FRONTIERS IN EDUCATION

GEORGE D. STODDARD

Cubberley Lecture—Stanford School of Education

Frontiers in Education

THE CUBBERLEY LECTURESHIP

Emergent Conceptions of the School Administrator's Task
By HAROLD BENJAMIN. 1938

Educational Leadership in This Emergency
By WILLIAM G. CARR. 1941

Frontiers in Education
By GEORGE D. STODDARD. 1945

Frontiers in Education

By

GEORGE D. STODDARD
Commissioner of Education, State of New York

CUBBERLEY LECTURE
Stanford School of Education
July 19, 1945

STANFORD UNIVERSITY PRESS
STANFORD UNIVERSITY, CALIFORNIA

STANFORD UNIVERSITY PRESS
STANFORD UNIVERSITY, CALIFORNIA

LONDON: HUMPHREY MILFORD
OXFORD UNIVERSITY PRESS

THE BAKER AND TAYLOR COMPANY
55 FIFTH AVENUE, NEW YORK

HENRY M. SNYDER & CO.
440 FOURTH AVENUE, NEW YORK 16

PRINTED AND BOUND IN THE UNITED STATES
OF AMERICA BY STANFORD UNIVERSITY PRESS

THE CUBBERLEY LECTURESHIP

IN RECOGNITION OF THE OUTSTANDING CONTRIBUTION OF ELLWOOD PATTERSON CUBBERLEY (1868–1941) TO EDUCATION AND TO THE SCHOOL OF EDUCATION AT STANFORD UNIVERSITY, HIS FRIENDS GAVE TO STANFORD UNIVERSITY A FUND FOR THE MAINTENANCE OF A LECTURESHIP IN EDUCATION. AS TEACHER, ADMINISTRATOR, AUTHOR, AND EDITOR, HE CONTRIBUTED GREATLY TO THE DEVELOPMENT OF THE PROFESSION OF EDUCATION. HIS HIGH IDEALISM, HIS DEVOTION TO HIS WORK, AND HIS INTEREST IN HIS STUDENTS AND HIS ASSOCIATES WILL LONG REMAIN AN INSPIRATION TO ALL WHO KNEW HIM. THIS LECTURESHIP IS AN EXPRESSION OF THE APPRECIATION OF MANY WHO HAVE BEEN INFLUENCED BY HIS LIFE. IT WILL HELP TO PERPETUATE THE SPIRIT OF HIS LABORS AND PROVIDE FOR A SCHOLARLY TREATMENT OF IMPORTANT PROBLEMS WHICH CLAIMED HIS ATTENTION DURING HIS ACTIVE CAREER.

Frontiers in Education

I

Any growing edge that involves hardship and struggle can be called a frontier. There was a time in education when new additions to its structure constituted genuine frontiers. The common school, the kindergarten, the nursery school, the high school, the public university, the junior college, the folk-school and extension classes all have established themselves away from center and against odds. Colleges for ex-students and alumni, maintained by the parent institutions, may be next in order. The school for labor relations has arrived.

However, I shall not discuss these tangible frontiers at this time but other issues, involving not so much "where to teach," or "whom to teach," as "what to teach."

There is an organic, self-contained frontier that characterizes all evolutionary process. The real struggle in education today is an attempt to achieve unity and direction on some basis, be it ancient, medieval, or modern, or a merging of all three. In professional circles it centers in a search

for the basic, the core, the general, the liberal, the universal.

In the United States education is so taken for granted that what men live by will be found somewhere in the curriculum. If this were not so, the schools beyond the compulsory age of attendance would be emptied and the desirability of compulsion would itself be called into question.

It will be well, therefore, to plunge into an examination of proposals for curricular change—to ask of the educational reformer, "What are your intentions?"

I hope that my remarks may not be circular, but they will be elliptical, for they revolve about two foci: (1) the search for a core curriculum and (2) the place of science in a liberal education.

A prudent general chooses his own battleground. My choice will be the college, with a little space for supporting movements in the lower schools.

What, we may ask, is a basic core curriculum? What is it that everybody should know, or do, or be?

It is clear that everybody cannot know everything, nor much about anything. We are dealing with something doubly precious: the time and energy of youth and the distilled wisdom of a culture. The time of youth does not run like sand out of a glass. Every fragment is part of a living, pulsing whole. Under abnormal conditions years may be lost and a life ruined. On the other hand, a peculiarly insightful moment of time may arouse latent intellectual power. It follows that a gathering of information should be accompanied by critical thinking.

A crucial factor in any growing culture is its sense of the incomplete. When all wisdom comes from above or behind, stagnation sets in. We can be sure of one thing in this world of the indeterminate: the future is not fully revealed in the past. The oyster does not predict the man. Similarly, you cannot start with a flat surface of small size and come out with celestial mechanics. Nevertheless, science once started forms a never-ending chain; and the humanities, in any age, have much in common.

I expect that every teacher in this gathering is

clear as to the meaning of basic science. Still, in education as a whole the term "basic" is somewhat elusive; it shifts about. Basic English, for example, is a kind of pidgin English. It is not a skill that is designed to encourage a further understanding of linguistic concepts; it leads only outward into social contact. It is a substitute, a selling short, a sloughing off of everything beautiful in speech in order to arrive at a primitive exchange.

On the other hand, the basic or core material in a program of the liberal arts constitutes a search for common learnings at a certain level of insight. It is supposed to be general, but not superficial, although unkind critics have turned the matter about. What are its ingredients? Well, we are clear at the lower levels. We teach children not to drink out of puddles, and to keep their smudgy fingers out of hot water. The basic concepts of health are not considered debatable. Similarly we stress the three R's and, more recently, the social studies.

The language arts carry the chief weight in our common culture. To be illiterate is not only haz-

ardous and frustrating to the person concerned; it is a nuisance to everybody else. It is small wonder that society, through the public schools and comparable agencies, has "ganged up" on anybody so obtuse or obnoxious as to resist reading and writing. It has coined some nasty words for his special case, such as "imbecile" and "moron."

For the more numerous progeny for whom the spirit of intelligence seems willing but not the flesh, we have, as teachers, devised some lively punishments: scolding, browbeating, flunking, and shunning—to mention a few. The school failure is a pariah at school and at home, and sometimes on the playing field.

Now the young child has rarely resisted learning. By ear alone he masters substantial assignments in language. His English is really functional; he will start a sentence bravely and will usually finish it—an accomplishment not fully appreciated until one tries the same task ten years later in Latin, French, or German. His motor co-ordinations by the preschool age are remarkable; with guidance he can learn to talk, dance, skate, swim, and play musical instruments. He

learns as he eats or sleeps; the process is germane to animals, and nobody up to that time has offered him desirable substitutes.

The young child has another neat trick—a most alarming one. He persists in asking the hardest questions imaginable: "Where do we come from?" "What is noise?" "What is light?" "Who sprinkles the rain?" "What makes the garden grow?" "What good are worms?" "Does mama love papa?" "Who, what, when, where, and why?" Small wonder that parents hustle their children off to school, not that all questions may get answered, but that they may be deflected into proper channels. As we know, the school, for the next twelve years, keeps the child busy with many things; he may never get back to these fundamentals.

The school's intentions are good. The teacher and the curriculum-maker know that questions are easy to ask and hard to answer. They seek to prepare the child along three essential lines: (1) to develop the tools of thought; (2) to restate the basic questions in art, science, and the humanities; and (3) to bring each child into a satisfac-

tory relation with a world of choice points and values.

Formerly the tools of thought were believed to be sharpened by exercise, especially if distasteful. We suffer still from a hangover of that outworn theory. We should know that geometry sharpens the mind only if the mind is seeking geometric solutions. It informs and prepares the mind of the engineer, the architect, the physicist, the mathematician. It is to the technologist what skates are to the skater; it will carry him over many a stretch of thin ice. In addition, geometry has a certain *general* or *basic* value, since all persons are confronted with geometric forms, if not geometric reasoning. A failure in geometry, let us say in city planning, may have a depressing effect upon thousands of citizens who are vaguely aware that something is wrong with a building, a street, or a vista.

There may be, however, a division of labor. A little mathematics may lead to a lot of engineering; a little engineering may lead to a lot of town planning. To go beyond a certain point in mastery, to pursue the "why" to the exclusion of the

"how," is to become an abstract specialist. Only to ask "how" is to be a technician and a useful worker but not really a scientist. The liberal student seeks light from both sources.

There should never be a conflict between the useful and the liberal. After all, the early American college was somewhat vocational. The New England settlers were intent upon training in religion, law, and medicine. The classical languages were a common currency among the elite; they were studied more for literary allusions than for spiritual guidance. A Plato was acceptable to aristocrats, but a Socrates remained suspect. The concept of "liberal," strangely enough, became illiberal in its application to highly selected curricula and student bodies. Frequently it was divorced from the dangerous thoughts that had accompanied its origin. Greek was studied in ugly factory towns by persons who deplored nudity in art and freedom in philosophy. To study was not to use, to create, and to make progress—to become like the Greeks at their best—but to escape into phantasy.

There is a place for dreams. Educators, at long

last, are waking up to their meaning. A good dream, a good plan, a promise of the future, is essentially one that starts from reality and returns to it after a reasonable detour. Scientists treat such dreams as hypotheses and, with the utmost precision, refer to them as beautiful. The artist sees the completed picture; a Mozart hums the perfected symphony. And now the educator seeks harmony.

II

A region of education, dear to all planners, is the liberal arts. It is not exactly virgin territory. At present so many professors and deans are staking out claims, or perhaps just digging foxholes, that it resembles a populous WPA project.

We lack the time and I the patience to peer over the edges of all these diggings—and that is a pity. What I found, for example, in previews of the work at Amherst and Colgate was refreshing and not without significance for the comprehensive university.

Let us turn however to three spacious reports that made their appearance over the horizon, ex-

actly at one-year intervals, in the rare days of June 1943, 1944, and 1945.

The first document is entitled "The Post-War Responsibilities of Liberal Education."[1] It was prepared by the Committee on the Re-Statement of the Nature and Aims of Liberal Education for the Commission on Liberal Education of the Association of American Colleges.

The report suggests "that men and women *are* liberally educated to the degree that they are *literate* and *articulate* in verbal discourse, in the languages of the arts, and in the symbolic languages of science; *informed* concerning their physical, social, and spiritual environment and concerning their relationship thereto as individuals; *sensitive* to all the values that endow life with meaning and significance; and able to *understand* the present in the perspective of the past and the future, and to *decide and act* as responsible moral beings."

So far, so good; the question is, What skills in what areas of knowledge? The report tells us—

[1] American Association of University Professors, *Bulletin*, Vol. 29, No. 3 (June 1943), pp. 412–31.

and I shall give the answer verbatim, for it is as hard to compress as water—first, the skills and abilities:

a) To speak one's own language correctly and effectively; to read significant documents with comprehension; and to write clearly.

b) To use at least one other language with facility.

c) To recognize and organize facts of different types, and to interpret them coherently.

d) To understand and appreciate great documents of art, morals, and religion, and to evaluate them with imagination and wisdom.

e) To use intelligently and with a sense of workmanship some of the principal tools and techniques of the arts and sciences.

f) To live with others, with imaginative sympathy and understanding, and to work with them cooperatively and justly.

And, now, the subject matter of a liberal education:

a) The world of nature—the data, methods, and achievements of the physical and biological sciences, and historical development of these sciences, their technological value, and the philosophy of science.

b) Human society and man's interrelated social, political, and economic institutions—their historical development, underlying principles, and respective values for human life.

c) American civilization and its European background—its historical origin, its relationship to European culture, its own distinctive character and contemporary tendencies.

d) Other cultures—primitive and advanced, Oriental and Occidental, and their significance.

e) The arts and crafts—man's artistic achievements in their historical setting, and the mediums and form of artistic expression, past and present.

f) Man himself—as a biological, psychological, moral, and spiritual being; and as a member of a family and of a local, national, and international community.

g) Man's attempt, through the ages, to understand (in art and literature, philosophy, and religion) what life means and how to be a responsible and useful human being.

As a final note of warning to the harassed student the Committee stresses the crucial importance of integration: "To be liberally educated is to understand these facts and these values in their relation to one another."

Certainly everything about this ambitious program is good, so good in fact that I found myself worrying a bit about student athletics, social life, and work experience—not to mention a year or two knocked off as a concession to the great god Acceleration. What a core! What an apple for the teacher—for every teacher of every subject!

Let us not be discouraged. Let us remember what a heaven's for as we advance to the succeeding June.

A Design for General Education for Members of the Armed Forces is the long title of the report of the Committee on a Design for General Education, which is a subcommittee of the Committee on Relationships of Higher Education to the Federal Government, all of the American Council on Education.[2]

There being nothing very restrictive about such terms as "armed forces," "higher education," or "federal government," we may proceed on the assumption that we have recommendations on liberal education for all concerned. Moreover, the

[2] American Council on Education Studies, *A Design for General Education*, Series I, No. 18 (June 1944), 186 pages.

Committee welcomes the practical identification of "liberal" and "general." To quote: "The purposes of general education should be contributory to those of a true liberal education; general education should be looked upon as an integral aspect of a full, liberal, educational experience."

There is an implication early in the report that general education is more elementary than liberal education, but the full weight of the developed program tends to remove even the difference in degree. As I have said elsewhere:

The objectives agreed upon number ten—health, English, social adjustment, family life, citizenship, science, literature, art, philosophy, and vocation. Each objective is analyzed in some detail. It may be said that busy soldiers and sailors are confronted with a program resembling the whole course of schooling above the three R's. Cursory examination of the hundreds of concepts mentioned in the Council's report reveals a necessity for assigning ration points. The slates of students, military or otherwise, are far from clean. How shall we get rid of past error? At what point in learning shall we decide that the case of a particular student has become tutorial, clinical, or just hopeless?

In spite of these unanswered questions, the Coun-

cil's report is on the right track. We should by all means map out the mental and behavioral explorations essential to a maturing personality. For example, the unit on marriage and family adjustment, while designed for men, reveals a crucial need for every youth and adult. To understand a machine and not a child, is neither masculine nor intelligent. Given a map, we have at least a base of operations. We can get a sense of ground covered; we can estimate the distance ahead. As testing rises above easily measured skills and relates itself to the evaluation of major objectives, we shall secure for all students a new sense of progress.[3]

A month ago, President James B. Conant sent me what he described as "a rather formidable document." It is entitled, *General Education in a Free Society, Report of the Harvard Committee.*[4] Its letter of transmittal indicates a two-year period of soul searching on the part of twelve men who really lived with the subject.

The book is indeed formidable, not so much for its size, which is modest, as for the subject mat-

[3] George D. Stoddard, "The 'Last-Chance' Curriculum," *The Saturday Review of Literature,* Vol. XXVII, No. 38 (September 16, 1944), p. 14.

[4] *General Education in a Free Society,* Harvard University, 1945, 267 pages.

ter. The whole theory of general education is explored, with a passing reference to the needs of infancy and early childhood.

While it contains much of interest to the student of secondary education, I shall jump to the tertiary level at which general education is to flower, or wither, as the case may be.

In a compact search for intellectual unity the report *rejects,* in turn: (1) religious doctrines, any one, or all of them taken together; (2) the great writings of Western culture; (3) a reliance on current events and immediate problems, such as health, vocation, and family; and (4) a pragmatism based on science, or a science that embraces values.

Let us pause here to reflect upon the ground that has been cut out from under our feet. Religious dogma, the great books, the workaday world and the world of science—all in Harvard's big red ash can, as far as the quest for unity is concerned!

For fear that the reader may close the book in despair at that point, he is allowed just a glimmer of hope:

[The over-all logic] is evidently to be looked for in the character of American Society, a society not wholly of the new world since it came from the old, not wholly given to innovation since it acknowledges certain fixed beliefs, not even wholly a law unto itself since there are principles above the state.

The essential character of this logic is a newly formed merger between tradition and experiment, between the idealism of the Christian world and the worthy objectives of science. Americans are peculiarly fitted to understand and appreciate their heritage without being drowned in it. They are strong enough to move forward while carrying a full pack, and they must move or fail in their special task. Science, while not elevated as the one true guide, is allotted more living space than we might expect:

Science has done more than provide the material basis of the good life; it has directly fostered the spiritual values of humanism. To explain, science is both the outcome and the source of the habit of forming objective, disinterested judgments based upon exact evidence. Such a habit is of particular value in the formation of citizens for a free society. It opposes to the arbitrariness of authority and "first principles" the

direct and continuing appeal to things as they are. Thus it develops the qualities of the free man. It is no accident that John Locke, who set forth the political doctrine of the natural rights of man against established authority, should have been also the man who rejected the authority of innate ideas.

We must get on with the story. What, finally, is recommended?

The Committee, after lingering in many a sweet pasture, issues a resounding mandate to general and special education to get their heads together, before one of them is chopped off:

General education should provide not only an adequate groundwork for the choice of a specialty but a milieu in which the specialty can develop its fullest potentialities. Specialization can only realize its major purposes within a larger general context, with which it can never afford to sever organic connection. General education is an organism, whole and integrated; special education is an organ, a member designed to fulfill a particular function within the whole. Special education instructs in what things can be done and how to do them; general education, in what needs to be done and to what ends. General education is the appreciation of the organic complex

of relationships which gives meaning and point to the specialty.

Practically, this means six general courses out of sixteen for the Bachelor's degree, the six to include at least one course each in the humanities, the sciences, and the social sciences. Everything hangs on the excellence of the curriculum and of the teaching staff. Harvard will strive to cover the ground laid out, buttressed by a continued interest in the quality of student experience at the secondary level.

The discernible and exciting frontier in all these plans lies in the deliberate search for unity. America is coming of age, and with it the American college. We can no longer borrow blindly from Europe or simply reach out like a hungry child in a cafeteria. We approach an age of quality, distinction, and high meaning. We shall try to discover a way of life that achieves direction without loss of vigor.

III

Since so much depends on the quality of teaching, I shall digress for a few minutes from the

main theme. We shall need teacher education for all who teach the basic subjects. Until this can be achieved, not without the usual wrangling, we might do well to seek recruits from the staffs of superior secondary schools.

A few examples of current teaching demands may be helpful.

An intriguing problem in education, public or private, is how to teach the gifted in the midst of the less gifted. There is no longer cause to regard the problem as insoluble. In a democracy the truly gifted will never be found in the wrong families, nor will their demands differ *in principle* from those of ordinary persons. Except in education, the problem has proved embarrassingly simple.

Let us try a few questions by way of illustration—a bit of paraphrasing. The basic question is: How shall we develop high talent within a matrix of average and above-average ability? A few analogies follow:

1. In a democratic society, how shall we create wealth in the midst of poverty? (We have done it.)

2. In a worldly society, how shall we develop idealists, saints, heroes, and martyrs? (We have done it.)

3. Since most people ignore scientific works and the fine arts, how can we encourage a mastery of science and art among the few? (We have done it.)

The basic question is itself defective. It needs a counterpart: How shall we utilize genius in the service of the common people? All concepts of giftedness or genius are related to customs. We speak of the genius in music because music is highly prized. Other special abilities are recognized only to be discounted, such as a memory for names, dates, and boxcar numbers. Abstract reasoning is good, although severely rationed, because it has survival value—should it interfere with fishing where people lived on fish, we should find it taboo. As G. Stanley Hall once remarked, a high correlation between intelligence and infertility is a scandalous situation.

There is, in short, a convergence of individual and social intelligence.

The gifted student should help the others. He

is likely to be led into teaching anyway and he may as well begin to practice the art. The less gifted should help those still farther down, until, at last, everybody is pulling for poor Charlie. As Carlyle would say, "By Gad, you'd better." Charlie has a habit of reappearing in later life as a solid citizen earning good wages. The twentieth century needs the genius, but not the insufferable genius. We want creative persons who walk the fields and explore the skies above, hand in hand with their fellow men.

Another teaching problem centers in the educational interests of veterans. The problem is comprehensive, since veterans represent every walk of life. As students, they will have two things in common: a relative maturity in years and some experience in the armed forces. Both are conducive to the acquisition of direction and focus. "What," they may ask of an instructor, "are you trying to do? What is the objective, the mission? What is your plan? What is the timing? Where do we come in?" There will be little patience with the amorphous and the fragmentary.

I venture to prophesy that teaching will improve. It always was proper for students to ask these questions. It may be that some subjects are dragging because they have not been gone over in a hunt for the chief objectives. The dynamic role of the student in the process of teaching and learning tends to be minimized for the reluctant adolescent; the veteran-student will do well to restore the balance.

The military success with language study is a case in point. The methods were developed by experienced teachers who were temporarily off their reservations. Consider the ingredients; try to match them in the quiet halls of any campus:

1. Students selected for aptitude and interest.
2. An immediate, day-long, week-long, month-long contact with the alien tongue, oral and written.
3. A full use of well-known teaching devices.
4. A constant attempt to relate the language to the people and their customs.
5. A freedom from conflicting demands on the part of staff and student body.

6. A motivation based on the subsequent use of the language in patriotic service.

Under these conditions the study of language is an unlocking key to something badly needed. There was a time when Greek and Latin performed this function. They helped to blow away the fog of the Middle Ages. Later, French was more than an ornament; it was a utensil of trade and diplomacy, and German was a "must item" in scientific exchange. Today the study of Russian appears desirable in all these respects. The time is ripe for target shooting, not the retention of a linguistic blunderbuss, whether the target be the Roman Empire, France, Germany, Poland, Russia, China, Burma, or Brazil. Broad targets, horizon-wide, are the improvement of English or access to materials already available in fine translations. If those particular targets are chosen, the veterans will surely walk out, leaving a big hole in any classroom. The first step in the teaching of language by the Army system is the mental conversion of the student. That is half the battle—the half frequently lost in the droning

confusion of the traditional study hall. The Army's secret weapon is the will to learn. The will to learn is derived from utility. No language is an end in itself, not even to those who teach it.

A third illustration is found in education for the air age. The faith of seventeen of us in such a program is exemplified by our sponsorship of Air Education, Inc. Nevertheless we should keep our heads. As we ride the rockets, we shall be going from your place to my place, from my place to your place. The passage itself may take little time, affecting us about as much as an overnight ride in a Pullman. For those who like to linger in high places over lovely scenery, we shall introduce lazily floating dirigibles in order to restore a sense of the voyage. The counterpart of this exists today: in an age of speed we prize the footpath, the stroll over the links or through woods, the horseback ride. Above all other pleasures, we like to sit, scanning the page, the screen, the air waves, or watching the violent exercise of a chosen few.

It is clear, therefore, that while scientists develop air transport and technicians maintain it,

the rest of us worry about *destinations*. When we go so far so fast, what do we hope to discover at the other end? Of course, there are some natural wonders that cannot be moved; they are worth coming to see. No Easterner can remain unaffected by his first view of the Rockies, nor ever forget the glorious coloration of the desert lands. There is only one Grand Canyon; it should be the birthright of every American to see it while young, and then to revisit it with his children. If space can be annihilated, let us shorten the distance between crowded districts and the great open spaces where nature is predominant.

In return, the city will offer its special attractions. Its greatness lies in organic wholeness. The people live and work together; they recognize and encourage talent. In a city, team play is essential. Often a man cannot get from his home to his office without the help of hundreds of others who maintain the traction system. A handful of disaffected employees or employers can tie up vital areas of production, distribution, transportation, or cultural exchange. The monkey wrench is always handy. That things generally

go so well is a tribute to our capacity to live and work together.

In short, the chief lesson in an age of air transportation is not to fly away and forget; it is to enrich our lives on the ground.

IV

Let us turn now to the second focus of revolution mentioned at the beginning of this paper—to science and the scientist in a democratic society.

The freedom the scientist demands in order to be productive and original is no inalienable right, for the simple reason that it cannot stand alone. He needs funds, books, laboratories, and assistants; he needs a free press. Very likely he will return all expenditures a hundredfold, but the question is, *to whom?*

Hitler had his scientists. Some remained out of politics and asked only to be let alone. They were not let alone; they were forced into political action. They lost their freedom. Soon they lost everything that makes a man either scientific or decent.

Unhappily science will grow more deadly. In this war we have learned the fine art of destroying cities above ground. The countermeasure, which is supposed to neutralize the latest method of military attack, is in itself monstrous—a life underground. Man is driven into the caves from which he emerged only a few thousand years ago, and he no longer feels at home there. In all countries we have not only the transformation of a peaceful product—the plowshare into the sword—but intense devotion to research on war materials and weapons.

Nothing can stand up against modern weapons. Adequate defense is no longer to be found in armor, fortress, isolation, or camouflage. Defense is prior attack or counterattack—that is, destruction turned away from the defenders. This is indeed a grim lesson, short and ugly: in modern war the loss of life and property is certain to be tremendous, and it may be evenly distributed to all populations and localities.

Now it can be argued that technology really has had nothing to do with world wreckage. The scientist likes to feel that way about it. He knows

that research will continue despite all charters, treaties, and covenants. It will be as hard to control as thought itself, for it *is* a form of thought. The scientist is discovering new pathways to danger and death. The same methods that grow crops, develop machinery, feed children, and multiply incredibly our control over disease can be devoted to the best means of destruction.

The solution is not to stop research, however dangerous. We shall risk making the fastest flying bombs, the most poisonous gas. As between high explosive and gas or disease germs, there is little choice along ethical lines; the decision is at root military.

The question is, can we remember that the gun is always loaded? Any chemist, worthy of his salt, could blow up his laboratory—and a few people in it, for good measure. Anybody's throat could be cut in kitchen or barber shop. There is enough poison around most homes and farms to kill all rats and other creatures deemed obnoxious. Persons properly out of custody have learned to live with these terrifying facilities. We think nothing of it. We are on guard against three

groups, and only three: (1) the inexperienced, (2) the insane, and (3) the criminal. They can all use knives, guns, and chemicals in unpleasant ways. Accordingly, we invest our homes and municipalities with protective devices. We establish certain conventions. We teach children. We try to understand and prevent insanity. We study delinquency and crime. In spite of enormous failure, we keep at these problems. As a result, the mature, the sane, and the law-abiding are in the majority.

In short, we strive to live happily among dangerous but useful objects and conditions, just as mankind has done from the beginning. The sea, the cliff, the river, the stone, the tree, the stick, the fire, the knife, the gun, the highway, the airplane, the rocket, and the atomic bomb all have something in common. Our basic physiological mechanism responds to the older fear stimuli, to high places, darkness, and deep water, but not as yet to the new. People will risk their necks at high speed, without fear, only to set off extraordinary reactions toward the harmless snake in the picnic box.

Will education be fast enough to save us from an acceleration of danger? Heredity is too slow and too rigid; it is outmoded. The learning needed is the same for nations as for nurseries, kitchens, and factories. Most children keep a scratch or two ahead of their own destruction. Women, considering the arsenal in which they work, are enormously patient and thoughtful of others. Men who work in gun factories rarely shoot it out with one another, and powder magazines are less explosive than some other kinds.

In a world of natural and man-made dangers, we can learn to *become safe from each other.* All deviations from this principle should be placed at once in the category of the criminal or the abnormal—perhaps in both. We cannot longer regard inexperience as an excuse. We know that to threaten war is to wage war.

Even if all lethal weapons were abolished. such massive things as mechanical advantage, food supply, or population might win a war. Anything yielding an edge to a nation with predatory intentions would eventually produce the required armament. A ban against fighting might lead to

defeat; resistance to health measures or technology could have a like effect.

This surely is the curse of Adam upon all forms of life: the normal, whether in cell or society, is close to the abnormal. The good shades over to the bad. Patterns of growth are not inevitably upward but only of different form. Species and societies arise, predominate, and deteriorate. Man, for all his artful gifts and aspirations, remains forever animal. He is called upon to adapt himself to changing conditions, including the environment as modified by his own works. To live in danger has been his history; it will be his future.

A victory of man over himself will not be won easily, and perhaps not at all. There are divisive forces within families, cities, and nations almost as ruinous as international conflict. The dead may not be piled so high, but the psychologically wounded are innumerable. The world of phantasy reaches out; the means of escape are everywhere at hand. With the coming of peace we shall concentrate upon the appalling ravages of alcoholism, disease, drug addiction, delinquency,

crime, neurosis, and psychosis. We shall seek again the underlying causes of unhappiness, cruelty, and aggression. We shall seek not alone antidotes but the positive means of growth and refreshment. If peace can be maintained long enough, a new social structure, deep in the earth of science and technology and rising to new heights of good will and spiritual quality, can be brought into being.

The frontier in the education of the scientist lies in both the foundation and the crowning tower. We need his skepticism, his urge to be shown, his way of testing the strength of materials and ideas. We need his ethics. The good scientist is good in all matters that affect his procedures; he establishes a special world of fellowship and exchange. Within it, he is inherently moral and reliable. When a bridge falls down, it is front-page news, so rarely does it happen. Given this objectivity, this intellectual freedom, the scientist should be able to move serenely in other areas that involve the exercise of judgment. Frequently however he relies on common stereotypes, staying within airtight compartments.

The time has come, I believe, to enlist the scholar and the researcher and, with them, the men of affairs who keep the ship on an even keel of production, distribution, and government. They must relinquish the greatest fear of all—the fear of thinking. Even the great scholars and artists can be spared these demands on only one condition: either they stay within their specialties or emerge as neophytes, eager not to pronounce but to learn. Of course, any expert human enough to dance, swim, golf, garden, or carry on a conversation cannot claim the peculiar advantages of the isolate; he is expected to be intelligent outside his shell. The traditional alternative is to stay inside—an appealing choice in a world devoted to every form of communication except the free exchange of ideas but a choice deadly to one's usefulness as a teacher of the liberal arts. The new scholar must know and exchange and teach and exemplify; to grow and to help in a distressed world, he must give constantly of himself.

Does not the burden of complaint against physical science pile up against its outcomes? The method is feared only when it seeks admission

to new places. There is, too, a vague resentment against noise, heat, dust, smoke, and the factory profile. Science even gets blamed for the ugliness of cities, cheap advertising, and radio claptrap, every one of which falls within the purview of the fine arts.

Except in methodology, physical science (not the individual scientist, of course) cannot be said to have any preference as between beauty and ugliness, noise or silence, sin or virtue. It undergirds homely or handsome buildings but never the poor design. It is the greatest noise producer in the world and the greatest silencer. If your good health is a virtue, science will contribute to it with amazing effectiveness; if your enemy's ill health is an equal virtue, science is quick to burn him, poison him, or blow him to bits. In a gentler mood, as it were, science will discover strange things in a cup of water, leaving for the humanist, the moralist, or the educator the delightful task of making cleanliness a virtue. Is it reasonable for anyone to get angry at so obedient a servant?

The argument for scientific freedom is double-

edged. As the scientist gets into relation with psychology, sociology, economics, and government, the leaders of these fields in turn must protect his status. No political party can decide how research shall turn out; no matter what the assignment in Washington, a Vannevar Bush is supreme within his bailiwick. American military research forged ahead in this war, after a belated start, through the unbeatable formula of brains, power, and purpose.

It has taken us a long time really to accept the principle that a theory in physics, astronomy, or biology is no fit subject for theologian, politician, or humanist. It can be verified, modified, or rejected only by the free-thinking scientist freely experimenting. What a theory means to man's future adjustment and happiness, what to do about it, what values may be derived from it—questions like these concern everybody.

In the teaching of science the frontier is the social studies. Here the scientific and the nonscientific mingle, such that the physical scientist and the man of letters pounce upon the social scientist as a dangerous middleman—definitely ex-

pendable! The one forgets the centuries-long fight: he had been told that astronomy and biology were forever denied to him as fields of study. Failing to deter the hardy adventurers, the same forces ridiculed his methods and conclusions. The other, the philosopher, for example, is curiously cold toward being found on this frontier, although it is the only place where new veins of ore are likely to be discovered. John Dewey constitutes a notable exception. The decline in philosophy in modern education is so dramatic and unfortunate that I should be almost willing to define a philosopher as a man who searches out, and falls in love with, unpopular truth.

In any case, the tendency of scholars to derogate the student of social trends leads to unhappy results. The educational psychologist knows full well that his findings are not exact, but neither are they casual guesswork. Laugh, if you will, at the *laws* of learning, the *principles* of motivation, or a *formula* for factoring mental ability; but remember that these problems are durable and important, and the methods do yield verifiable results. There are people in the world glad

to record and enlarge upon every failure in the objective approach to human behavior, laws, and institutions. They thrive on the ignorance of others. They want nothing of truth, goodness, or beauty, but only personal power. Unwittingly, we play into their hands.

The question is, what kind of a world do we want? What kind of people? Man's truly precious heritage is his brain. All science, art, philosophy, and social order are merely a physical extension of events inside the skull. Everything new is first imagined. Were a fatal malady to attack the cerebral cortex over a wide scale, we should take alarm; we should mobilize the full resources of medical science. Perhaps the time for mobilization is at hand, lest the ages recognized as dark since the Renaissance and the Reformation be brought to us strangely disguised as light; lest science be identified with evil, which it is not; lest free inquiry, whatever we may call it, be excluded from areas crucial to human progress.

A one world of the sciences, social sciences, and humanities will be no panacea, but it will offer a

strong common front to the encroachment of laissez faire, superstition, and authoritarianism. It will open a new door to freedom.

In many respects agriculture shows the way. It tends to grow healthy, sane, and good. The modern farmer is not afraid of science; he swears by it. He is a sturdy friend of pure and applied research, and this I could demonstrate through personal experience with legislation affecting agricultural colleges. At the same time the farmer achieves a stable balance as between self-help and co-operation. He forms a community, if necessary with state and national coverage. His character-building struggles, his partnership with nature, his attitude toward life have never ceased to attract the poet, the painter, and the novelist. He may talk glumly, but he is really an optimist. I have seen him ploughing around the oil derricks in the red soil of Oklahoma, content to earn his living the hard way; and I have seen him rolling up the rusty wire and gingerly stacking unexploded shells on the scarred fields of France. Even mined-out, quarried-out trenches and hummocks offer only a temporary barrier to his insidious

technique. When a farm improves, like a person it gets better all over.

Cities are different. They dissolve in the middle and grow around the edges, to emerge as strange civic doughnuts, pleasing only to those who live in the sugar-and-cinnamon districts.

I am no farmer, and I live in the cinnamon belt. My plea, after all, is not for a return to the farm but for a wider distribution of material, intellectual, and civic resources. We have asked people to be content with their lot, wherever it may be situated.

We must now exploit free enterprise and cooperative enterprise to make life richly rewarding. That was the promise of science everywhere and the promise of America in particular. Nobody is going backward in place or time. There is no "old country," nor is there a far country holding out the prospect of a new day. This land *is* the new and the far; here lies our future. We shall go away and return, laden at times with the goods and ideas of a civilization more ancient than ours.

For America the educational frontier is within. It is the child, multiplied by fifty million, playing

and growing in an atmosphere of responsible freedom. It is the new, strong, free adult, linking his fortunes with others, as a matter of right and privilege, at once a personality and a part of the larger whole. It is the American dream, not realized, but approached with the courage and enterprise that distinguished the pioneers.

As we enter the United Nations, so splendidly brought forth at San Francisco, let us hold firm to the power of education to clear the minds and open the hearts of men. Force alone generates hatred and rebellion; culture alone is debilitating. Our finest export will be firmness with friendliness, and a contagious habit of free inquiry. Instruction, example, and fair-mindedness, those common treasures found in any schoolroom, may look good to people everywhere.

It was, I believe, to such a vision of American life and America's place in the world, that the late Ellwood P. Cubberley devoted his extraordinary talent for intellectual leadership, and it is to him that I dedicate this brief review of a problem that never dies.