminently scientific paper on some subject of absorbing interest but since no penalties are provided for a failure to comply with this regulation, I feel that I may safely disregard the specifications in the present instance and spend a few minutes in discussing a matter which, though not strictly scientific, is, in large measure, a subject that concerns both the scientist and the public.

My thesis is that not enough is being done by the scientist to popularize science and the study of science. Of so-called popular science there is no end, but most of this is mere talk about science; information derived from others and passed on to third persons. Real students of science are rare. Every teacher knows how lamentably few of his students continue the subject after the course is finished unless, perchance, the information so secured may be used later in making a living. What is needed is to arouse an interest in, and a love for, scientific study at first hand.

The scientist carrying on investigations which he feels are sufficiently valuable in themselves, rarely feels called upon to make his problems intelligible to the general public. Frequently he has not the time or the opportunity even if he has the inclination to do so. In return the public is prone to think that science is the province of the super-individual and quite beyond ordinary comprehension. Though an occasional investigator may be attracted to scientific things, the majority do not know where or how to begin. Much as they would like to understand and enjoy, they can only wonder and speculate.

The stirring of the scientific instinct may often be observed in the collecting of shells, minerals, plants, bird's eggs, and even buttons and tobacco tags. This interest can, and should be, directed into useful channels before its pos-

sessor concludes that the only worth-while collection is a collection of the "coin of the realm." When I recall that one of our foremost conchologists was a grown man before he knew one shell from another, and that a certain excellent botanist was more than fifty years old before he began his studies, I can imagine that many an enthusiastic student has been lost to science for want of somebody to set his feet in the right path.

Nor is the attempt to spread a wider interest in science of benefit only to the beginner. A better informed public may be depended on to aid even the advanced scientist in his work. In all problems that depend on the securing of data from many and widely separated observers the co-operation of the public is invaluable. Such problems as the range of species, the migration of birds, the spread of the boll weevil, of the chestnut blight, and the corn borer, as well as extended phenological investigations must depend on help of this kind for solution. And if such considerations are not convincing, there is still the matter of funds for salaries and research, which aid, coming largely from an appreciative public, is likely to be proportionate to the interest aroused.

Practically all the advances toward a healthier and happier existence have come through the efforts and discoveries of the scientist but without support from an intelligent public such advances may be greatly delayed or even frustrated. We have not yet passed the stage in which our streams are polluted, our forests mismanaged, our timber wasted, and the range destroyed. Floods thus become increasingly destructive, disease may spread unchecked, and beautiful scenery, the heritage of every citizen, obscured by ugly bill-boards, or defaced by hot-dog stands and filling stations.

Unless one makes a special inquiry into the matter it is impossible to realize how abysmally ignorant of the fundamentals of science the average individual is. As a matter of fact, he rarely distinguishes between the real scientist and the adherents of a sect whose doctrines, however, worthy of admiration they may be, are, of all things, the least scientific. The public's knowledge of science is likely to be of the kind referred to by that homely philosopher,

Josh Billings when he wrote: "It is better to know less than to know so much that ain't so."

So far as science is concerned, a large part of the public is still living in the Dark Ages. In spite of St. Paul's adjuration to "Prove all things and hold fast that which is good" it inclines to the other extreme and giving up its natural right to think, listens to the voice of "Authority" —that voice which, according to H. G. Wells, made itself so clearly heard in the early centuries of our era as to obfuscate practically all knowledge and intelligence for nearly a thousand years.

It is probably no exaggeration to state that fully half of the people still believe in miracles; not the miracles of Bible times, but present day miracles in which some natural law is contravened on special occasions or for special purposes. How else can one explain the custom of wearing a string of amber beads for the cure of goiter, the tying of a red thread around the neck to stop nosebleed or the various incantations for charming away warts?

It is true that we have pretty generally abandoned a belief in the power of fern-seed to make one invisible, or in the mandrake which was reputed to emit such shrieks on being pulled from the ground as to make everybody within hearing, mad. But Paracelsus' "Doctrine of Signatures" still has its votaries and in out-of-the-way places people still plant in the sign of the moon, believe in the power of a forked stick to locate underground streams and buried treasure, and assume that it is necessary to mutilate a crow's tongue in order to make him talk.

Even in less remote districts, people hold a respectful attitude toward ghosts, witches, fortune-tellers, charms, signs, mascots, and the revelations of the ouijaboard. And still more scientific folk have been known to carry a horse-chestnut or a small potato in the pocket as a charm against rheumatism and for all I know may still place absolute faith in a small bag of asafetida worn around the neck as a protection from any kind of an epidemic. We smile at the Hopi Indian's snake-dance for the purpose of making it rain and then raise a fund for some pretentious aviator to bombard the clouds on our own account.

The public is not entirely to blame for its beliefs, for it has been somewhat unfortunate in its guides and teach-

ers. The modern agency from which most of us derive an idea of matters outside of our immediate cognizance—the newspaper—is, in matters of science, about of the time of Aristotle. Newspaper science is "fearfully and wonderfully made." Usually it is incorrect and frequently wilfully misleading. The callow reporter, an entire stranger to scientific method, and often others not so callow, is impressed by the marvellous or what appears to him to be the marvellous. Not satisfied with things as they are, he must ever dress them up in a garb of "human interest." Thus it happens that he places great stress on such horrendous things as man-eating trees, plants that have the power to foretell earthquakes, plants that cough, or get angry, or exhibit indications of cerebration that none but the higher animals possess.

It has often been said that if the daily press devoted as much space to science as it now devotes to sports, the scientist and all his works would come into their own—but not if the cub reporter conducted the science page. Though science should become as popular as short skirts and bobbed hair, it would still be the kind of science which we enclose in quotation marks so long as it concerns a fairyland in which the birds, flowers, trees and wind hold converse and the universe is pictured as an elderly dame called nature. It is perhaps too much to expect that the newspapers will do much for science of their own accord. The subject lacks the spectacular, offers no very definite field for exploitation, and does not contribute to the gate receipts.

For a time it was hoped that the introduction of science into high school curricula would largely increase the interest in things scientific, but this does not appear to be so at least in the case of the "natural sciences." The restriction on time and material necessitated by class-room study, the emphasis placed on drawing and note-book making, the disassociation of the objects studied from their natural environment, the use of pickled and preserved specimens and the insistence on the ability of the student to repeat the words of the text have all served to dampen enthusiasm and curb curiosity. It is no longer fashionable to know the animals and plants in their haunts. The science of biology has pressed on into new fields and the young student of the

present frequently has a better knowledge of his specimen's interior than he does of its exterior.

Doubtless the scientist will concede without argument, most of the statements here made, but he may ask how matters can be remedied. To such a question I must answer that I do not know, else I would be talking of cures instead of symptoms. After trying to popularize science on my own account for more than a quarter of a century without very encouraging results, I hesitate even to make suggestions. I am convinced, however, that meetings such as these may be made to go a long way in arousing enthusiasm in the beginner. To accomplish this, it seems to me, we shall have to put greater efforts on making our scientific papers intelligible. Perhaps we shall have to divide the time between papers designed for the edification of the advanced scientist and others intended to attract the non-scientific, but if we do, it will be well to remember that we cannot make these latter too elementary.

In order to make better progress, the scientist, no matter what his field, will have to take the public more into his confidence. Even at the risk of seeming to court the limelight, he will be obliged to crowd the science reporter out of the local papers—or reform him. Publicity such as that which made the little town of Dayton famous is not desirable, but propaganda that will establish science in its rightful position before the public, is necessary. Not until a majority of the people in a given region attend the meetings of the Academy and similar societies will science have reached the prominence to which it is warranted in aspiring.

In recent years, the working people have been favored with greatly shortened hours of labor and thus an increased number of people have time to take up scientific studies. We should not let the auto, the radio, the movies, and sports, engross, entirely, the attention of this new aggregation of prospective investigators.

Nor does the desire to interest these and others in our work spring from any hope on the part of the scientist for additional honors or greater veneration. It is prompted solely by a sincere desire to bring to the masses a more worthy way of spending their leisure, to give them a deeper appreciation of the world we live in, and by advancing science promote a safer, saner, and more satisfactory existence.