

EDITORIAL

SIGNIFICANT FORM IN ANAESTHESIA *

In the process of learning there should be present, in some sense or other, a subordinate activity of application. In fact, the applications are part of the knowledge. For the very meaning of the things known is wrapped up in their relationships beyond themselves. Thus unapplied knowledge is knowledge shorn of its meaning.†

—ALFRED NORTH WHITEHEAD

THE epigraph of this discourse is taken from Alfred North Whitehead, the sage of Cambridge, the sage of Harvard, the great mathematician, the great philosopher. Herein is implied the old concept of *value*, value of knowledge and, as well, value of application; both akin to "Significant Form" in the title of this address and not unlike the words of a well-known critic, Mr. Clive Bell, namely: "Significant Form is the one quality common to all works of visual art" (*Art*, p. 8. 1914). Professor L. A. Reid, a philosopher well versed in the problems of aesthetics, extends the scope of this characteristic to all art whatsoever. For him, "Beauty is just expressiveness," and "the true aesthetic form . . . is expressive form" (*A Study in Aesthetics*, pp. 43 and 197, 1931). Another art critic, Mr. Roger Fry (*Vision and Design*, p. 50, 1925), accepts the term Significant Form, though he frankly cannot define its meaning. From the contemplation of (say) a beautiful pot, and as an effect of its harmony of line and texture and color, "there comes to us," he says, "a feeling of purpose; we feel that all these sensually logical conformities are the outcome of a particular feeling, or of what, for want of a better word, we call an idea; and we may even say that the pot is the expression of an idea in the artist's mind." After many efforts to define the notion of artistic expressiveness, he concludes: "I seem to be unable at present to get beyond this vague adumbration of significant form."

Susanne K. Langer (*Art: The Symbol of Sentience*, New World Writing, Fourth Mentor Selection, 54, The New American Library, 1953) writes: "A work of art is so complex a thing—being at once a social possession, a personal record, a piece of self-expression, an influence, an object of sensuous delight or of entertainment—that too many things can be truthfully said about it to keep the problem of its specifically artistic virtues clear without severe abstraction. But once the symbolic form is perceived, all other values a work of art

* Read at the meeting of the New England Society of Anesthesiologists held at Hanover, New Hampshire, October 8, 1954.

† *Essays in Science and Philosophy*, p. 219, New York, Philosophical Library, 1947.

may have appear peripheral and irrelevant unless they contribute to the force of that symbol."

Just as "there are analogies between silence and tranquility—between the bustle of morning and the gaiety of hope" (Alison), so, too, there are analogies between application in learning and significant form in anaesthesia. While I was in France last year, a good friend of mine, a distinguished professor of anaesthesia at one of the greatest universities of this continent, wrote to me asking for an expression of opinion, from the anaesthetists of Paris, on what they considered the ten or a dozen chief advances in anaesthesia over the last fifty years. Accordingly, I sent out a circular letter to some forty, the élite of the speciality of anaesthesia in Paris, and received most cooperative response. The general belief was given in the following order:

1. Provision of opportunity for young doctors to learn anaesthesia:
 - a. Clinical centres
 - b. Laboratories for research
2. Use of oxygen in anaesthesia
3. Elimination of carbon dioxide:
 - a. Absorption
 - b. Nonbreathing
4. Knowledge of the effects of drugs on the vital functions
5. Discovery and use of Muscle relaxants
6. Preoperative and Postoperative care:
 - a. Psychotherapy
 - b. Parenteral feeding
 - c. Recovery rooms
 - d. Control; oximetry, ECG, EEG, etc.
7. Methods:
 - a. Tracheal Intubation
 - b. Intravenous anaesthesia
 - c. Assisted and controlled breathing
 - d. Controlled hypotension
 - e. Potentialized hypothermia
8. Agents:
 - a. Short-acting barbiturates
 - b. Cyclopropane
 - c. Ethylene
 - d. Vinyl ether
 - e. Trichloroethylene
 - f. Regional anaesthetics
9. Techniques for regional anaesthesia:
 - a. Intrathecal
 - b. Epidural
 - c. "Blocks"
10. Complemental combinations of agents and methods

This list gives evidence of considerable significant form, and the superorganic evolution (Herbert Spencer) which has been going on in our subject shines through to such an extent that the symbols themselves seem to sparkle with meaning. Of course there is a great deal of overlapping and there was some difference of opinion. But these are not serious matters. We all can agree that such is the importance of these advances that the arm of surgery has been extended in humane rescue, and that the patient is assured of increased ease and safety.

Some years ago, I declared that the best of all that's new in anaesthesia is *the new and widespread interest in the provision of opportunities for those who desire to learn anaesthesia*. More and more, I have continued to believe it to be our bounden duty so to provide. For each young aspirant, let us increase the timeliness to unfold

inclination and to develop thought. Let us make sure that each young candidate understands that "the key to the history of mankind lies in this fact—as we think, we live." Let us remind him of Matthew Arnold's famous definition of culture: Culture is the knowledge of the best that has been thought and said in the world. Let us remind ourselves as well as those who are learning beside us, with Montesquieu, that "The first motive which ought to impel us to study is the desire to augment the excellence of our nature, and to render an intelligent being yet more intelligent."

But Whitehead points out that something essential should be added to this characterization. "That 'something' is the profound flux of the world." For "change in the conditions of social existence is recognizable within the life of one human being and almost within the span of one year." There may be placed "in sharp contrast two antithetical truths; one that culture is assimilation and imitation of what is best in the past, and the other that the transience of conditions renders the details of the past irrelevant to the present. The problem of modern education is contained in this antithesis. Almost all intellectual knowledge is derived from the past; our mental outfit consists of "ancestral voices prophesying." The criticism of knowledge is the criticism of the past. Whatever be the subject which we teach, our main task is to inculcate how to inherit, appreciatively and critically. What our students should learn is how to face the future with the aid of the past."

"Knowledge is the reminiscence by the individual of the experience of the race. But reminiscence is never simple reproduction. The present reacts upon the past. It selects, it emphasizes, it adds. The additions are the new ideas by means of which the life of the present reflects itself upon the past. Thus culture, besides involving a criticism of tradition, also requires a critical appreciation of novelty. . . . But we must apply the system of thought, in the shaping of the ideal—as we think, we live—, past and future fuse together in the present. The past is there as an inescapable fact, with its secret impress of modes of operation. In order to conjecture the boundary of possibility we must scan the past."

As we take part in the education of the young candidates who are learning anaesthesia, let us continually be conscious of the two parent qualities of high civilization, namely, the Sense of Values and Reason Enthroned. In his book called *Civilization* (p. 58, London, Chatto & Windus, 1928), Clive Bell says: "A sense of values is possessed only by those who are capable of sacrificing obvious and immediate goods to the more subtle and remote. . . . Reason is enthroned when there is a prevalent opinion that everything requires, and must ultimately admit of, a rational explanation and justification."

Let us, therefore, do all in our power to provide opportunity for the young doctor of medicine to learn anaesthesia. Time and time

again I have preached this doctrine from the house-tops, and, although its details are worthy of reiteration, I shall, at this time, only repeat that, in a postgraduate course of anaesthesia, the candidate should rotate from one hospital to another, throughout the given number of years, every six months, and that there should be an exchange of lecturers between schools. In our narrowness, we teachers are all too apt to refrain from sending our students away from beneath our own wings. It is a form of egotism. It is very wrong. For, by having the student anaesthetist move from one center to another, he gains a diversity of experience under the tutelage of many leaders. In this way he cannot be "branded," cannot become "hallmarked," by person or by place, even though these be all-excelling! It is reasonable to believe that he who learns from many masters, all else being equal, will these outdo. As time goes on, he will outdo these masters in knowledge and in action. It is reasonable to believe that he will be more capable, more versatile, more percipient than he who ranges under one rubric. Indeed, the anaesthetist of to-morrow will surely be more accomplished than are we!

On behalf of this not-too-small portion of super-organic evolution, has it not become our bounden duty, in manner altruistic, so to provide? Has not Virgil said: It is the lot of most teachers to be outgrown by their best pupils? Robert Bridges, in *The Testament of Beauty*, has it:

if but the teacher be himself
virtuous or musical—an exemplar as such,
he will be keenly follow'd, and often in his love
that his pupil surpass him is his best reward.

Let students and teachers so animatedly cooperate that they may become aware of a situation to which the words apply which Socrates used of life: "Noble is the prize and our hope is great." Let teacher and student realize with Cicero:

Ita illi ipsi doctrinae studiis et
sapientiae dediti ad hominum utilitatem
suam prudentiam intelligentiamque
potissimum conferunt; . . .

de Officiis, 1, XLIV, 156.

Translation: The principal thing done, therefore, by those very devotees of the pursuits of learning and science is to apply their own practical wisdom and insight to the service of humanity; . . .)

Sir Thomas Lewis (*Research in Medicine*, p. 102, London, H. K. Lewis, 1944) has said that "research in teaching schools is important because research and teaching react favourably upon each other, together creating the right atmosphere and building up the right tradition." The research should be of the clinical variety wherein the work may be done equally freely in the laboratory, the operating

room and the ward. For a long time I have advised that a department of anaesthesia ought to consist of two divisions, the one clinical and the other laboratory. All of the work should be led by the professoriate and encouraged among the members of the staff. The young student of anaesthesia should be given ample opportunity to recruit himself into research work. On the first of September, 1954, at the annual meeting of The British Association [for the Advancement of Science] held in Oxford, Dr. E. D. Adrian said in his presidential address: "If all goes well with our training, the brains we have ought to be more civilized than those of our fathers and those of the next generation more civilized than ours."

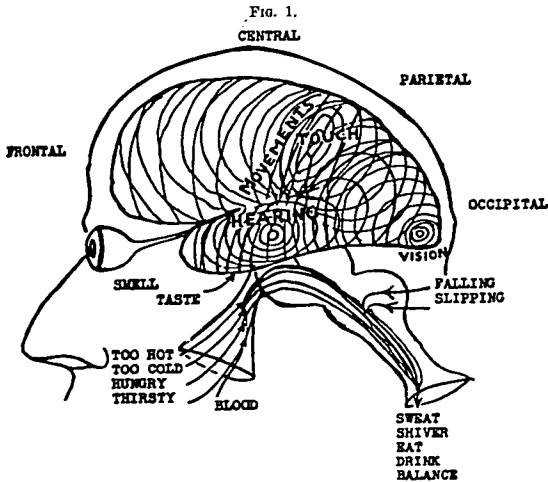
I shall not extend further answer number *one* of our questionnaire. But, we may well be encouraged to note that increasingly more and more teaching centers are being organized and that research in anaesthesia is being intensified. Advance in these directions has meant development of the specialty, has made it so that the other answers could be given as they have been.

Now, it would be effrontery, before an audience like this, to expand the other subjects of our list. Reflection reveals that they are steeped with significant form concerning anaesthesia. Remember, it has been said that "Significant Form" is what we mean by calling anything "artistic." With a little reflection, one finds that each development catalyzes others and a veritable network of causes and effects takes place, not unlike the vast interlocking industrial network which provides food, vaccines, antibiotics, and hospitals; not far separated from the homeostasis in social and ethical fields.

When the great Harvard physiologist, W. B. Cannon, suggested the significant appellation, homeostasis, he wrote: It was a signal contribution to our understanding of physiology that Claude Bernard made when he recognized that the blood and the interstitial lymph provided appropriate and favorable surroundings for the living cells of the organism. He, Bernard, early pointed out that the *milieu interne* not only is a vehicle for carrying nourishment to cells hidden away in the deep tissues, far from the surfaces of contact with the world outside, and for bringing away from those cells refuse for excretion, but also that it is under control of agencies which keep it remarkably constant. He clearly perceived that just insofar as that constancy is maintained, the organism is free from external vicissitudes. "It is the fixity of the *milieu intérieur* which is the condition of free and independent life," Bernard wrote, and "all the vital mechanisms, however varied they may be, have only one object, that of preserving constant the conditions of life in the internal environment." In the opinion of J. S. Haldane, "No more pregnant sentence was ever framed by a physiologist."

Gray Walter, in his book, *The Living Brain* (1953), tells how Sir Joseph Barcroft translated Bernard's dictum, *la fixité du milieu intérieur est la condition de la vie libre*. Barcroft translated this into

simple questions and guided us to the answers. "What has the organism gained," he asked, "by the constancy of temperature, constancy of water, constancy of sugar, constancy of oxygen, constancy of calcium, and the rest?" With his gift for quantitative expression, it was all in the day's work for him to demonstrate the individual intricacies of the various exquisitely balanced feedback mechanisms. But there was in his manner a kind of modest trepidation, as if he feared his flight of fancy might be ridiculed, when he gave this illustration of homeostasis and its peculiar virtue (fig. 1): He said "How often have I watched the ripples on the surface of a still lake made by a passing



"... but the lake must be perfectly calm....."

The upper brain is freed from the menial tasks of the body, the regulating functions being delegated to the lower brain

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boat, noted their regularity and admired the patterns when two such ripple-systems meet . . . *but the lake must be perfectly calm.* . . . To look for high intellectual development in a milieu whose properties have not become stabilized, is to seek . . . ripple-patterns on the surface of the stormy Atlantic." Only isolated and intermittent evidence of any higher significance is found in the ripple-systems of brains other than that of man. For mammals all, homeostasis was survival; for man, emancipation.

"Concerning one prehistoric result of this emancipation we may conjecture with some assurance, man's mastery of fire. Within the

increased area of the cortex of the ancestral organ was evolved a mechanism capable of the new series of processes: observation, memory, comparison, evaluation, selection. Man was learning which end of a burning stick he could grasp with impunity . . . ; the taming and use of fire raised man indeed to Promethean heights, master not of a tool but of a force. The perfect calm of Barcroft's lake is the physiological aspect of the peace that passeth understanding, of the 'happiness that lies within.' "

Recently, and in a seemingly metaphorical manner, the concepts of homeostasis have been given wider philosophical application, even into social and ethical fields, particularly by Dr. Alfred E. Emerson, a well-known ecologist. He says that the scientific principle of homeostasis assists in the resolution of many controversies and dilemmas. It relates the individual to the group, . . . the conscious to the unconscious, science to ethics and aesthetics, . . . and so forth. A. Korzybski (*Manhood of Humanity*, 1951), has written on the Manhood of Humanity and, as Montagu (M.F.A.: *Time-Binding and the Concept of Culture*, Scientific Monthly, Sept., 1953) points out, "the good life was what Korzybski was passionately interested in." Korzybski said, "Ethics is too fundamentally important a factor in civilization to depend upon a theological or a legal excuse; ethics must conform to the natural laws of human nature." And "The period of humanity's manhood will be a scientific period—a period that will witness the gradual extension of scientific method to all the interest of mankind—a period in which man will discover the essential nature of man and establish, at length, the science and art of directing human energies and human capacities to the advancement of human weal in accordance with the laws of human nature." Ashley Montagu says: "What, in brief, has been discovered is that to live as if to live and love were one is the only way of life for human beings, because, indeed, this is the way of life which the innate nature of man demands. The highest ideals of man, therefore, spring from his own nature, and the highest of these ideals and the one which must inform all others is *love*. This is not a new discovery in the world; what is new is that scientists should have made it by scientific means." They have given a scientific validation to the Sermon on the Mount. Therefore, we must teach the art and science of human nature, the art and science of human relations. But, above all else, we must teach men how to love. Then shall one heed Shelley to say:

virtue shall keep
Thy footsteps in the path that thou hast trod,
And many days of beaming hope shall bless
Thy spotless life of sweet and sacred love.

—*The Daemon of the World*

But, no doubt there are some warnings. Let us heed these of Harrison Brown, Professor of Geochemistry at the California Institute

of Technology, from his book, *The Challenge of Man's Future* (New York, The Viking Press, 1954): "Strong arguments can be presented to the effect that collectivization of humanity is inevitable, that the drift toward an ultimate state of automatism cannot be halted, that existing human values such as freedom, love, and conscience must eventually disappear. Certainly if we used the present trends in industrial society as our major premises, the conclusion would appear to be inescapable. Yet is it not possible that human beings, recognizing this threat to the canons of humanism, can devise ways and means of escaping the danger and at the same time manage to preserve those features of industrial civilization which can contribute to a rich, full life? Is it really axiomatic that the present trends must continue and that in the long run industrial civilization and human values are incompatible? Here, in truth, we are confronted with the gravest and most difficult of all human problems, for it is one that cannot be solved by mathematics or by machines, nor can it even be precisely defined. Solutions, if they exist, can arise only in the hearts and minds of individual men." It may be that, in the words of Dr. Alfred P. Stiernotte (a young American philosopher, not unlike the great Nobelist, Albert Schweitzer), philosophy of science must not only dance with the electrons, it also must "dance with the daffodils" as Wordsworth himself did! And in so doing, it may see with more clarity the need for integration of the sciences into a coherent picture of the universe which is the essence of metaphysics (*American Scientist*, October, 1954). He draws attention, too, to the early Greek philosophers, none of whom separated life into watertight compartments of science and religion.

A little book, entitled *On Education* (Cambridge, at the University Press, 1954), and written by Sir Richard Livingstone, contains some excellent thoughts on what education can do to remedy the lack of standards and clear beliefs which is the most dangerous weakness of the Western World. He states: "We have got a political democracy, but not yet an educated one. This is our problem. It cannot be solved without education." Amidst much serious discussion, he asks the question: "What is a complete human being?" and gives the Greek answer: "Human beings have bodies, minds and characters. Each of these is capable of what the Greeks called "virtue (*ἀρετή*) or what we might call "excellence." The virtue of excellence of the body is health and fitness and strength, the firm and sensitive hand, the clear eye; the excellence of the mind is to know and to understand and to think, to have some idea of what the world is and what man has done and has been and can be; the excellence of the character lies in the great virtues. This trinity of body, mind and character is man: Man's aim, besides earning his living, is to make the most of all three, to have as good a mind, body and character as possible; and a liberal education, a free man's education is to help him to this; not because a sound body, mind

and character help to success, or even because they help to happiness, but because they are good things in themselves, and because what is good is worth while, simply because it is good." We must look beyond science, technology, economics, sociology, handicrafts, subjects "with a vocational bias," we must look beyond (without overlooking) these and recall and extend a statement by Alfred North Whitehead that would probably surprise most people: "Moral education," he says, "is impossible without—what? Residential schools, games, a happy and disciplined family life? No, none of these. Moral education is impossible without the habitual vision of greatness." It could not be put more strongly. He used the word "impossible," and then, the expression, "habitual vision"—not a chance and occasional glimpse. Outside Plato, there is no profounder saying about education. A "habitual vision of greatness" is necessary not only to moral education, but also to all education. What more important service can school or university do for their pupils than show them the best things that have been done, thought, and written in the world, and fix these in their minds as a standard and test to guide them in life?

Here are some words from Plato: "As for wisdom and firm belief, a man is fortunate if he acquires them in advancing years; to possess them with all their attendant blessings is to have reached the full stature of man. . . . But if you consider one factor in it, the rightly disciplined attitude to pleasures and pains, by which a man from first to last hates what he should hate and loves what he should love—if you isolate this factor and call it education, you will be giving it its true name." This is what Plato wrote in his *Laws*. In his *Republic*, he gives the following noble and concise expression: "Goodness is the health, beauty and well-being of the soul; evil is its disease, deformity and weakness." A knowledge of these should enter into any scheme of higher education, so that people can enter life with a reasoned philosophy of it and not merely with good habits. T. S. Eliot, in his *Choruses from The Rock*, has the Rock say:

The world turns and the world changes,
But one thing does not change.
In all of my years, one thing does not change.
However you disguise it, this thing does not change:
The perpetual struggle of Good and Evil.

During the past decade or so, considerable attention has been given to the problem of the teaching of philosophy in the universities to students specializing in subjects other than that of philosophy. Most authorities agree it would be a great contribution to general education and general culture. But there are difficulties, the chief difficulty being the finding of room in the curricula. Just lately, W. B. Gallie, Professor of Philosophy, University College of North Staffordshire, has advocated that the teacher of the speciality concerned ought him-

self to deal with the philosophical questions of his own subject. But, as he will recognize that he cannot proceed very far with these questions, he should seek aid from philosophers who can sympathize with him. He believes that there would be eager response from these philosophers. Philosophical knowledge undoubtedly will enhance fitness for teaching among the personnel of our profession and make better specialists; better physicians, better surgeons, better anaesthetists. Such pursuit of perfection, then, will be "the pursuit of sweetness and light." John Milton's poem, called *Light*, ends as:

So much the rather thou Celestial light
Shine inward, and the mind through all her powers
Irradiate, there plant eyes, all mist from thence
Purge and disperse, that I may see and tell
of things invisible to mortal sight.

Now, therefore, we have cause for thankfulness and may feel, with William James, "encouraged and uplifted and washed in better moral air." Those of us who have helped to bring about growth in anaesthesia can appreciate the significant form, and, in looking to the future, let us with Keats, exclaim:

So on our heels a fresh perfection treads,
A power more strong in beauty, born of us
And fated to excel us, as we pass
In glory that old Darkness: . . .

Hyperion, Book II.

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