As a teacher, Professor Gibbs is said to have possessed great originality and to have inspired all who came under the spell of his genius. In his classroom there were often revealed

> Rich stones from out the labyrinthine cave
> Of research, pearls from Time's profoundest wave
> And many a jewel brave, of brilliant ray,
> Dug in the far obscure Cathay
> Of meditation deep . . .

The late Professor Bumstead, who was among those privileged to study under him, writes:

> Although long intervals sometimes elapsed between his publications, his habits of work were steady and systematic; but he worked alone and, apparently, without need of the stimulus of personal conversation upon the subject, or of criticism from others, which is often helpful even when the critic is intellectually an inferior. So far from publishing partial results, he seldom, if ever, spoke of what he was doing until it was practically in its final and complete form. This was his chief limitation as a teacher of advanced students; he did not take them into his confidence with regard to his current work, and even when he lectured upon a subject in advance of its publication, the work was really complete except for a few finishing touches. Thus, his students were deprived of the advantage of seeing his great structures in the process of building, of helping in the details, and of being in such ways encouraged to make for themselves attempts similar in character, however small their scale. But on the other hand, they owe him a debt of gratitude for an introduction to the profounder regions of natural philosophy such as they could have obtained from few other living teachers. Always carefully prepared, his lectures were marked by the same great qualities as his published papers and were, in addition, enriched by many apt and simple illustrations which can never be forgotten by those who heard them. . . . No student could come in contact with this serene and impartial mind without feeling profoundly its influence in all his future studies of nature.

As a man Professor Gibbs was singularly retiring. With the exception of those few years spent as a student in Europe, he lived quietly during the academic year in New Haven and passed his summer vacations among the mountains of New Hampshire. He never married but made his home with his sister and her family. Professor Gibbs was unfeignedly modest with regard to his achievements, so much so, in fact, that those who were nearest to him believe that he failed to realize his remarkable mental endowments. He never permitted the importance of his scientific work to interfere with the most trivial duties as an official of the college, and he was ever ready to give generously of his time to those of his students who came to him for advice or assistance. In looking through some of his correspondence recently, a member of his family was particularly impressed by the patience he displayed in endeavoring to help those who were victims of some scientific delusion. In several instances he carried on lengthy correspondence with such people, even though they might not be open to conviction, in the effort to point out where their fallacies lay. Ex-president Hadley said of him, "his plain way of seeing straight where other people's preconceived ideas compelled them to see crooked was characteristic of the man and of his work from beginning to end." In a review of his collected papers which appeared in the *Nation,* the opinion was expressed that "Josiah Willard Gibbs advanced science the world over more than it has ever been given to any other American researcher to do," while one who knew him intimately said of him, "the greatness of his intellectual achievements will never overshadow the beauty and the dignity of his life."

> Wherever he be flown, whatever vest
> The being hath put on which lately here
> So many-friended was, so full of cheer
> To make men feel the Seeker's noble zest,
> We have not lost him all; he is not gone
> To the dumb herd of them that wholly die;
> The beauty of his better self lives on
> In minds he touched with fire, in many an eye
> He trained to Truth's exact severity.

FREDERICK H. GETMAN
STAMFORD, CONNECTICUT

MEDICAL RESEARCH

MANY of the less reputable characters of history have found charitable interpreters in our time. M. Anatole France, for example, put the case for Gallio in a very favorable light. But Gallio's contemporary, Simon, alleged to have been a sorcerer but perhaps only a psycho-pathologist with a *flair* for promising therapeutic improvements, remains proverbially infamous. Yet, on the evidence, it seems that Simon was treated a little harshly. He appears to have made to the Apostles a proposition which would surely have seemed neither novel nor heinous to the Academic Registrars of the schools of Athens or Pergamos. One wonders what Peter would have said if Simon the magician, instead of merely offering the Apostles a fee for a course of lectures, had invited them, for a substantial consideration, to devote their entire energies to research into one problem of psycho-pathology named by himself. This at least is certain, that any such proposal in the twentieth century would be welcomed by a large majority of the general public and an important minority of the medical profession as a praiseworthy, public-spirited action to which the offensive word "simony" could not possibly be applicable.

The fact is that a great many sensible and honorable men act as if they believe that "the gift of God may be purchased with money," because this, like most false doctrines, contains an element of truth. The element of truth is plain enough. He who is inspired by a Daemon, can not deliver his message, if his bodily needs are not satisfied. It is rank simony—besides being ridiculous—to believe that the offer of a prize of a million will cause a better play than "Hamlet" to be written or finer researches than those of Pasteur to be accomplished; it is not simony but elementary common sense to believe that a nation which condemns poets and research chemists to hopeless poverty is unlikely to breed Shakespeares and Pasteurs.

These considerations are so obvious, their application in the field of art and literature, to *that* manifestation of the Holy Ghost, so universally admitted, that one must suppose the would-be purchasers of discoveries in the field of medicine do not really understand that the operation of the spirit there is comparable with that of the literary or artistic daemon. Perhaps the reason is that no general readers and very few medical men have any sense of the secular continuity of research and its applications. It is not, generally speaking, true that either the rise or decline of a great killing disease, such as tuberculosis or cancer, exhibits discontinuities certainly referable to some one factor. In the popular sense of the words, there is no disease the "cause" of which is more exactly known than tuberculosis. No scientific communications were ever more exact and complete than those in which Koch described and defined the "cause," the living germ, which is responsible for the morbid changes. One might expect—to judge from popular utterances—that failing a knowledge of the "cause" we should be powerless and having such knowledge, omnipotent in our struggle with tuberculosis. An examination of the annual rates of mortality over the last seventy years dispels any such illusion. The discovery of the "cause" has neither accelerated nor slackened the rate of decline. Bubonic plague, again, ceased to be a prime cause of mortality in this country rather more than 200 years before its "cause" was known; knowledge of its "cause" has not enabled us to conquer it in British India. Scarlet fever is (at present) a small factor of mortality, although its "cause" is unknown. Diphtheria, on the other hand, is an important means of death, but its "cause" has been isolated and exactly studied.

From these facts we may infer that the "cause" of a disease, in the popular sense, is but an incident of research, not the goal of a natural philosopher. The professed enemies of research have indeed inferred from some of these facts that laboratory investigation is worthless and, in drawing that inference, have been as illogical as the enthusiasts who conceive medical research as a true adventure of Sherlock Holmes. If instead of reading *about* the work of great investigators we studied the classics of the science themselves, we should find that the great men never expected to pass at once from the isolation of a "cause" to the conquest of a disease—another overworked metaphor of popular medicine. The importance they attached to the discovery of a "cause" was the power it conferred of simplifying the conditions of study, of making it possible to imitate the operations of nature under controlled conditions. We may freely grant that, in fact, at the present time, scarlet fever is a much less formidable disease than diphtheria, although sixty years ago it was probably a more serious disease and that laboratory research has, so far, given us no aid in the struggle against scarlet fever. Even so, in a very real sense, the terrors of scarlet fever are greater than those of diphtheria. The reason is this. The simplification of the issues which the isolation of the bacillus of diphtheria permitted, the consequent possibility of an experimental study of means of immunization, has given us a method of prophylaxis which, however far from perfection it may be, is demonstrably efficient, so efficient that we may be absolutely certain that such rates of mortality as were not uncommon 100 years ago in large populations will never again be seen in a civilized country. We can make no such confident prediction regarding scarlet fever, we have *no* experimentally suggested prophylactic, good, bad or indifferent. If the type of that disease changes again—200 years ago, in Sydenham's day, it was as mild as it is now, sixty years ago it was one of the great killing diseases of childhood—we shall not be much better off than in the influenza epidemic of 1918 and for the same reason. The instances of anti-typhoid inoculation within the sphere of prophylaxis or of salvarsan, within the field of personal cure, are similar. The epidemiological problems neither of the enteric fevers nor of syphilis have been completely solved by the isolation of the "cause," but in each case the isolation has led to a sensible diminution of human misery. But that the isolation of a "cause" shall in fact lead to a right use of the means of discovery which the isolation has rendered possible, another condition must be realized—there must be a man of genius fit to use the tools placed in his hands. It was not the discoverer of the "cause" of enteric fever who devised the vaccine; Ehrlich did not discover the parasite of syphilis. Lister's work would have been impossible without that of Pasteur, but Pasteur could not have done what Lister did. Everybody, I suppose, realizes the greatness of both Pasteur and Lister; nobody wastes time in disputing which was the greater. In the achievement of any great thing many have cooperated; it is

certain that both Lister and Pasteur would have recalled to our memories many names of men, their intellectual peers, who had a part in the work which we associate with them alone. If we consider only the men prominently associated with the advance of knowledge, of research into the etiology, prevention and treatment of some disease with respect to which we have been successful, we shall rarely, perhaps never, be able to name *one* man who deserves the lion's share of credit. In the history of research into typhoid fever, a glorious history, the names of Budd, Pettenkoffer, Eberth, Klebs, Gaffky and Almroth Wright, stand out. They were men who all greatly surpassed the normal standard of intellectual power, but were trained in different schools, and reached their several ends by different means; all were great investigators, not one was a sleuth hound who, having dramatically arrested the villain of the typhoid mystery, received the reward offered by a medical Scotland Yard.

It is just as futile to offer prizes for specific discoveries in medicine as to offer rewards for the composition of tragedies. Perhaps it is more futile, since the cooperative element in scientific discovery is more prominent. The recognition of that element has induced some to think that while it is wrong to attempt to purchase individuals it is right to try to purchase groups. We hear much of the need for team work. But the success of team work in matters of the spirit depends upon the willingness of individuals to act as a team. Even at football, I have heard, one can not manufacture an invincible eleven by bribing star players to form a side. To the business organizer of scientific victories it might seem obvious that the united forces of the best clinician, the best bacteriologist, the best biochemist, the best epidemiologist and the best men in a dozen other specialities, mobilized on the cancer front, would speedily conquer that redoubtable enemy of the middle-aged and elderly. But unless it can first be shown that all these star performers wish to abandon the investigations in which, by definition, they are successful, and are able to work in team, the obvious expedient begins to look very much like the sorcerer's heresy, to be another effort to purchase the gift of God with money.

One is, therefore, led to state certain facts and to base upon them certain principles.

The facts are that no great discovery stands alone and no important advance in medicine has been the result of working with a single intellectual tool. Upon these facts, we ground certain principles, or rather one general principle. It is that the endowment of research, the general support of all who approve themselves worthy to extend the bounds of knowledge in *any* direction, should be a rule of policy, both personal and collective. The rule of Looking-Glass Garden, that if one wishes to meet the Red Queen one walks the other way, holds in other gardens; its meaning was familiar to the psychologist who said that "the foolishness of God is wiser than men; and the weakness of God is stronger than men." It has been the rule of the most successful endowment of research England has yet seen, that administered by the Medical Research Council. If A. B. submits a program of research which, he conceives, will throw some light upon the etiology of acromegaly, let us say, and the council are satisfied that he knows what he is talking about, they do not say to him, "You are evidently an able young man and your idea is good, but acromegaly is a rare disease and kills its units, while cancer is a common disease and kills its thousands, if you will turn your attention to cancer we will give you twice the grant you ask." They do not presume to control the operations of the human spirit; they know that it is quite possible that a research into acromegaly may teach us more about cancer than a specific inquiry into cancer. The wise old physician who endowed the best scientific foundation of Oxford did not insist that his traveling fellows should study any particular thing; he wished them to study and that was enough.

Those who demand that more money should be devoted to research in one particular field, that more attention should be devoted to influenza, to cancer or to some other particularly important matter and sneer at the allocation of grants for "academic" investigations have forgotten this principle and are in danger of the judgment pronounced upon Simon the sorcerer.

MAJOR GREENWOOD

HILLCREST, CHURCH HILL,
LOUGHTON, ENGLAND

THE CONSERVATION OF MARINE MAMMALS

THE killing of extraordinary numbers of whales from shore whaling stations in different parts of the world during the past few years through the use of improved modern weapons and means of transportation seriously endangers the future of these animals. This situation, coupled with the knowledge of what has occurred in the past to seals, sea elephants and some other marine mammals, has drawn attention to the urgent need of taking steps to bring about proper conservation of all the existing valuable sea mammals.

In the United States, the most active organization gathering and disseminating information on the subject is the Committee on Conservation of Marine Life of the Pacific Division of the American Association for the Advancement of Science, under the leadership