

growing awareness, E.P. Odum stands out as a major figure in developing and communicating concepts grouped together as ecosystem ecology. In this, his latest book, he gives thoughts and understandings distilled from a lifetime's study. He writes for the general audience and provides a pithy introduction to ecology viewed especially as the patterns and processes of ecosystems vital to and increasingly influenced by human activity.

The book is highly readable and informative. It reads far more as an extended essay than as a textbook and is written for a much wider audience than the author's classic advanced textbook (most recent edition: *Basic Ecology*, 1983). It begins with a prologue in which the dramatic, crippled flight of Apollo 13 is retold to introduce the concept of life-support systems for our globe as a whole. It is followed by a more formal introduction to this fundamental concept, and development through discussion of ecosystems, energy flow, nutrient cycling, population processes, succession and evolution. Also included is a brief survey of the world's major biomes. Throughout, the author mixes a seasoned veteran's wisdom and perspective with the factual and conceptual framework to which he has contributed so substantially.

A major theme is the absolute importance of merging ecology and economics by incorporating the "vital goods and services of nature" into the economic foundations of society. This theme is especially stressed in a thoughtful epilogue in which the author peers ahead to what may befall our "spaceship earth" and its endangered life-support systems.

In summary, this updated version of the author's ecological world view should admirably crystallize the significance and importance of the ecosystem perspective for the newcomer to ecology. The book is attractively produced, with relatively large print and well-reproduced illustrations. The writing is delightfully clear, concise and engaging.

In presenting his ideas and perspectives on ecology, Odum does not speak for all ecologists. But ecologists in general certainly share his great concern that a wider audience become well-versed in the principles of ecology and their relevance for our everyday (and continued) existence. This book provides an excellent vehicle to reach that wider audience.

Edward W. Evans
Utah State University
Logan, UT 84322

Teacher-To-Teacher

Don't Be Apologetic about Teaching Evolution

James V. Bradley

In an off-hand comment, recently a friend and fellow biology teacher at Lake Forest High School recounted how a parent thanked him for not stressing evolution in his teaching of first-year biology. He was not like those other teachers who seemed to teach evolution all year long (or so it seemed to the parent).

Afterward, I got to thinking about his comment. He does teach an honest, straightforward section on evolution. After he's covered evolution, he goes on to another topic, with no further reference to the evolutionary process. He must be like thousands of other good teachers around the country who don't make a conscious decision but take the path of least resistance—down-play or compromise on evolution; why look for ways to be hurt?

He has succumbed to an atmosphere of intimidation created by a very small minority in the community who believe that dinosaurs and humans existed at the same time, that the Grand Canyon was formed by Noah's flood and that the earth was made in six 24-hour days less than 10,000 years ago. These people, who believe in a literal translation of the Bible, have a real problem with biology, geology, astronomy and chemistry. Their confidence, which comes with the belief that God is on their side, and their often aggressive, intimidating behavior have had a profound effect on biology education in this country. How else can one explain the fact that not one high school text in the United States has an evolutionary theme linking all of biology together. The ecological approach, the biochemical approach, the systems approach, the phylogenetic approach (it makes anatomy labs easier studying one group at a time) all hint at but never acknowledge evolution as the guiding natural force that shapes life on this planet. And this in a Judeo-Christian society that, in general, has no problem accepting evolution.

It is time to recognize that an inability to adjust to a fast-changing world is common in many societies and that this difficulty with evolution and modern science is primarily the creationists' problem—not ours. True, we have to deal with them, but their choice not to join the 20th (or even the 19th) century is essentially their problem to solve. Their problem should not stop us from passing on important and vital, hard-won scientific knowledge to our students.

On parents' night or during parent-teacher conferences where course content is discussed, I pass on to parents, whenever I think it is appropriate, this list of advantages in giving students a solid background in evolution theory. The intent is not to convince creationists that evolution occurred—they refuse even to recognize the very tenets of science. Parents reading this list sense the newness of this approach and immediately gain insight as to my goals in educating students. The list also serves as a statement on the structure of my course and presents a strong, unapologetic approach to teaching biology through evolution.

I recommend that teachers using this approach make up their own list of news articles and questions that they intend to cover during the year. It will stimulate their thinking about biology, and the additions to my list will often clarify information that in many textbooks often only hints at evolutionary relationships.

James V. Bradley teaches biology at Lake Forest High School, Lake Forest, IL 60045. He has a B.A. from Northern Colorado University and a M.A.T. in biology from Colorado State University. The author or coauthor of several textbooks, Bradley has just finished a year's sabbatical working on a new biology textbook. He received the OBTA for Illinois in 1981 and has published in *ABT* and presented papers at various NABT conventions.

Advantages of a Thorough Background in Evolution

That fact that evolution occurred and is occurring is no longer seriously debated within the scientific community. Scientific theories about how evolution occurred are, however, seriously debated and will continue to be debated as long as scientists exist; this is the nature of science. Evolution is an important part of the course I teach because it, like no other theme, establishes a solid base to which all other topics, such as ecology, anatomy, botany and genetics, relate.

Introducing the theories and mechanisms of evolution early in the year enhances the students' understanding of all the learning that takes place throughout the year. Teaching biology without evolution is like teaching current social or economic issues without a historic background. It can be done, but I have come to realize that no other concept can be more effective than the concept of evolution in linking the diverse sciences covered in a basic biology course. The words of an eminent scientist, Theodore Dobzhansky, really state the case succinctly: "Nothing in biology makes sense except in the light of evolution."

I have listed below a series of typical news items and simple questions that cannot be fully appreciated or answered by students without a knowledge of the natural mechanisms involved in the continuing evolution of life.

News Items

- An ordinarily relatively harmless bacteria has become an extremely dangerous infectious agent in a Chicago hospital.
- Scientists have transplanted human blood cells that function in immune defense into the bodies of living mice. The blood cells have reproduced themselves and have produced antibodies when the mice were injected with tetanus toxoid.
- A new and dangerous Asian flu virus has been detected in major cities in the U.S.
- Scientists have transferred the human gene for making insulin into bacteria. The bacteria now produce human insulin.
- Anthropologists report that human teeth are getting smaller.
- Pet parakeets released in Chicago may eventually pose a threat to farmers in Illinois.

- Overpopulation of deer poses a threat to the Ryerson Nature Preserve in a Chicago suburb.

Questions

- 1) What causes the many varieties (races) of goldfish, dogs, birds and humans?
- 2) Why is it impossible to win the fight for a dandelion-free lawn?
- 3) What is it about the parasite causing malaria in humans that makes it so hard to kill?
- 4) Why can't scientists develop one inoculation that gives immunity to AIDS? After all, we can gain immunity from smallpox with one inoculation.
- 5) How do the blind cave fish that one sees in pet stores lose their eyes?
- 6) Why does one crab apple tree produce thousands of crab apples, or one female spider produce hundreds of spiders?
- 7) Not one insect species has been eradicated by insecticides. Why?
- 8) Why would a layperson have difficulty in distinguishing between the early embryos of a pig, dog and human?
- 9) Why do scientists use mice to test drugs they intend to use on humans? What do mice have to do with humans?
- 10) The fetal skull of an orangutan and a human are very similar. Why?
- 11) Once you memorize the bones of the cat, the bones of the dog, bat and human are much easier to memorize. Why?
- 12) Why do people feel threatened when fish from the local river show tumorous growths?
- 13) Why are fossilized ferns some 300 million years old easily recognized as ferns, while other fossilized plants do not resemble any plants living today?
- 14) Why do pythons and whales have remnants of hip bones? Why do baleen whales have embryonic teeth? Why can some students wiggle their ears?
- 15) How did a stick insect come to look like a stick, and why are some fish light on the bottom and dark on the top?
- 16) What is so effective about spirals that they are seen in structures as diverse as DNA molecules, pine cones and tendrils on plants?

AV Reviews

Rachel Hays
Department Editor

Genetics: Cancer, a genetic disease; Genetics: jumping genes; and genetics: beyond the double helix. Coronet/MTI (106 Wilmont Rd., Deerfield, IL 60015). VHS videos (3 of 10). 25 min. each. Purchase: \$250/each.

The first video is designed for advanced high school biology or general college audiences. The program details the role of genes in the development of cancer and concentrates on the ways genes, interacting with the environment, can lead to malignant growths in the body.

Research in Japan, Britain and the United States is used to help explain the activation of oncogenes and the role of the environment in cancer. Animated drawings help to explain retrovirus, reverse transcriptase, protooncogenes and cell growth and differentiation while also helping to explore the effects of ionizing radiation.

Although this program is effective and attractive in the graphics presented, interviews are difficult to understand because of accents. This video is appropriate for introducing current research and the role of genetic and environmental interaction in producing cancers.

The second video is directed at genetics students or biology majors. Although it is labeled for advanced high school students, I don't agree that it is

Rachel Hays is the editor of the Audio Visual Review section of *ABT*. She holds a Ph.D. in botany from the University of California, Davis, and has taught courses at the college level. With a B.S. from San Diego State University, Hays went on to the University of California, Davis for her M.S. degree. For several years, Hays has done research for the Natural Resources Ecology Laboratory at Fort Collins, CO, studying nutrient cycling and soil organisms. She has published articles in several popular and scientific periodicals. Her address is: **6921 Buckhorn Ct., Loveland, CO 80537.**