Accessory Hearts

Memories of Thurlow C. Nelson by a Former Student

How many teachers did you have before graduation? Perhaps fifty in high school, maybe twice that in college and more for a graduate student. Forget the total, for each of us two or three stand out. Was it insight into subject matter, or more likely, were there lessons that gave guidance and meaning to one's pursuit of intellectual maturity?

E. O. Wilson, author of "Creation: An appeal to save life on earth," recalls his great teachers: "Almost unconsciously, we became real, practicing scientists…the joy we drew from the hands-on training entered our bones and shaped our souls." Heavy words, but that's the way it is, and how fortunate fledgling scientists are when the subject matter, so guided, sweeps them to a lifetime experience.

Back problems put me in a hospital for serious surgery. Following the operation, through a haze of anesthesia, I felt contractions pulsing up and down my legs. Coming to my senses, I saw inflatable leggings driven by a compressor. Smart idea, keeps the blood circulating: an accessory heart, so to speak. But where did the accessory heart idea come from? Not from the probing of medical mavens. Oyster biology, of course. Swollen vessels pulsing along the free margins of the oyster's gills, give its heart a little boost where it needs it most. Distance wise my feet and heart are roughly proportional to an oyster's gills and its heart.

This revelation dulled postoperative pain, but relief came recalling the last course given by Thurlow Christian Nelson, TCN to Rutgers biologists, who had retired to Cape May Courthouse in southern New Jersey. Four graduate students drove from New Brunswick to the Cape Shore Laboratory on Friday, bought groceries, and met for an evening lecture, which set the stage for Saturday's fourteen-hour lab session. TCN's dedication could be overwhelming, yet there was sincerity, a regard for life that penetrated even a graduate student's pragmatic consciousness as possibly transcendent.

Saturday morning we got to work after hearing a clattering of footsteps on the stairs leading to our second floor lab, kitchen and dormitory, "Here comes TCN chomping at the bit," rang out as a warning to clear the place for action. It started with a demonstration that must have taken him hours to prepare, but it only went so far. We were expected

to do the real work: trace feeding pathways on mollusc gills, examine digestive processes, catalog parasites, and compare anatomical refinements. If you didn't know how to draw, you soon learned.

Oysters are filter feeders that remove suspended matter in water drawn through its gills. Cilia sort small food particles from larger, mostly useless debris. Other pathways move food to the mouth. Using dye particles of various sizes, we were to draw this process and describe the coordinated actions. Had we done this 15 years earlier, our results would have been publishable.

The oyster's crystalline style fascinated me. It has enzymatic properties and rotates in a sack, pressing against a shield thought to assist in breaking up food particles. As far as I know the style is the only rotating structure above the molecular in the animal kingdom. So why didn't nature, widely touted for its cleverness in all situations, come up with a wheel? What an adaptation for fitness and selection that would have been—enough to cause evolutionary biologists to question Darwinian concepts of fitness!

TCN discovered in the American oyster a mysterious chamber that turned out to be an adaptation for life in turbid estuarine waters. By filling this chamber with water and then making a quick squeeze, the oyster sent a jet of water across its gills, cleansing them of debris too heavy to be removed by ciliary sorting. This came as a surprise, because the European oyster, the reference standard for oyster anatomy, lacks it. But the European oyster lives in clear coastal water and does not need the cleansing jet so important in the American species. For a lab session, TCN had perfused red Jell-O into oysters so that we could make sections and deduce how this remarkable structure worked.

Such intensity, subtle encouragement and striving to observe—these I remember amidst a plethora of detail. Our lab reports handed back the following week had thoughtful comments written with pencil in a careful hand that did not detract from a drawing or description.

Always be aware of your surroundings: this was an ancillary lesson driven home in various ways. Before class ended Sunday afternoon, following more lectures and discussion, we collected specimens on the Cape Shore's deserted beach. Walking, hands full, I mentioned to TCN that I needed a pail. Without missing a step, he scooped up a large horseshoe crab shell and said, "Here, have one of nature's buckets."

When the great Edinburgh biologist C. M. Yonge visited TCN, we were invited to Cape May Courthouse for an evening discussion ranging from the ocean depths to shoreline zonation. Those days, graduate students were expected to take a fair measure of joshing. When the discussion turned to a deep-sea fish that had revolutionized classification, I added that it was probably a

graduate student that took down from a dusty museum shelf an overlooked jar holding the soon-to-be-famous fish, and everyone had a good laugh.

Back in the hospital, a nurse removed my peristaltic leggings, but what about accessory hearts? They still beat within me—and for good reason—a metaphor implanted under the guidance of a great teacher is always with you: it "shapes your soul" and makes you what you are.

Wilson, E. O. 2006. The creation: An appeal to save life on earth. W.W. Norton, New York, N. Y. 175 p.

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National Symposium on Shellfish and the Environment

The NOAA Aquaculture and Habitat Conservation programs recently hosted the National Symposium on Shellfish and the Environment. The meeting, organized by Sandy Shumway and Kate Naughten was held in Warwick, RI on June 9-10. Senator Jack Reed of Rhode Island provided an enthusiastic overview of aquaculture and its role in the U.S. economy, and emphasized the proactive approach that Rhode Island is taking to ensure a sustainable and environmentally responsible aquaculture industry.

Approximately 80 representatives and experts from the shellfish industry, non-governmental organizations, researchers, and federal and state officials attended the Symposium. The conference was a combination of invited scientific presentations and facilitated group discussion groups, and covered topics as wide ranging as carrying capacity, eutrophication and water quality, habitat, invasive species, genetics, disease issues, social aspects of aquaculture, gear/harvest impacts, and cumulative impacts. Invited speakers included Jon Grant, JoAnn Burkholder, Odd Lindhal, Dianna Padilla, Dennis Hedgecock, Roxanna Smolowitz, Loren Coen, Brad Harris, Gary Jensen, Colin Brannen, George Leonard, John Hargraves and Gary Wikfors.

The information generated by the Symposium is being synthesized and will be used to facilitate public policy and resource management decisions for shellfish culture in the United States. Although a summary of the Symposium will not be available till later this year, presentations from the symposium can currently be viewed at http:// aquaculture.noaa.gov/news/shellfishsymposium.html.

NSA Publications Archived On Line

Open-access archived copies of NSA publications dating back to 1946 can now be accessed through the Biodiversity Heritage Library (BHL) website (www.biodiversitylibrary.org/creator/2352). The BHL is a joint effort by 10 major biology libraries to scan, digitize and make available the biodiversity literature in their holdings. The Marine Biological Laboratory Library at Woods Hole, one of the member libraries, provided the NSA publications. Copies of the NSA Convention Addresses (1946-1949), the Proceedings (1954-1979), and JSR (1980-2003) are available for viewing and downloading. Finding articles on the BHL site is not like performing a "Web of Science"-type search. When you log onto the above site, you will see links to the three publications. Clicking on any one will open a window with links to years (Convention Addresses - note that 1947 includes 1948) or volume numbers (Proceedings and JSR). Clicking on a year or number will, in turn, open a window showing, on the left-hand side, individual page titles or numbers. Clicking on one of these will open an image of that page. (Note that some of the pages labeled "text" are blank. Although faint printing may be visible, it is merely the back of the preceding, printed page). Icons at the top of the image allow printing, saving or resizing of the page image. Uncorrected optical character recognition files are also available for viewing– just click on the "view text" link under the page list window. An image of the entire volume in pdf format also can be downloaded. Clicking "download" to the right of the volume number will open a window with a list of different file types that BHL has created for that volume. Of these, the file with the ".pdf" extension is the best download.

At present, the BHL site is not set up to search for individual articles, authors, or key words (other than in the title – i.e., "shellfish"). The goal of BHL is to scan as much material as possible while funding is available, "then add in advanced technology solutions for secondary post-processing as they are developed. " Meanwhile, with a modest effort, references to articles in past NSA publications can now be retrieved by any researcher with internet access. Although a little patience is required to obtain articles on the site, users will be rewarded by finding that these early publications contain a wealth of valuable information, much of which has been ignored because of difficulty in accessing the material. No longer should this be an impediment to sound scholarship (see JSR Editor Sandy Shumway's article on page 12 of the June 2008 Newsletter).

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