

Children are born true scientists

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1. Those hazards which cannot be safely learned by children should be identified and removed from children's lives.
2. Parents and planners should leave opportunities for children to explore and find or create their own environments rather than attempting to provide specific places and equipment for all of their children's needs.
3. Environmental planning and design should be based upon an understanding of human ecology.
4. Environmental planning and design of local environments should always involve the participation of residents, including the children, to the maximum degree possible.

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SCHOOL DAYS

Children are born true scientists

R. Buckminster Fuller

Buckminster Fuller is University Professor Emeritus, Southern Illinois University and the University of Philadelphia. This article is abstracted from his Introduction to a projected book by Einar Thorsteinn.

The philosopher-scientist Sir James Jeans said "Science is the attempt to set in order the facts of experience." The great Viennese physicist, Ernst Mach, whose name is used to identify ultrasonic airplane speeds — Mach Number — said, "Physics is the attempt to set the facts of experience in most economical order" — the only raw material of all science is experience.

Children are born true scientists. They spontaneously experiment and experience and re-experience again. Seeking to sort-out and find order in their experiences — which is the mostest? Which is the leastest? They smell, taste, bite and touch-test for hardness, softness, spring-

iness, roughness, smoothness, coldness, warmth; they heft, shake, punch, squeeze, push, crush, rub and try to pull things apart. True scientists deal only in the experienceable and base their assumptions only upon the physically re-demonstrable behaviors and characteristics.

Innocently betrayed by the equally innocently de-toured-from-reality educational system, the young scientists are lured into forsaking their innate true scientist advantage by adopting the school-proffered mathematical tools with which to probe, sort-out, and reassociate their experience-won information most of which mathematical tools are experimentally non-demonstrable pretensions. In conventional mathematics a real something having substance is three dimensional. Try to demonstrate a structural model of a two dimensional plane surface of a less than three dimensional nothingness or try

to produce a structural model of the square root of minus one! The Massachusetts Institute of Technology's Department of Mathematics catalogue states "Mathematics is the *science of structure* and pattern in general." Humanity's invention and adoption of the word "*image*" and its brain formed employment as *image-ination* was occasioned by the need to describe to others the visual experiencing of images. Scientists deceive themselves by adopting such non-experienceable "tools" as unimaginable *imaginary numbers*. Seeing always and only occurs inside the brain. "Seeing" always occurs only as *image-ination*.

Victims of their self-deluding mathematical game playing, academic scientists have been forced to improvise a vast complex of equation formulating involving speculative probabilities being forced as well to adopt a plurality of incommensurable fractions as constants with which to compensate for their use of a mathematical coordinate system other than that employed by the physical universe, by all of which strategies they finally arrive at quantations having reasonable agreement with the quantities demonstrated by physical experiment. Having learned awkwardly, circuitously and fortuitously to cope with a four-dimensionally operating physical universe while employing an exclusively three-dimensional logic. This "non-modelable" cobweb weaving in the dark being the only scientific method of which they know and with which they have become painstakingly familiar, academic science succeeds in indoctrinating only a small fraction of one percent of humanity to a degree adequate to skirmish "professionally" in the frontiers of scientific advance.

This innocently acquired dilemma of humanity is now correctable because persistent childlike integrity of exploration, employing only experimentally evidencible tools and strategies has discovered and demonstrated the mathematical coordinate system being employed by eternally regenerative scenario Universe. If it becomes popularly adopted, this discovery has occurred just in time to avert comprehensive disaster for all humanity. In many religious scriptures it is prophesied that if and when humanity attains salvation, "a little child shall lead them." This should be modified to read, "the only true scientist, the child, shall lead the way with its experimentally demonstrable, omni-rational coordinate mathematics." How and why may this occur?

Within the realm of design science and engineering, it is now incontrovertibly demonstrable that if humanity employs the sum of its knowledge and pools all the world's resources we now have aboard our spaceship Earth more than ample capability to take care of all humanity for all generations to come and to do so at higher standards of living and individual freedom than any humans have thus far experienced or even dreamed of while in no wise endangering the ecological integrity of our planet. This is to say that we have four billion billionaires aboard our planet whom the competitive expedencies of our present (1977) cultural economic system are inadvertently depriving of realizing their good fortune.

It is technically feasible to accomplish this lasting success for all humans within ten years while concurrently phasing out all further human use of fossil fuels and atomic energy. We can live handsomely on our annual

energy income from the Sun and the many modes of impoundment by our planet's biospheric and ecological energy intertransformings.

Why aren't we spontaneously doing this? First, because humanity has for all time past been convinced that there is a lethal inadequacy of life support on our planet. Each political system says, "You may or may not like our system but we are convinced that it is the fairest, most logical and ingenious system for coping with lethal inadequacy of life support but because there are others who disagree and think they have the 'only' system it can only be resolved by trial of arms which is fittest to survive." We now have 150 sovereign state admirals simultaneously in command of our one and only spaceship Earth. We have the starboard side of the ship trying to sink the port side.

Only a new kind of revolution can solve the problems. Unlike history's past politically and religiously commanded revolutions, realizing the now feasible physical success for all humanity involves an exclusively technical design revolution. It cannot be accomplished by political strategy. It cannot be accomplished by private enterprise's unilateral advantage seeking. It cannot be accomplished by priestly intercession. It can only be accomplished by a design revolution which produces so much higher technical performance per each unit of resource invested as to take care of all human needs. It can be accomplished only through each of the individuals of humanity at large first acquiring working knowledge of the child-discovered mathematical coordinate system employed by nature and thereby in turn comprehending that it is technically feasible to attain lasting physical success for all humanity and therewith setting about spontaneously to accomplish the success; secondly, by humanity at large apprehending that this can be accomplished only if it is for all humanity; and thirdly, by humanity at large recognizing that the accomplishment of lasting physical success for all also requires development of general scientific and technical comprehension together with physically demonstrated technological competence on the part of humanity at large.

Because people know how to use a telephone or to drive a car and how to travel by airlines does not mean that they understand science and technology. At present there are 40 million scientists and engineers on planet Earth—that is only 1 percent of humanity. Ninety-nine percent of humanity does not understand science and technology.

Though science is very properly founded on experimental evidence and alters its position only when required to do so by new and unexpected experimental evidence, 99 percent of humanity does not understand science because science's mathematical language is not based on experimental evidence. Science refers all events only to its three-dimensional interperpendicular and interparallel X, Y, Z coordinates. Physics has found no straight lines — has found only waves — physics has found no solids — only high frequency event fields. **Universe is not conforming to a three dimensional perpendicular-parallel frame of reference.** The universe of physical energy is always *divergently expanding* (radiantly) or *convergently contracting* (gravitationally).

Fortunately, we can now report that the requisite educational revolution is occurring — one in which only *experimentally demonstrable geometry is employed*. It is

called Synergetics. It is based on the discovery of the relative energy investment values of nature's geometrical hierarchy of cosmically primitive structurings and inter-transformings. It is the geometry of general systems. All of its lines are vectors — that is, they exist only as energetic phenomena. A vector always represents the product of mass multiplied by velocity of a given entity

operating in a given angular direction in respect to a given axis of observational reference. Synergetics discloses the orderly ways in which nature intertransforms, propagates, pulsates, sometimes visibly and sometimes invisibly, yet is always demonstrably operative by "tuning in" and "tuning out."

Society and the educational system

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The author is Headmaster of Moraitis High School, Athens, and this article is abstracted from a paper he presented to the Athens Symposium.

In the societies of the so-called "industrialized west," there exists a direct relationship between society and the educational system. For although society can influence its younger members in a number of peripheral ways, it is by systematically gaining control over organized schooling that it can guarantee the perpetuation of its value system. Of course, in this context society has to be considered as a whole, not only (as it is usually expressed) through its ruling class. It is this particular point which links the Greek educational system to our subject, because, as far as I know, it is unique in its isolation from society as a whole.

I am referring to the highly centralized structure of the Greek educational system, whereby everything — from the formulation of a national policy to the details of everyday classroom practice — is laid down by a central agency: the Ministry of Education. As a result of this arrangement, and since for the last 150 years or so there has been no noticeable change in the socio-economic class which has provided the ruling party, the system has only served the value reproduction pattern of this particular social group. The system, both in its aims and in its means, has evolved only to the extent to which, and in the direction in which, this group has changed its own values and has accepted new procedures. Other social groups — often quite considerable in size — have only indirectly and to a small extent been able to influence developments in the way in which their children have been educated.

But the particular problems of the Greek system, burning and frustrating as they may be for us who suffer the immediate consequences of it, fall outside the scope of this symposium. If I have brought them up, it is only because I believe that they have some relevance to future general developments in education. Indeed we should not forget that, parallel to the tendency toward deschooling (which seems to be fading out), there is another tendency toward more central control in education. To a very large extent it is due to increased national expenditure on education, and, as the British say: "He who pays the piper, calls the tune."

This trend can be observed even in countries which have long been examples and indeed prototypes of deeply rooted beliefs in decentralization, such as Germany,

Great Britain or the USA. More and more in these countries — and in others as well — the federal or national government has been gaining control over educational matters. It is often indirect and is imposed through the financing of special educational programs, the setting up of national requirements for entrance into institutions of higher education, or the imposition of national examination patterns. But it is, nevertheless, effective in imposing the central authority's values over an increasingly large number of people who have so far felt more or less free to decide for themselves on their children's education. As I have said, the Greeks can testify that this can have the same effects on a large scale as have often been observed under research conditions with a relatively small group of youngsters.

The issue is indeed highly political and leads to more and more "experts" at the top believing that they know best and acting accordingly. On the other hand, however, as literacy (in the broad meaning of the term — not merely the mastering of the 3 Rs) rapidly increases in our societies, people become less and less prepared to accept that some one else knows best.

When the solving of problems in education requires the collaboration of a constantly larger number of specialists instead of one all-wise expert, it is perhaps characteristic of the culture prevailing at the top that the only other specialist who seems to have been accepted to participate in decision-taking procedures in education is the economist.

What, then, in view of all this is the lesson we could draw out of this session? As I see it, from the Greek point of view, it is first of all to accept that "equal opportunities in education" does not mean "equal opportunities to be subjected to a culture and a value system imposed upon the children by some one else." On the contrary, it means that every child should be given the opportunity to develop his or her personality and his or her abilities according to the needs, desires and expectations of the social group to which he belongs, and at his own pace. To this effect society as a whole and every particular group of it should directly participate — not as a pressure group but as an equal partner — in the decision-making procedure in educational matters.

Finally we should realize that increased central control in education means the imposition of someone else's culture upon the young generation, that it increases indoctrination, and that it takes away some of the funda-