

# THE INQUIRING MIND

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**How are we doing in the fields of science and technology today?  
Have we properly visualized our task and our goals? Are we putting  
first things first? Do we even know which things ARE first?**

IN 1798 A MONK by the name of Thomas Robert Malthus published a paper with a long and complex title which attempted to analyze man's future on this planet. Examining past experience and bringing to bear on this experience the brilliant logic of an analytical mind, he came to some rather dire conclusions about the future. It was quite obvious to him that men had to eat; that the only major source of food was the arable land; that the area of such land was limited. Therefore, there was a limit to the potential food supply, and hence to the population that could exist on the earth.

On the other hand, he noted that the human population tended to grow at an ever-increasing rate. Any sort of voluntary birth control, it seemed to him, would be either unnatural or immoral. Therefore, the only possible future was one in which the population eventually outgrew the food supply, and thereafter death by starvation, disease and war would take over to balance a birth rate which knew no control.

Clearly, a world in which most of the people would assuredly die of one of these causes was not a very pleasant one to contemplate.

However, here we are 156 years after the Malthusian prediction, and the portion of the world that we live in does not face the Malthusian death sentence. Our population is expanding at a rate never dreamed of in Malthus' time. There are four times as many people on the earth now as then. At the same time, here in the United States at least, we have far more trouble with food surplus than with shortage. We buy potatoes and dye them blue, butter and let it spoil, wheat and give it away, in our desperate effort to avoid the economic consequences of growing more food than we can eat.

Surely Malthus was the most mistaken man in history. Or was he?

Actually, as Harrison Brown points out in his recent book (from which I shall now borrow heavily), *The Challenge of Man's Future*. Malthus' reasoning and logic were entirely correct. His only misfortune was that his observations and assumptions were later rendered obsolete by unforeseeable new developments. What were these new developments? They were of two kinds—technological and social. On the technological side men learned how to raise more pounds of food to the acre, learned to get more nutritive value to the pound, and learned how to transport food quickly from areas of surplus to areas of shortage. On the social side, great segments of the human race came to regard voluntary birth control not as a sin but as a virtue.

Now I think it is quite evident that without this latter factor—voluntary population control—the Malthusian disaster can be only postponed, and not finally prevented, by any advances in technology. We must admit that the supply of land is limited, that the productivity of land can *not* be expanded beyond all limit. But population, if not controlled, does expand without limit, and sooner or later—in 50, 250, 500 or 5000 years—a population which is doubling every 75 years or so is bound to outrun any given food supply.

This makes it clear that the primary need of the world is to insure that in all parts of it the population recognizes the need for growth that is controlled by voluntary action rather than through starvation. Clearly, this is not primarily a job for science and technology, but rather for education.

But science and technology do have some terribly important tasks to perform in this field. First, there is the task of improving the technology of producing, processing and preserving food so that the food supply will keep pace with population for the 25, 50 or 100 years

required to complete the educational job. Second, there is the task of improving standards of living over a larger part of the world—for increased education goes only with increased living standards and increased disposable wealth. Finally, science and technology have the task of providing the necessary tools so that any segment of the population that has overcome the starvation limit can then proceed to help men and women lead happier and richer lives.

Now I claim that these constitute quite substantial and immensely challenging tasks. Another way of expressing them is to say simply that if men are to attain those social, moral and spiritual goals which we of the Christian nations believe desirable, then science and technology must provide the physical tools to make their attainment feasible.

This being about as important a goal as I can think of, it behooves those of us who are working in the fields of science and technology to ask ourselves how we are doing. Have we properly visualized our task and our goals? Have we properly analyzed and evaluated the steps which need to be taken, the prerequisites for progress? Are we putting first things first and do we know which things *are* first? Are we creating within science and technology itself, and within the community at large, the conditions most likely to nurture progress and success?

Now it would be presumptuous of me to attempt to answer these questions or to try to solve the problems they suggest. But I can presume to raise the questions and ask you to think about them, in the hope that if enough people think about them, we may some day get them answered.

### The goals we seek

It seems to me obvious from the way in which I have stated the problem that it is important that we keep in mind the goals we seek. As I have suggested, these goals are not merely more food, more products, more gadgets. Our goal in the last analysis is a moral goal—more happiness for individual human beings, expressed in whatever terms their own philosophy of life dictates.

I emphasize and repeat this matter of ultimate goals precisely because it is so obvious to us that it is often forgotten. We become so absorbed in our gadgets, our machines, our new foods, new medicines, our new weapons, that only too often we think of them as ends in themselves—forgetting what they are *for*.

Now if we ourselves—if we scientists—forget the ends in our absorption with the means, that is bad enough; for then our work loses its meaning. But it is even more dangerous if we let the public believe that our machines and our mechanisms are ends in themselves. For then our work, which in the end depends upon public support, will surely be destroyed. And it will be destroyed by the public even though the public itself, rather than the scientists, would be the principal losers.

Let us bring this closer home. It is a paradoxical

fact that, in these days of the mid-20th century, science and technology are being simultaneously praised to the skies and damned with religious fervor; they are being handsomely supported and heartily kicked. Scientists are publicly acclaimed as a group and privately slugged as individuals.

Why is this?

Clearly, we have not told our story adequately. Our physical achievements are evident. But, because they are physical, we are accused of being materialists. Because the tools of science are powerful, their power is feared and those with the power are suspected of evil motives. Because weapons have been produced to help men fight in their own defense, it is assumed that they also make men *want* to fight. So we see that as we brag about our knowledge but are silent about our aims, then the public will come to ignore our knowledge and denounce our aims.

### What scientists work for

So my first plea is that scientists shall throw off their reticence in speaking of their feelings and come out boldly and unashamedly to say, "We are working for the betterment and happiness of human beings—nothing less and nothing more."

But, in spite of the romanticism of the poet, we know full well that for most human beings *happiness* is not attained solely by sitting under a tree with a loaf of bread and a jug of wine. And even if it were, someone has to bake the bread and bottle the wine. The poet was right in suggesting that the essential elements of happiness consist of food, shelter, companionship and leisure. He only forgot to mention that these must be achieved by effort, and that the effort itself may bring happiness, too.

In any case, we are forced at once to consider how human effort can be most effectively employed to provide the physical elements for happiness and also the leisure to enjoy them. Nor are we content—as were those of medieval and ancient times—to have *many* people exert the effort and a few people enjoy the leisure. We have proved that *all* may work and *all* may play.

Now what is it that has made it possible for us today to think of a modest amount of happiness coupled with a reasonable amount of work as a possible goal for *all* people, rather than just a few? The answer is, clearly, that a series of *intellectual achievements* have enabled men to enlarge, to expand, and to dream of achieving a moral goal.

What are the intellectual achievements?

I think it is fair to say that the essential cause of the difference in the physical and the moral outlook of the western world in the 20th century, as compared to the 10th is simply that, along some time between those dates, men invented a new process of thinking.

Men had, of course, always thought, always observed, always speculated, always wondered, always asked ques-

tions, always explored. But along about 1700 men began to do these things in a new way. Men began to realize that by making observations carefully and analyzing them quantitatively, it could be shown that nature behaved in a regular manner and that these regularities could be discovered, reduced to mathematical form and used to predict future events.

This was an astonishing discovery. And as this new concept, outlined by Francis Bacon, was pursued—first by Galileo, then by Newton, then many others—a new world of understanding was opened to men's minds. Nature was partly comprehensible, not wholly mysterious and capricious. The falling stone and the moving planets became suddenly not only understandable but miraculously and simply related. Men couldn't *affect* the motion of the planets, but they *could* control the motion of the stone and of other objects.

And so, machines were invented, the concept of energy emerged, steam was put to work—and suddenly, after thousands of years of doing work only with the muscles of men and animals, men found that a piece of burning wood or coal could take the place of many slaves or horses or oxen.

From that time on, happiness and leisure for all men became a possible goal, not a crazy dream.

### A limitless quest

But that was only the beginning. The scientific method led from physics to astronomy to chemistry to biology. A beachhead on the shores of ignorance became a vast area of knowledge and understanding. Yet, as the frontiers of knowledge advanced, the area of ignorance also seemed to enlarge. Nature was not simple after all. A literal eternity of new frontier was opened up. The quest for understanding, we now see, will, for finite man, be limitless.

I need not recount the way in which this new understanding has spread—often slowly, often with startling rapidity—from one field to another.

But I would like to direct your attention to the conditions that are required for knowledge and understanding to grow and to spread. Intellectual advancement does not come about automatically and without attention. There have been throughout human history only a few places and a few periods in which there have been great advances in knowledge. Only under certain special conditions does the inquiring mind develop and function effectively. Can we identify these conditions? Certainly we must try.

The first condition, of course, is that at least a few people must recognize the value of the inquiring mind. Here we all take for granted that new advances in understanding come only from the acts of creative thinking on the part of individual human beings. We know that, and we respect and admire the men who have shown the ability to think creatively. But we mustn't get the idea that our admiration for original thought is shared by all people.

Even in this country, the man who thinks differently is more often despised than admired. If he confines his new thoughts to the realms of abstruse theoretical physics or astronomy, he may not be molested. For then he will be speaking only to those who understand him. But if he wanders into biology or medicine, into psychology or sociology or politics, then he should beware.

Now in recognizing the virtues of thinking differently, we do not mean that we must encourage the idiot, the criminal or the traitor. Honest, truly intellectual inquiry is perfectly easily recognizable by those who have some training in the field. But just here we run into difficulty. Those who are incompetent to judge may nevertheless render judgment and pass sentence on those with whom they disagree, or whom they fear.

One of the great unsolved problems of a democracy is how to insure that, in intellectual matters, judgments are left to those who are competent, and the people will respect that competence. But when uneducated fanatics presume to choose and to censor textbooks, when government officials impose tests of political conformity on the scholars that may leave or enter a country, and when the editors of a popular magazine set themselves up to judge who had the proper opinions of nuclear physics, then the inquiring mind finds itself in an atmosphere not exactly conducive to maximum productivity.

Fortunately, for the past 100 years in Western Europe and in the United States the impediments to creative scholarship have been less important than the great encouragements. In the past 10 years the physical conditions necessary for research in the sciences have enormously improved. More opportunities have been created to study, to travel, to carry on research, than ever before existed.

### The needs of the inquiring mind

But physical conditions are not enough. Big, beautiful laboratories do not themselves produce research—only the men in them can think. And if conditions are such as not to attract men who think or such as to impede their thinking, then the laboratory is sterile. Such laboratories, as you well know, do exist. There is no use storming and raging at the perverseness of scientists who refuse to work when conditions are not just to their liking. We don't call a rose bush perverse if it fails to bloom when deprived of proper water and soil. A community or a nation which wishes to enjoy the benefits that flow from active inquiring minds needs to recognize that the inquiring mind is a delicate flower, and if we want it to flourish we are only wasting our time if we do not create those conditions most conducive to flowering. The cost of doing so will be well repaid.

The inquiring mind then needs, first of all, some degree of understanding and sympathy within the community. And if there are those who cannot understand, then at least they must be insulated by those who do, so that they do the least harm. As someone has said, we can stand having a few idiots in each community

—as long as we don't put them on the school board.

As I have already suggested, it is not enough for the scholar or the scientist to wring his hands and wish that there were fewer idiots or that they had less influence. He must also, to the extent of his ability, explain to those who can understand what he is doing and why. We now see that an intelligent and informed segment of public understanding is essential to the progress of scholarly endeavor.

### Scientist and government

This leads me to another subject which has become timely to the scientist and to the citizen in recent years; that is, the relation of the scientist and the government. This is obviously a very large subject which I cannot attempt to explore here. But as the scholar needs an informed community to support him, so he owes an obligation to that community.

The prime obligation of the scholar, of course, is to pursue scholarship. That is, he must seek answers to important questions, observe carefully, analyze accurately, test rigidly, explain imaginatively, and test and test again. Then he must publish his results, fully, fearlessly, objectively, and defend them enthusiastically unless or until the facts prove him wrong. Through such intellectual struggle does the truth emerge.

But in these days the results of science impinge so heavily on public affairs that the public—in particular the government—needs the scientist's help in so many ways. Obviously, the government needs the direct services of thousands of scientists and engineers to carry on work in public health, standards of measurement, agriculture, conservation of resources and in military weapons, to name a few.

But when there is developed a new weapon, a new treatment for a disease, a new way of using public resources, does the scientist's responsibility end there? I think not. There are so many ways in which important matters of public policy are affected by these new scientific achievements that scientists must stand by as advisers at least to interpret, explain, criticize and suggest on policy matters.

### Scientific advice

We would not think, of course, of allowing a new law affecting public health to be passed without asking a physician's advice on whether it is wisely conceived. Yet I am sure state and federal legislatures *have* thought of it—in the various antivivisection bills, for example. Fortunately, (for this purpose at least) the medical profession has great influence and can make its opinions heard. And most of the public respects its doctors.

But when national security matters are being discussed which involve the nation's strength in atomic weapons, it is clear that those in charge of forming policy will need to have much help on questions of what atomic weapons really are, what they do individually, and what

would be the effects of setting off the whole stock pile. I am not saying that such scientific advice is not sought (though I think it is not always adequately used). But I do say that scientists need to be ready to help. Yes, they may need to be ready to intrude with their advice even if it is not asked for.

This problem has, of course, caused much recent trouble and misunderstanding. Many prominent citizens, including many politicians and editors, apparently feel that scientists should stick to the laboratory and let public policy matters be handled by others. Now no one argues that *decisions* on public matters must be made by the properly constituted responsible officials. But *advice* and *information* on scientific aspects of the problem is often essential and must come from scientists.

It is often true that the scientific aspects of a problem are so important that they overshadow all else—and the scientist's advice becomes adopted as a decision. But in other cases, other factors may appear important and the scientist's advice may be wrong, or may not be taken. Even the scientist, being human and being a citizen, will take non-scientific matters into account in rendering his advice. He may be just as competent to do this as anyone else. Being a scientist does not disqualify a person from being an intelligent citizen. But the possibilities of disagreement and misunderstanding are very great.

### A risky course

A very great and admittedly loyal scientist is right now being persecuted partly because, though he gave advice of surpassing value on many, many occasions, he gave on one occasion advice which some (but by no means all, then or now) believe was wrong. The sad part of this case is not so much the harm to the individual, as the harm to the country that will result if scientists cannot give honest advice to their government officials, or will be no longer asked for advice, or listened to. Dire disaster could indeed follow from such a course pursued in the thermonuclear age.

I fervently believe that the world has been remade the past century—remade physically, socially, and spiritually—by the work of the inquiring scholars. These scholars have sought new knowledge and new understanding; they have sought to use this understanding to produce those things that men needed—or thought they needed—to improve their health, their comfort, their happiness, their security.

Scholars will continue these activities and the world will continue to change. Their efforts must be aided; for though what they do may yield dangers, the dangers are far greater if they do less. And since what they do affects the world, affects you and me and our community and our country, we should have these inquiring and active minds around all the time to direct their attention to the most difficult of all problems—how to help men make better use, in their relations with each other, of the great new areas of knowledge which can yield so much to make men happier and better.