Serendipitous intersections with Jack Vallentyne

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Jack Vallentyne's character, vision and accomplishments are well memorialized in his published opus, institutional structures he helped create, the memories of children and others who knew him as Johnny Biosphere and in the recollections of his students and colleagues published in this issue and elsewhere. I met him when I came to Cornell in August 1961 as a graduate student in its Department of Zoology. I never took a course with Jack or collaborated on a research project with him or saw him more than three to four times after we both left Cornell in August 1966. Yet he exerted multiple positive influences on my own professional life. I offer a few recollections of our personal interactions and brief accounts of his influence on early diffusion of the trophic cascade concept and the teaching of physical limnology.

Cornell companions and connections

On arrival at Cornell I was assigned, with Roger Green, a large office (Room 218) in Stimson Hall next to Jack's office and lab (Room 216). My doctoral dissertation, under ecologist Lamont Cole, was on newt migrations and Jack was working on the biogeochemistry of sediments. Lamont was nearby (Room 215), and having earlier published seminal theoretical works on population ecology, was actively entering the arenas of environmentalism and public policy (e.g. Cole, 1958, 1968; Cole et al., 1965). Lamont had been instrumental in bringing Jack to Cornell as an associate professor in 1958, from Queen's University in Ontario. He may have helped prime Jack for his own major involvement in policy issues on his later return to Canada.

Lamont probably told Jack, as he did me, that our corner of Stimson Hall was where in 1917 James B. Sumner began work that would lead to the first isolation of an enzyme in pure form and demonstration that it was a protein. What Jack probably did not know was that Sumner's (1926) classic paper, *The isolation and crystallizaation of the enzyme urease*, was published on August 1, 1926–exactly one day after Jack was born.

Among Jack's personal characteristics were his quiet reserve, his economy with words, and his friendly grin. Jack had "joined the Canadian Army at 17 and was quickly identified as a sharp-shooter, but World War II ended before he was old enough to fight" (Vallentyne, 2006). Thus he didn't sweat the small stuff. He had no objections when I brought a cobra and two rattlesnakes to keep in my office along with my newts–at a distance of only thirty feet from Jack's desk, as the snake or newt crawls. But others did, especially when one (or more?) of the newts escaped and eventually fell from the ceiling onto the desk of the departmental administrative assistant two floors below. "What was to follow?" she sharply rebuked Lamont. Either the reptiles went or she was quitting.

Though Jack did not see the frontlines in World War II, one might speculate that his military training, now rare among academics and scientists in the U.S. and Canada, may have influenced his persona and scientific career. Was it partly responsible for him not sweating the small stuff, for his focus on the big

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picture, for his skills as both a leader and team player? Some of the weaknesses of academic and scientific subcultures might be moderated if more university faculty members were to serve in the military, to work in the private sector, or to live abroad for a few years before becoming ensconced in an ivory or agency tower.

A player in the "top down" paradigm

In August 1966, Jack and I mused together at a faculty and graduate student picnic at Taughannock Falls, just up the western side of Cayuga Lake from Ithaca, about our future respective directions. They were to lead to some convergence of the newt trapper and sediment biogeochemist, though we did not see it at the time.

Jack was heading back to Canada, initially to form a team of scientists that would soon be doing world class limnological research in the Experimental Lakes Area of Ontario, working out of the Fishery Research Board of Canada's Freshwater Institute in Winnipeg. Focus would be on effects on lakes of increased nutrient inputs, the so-called "bottoms up" effects. I was heading to the Department of Entomology of the University of California at Riverside on a postdoctoral fellowship with Mir Mulla to use experimental ponds to study pesticide-wildlife relations and, as it turned out, the "top down" effects of fish on aquatic ecosystems.

Knowing little of aquatic ecosystems other than their value as newt habitat, I asked Jack early that summer to recommend some "starter" readings. He gave me a copy of his classic, award-winning précis on *Principles of modern limnology* (Vallentyne, 1957) and suggested I read D. G. Frey and F. E. J. Frey's translation of Ruttner's (1963) *Fundamentals of limnology*. Those readings constituted my "formal" training in limnology and led me into a new world.

Jack again played a critical role when I submitted our first manuscript to *Science* on the "top down" effects of fish and the possibility of moderating algal blooms via manipulation of fish populations (Hurlbert et al., 1971). Reporting results of a microcosm experiment with mosquitofish, the article concluded that:

> [L]ake and pond ecosystems are strongly influenced by the feeding behavior and population dynamics of animals at the top of the food chain. . . If increased zooplanktivory permits an increase in phytoplankton, we should expect correlated changes in the vertical distribution and an amounts of photosynthesis, dissolved oxygen, and mineral nutrients; vertical migration of zooplankters; rate of precipitation of organic matter; the chemistry of the sediment-water interface; and the kinds and numbers of benthic organisms . . . In nature, Gambusia and other small fish can rarely effect as extensive changes as we observed in our pools because their populations are limited by piscivores. . . . .[E]xcessive phytoplankton, a principal symptom of eutrophication, may in some cases be more directly a result of man-caused alterations in fish populations than of man-caused increases in nutrient influx. . . [M]anipulation of fish populations, especially the artificial enhancement of piscivore populations, is a potential method for reducing phytoplankton levels. Unfortunately, in shallow lakes such "biological control" of phytoplankton might cause increased standing crops of equally undesirable macroscopic vegetation. . . [F]ish deserve a higher place in the conceptual schemes of eutrophication research than they are now accorded.

This report, extending the ideas of Hrbácek et al. (1961) and Brooks and Dodson (1965), started a boom in "trophic cascade" research at limnological centers around the world that continues today. Only many years later did I learn that Jack had written one of the favorable reviews leading to acceptance of our paper. There is a nice symmetry to the fact that he played this indirect role in stimulating study of "top down" effects shortly after he had established the world's major scientific effort on "bottoms up" effects in the Experimental Lakes. Much later, even the Experimental Lakes Area (ELA) program added "top down" studies to its portfolio. Effects of Yellow Perch and Northern Pike were studied in ELA 221 and those of Northern Pike in ELA 227 (Vanni and Findlay, 1990; Elser et al., 2000; Findlay et al., 2005; Schindler and Vallentyne, 2008: 172ff; Schindler, 2009), in order to further test and extend hypotheses generated by our 1970 microcosm experiment and its 1968 predecessor (Hurlbert and Mulla, 1981).

Jack and the teaching of physical limnology

In 1967 Jack published a fine little paper that described how one could simulate and do experiments on lake physical phenomena using aquaria, infrared heat lamps, small fans, a vertical array of thermometers, and a few other materials (Vallentyne, 1967). As Jack had left classroom teaching when he moved back to Canada in 1966, he probably had no opportunity to put his proposal to a hard test.

Many limnology instructors have made use of Jack's model aquaria. In response to a query I sent out to a few hundred limnologists, 24 responded that they had used such systems with success. Jack's 1967 paper may have done as much for scientists' and students' understanding of physical limnology as did the first volume of Hutchinson's (1957) grand treatise. The two works complemented each other nicely. Not bad for a sediment biogeochemist.

When I began teaching limnology in the early 1970s, in a county with no natural lakes, I had had no formal training in limnology, let alone physical limnology, had some experience with shallow (<1 m deep) water bodies (microcosms, experimental ponds, salt lakes in the Andes), and barely knew the difference between a hypolimnion and a hypotenuse. Jack's model aquaria, however, seemed like something I could handle. And for the next 30 years my limnology students and I learned a great deal from them.

Many instructors seem to agree that in a basic, one-semester limnology course there is no better way than Jack's model aquaria to teach the facts and principles of physical limnology, their manifestations in different types of lakes, and their manifold consequences for ecosystem function. When I bump into my former limnology students, the model aquarium exercises seem to be one of their strongest memories of the course. Jeff Pasek, who took my course in the 1970s, is watershed manager for the city of San Diego Water Department. I occasionally prevailed upon him to give my later limnology students a tour of water department facilities. After introductions, and with a sly smile, his first comment to the students often was, "Is he still making you do those stability calculations?" The students immediately bonded with him.

For instructors who would like to give Jack's aquaria a try, I'd be glad to pass on an 8-page handout developed for my course, and some of the other instructors listed above surely would be willing to do the same. Chapter 3 in Wetzel and Likens (1991) offers additional ideas for such exercises. Franks and Franks (2009) describe similar aquarium exercises for simulating salinity stratification, mixing processes and internal waves in oceans.

Juanito de las pampas

The last time I saw Jack was in September 1994 at the First Argentine Congress of Limnology, in Tucumán, Argentina. In the official program the title of his invited talk was *Ecocatalysis between limnology and politics,* but the title of his actual presentation, which he gave in Spanish, was *Infundiendo el pensamiento ecológico en la política (Infusing ecological thought into politics).* This presented some history and ideas he had just discussed in Vallentyne (1994). He later amplified these in an account of his role in stimulating governmental action on removal of phosphates from detergents, adoption of an ecosystem approach to Great Lakes water quality, and controlling production and uses of chlorine (Vallentyne, 1999).

Jack suggested "ecocatalyst" as an appropriate descriptor for the effective environmental activist. In his own words:

> A catalyst is a chemical that hastens the rate of a reaction by lowering the activation energy required for the reaction to proceed. . . . Catalysts participate in the reaction and are regenerated in the process – ready to initiate another transformation. In an analogous manner, 'ecocatalysts' are persons who hasten the rates of social transformations already destined to proceed (Vallentyne, 1994).

Jack was an ecocatalyst par excellence. Such can have effect even when scarce or in low concentrations. Interestingly, in his 1999 paper he refers to himself as an "instigator of these processes of societal change" but does not use the terms “ecocatalysis” nor “ecocatalyst” or even reference his 1994 paper. Jack has many word coinages to his credit but in most cases he seems to have left their diffusion to others.

Surprised to bump into each other in Tucumán, Jack and I spent one pleasant evening together with Argentine beef, *muchas copas de tinto*, and recollections of all we'd seen and done since 1966. Ah, the stories I heard of ELA, Burlington and other northern personalities. Fortunately for some, I forgot to write them down.

Jack was in true form in Tucumán, trying to live up to the title of an earlier note of his, *The perfect message does not employ words* (Vallentyne, 1984). Limnologists from the different foreign countries represented, together with a few Argentine limnologists, were invited to meet briefly with the governor of Tucumán Province, ex-pop singer Ramón Ortega. The governor welcomed us warmly with good words about science, we were introduced individually, and then each was asked to say something about the conference, our interests, or the environment. Many responded with a certain effervescent prolixity. When it was Jack's turn, he looked the governor in the eye and said, “Water is life.” There was a long pause. The governor's visage was saying, “I wonder what the rest of the paragraph will be when this shy Canadian manages to get it out.” Jack just sat there grinning. The governor finally recovered and said something to the effect of, “Yes, that is very true.” Probably everyone at that meeting still remembers Jack's words – and no one else's, including their own and the governor's.

One of Jack's most important scientific contributions was the concept of demotechnic growth. An analysis of that, of his early concern for national and global overpopulation, and of the fiery challenges he offered us in his last work (Vallentyne, 2006) on these matters is given in another tribute (Hurlbert, 2011; Hurlbert, in preparation).

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