

## The Seven Freedoms

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Since the first appearance of the human race upon this globe, man has been in quest of an evasive, indefinable something which we call freedom. The pages of history have been dyed with human blood and that without the attainment of the ultimate objective. Today we find ourselves, according to H. G. Wells, in a strenuous race between civilization and catastrophe, with catastrophe threatening momentarily to overtake civilization.

Throughout the centuries our forefathers have struggled for freedom of worship. We, too, are committed to that struggle. In terms of the lives of one and one-half billions of people, the goal is still far from attainment. Millions are still clamoring for the right to enjoy freedom of worship.

Freedom of speech is another star on the horizon of idealism which has been followed throughout the centuries. At times it has shown forth in all its splendor but again it has appeared only as a tiny speck of light in the distance. Today its radiance is obscured both from without and from within: both from action and inaction. Far too many of the teeming millions who are following this star are doing so by proxy. They are content to let others speak, write, and vote for them. The politicians speak whereas the masses, including the scientists, remain silent. Undoubtedly there is no group better qualified to analyze the mess and to reason from cause and effect than are the scientists, yet they seem content to let someone else express their views and cast their ballot. They are too engrossed with the problems of today to think about those of tomorrow.

According to the *American Scientist* (Scientists Should Knock at the Door of American Politics, p. 87, by Morris Llewellyn Cooke): Scientists will be the first to admit that all is not well in the current relations between science and politics. There is little understanding on either side. To put it bluntly, the politician largely ignores the scientist, and the latter all but despises the politician.

"Science is at an all time peak performance. In fact our technological advance has become so rapid that unless we drastically alter some of our social and political concepts and the institutions through which they are given expression, technological achievements by their misuse may be our undoing. In spite of the glamorous accomplishments of science, it is apparent that the spectre of dire and growing want in the midst of potential plenty exists for the greater part of humanity. For fast-moving progress along a broad front, the active and comprehending cooperation of politicians is absolutely required. So if there is anything

which scientists can do to woo and win the politicians, it will have tremendous social significance. But it will be futile to knock at the door of American politics unless we come equipped with both understanding and sympathy. Some common ground between the two areas must be found. This, however, should not be too difficult.

"Whether we like it or not—and some technologists do not like it at all—we are part and parcel of a community life which grows more complicated day by day, with increasing interdependence of the various factors and an ever-mounting toll which the public pays for inefficient or anti-social management of these public and semi-public affairs.

Bernard M. Baruch recently said (*Lafayette Journal-Courier*, p. 1, Oct. 9, 1946) that on the question of principles, "it is an inalienable right each of us has to express an opinion on every policy animating this country, whether national or international. This is the highest function of those who live under a political democracy; of those who cherish the right of free speech. Every man has the right to an opinion but no man has a right to be wrong in his facts. Nor, above all, to persist in errors as to facts."

It is in reality the attitude toward facts which is the principal cause of dissension between the politician and the scientist. Quoting from David E. Lilienthal (*The Chemical Bulletin*, p. 411, October, 1946): "Political methods—I am over-simplifying a bit, but not much—are based on three procedures, so far as the people are concerned, as follows:

"First: Tell the people what you know they want to hear—regardless of the facts. This gives great scope for orators, slogan-makers, and dogmatists.

"Second: Tell the people what *you* want them to hear—regardless of the facts. This is the technique of the well-poisoner.

"Third: Tell 'em nothing, and make 'em like it. This is an ancient art, but its modern practitioners have brought it to a new high level.

"Political methods are generally quite in contrast to the scientific spirit and method. In his *Novum Organum*, Francis Bacon said many, many years ago: 'We cannot command Nature except by obeying her.' The scientist, essentially a humble man, obeys Nature by honestly observing and then truthfully recording *not* what he *wants* to find, but what in truth he *does* find."

The entire world today is clamoring for freedom from want, yet there has never been a period in the history of the world when the sum total of wants were greater than they are today. Not only are the wants of the world today greater than ever in the history of the past, but our capacity for taking care of these wants seems more remote than ever before. We find ourselves in the position of the blind man on a dark night in a dark alley looking for a black cat that isn't even there. The Nations of the world found themselves well prepared to arm, equip, feed, and clothe the greatest fighting forces ever known to mankind, yet these same nations find themselves totally incapable of feeding and clothing the millions who survived annihilation. Whither are we

bound? Are we adrift on the chaotic seas of life without chart, helm, or anchor?

Closely associated with the freedom from want is the freedom from fear. Fear has always reigned supreme throughout the annals of history. The hour is far past for the replacement of fear with some good, clear, sound thinking. Since our forefathers landed on the rock-ribbed coast of Maine, "we, the people" have engaged in wars of one type or another to the amount of about 414 billions of dollars. This represents approximately 114 billions more than the total worth of the United States. We are in the red, in other words, to the sum of 114 billions of dollars because of some type of fear or another.

Quoting from *The Catholic Hour* of September 8, 1946: "Other nations fear American monopoly of atomic weapons and are doing what they can to offset it. Nations which suspect American preparations for a future war seek to do likewise and to engage in unilateral activities directed allegedly toward their own national security. A vicious circle in suspicion and armament continues to produce distrust and fear.

"Unless the suspicion and hatred now existing and increasing among the Great Powers is soon terminated and unless the competition in armaments soon ceases, the world is headed for a third world war."

If World War III does come, and come it must unless someone comes up with an opiate for fear, we will have to revert to the stone age and live with the ants in caves and subterranean homes, villages, and factories. To go under ground, according to reliable estimates, would cost the United States approximately 300 billions of dollars. Add this to what we have already spent on wars, and you have a per capita fear-complex cost of approximately \$5,000 or about five times the per capital net worth of the United States. Once again I ask, whither are we bound?

Next we come to a consideration of what has been called the freedom of economic enterprise—the right to earn a dollar and the right to spend that dollar. Today there is some question as to whether or not either of these rights actually exist. Either politics or society or both have become so complex that almost everything is run from the top and the individual has become a mere cog in a Frankenstein innovation which threatens to deprive him of his last iota of individual initiative. One is told when to go to bed and when to get up, when to work and when not to work, when to plant and when to reap, what to plant and what to reap, when to build and when to tear down, and even when to rejoice and when to weep. We have been beset from within and without with economic planning which savors too much of planning and not enough of sound economics.

In an address before the National Highway Transportation Congress, on September 26, 1946, Alfred P. Sloan, Jr., chairman of General Motors Corporation, said: "Today the automotive industry is beset by all manner of limitations. It is not what we would like to do, what we had planned to do, or expected to do. It is what we are permitted to do.

"Indifferent workers take the place of effective workers. Work stoppages take the place of continuous operation. Absenteeism takes the place of full service. Naturally it does not work.

"And then some wonder why we are in such a mess and we certainly are in a mess at the moment. Our opportunities for accomplishment were never greater, on the one hand, and the obstacles against some progress never more discouraging, on the other."

The sixth item is freedom from prejudice. Turn to agriculture, business, creed, economics, labor, politics, race, religion, science, social welfare, or where you will, and you find the situation bemuddled by all types of prejudice. How can we hope to have freedom of worship, freedom of speech, freedom from want, freedom from fear, and freedom of economic enterprise until we have freedom from prejudice. Perhaps it can be said without exaggeration that half of the world moves on the wheels of prejudice.

This freedom from prejudice has a special application here and now. The scientist, with his head above the stars because of scientific achievement, has his feet often times wallowing in the mire of scientific prejudice. Wöhler, in 1824, stewed up some lead cyanate with ammonium sulfate and four years later discovered, because he was free from the vital-force stench of scientific prejudice, that he had synthesized urea. Likewise Perkin in 1856, because he was willing to accept the answer of the test tube rather than adhere to some preconceived notion which was based on erroneous postulates, effected the first preparation of a synthetic organic dye. It is of interest to note that he was motivated by the additive theory, that he had not purified his starting materials, that his technic was mediocre, and that he did not even know the formula of quinine, which he was attempting to synthesize, yet he came up with one of the strikes of the century because he possessed, to some degree at least, freedom from prejudice.

Coming somewhat nearer home with respect to both time and place, one of my graduate students in 1932 was attempting to condense silicon tetrachloride with diethylzinc to yield tetraethylsilicon. This work was undertaken because a friend of Purdue University at the Indiana Refining Company wished to test tetraethylsilicon as an anti-knock fuel. Our final product, accordingly, was predetermined. We knew what the answer to our experiment should be. We had a scientific prejudice. It is not surprising, therefore, that the greyish, gummy mess which was obtained (now known to be of the silicon type) was consigned to the sink as a scientific abortion.

I recall, somewhat more graciously, an attempt by one of my graduate students to condense ketene with nitromethane. Repeatedly, he bubbled ketene through nitromethane in the presence of various catalysts with negative results. It then occurred to us that the use of a solvent such as acetone might facilitate the condensation. After more attempts and failures, three milliliters of a product was obtained. This product, however, was not the anticipated derivative and might well have been consigned to the sink except for the fact that we did not care in this case what the test tube gave us. As a result we put ourselves to the task of finding out what the experiment had yielded and thus discovered that we had effected the synthesis of isopropenyl acetate (methylvinyl acetate), which proved to be a very important monomer for synthesis

of the Lucite type of plastic. Some of your purchases in the near future will be tied up in some way or another with this new monomer because we were willing to accept the result of the experiment—we were free from scientific prejudice.

According to the *AAAS Bulletin*, this is a time calling for scientific statesmanship, as well as for eminent specialists, for wide horizons, as well as for penetrating insight into special problems.

The last item to consider is freedom for research. The Fulbright bill, S. 1248, favorably reported by the Senate Committee on Commerce, was introduced by Senator Fulbright, former president of the University of Arkansas, to establish a Bureau of Scientific Research within the Department of Commerce. The announced purposes of the bill are:

“1. To promote in the national interest the fullest and speediest introduction of new techniques in science and invention and in manufacturing, communication, and other phases of production activity.

“2. To promote the maintenance of free enterprise by making available to small and medium-sized business, scientific and technical inventions, products, and processes.

“3. To establish a central scientific and technical office to assure maximum use of new inventions, products, and processes.

“4. To aid, encourage, and protect the research and enterprise of inventors, scientists, technicians, scientific and educational institutions, and research laboratories engaged in scientific and technical work, and to make their resultant discoveries and data more readily available, without discrimination, to all sections of industry, agriculture, and the public in order to promote full employment and higher standards of living.

“5. To compile and maintain a comprehensive inventory of the findings and other pertinent data resulting from federally financed scientific research and development, and of other information on scientific and technical advances in this country and abroad, and to make available to the public.”

The research program of the Navy and its relation to educational institutions was outlined this morning by Captain Lawrence. This affords an opportunity for educational institutions to receive funds for fundamental research along their own particular lines of endeavor. Then too, for those who are particularly interested, carbon 13, ranking in importance with x-ray as a tool of medical science, is to be made available by the Houdry Process Corporation without cost to qualified non-commercial biological and medical research organizations. The use of C-13 may be compared to a chemical microscope, making it possible to follow chemical reactions in the body, and has already been used successfully to show how fats are broken down, a process about which science has hitherto only guessed.

A healthy research program in the colleges and the universities, moreover, is an excellent way for these United States of America to maintain scientific leadership. Such leadership seems to be intimately tied up with national safety. We cannot hide behind the atomic bomb.

Quoting from *Chemical and Engineering News* (24, 500, Feb. 1946): "Foreign missions in the USSR reported to their governments February 1 that Soviet scientists had succeeded in splitting the uranium atom. Konstantin Petrozhak and Georgi Floryov on January 27 divided a second prize in the distribution of Stalin Awards for 'discovery of the occurrence of spontaneous disintegration of uranium', hailed as 'one of the greatest achievements in Soviet physics in recent years'. The significance of the announcement is that the work is said to have been done in 1943 and 1944."

All too frequently in the teaching profession, the research motive withers and dies because of lack of encouragement, equipment, help, and time. This must not and cannot be. Research must go on, and research in educational institutions must assume a more important place in the total research program than ever before. Any teacher becomes a better teacher if he is inspired by the research motive. The times demand that we do the best teaching possible, and that in turn demands that teachers in colleges and universities, and in certain instances even in high schools, be given the opportunity, facilities, help and time to do research. I submit then these seven freedoms, but the greatest of these with respect to the program of the Indiana Academy of Science, is freedom for research.