

Biology Teaching—2000 A. D.

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New classes, new techniques, an increase in school populations demand that we take a constant look into the future so that we may be prepared to share our best with our students.

As we look from human beginnings toward the year 2000 we can become hopeful that the “blood, sweat and tears” side of life will be minimized, freeing us for a more creative pursuit of recreation, education, and research.

Basis for Prediction. What, then will biology teaching be like in the year 2000? Probably it will no longer be a separate function since biology will likely be absorbed into some larger pursuit. The main trend and issue of our times offer clues:

A. *The Trend.* Increased communications among all parts of society is the main trend. Where useful dialogue is limited storm clouds gather! A few areas of current turbulence are those between national and international; school and society; and youth and adults. Organisms are mainly significant in terms of the messages they give and receive. The fact that man’s messages and routine brainwork are being done more and more by automation does not make this less a biological problem. Automation is taking loads off our minds in much the same way that earlier machines took loads off our backs. In this way we should be liberated to be more human.

B. *The Issue.* Where lies reality? This raises the old biological problem of “vital forces” versus energy as the basis of life. By over-generalizing in order to make a point we can identify two widely used methods for seeking out reality.

1. *Worshiper-Shrine-Deity Interaction.* This, the religious method may be pictured as a worshiper before a shrine interacting with his ultimate reality—his deity.
2. *Observer-Computer-Observed Interaction.* The method may be pictured as a person using a computer to interact with his ulti-

mate reality—the measurable universe of energy.

Many people use both methods. The issue remains unresolved for most—while related pressures mount. Already man’s “technology and his morality have come face to face,” according to Nobel Prize Winner Glenn Seaborg, “where he can scarcely treat fact and value separately, and where he may see principles as diverse as the Second Law of Dynamics and the Golden Rule being considered side by side in the making of decisions which determine his future.”

Prediction. Let us start by sampling some experiences of 16 year old Tom Williams as he opens doors to adult knowledge and windows to his own creativity. The Williams have come from their home on the opposite coast for a two-week stay. Tom has not filled his quota of schooling during the current year so he and his family decided that he should spend several days at the nearest Community Center—pre-selected by computer before he had left his own Center.

Tom’s father is a sociologist, his mother an artist and Tom plans to be an ecologist. Since Community Centers are designed to serve people of all ages at all times the family spent the evening at the home SV (Searchovision) set “walking through” the local Center and the general region in order to plan the wise use of their time.

Next morning as Tom walked toward the Center (like others, within ten minutes travelling distance) he wondered how long Centers had been in existence. He queried his wrist SV set and it stated that Centers did not come into wide usage until about 1980. Then their numbers fairly exploded due to a desire to create jobs and to promote a wiser use

of man's time and energies. Automation had greatly reduced the work load; yet the enterprise world continued its regular work week to enable its employees to play a greatly expanded role—as consultants; to arrange exploratory field trips and apprenticeships; and to continue their own learning (for it had finally been concluded that the only thing more expensive than education was ignorance). In order to enhance this role schools, community centers, youth centers, parks and libraries were combined into multi-use Community Centers. While these vary greatly in design, all of them emphasize human ecology—an optimum environment for the stimulation of recreation, education and research.

As Tom approached the Center he felt some pangs of fear since he knew no one. However, he had enrolled in dozens of new Centers before and he knew that his folks hadn't come with him because they wished him to learn well the basic skill of carrying most of his own educational continuity while moving through new environs.

At a convenient Center entrance Tom stated his name and was invited in by a pleasant voice. Had his name not matched the pattern of his voice (stored within the computer) he would have been interviewed. He was automatically registered for one of his days of schooling and his record (what Tom *can do*) made available to SV (Searchovision) inquirers anywhere in the Center. As he explored the Center he found it delightfully aesthetic. Climate control, Tom's special interest enabled the center to provide ecological settings varying from rain forest to desert in the 20 acre tract.

Tom's wrist SV kept him oriented. It also answered questions as he visited waterfall, lake pond, garden, orchard, sportsfield, workshops, and various and extensive learning centers located underground. His parents arrived and they had lunch at nominal cost. They then visited a family-sized Artovision room where upon request famous bird paintings and sculpture were electronically displayed in authentic color and dimension. Tom and his mother discussed accuracy versus beauty.

Tom and his father then left to visit a small Environsimulator Room. They were planning a population study of common interest. When they asked for a specific environment they were pictorially immersed in it—even to the point of appropriate odors and sounds. They could also ask for specific flora, fauna and biomes. In this way they explored a zoo, a primitive area and several man-modified areas.

Having selected what seemed a suitable problem and locale for their lab work they went into an evaluation room and with consultant and computer aid checked their problem against their recorded proficiencies or those they could develop in the allotted time using teaching machines and appropriate volunteer tutors. Slowly a research study emerged fitted to their needs. Tom selected

other members of their research team—mostly because his father wanted Tom to learn well the basic skill of grouping wisely and regrouping as the problem changed—and without causing offense.

That night Tom and a new friend attended a "live" concert at the center followed by a "town meeting" discussion of water and air pollution problems. Upon returning home Tom and his father used SV to further review research findings related to their study. Print-outs were made of key materials for study in depth before they went by Center Spacemobile to the field research area the next day.

Society functioned as a vast idea-processing complex and Centers played key roles in idea creation and exploration. That evening Tom attended a panel on Cosmo-ecology (the way in which human systems interact with the vast flux of systems comprising the cosmos). A panelist spoke of how the worshiper-shrine-diety approach to reality of the 19th century was challenged in the 20th by the observer-computer-observed approach; and how in his opinion the latter was dissolving this apparent dichotomy, as follows:

A. *The Observer*. In order to make the computer easier to talk to by its user, human mental processes are intensively studied. Better theory about the mind and learning made possible computer "nervous systems" which are more and more nearly an extension of man's own nervous system.

B. *The Observed*. To make all knowledge most usable as well as most accessible it needs to be synthesized into as few generalizations as possible. Scholars are forced to keep relating their narrower fields to the total picture. A computer easy to "chat" with is a "scatterbrain" if you can't talk to it on a variety of subjects in an organized way. For example the unifying of zoology and botany made biology more useful; and the relating of biology and chemistry gave us biochemistry and the concept of DNA. The development of Centers and SV sets has speeded up such unification.

Another panelist differed. She pointed out that this did not necessarily mean the elimination by science of the worshiper-shrine-deity approach. Rather she proposed that this "either-or" could be resolved if the universe as a whole proved to be a total learning system—each energy exchange being a message exchange. Then there would be an overall "vital force," on the one hand, yet with all behavior being measurable on the other. Discussion on this theory was hot, heavy—and inconclusive. Tom, beginning the prime age for ideation, thought of another possibility—"maybe . . .?"

Biology teaching in 2000 is bound to be more extreme than our wildest dreams. Each learner will likely be his own teacher—but conversely the best way to teach yourself is to help others learn. Everyone may be a biology teacher!