

Science and Survival

ALBERT E. BURKE

The topic that was chosen for me today is one that I would really like to talk about. There is only one minor difficulty. About three weeks ago my notes for this talk and everything else I have ever done and my home and my office were burned to the ground, so that what I am going to tell you will probably surprise me as much as it is going to surprise you. But I do remember some of the things that I dealt with in the subject of “Science and Survival,” and it is not quite the technically oriented talk you might think.

In the first place, I intended the subject to suggest a broad framework within which people in this country, particularly, should think—students, adults, leaders of the community, people in government—the way they should think but unfortunately do not. I think that many of the problems that we face in the world today in trying to deal effectively with people around us, particularly—many of these problems are rooted in the fact that we do not understand our place in a scientific age. We do not really understand science.

There is a quotation attributed to Saint Paul which goes something like “Who would redeem the world must first discern it,” and, in our time, discerning the world is probably the most important job we have to do.

Before you can discern anything you must understand what you see; you must understand what is happening. Anybody raised in our time who does not understand the part that science plays in the world’s affairs and its place at the root of most of the problems that we face today—anybody who does not understand this cannot possibly redeem anything. As an illustration of what I mean, within a fairly broad framework, several years ago, while I was still teaching at Yale, I was asked to sit in on a State Board of Education meeting where the subject of discussion was to be one that is probably closer to the heart of every academician than any other. We were going to talk about the well-rounded person.

You can get the discussion going on this subject faster than any other in an academic community. I have heard about the well-rounded person. I hope someday to meet one. I have met many people who were so rounded that they could be rolled in any direction. This, however, is not quite what is meant by the well-rounded person.

Albert E. Burke was a scientist, economist, and essayist when this address was given at Brigham Young University on 12 March 1964.

The purpose of the talk was to discuss how to change the curriculums so as to turn out a well-balanced individual. I was asked to sit in on this discussion because my field was largely science, and science is one of the poorest treated of subjects in almost any curriculum around the country today. You do not become acquainted with the subject of science in a quick survey course that you may take for one or two terms. It really requires more than that.

Well, I agreed to sit in on the meeting, which was to be held in Hartford, Connecticut, and I was in New Haven. It was set for 3:30 in the afternoon, and I had a two o'clock class. The simple geographic facts of life meant that I could not possibly get to Hartford in half an hour, unless, of course, I tried. And I tried. As I was barreling along the Merritt Parkway, I flew low through an underpass and happened to notice as I came out of the underpass that there was a car parked off on the side. Now it was not the kind of car you think—it was not a police car. It was a late-model convertible coupe, and the hood was up.

At this point I must tell you that I was raised, in large part, not far from here in California. And when I learned to drive a car, my father impressed upon me the fact that if ever you saw anybody parked on the side of the road and they appeared to be in trouble, you stopped to help, because, who knows, you might find yourself in that mess someday, and you certainly would want to be helped.

Standing in front of this convertible coupe with the hood up was a young lady—one of the products of our better women's colleges in Connecticut. It was about the latter part of May, just before final exams, and it was a very warm day. She was dressed to accommodate the weather, and Mother Nature had been extremely kind in providing the accommodations. And it was because my father had impressed upon me the fact that one always stopped to help people when they were in

trouble that I stopped to see what I could do to help this young lady.

There is not really much more to this story except that, as I walked up to this sweet young thing, there she stood in front of this mechanical marvel with an ignition key in her hand. She knew something was wrong because when she turned the key in the ignition lock, nothing happened. She was aware of the fact that this was a product of a scientific and technological age that she had been riding around in, but she did not quite understand it.

Now I am not suggesting that it is the obligation of or that, in fact, every young lady that graduates from a women's college today can be expected to know how to repair one of our mechanical monsters. When I looked under the hood of that thing, I could not even see the engine for the power steering and power brakes and all the rest of the stuff that was there. I admit I would have had a bit of trouble doing something with that engine.

But the point is, here was the American dilemma: a university in an age of science turning out someone who did not really understand that age of science. There were pedals there to be pushed and there were keys to be turned and things happened, but in many ways that girl's understanding of what she had at hand was about as great as the understanding of a Hottentot about the magical activities of the witch doctor and the things that happen in their society. There was the same gap.

It is important enough in Hottentot society, but it becomes critical for us because that understanding of an age of science is absolutely critical to understand some of the things that are happening to us this minute. For example, when I taught at Yale I taught in the field of conservation. That is a subject that is more or less understood here, but back East it has not yet hit home. Conservation is mighty important in areas that are short of water or short of anything. In the East, shortages have

just begun to appear, and we are just beginning to think about them there.

I had to explain to my students some of the resource facts of life that made it possible to produce that automobile in the first place—something that most Americans do not think about. There are very few courses in economics taught in this country that explain anything about what I call resource economics—the part resources play in making things possible. I had to explain to them this fact and also why it was that Americans and Europeans, of all people on this planet, had done so much with things, as most other peoples had not. Why, for example, had Americans used trees and converted them into railroad ties or sailing ships or furniture or houses or an infinite variety of things in an economic system that emphasized profit making? Why had we done this; why had Europeans done this; and why, for example, do Vietnamese not think this way, Burmese not think this way, or other people who are important to us? Why this great difference?

In order to get at that and the importance of resources in our lives as the basis for power and prosperity in an age of science, I tried to explain to my students something about the most fundamental fact of life—the conflict that we face with the Soviet Union and Communist China to see which nation will be the leading nation in the future. Really, you cannot talk intelligently about this conflict if you do not understand something about science—but, most important, something about resources.

For example, in 1946, in a Soviet journal which, translated into English, is called *Questions of Economics*, there was an article written by a group of Soviet economists talking about the basis for power and prosperity in the non-Communist nations. What they were concerned about, as was quite clear in the article, was the basis of power among the Western nations—those that were to be allied in the North Atlantic Treaty Organization, those that were to be the combination of nations

that would oppose the spread of Communist influence and power. In this article there was one item written by a man named Varga, who is a theoretical economist in the Soviet Union, and what he said was that not one of the Western nations could be considered a great power if they were to be cut off from their sources of supply in other parts of the world. It was a wordy article, but it boiled down to this: nothing more than that if you were to cut them off from the molybdenum and tungsten and manganese and the variety of other things that go to make an industrial economy possible—if you were to cut them off from these things, they would not be great powers. Without raw materials, factories produce very little. As the article made clear, the Soviet Union was thinking in terms of where these things come from.

Everybody in this room is familiar, of course, with the fact that the Soviet Union has the largest submarine fleet in the world, and this is not due to the fact that the U.S.S.R. is made up of people who like the scenery below the surface of the oceans. It is made up of people who are aware of what constitutes the basis of power in a scientific world. You can read about this as it was actually borne out for us in a book written by Samuel Eliot Morison—the second chapter of his history of *The War at Sea*—in which he tells about a meeting that was held between General Marshall and Admiral King in April of 1942, at which time these men spoke seriously about the prospect of an American defeat in World War II if something was not done to stop the submarine campaign which was sinking our bauxite barge fleet coming up from the Guianas. We were importing bauxite to get the ore for aluminum that would make it possible to produce the 50,000 planes a year we had promised the Allies, and this was the backbone of what was to be our war effort. But in April of 1942, in that one month alone, the Germans had managed to sink 70 percent of the bauxite fleet operating at the time. This had become so critical that we were seriously

thinking of what to do in the event of a defeat. This is precisely what Mr. Varga had written about in 1946—he knew about incidents like this.

We had a chance to see what Mr. Varga was talking about in 1956, when there was a ruckus over who would run the Suez Canal. When the Egyptians took over the Suez Canal, all they did was interfere with the free flow to Europe of one important material—not a wide variety of these things, but just *one*. It was oil that could not get to Europe easily or freely. While you may not remember this, Europe’s economy practically ground to a halt because it did not have the oil it needed either to power itself or to grease itself. And these two things are as critical today as they were then.

Ten years after the Soviet article was written, we had a chance to recognize what was going on. At about the same time, I clipped two newspaper items out of the *New York Times* which seemed to me to point up the nature of the problem we face—not in terms of what Mr. Varga had been writing about, but in terms of the inability of the American people to recognize the heart of their problem. On the left-hand side of the *New York Times* there was an article about a hassle that was going on between General Curtis LeMay, of our Strategic Air Command, and Congress. The hassle was over whether or not we should maintain a round-the-clock alert of Strategic Air Command planes carrying nuclear bombs. The idea was to have a constant defense so that if anything were to happen, we would be prepared to immediately retaliate from any place in the world. Congress was against the idea because it would cost too much, and General LeMay was for the idea because he felt that this was essential to our security. That was on one side of the front page.

On the other side of the front page there was a minor little item—minor because it did not take up much space and it did not get front-page coverage around the nation as it did in

this particular paper—but it said that there was a factory down at a place called Port Nickel in Louisiana that had been completed at a cost of something like \$50 million. This factory had been constructed by the Freeport Sulphur Company, and they had been advertising for some time that this was to be the nickel-cobalt capital of the free world. That little item on the front said that it was not producing any nickel or cobalt; it was gathering cobwebs.

Two items on a front page, and practically every American who read it saw no connection between what General Curtis LeMay was talking about and what that article had to say about a factory in Port Nickel, Louisiana.

It may interest you to know that in order to put our Strategic Air Command planes together and put engines in them that will power them as effectively as they do, we need alloys that will make the metals sufficiently heat-resistant to stand the fuels we use and the pressures that must be used to power our planes fast enough and far enough to do their job. For a long time one of the most critical of these ingredients has been cobalt. It may also interest you to know that we have imported as much as 90 percent of the cobalt that we use in this country to do such things. Which meant that General LeMay was concerned about airplanes that existed because we had the cobalt to make the engines. If we did not have it, he would not have any planes to put in the air on a constant alert. There are not many substitutes to do the job of cobalt in preparing heat-resistant steels. There were not then; for that matter, there are not now, despite all the new discoveries we have made in metals.

The point involved here is that that factory was supposed to insure us the cobalt that we needed and the nickel that we needed, both of which are heavily imported from other places—both of which have to do with what Mr. Varga was talking about. And what he was talking about was *not* our allies in Europe. He was talking about *your country and mine*.

How in the world do you make this fact clear to a people who moved into a continent that was so rich that until recently we never had to think about such things? As I said, back East the whole subject of conservation is still a kind of thing to be dealt with by a dilettante. It is not a matter of life and death. It *is* a matter of life and death for practically all other people on this planet, and it certainly is the basis of power for us, as it is for others.

Go to a book called *The Minerals Yearbook of the United States*, one of the most important publications put out in this country and probably the least read. I would rate it as one of the publications I would require every American to read, year by year, because it would explain one of the most important things about the world we live in. Go to that book and read what it was we imported into the United States in the way of what is called "strategic, critical materials" before World War II. We imported about eleven. At the end of World War II we were importing fifty-three. Today the list has increased considerably more than that, and we get them from all over the world.

If there were no other reason for being interested in what goes on in the world around us, there would be this reason—that we now live in an interdependent world in which we, along with practically every one of our friends who call themselves industrial states, are critically dependent on the resources of the whole planet.

Now, given that as a basis from which to take off, if you were sitting on the Presidium of the Soviet Union or the leading group in Communist China and you wanted to deal effectively with the world around you so as to destroy the power of your enemies and increase your own power, how would you react to these facts of life? In order to make this point clear, I used to take two maps and hang them at the front of my classroom. They were maps of the world. I would cover them so that nobody could see them. I would hand

out assignments to that class which consisted of the following: One side of the class had the obligation of going through *The Minerals Yearbook of the United States* and the equivalent for Great Britain and the book like it for West Germany and France and all of those nations we talk about today as our allies in producing the goods of war and peace. Their job was to make note of the variety of things that were imported into each of these countries to feed the factories and those places, and then, after hours, when nobody could see them, they were to mark on their map with black thumb-tacks the places from which these things came around the world. Nobody else was to see that map until the end of the term.

The other world map had another assignment connected with it. The students who dealt with that one were to make note of every area around the world where there was nationalist unrest, either Communist-inspired or the kind of unrest that could be used by some revolutionary group who might be dominated by a Communist organization. All of those areas were to be noted, and they were to be marked on that map.

At the end of the year I would pull the covers off those two maps, and what do you think the students saw? Wherever there was a cluster of pins on one map indicating an important resource area for the Western world, there was an important cluster of thumb-tacks on the other map, indicating a strong Communist interest in those places.

This is not happenstance. This is the result of having people who understand that in the age of science and technology you must have food for factories and that the rate at which we consume things has gone beyond the capacity of our own resources to produce. I say that in spite of the fact that we do have in this country as wide a variety of raw materials as would be needed to meet most of our needs—not all of them, but most of them. However, given the present level of science and technology, many

of the resources that we have available to us in this country are either not the right quality or do not exist in the right quantity, and our factories are not geared to deal with low-level, low-quality resources. They are geared to deal with high-quality resources. We have just begun to deal with low-quality resources in the area of steel, where we make pellets out of low-grade ores.

The critical thing about all of this is that those two maps are the basis for the Communist foreign policy Mr. Varga wrote about; it is perfectly obvious in terms of what happened in 1956. General Marshall and Admiral King talked about it in 1942. Secretary Forrestal had a whole segment devoted to this subject in his diaries. Conservation group after conservation group and administration after administration in this country have been talking about this problem, but somehow it is not emphasized. It is not even considered to be important in analyzing what goes on in foreign affairs.

That refinery in Port Nickel, Louisiana, was not built to process low-grade ores. It was processed to work with the highest-grade ores, some of the best ores in the world, and the source of supply for that factory was a red thumbtack on that map—Cuba. You may not know this, but Cuba has about six times the known reserves of the kind of nickel-cobalt ores that were to be used in that Freeport Sulphur refinery in Port Nickel, Louisiana—six times as much as is known to exist anywhere else in the world. I think there is a slight relationship between this fact and the fact that the Soviet Union and Communists have been active in that part of the world. I am not suggesting it is the whole answer; I suggest it is an important part of the answer.

Of course, quite a few people were not particularly concerned about this. Quite a few of those who knew about our resource problems immediately dismissed the Cuban affair because, of course, if we could not get the ores we needed from that part of the world, we

could always go to another place where we could get quite a bit of this kind of material. That place had an interesting name. Let's see, what was it? Oh, yes, it was called Katanga. Now, if you checked that map, you would find that there was a red thumbtack on Cuba and one on Katanga. If you checked that map you would find that most of the unrest that goes on in the world today is peculiarly tied into places where critical materials can be found, too.

Make no mistake about it, the seats you are sitting on, the building you are in, would be quite difficult for us to make today if, in today's kind of interdependent world, we did not have control of the seas. It is for this reason—to patrol the sea lanes of the Western nations—that the Soviet Union has the largest submarine fleet in the world. Of all the people who have studied undersea warfare and what happened to us in 1942, there are no greater, more interested students than those in the U.S.S.R. This is one aspect of the importance of an understanding of what is happening in science and technology and what makes it possible. There is another.

Of all the things that concern me these days personally, it is the degree of hysteria and hate that I find voiced by people in political places or other places in an analysis of what is happening to us in this country. I have, frankly, had my fill of the kind of ignorance that prefers to find traitors hiding in back offices to explain why so many of the problems that we have appear to be insoluble. I think the only subversion involved in our affairs today—and I am not thinking about the kind of subversion that has to do with the political activities of Communists; I am talking about the kind of subversion that has wrecked government after government, overthrown civilization after civilization throughout the whole of that story—the only real subversion I know about began when a fellow named Leonardo da Vinci began putting together ideas in science that would change things.

If there is a force at work in our affairs today to change us—politically, socially, and economically—it is the force of scientific and technological change. The history book has yet to be written that will take into account this kind of background to the American story in analyzing what has happened and is happening to us.

One of the biggest problems we face today is that we have changed as a nation—changed completely and inevitably. The Constitution, unfortunately, was not written for an age of railroads; and though you can read in the Constitution the fact that only Congress has the right to declare war, while the president has the right to veto this act of Congress, you will find that if you go back about a hundred years in our history, that this is not quite the way the Constitution has operated. It all began when a fellow named Lincoln was president of the United States, and somewhere in the South somebody fired a cannon at a place called Fort Sumter.

Now it is true that Congress has the right to declare war, but, unfortunately, when that cannon was fired, Congress was not in session, and Mr. Lincoln had to make a very quick decision because that cannon was fired when railroads existed. That meant that you could put an army together in a great big hurry, and you could move it from one place to another in a great big hurry. The issue could be decided before you could get all your congressmen and senators to Washington to declare war. So Mr. Lincoln declared war, and Congress had nothing to say about it. From Mr. Lincoln's time right into ours, it has been the president who has taken the initiative in deciding what would be done with our troops—all the way to the action taken by Mr. Kennedy in sending some of our special forces to Vietnam without notifying either Congress or the American people. This, of course, was described in the press as a gross violation of constitutional principles, as indeed it was and has been ever since Mr. Lincoln's time. It was not unique with Mr. Kennedy.

There is that problem—we have changed. The Constitution is not what it was. It was not written to deal with an age of railroads; it was not written to deal with an age of telephones; it was not written to deal with the problems that have come along which must be dealt with, too.

Another thing has changed. I doubt that there are two things in the history of this country that are more basic to the American story than the idea of work and the idea of property. A respect for work and a respect for property are the most fundamental of principles on which this nation was built, and you can understand why.

If you go back to colonial times, you find that those early people who came to this part of the world moved into an environment that was hardly hospitable. You can learn that had it not been for the kindness of a couple of Indians who taught them how to plant corn and a few other things, during the forty-day average of drought we have in the East these people could have starved to death, because they practiced something that was called a subsistence economy, where practically all of their effort went into producing just enough food to stay alive. They did not produce surpluses then. They did not have the science and technology to do it. Science and technology make a difference.

In that early America, if the individual did not do his share to plow and plant, if he did not do his share to fight the Indians, if he did not do his share to make the community survive, he was considered to be an idler, and idleness was a sin. Any man who loafed was considered to be dangerous. Come out of that period into a labor-management negotiation today and sit in on the discussions there about shortening the work week, because, frankly, there is not enough work left to do. It is not right for one group of people to have the jobs while another group does not have the jobs, and, really, we must shorten the work week so

that we can give more people a chance to work at what there is left.

Today, thanks to science and technology, and thanks to something called automation, we do not need men to work anymore. This is one of the biggest problems we face today, which has Americans terribly upset and calling each other all kinds of names. They do not understand that the culprit here began with Leonardo da Vinci and the machines that have been replacing men.

The important thing, too, is that today we are not operating with a *small* margin of anything; we are operating with *large surpluses* of wealth. Now the question is: How can you make work the same thing in our time it obviously was in the beginning? How can you keep as a basic American principle the idea that there is dignity in work and that men who do not have work, men who are placed on a dole, men who are on unemployment compensation, men who are retrained for jobs they cannot do—how do you handle that in our time? Who has addressed himself to this issue?

Another issue is: What do you substitute as the basis for dignity and integrity when you have taken away one of the most important things in our history—property? I occasionally like to put small wagers on the horses. This is quite legal in a number of states and happens to be quite legal in New York State. I went to a race in New York State about three months back when something happened; a decision that was made by the judges about this race was not approved by the crowd. They reacted negatively—so negatively that they went into what amounts to a riot and did pretty close to \$60,000 worth of damage to property. It did not belong to them; it belonged to the state of New York. At about the same time a group of young people were hauled up before the attorney general of the state of New York for having thrown the kind of party you have probably read about in *Life*, where they destroyed the house in which they had the party. In both

cases there seemed to be a slight lack of respect for property.

Back in the early days, when it was understood that land and property were to be owned outright by the people who worked the land and owned the property, there was no question about respect for property. It was an important ingredient in our affairs. But today the whole idea of property has changed, and the people in real estate have a word for it. They call it *usufruct*. What that amounts to is this:

I have been told by the people who deal with real estate in my community that one out of every six houses sold in that community changes hands every year. They all have mortgages on them. The people who buy them do not pay for them. They make a kind of monthly payment to the bank for the privilege of living in a house. In other words, they are paying for a housing service. They do not own their property; they do not even think about owning their property. It is entirely proper just to pay this monthly stipend.

I am assured by the people who sell used cars in my community that half the cars that are turned in for new ones still have time payments left on them. We do not buy cars as property anymore, most of us. We pay for a transportation service with a monthly stipend. This is hardly the view of property that we enjoyed in the beginning.

The only reason that I bring these things up is that the nature of our society has changed drastically, and at the root of all this are the scientific and technological changes which have made it necessary for us to be a mobile population—the automobile, for one; the airplane, for another. Here are all the things that have come out of the changes in our time which are dealt with, how, in our classes? or dealt with, how, by our politicians? discussed, how, in your living rooms? understood to what degree by most Americans today?

I do not have any more time to belabor this point except to tell you that it is not an

insoluble problem. It can be solved. But it calls for a kind of solution that goes a long, long way back in time to a young man who lived about 2,200 years ago in the country that gave us the heart of our way of life today, or at least gave us the idea that the rule of the people was a good thing. That is all the word *democracy* means. This young man was terribly concerned that the Greeks of his day were not living up to their reputations. They were not thinking for themselves; they were not acting for themselves; therefore, how could they rule themselves? He had to figure out a way to bring the people of his day back to the true faith.

The problem was that in his day people did not have to think for themselves because they had what were known as “experts” around. They did not call them experts; they called them “oracles.” You could find an oracle in every temple. If you had a problem, all you had to do was go to the temple, ask the oracle, and the oracle would tell you what to do, and that was the end of that. Under these circumstances, since people did not have to bear the burdens of their own responsibilities, the idea of democracy could not work.

Now, how do you destroy the influence of an oracle? How do you prove that an oracle does not know everything? This is pretty difficult to do. But he worked at the problem, and finally one day he stumbled on what he thought would be the answer—a way to

discredit the oracle so that the people would be forced to go back to thinking for themselves. It consisted of a very simple routine. He would catch a hummingbird and put it in his hand. He would go before the oracle, and he would ask several questions. One of them would be “Oh, all-great, all-powerful, all-knowing, all-wise one, what do I have in my hand?” He fully expected that the oracle would tell him, “Young man, you have a hummingbird in your hand.” But at that point he had the oracle, because his next question was “That’s true, all-great, all-knowing, all-powerful one, but, tell me, is the bird alive or is it dead?”

If the oracle said that the bird was alive, he would squeeze his hand, kill the bird, and open it to show that it was dead. If the oracle said that the bird was dead, he would open his hand, the bird would fly away, and, as you can see, in either case, the oracle had had it.

Off to the temple he goes with his bird. “Oh, all-great, all-knowing, all-powerful, all-wise one, what do I have in my hand?”

“Young man, you have a hummingbird in your hand,” the oracle answered.

“That’s true, all-great, all-wise, etc., etc., but tell me, is the bird alive or is it dead?”

The oracle’s answer was—the only one possible then and the only one possible now—“Young man, the answer to that is in YOUR hands.”