Professional Article

EvoS Journal:
The Journal of the Evolutionary Studies Consortium

EvoS: Completing the Evolutionary Synthesis in Higher Education

David Sloan Wilson[1], Glenn Geher[2], and Jennifer Waldo[2]

[1]Binghamton University
[2]State University of New York at New Paltz

ABSTRACT

Evolutionary training in higher education is largely confined to the biological sciences and is even circumscribed *within* the biological sciences. EvoS provides a comprehensive solution to this problem in the form of a campus-wide program that can be implemented at most colleges and universities. This article documents the need for expanding evolutionary training in higher education and describes the formation of the first two EvoS programs, which provide the nucleus of an NSF-funded consortium of programs.

KEYWORDS

EvoS, Evolutionary Studies, Evolutionary Training, Evolution, Evolution Education

INTRODUCTION

Evolutionary theory provides a framework for studying all living processes, including processes that characterize our own species. Darwin appreciated its explanatory scope, which enabled him to study everything from barnacles to human morality. Unfortunately, the rest of the world has yet to catch up with Darwin's vision. Reluctance among the general public (especially in America) to accept evolution is well known (Miller, Scott, & Okamoto, 2006). Even among scientists, however, the evolutionary synthesis is not complete. A progress report would include the following facts:

Direct correspondence to David Sloan Wilson, Departments of Anthropology and Biological Sciences, Binghamton University, PO Box 6000, Binghamton, NY 13902. dwilson@binghamton.edu.

- Most biology departments include a group of faculty who study ecology, evolution and behavior as a single integrated subject, often labeled by an acronym such as EEB, and a group of faculty who study cell, biochemical, and molecular biology, often labeled by an acronym such as CBMB. Communication between these two groups is famously limited and occasionally even hostile. When biology departments fission, it is usually along these lines (Burian, 2005).
- Another indication of this division is that terms such as "evo-devo" and "evolutionary genomics" are of recent vintage, signifying that the larger fields of developmental biology and genomics have not made full use of evolutionary theory (Goodman & Coughlin, 2000).
- Even some branches of ecology are not making full use of evolutionary theory. We are only just discovering that evolution takes place at ecological time scales and that large-scale ecosystem processes must be understood in terms of the evolved interactions among the species that make up the ecosystems (Whitham et al., 2008).
- The study of evolution in relation to human affairs has an exceptionally complex history (Richards, 1987). It was obvious to everyone in Darwin's day that, if true, his theory would have momentous consequences for our understanding of humanity. Yet, by the early 20th century, evolutionary theory was largely restricted to the biological sciences and avoided for most human-related subjects. The use of evolutionary theory to justify social inequality, which became labeled *Social Darwinism*, was part of the problem (Dickens, 2000). Another problem was the allure of minimalistic theories, such as behaviorism in psychology (Lemov, 2005). As a result of this legacy, it is possible and even likely that college students in human-related subjects will not receive any evolutionary training whatsoever during their higher education.
- Another indication of evolutionary theory's exclusion from human-related subjects is that terms such as *Evolutionary Psychology*, *Evolutionary Anthropology*, *Evolutionary Economics*, *Literary Darwinism*, and *Evolutionary Religious Studies* are of very recent vintage – and still have an air of scandal about them.

It is important not to make *too* much of evolutionary theory's incomplete synthesis. Like the proverbial glass that is half-empty, it is also half-full and filling fast. Active progress is being made on all fronts, including virtually every human-related subject. Yet, advances made at the level of *scientific research* are not yet reflected in *higher education*. In other words, there is a major gap between the large amount of published scientific research that applies evolution across academic disciplines and the nature of undergraduate and graduate curricula at most universities. There is an urgent need to teach evolution to all students as a way to think about all biological and human-related subjects.

EvoS (for Evolutionary Studies, pronounced as one word) is a campus-wide program designed to fill this need by enabling any student to learn about evolution *in*

parallel with his or her traditional major (Wilson, 2005, 2007). It also creates a trans-disciplinary community of faculty who share a common theoretical framework. The first program was initiated by David Sloan Wilson at Binghamton University in 2003. The second program was initiated by Glenn Geher and Jennifer Waldo at SUNY New Paltz in 2007. In both cases, the programs were created with modest intramural funds and "parts" that exist at most colleges and universities, as outlined in more detail below. In 2008, we received National Science Foundation funding to expand EvoS into a multi-institution consortium, including the full spectrum from community colleges to major research universities. Groups of faculty from 30+ institutions have joined the EvoS consortium in its first year, at levels ranging from expressions of interest to full-fledged programs comparable to the Binghamton and New Paltz programs.

In this article we will share our experience in developing the first two EvoS programs, as a guide to those who wish to develop their own programs. We will tell our stories in simple narrative form. More detailed information about how to create an EvoS program is available on the EvoS website (http://evostudies.org) and forthcoming articles in *EvoS Journal*.

EvoS-Binghamton

When David started the first EvoS program, he had a simple idea in mind. As an evolutionary biologist who also studied evolution in relation to human affairs, he had a worldwide network of colleagues. In addition to this virtual community, wouldn't it be fun to create an *actual* community at his own institution? After all, if evolutionary theory applies to all aspects of humanity in addition to the rest of life, shouldn't it be taught to every student and be reflected in the interactions among all faculty?

As ambitious as this idea might sound, the first steps were easy to take. Binghamton University had a strong EEB group in the Biology Department, a strong Biological Anthropology group in the Anthropology Department, and a scattering of evolution-oriented faculty in other departments. In addition to these faculty members, who could serve as a core, numerous others were curious and open-minded, even if they did not regard themselves as qualified evolutionists. Finally, our Administration already appreciated the value of integration and had created a mechanism for curriculum programs that can be taken in parallel with any major, resulting in a certificate along with one's degree. An integrated curriculum program differed from a major or minor by allowing courses to be double-counted, making it relatively easy to earn one's certificate without an undue additional course load. An integrated curriculum in Global Studies already existed. David worked with the core of evolution-oriented faculty to create an integrated curriculum in evolutionary studies and Voila! EvoS was born.

Evolution is famously described as a tinkerer that builds new structures out of old parts (Jacob, 1977), a metaphor that definitely applies to EvoS-Binghamton. Numerous courses with evolutionary content were being taught by the core faculty, but most of them were invisible to students in any given department. Merely by listing them under the rubric of the Integrated Curriculum, we could provide students with an initial menu of courses. Rather than micro-manage their choices, we

established general distribution requirements and let them decide. This is important because learning about evolution can be taken in so many directions; an economics major, for example, will want (and need) to take different courses than a pre-med student. David switched his upper-level course on evolution and human behavior, which he had been teaching for many years, into a 100-level course titled "Evolution for Everyone" to reach as many students as possible, as early as possible in their academic careers. All of the courses could be taken on a stand-alone basis and there was no single required course, providing multiple entrances into the multi-course program.

From the start, David envisioned EvoS as a way to facilitate faculty interactions and bring new faculty into the program. This is accomplished in part by the EvoS seminar series, which brings external speakers to campus at roughly two-week intervals. Each speaker is co-hosted by the most relevant department so that faculty members from that department can learn about the evolutionary perspective from a respected colleague within their own discipline. Each seminar is followed by a social event attended by EvoS faculty and students, along with faculty and students from the co-hosting department. Funds for the EvoS seminar are provided by the Dean of the Harpur College of Arts and Science, who annually funds workshops and seminar series on a competitive basis. Because the EvoS seminar series draws large audiences and is co-hosted with other departments, we have consistently received funding from this source without having to make a special request.

Undergraduate students at most colleges and universities are not aware of research seminars and do not experience the open-ended discussions that are at the heart of graduate education and faculty life. By the simple device of a 2-credit "Current Topics" course built around the EvoS seminar series, EvoS students are welcomed into this world. This is the only course that is restricted to EvoS students and must be taken twice to earn the certificate. Students read one or more articles from the primary literature, write a commentary that is due before the seminar, attend the seminar, attend the social event following the seminar (with pizza and beverages served) and then participate in an extended discussion with the speaker and EvoS faculty and students. EvoS students participate in approximately twenty of these events over the course of two semesters, on topics that range from molecular biology to moral psychology, vividly demonstrating the breadth of evolutionary theory. EvoS students routinely describe the "Current Topics" course as their best intellectual experience at college.

In this and other respects, the structure created by EvoS created a positive feedback cycle of interactions. The number of faculty participants grew from about twenty to its current value of over sixty. Faculty have added evolutionary content to their courses and started new courses that reflect their newfound interests. Numerous publications and research collaborations can be traced to visits by the EvoS seminar speakers. In 2006, EvoS was designated an Institute for Advanced Studies within the University in recognition of its ability to foster transdisciplinary research. An infrastructure for community-based research from an evolutionary perspective was developed (http://evolution.binghamton.edu/bnp). EvoS has become so popular among the undergraduate students that a large hall in the

student union is required to hold the social event and continuing discussion that follows each seminar.

Remarkably, all of this was accomplished with very modest intramural resources. Most active faculty periodically revise their teaching and research to pursue their current interests. Most Administrations value integration, provide modest funds for seminars and pilot research, and are eager to reward faculty that display initiative. EvoS-Binghamton succeeded for the best of reasons—by rising to the top of peoples' priority lists.

External funding has enabled EvoS-Binghamton to expand by adding appropriate staff positions and providing resources for course and research development. A small grants program has proven particularly effective in stimulating integrative research projects. The most recent competition resulted in 20 such projects, ranging from the molecular genetics of bacteria in ice cores, to cultural transmission in crows, to the factors that cause traumatic experiences to result in positive change in humans.

EvoS-New Paltz

A few years after the establishment of EvoS-Binghamton, we at New Paltz thought the idea to be so interesting that we decided to develop a comparable program tailored to our own needs and circumstances. While New Paltz is considerably smaller than Binghamton (about 2/3 the student body size and no PhD programs), the core elements of a solid EvoS program were still available. With Tom Nolen, we had a serious scholar in evolutionary biology offering such courses as Evolutionary Theory and Sexual Selection. In fact, unsurprisingly, evolutionary themes were strongly featured in many of the courses taught in the biology department (that is usually how it works!). Beyond biology, we quickly identified a core group of faculty with interests across many disciplines that were already teaching, or were eager to offer courses featuring evolutionary themes.

From these parts, we built a curriculum that includes courses in Anthropology, Black Studies, Biology, English, Geology, History, and Psychology. Unlike Binghamton, which structured their program around the concept of a concentration, we elected to frame our program as a more traditional minor. And, again in contrast to Binghamton, we found a more structured approach to course selection to better suit our needs. Thus, the curriculum includes categories of "evolutionary foundations," "applications of evolution," and "EvoS Seminar Series," which is the course tied to the external speaker series. The full-fledged program launched in Fall 2007. Since then, it has already become one of the most popular interdisciplinary minors on campus. As evidence of our growing popularity, consider that we had 35 students enrolled the first semester we offered the program's core course, EvoS Seminar Series, 60 students the following year, and we plan to open the course up to 80 students next year.

As with the EvoS-Binghamton program, the seminar course and the lecture series that surrounds it take center stage in our EvoS program. The guest lecturers represent some of the most notable minds on all topics related to evolution. As with Binghamton, funding comes from various internal sources, and talks are often co-sponsored by other departments. In addition, we have taken advantage of inviting

local scholars to minimize costs and enhance the range of topics offered. Without question, the series provides enormous educational benefits to our students, our academic community, and our community at large. Always well-attended and always thought-provoking, these talks typically have more than 100 attendees and, in some cases, attendance has pushed 400. The seminars generate an extraordinary level of excitement among the students. In preparation for each talk, students are required to read and write about a paper related to the topic that will be discussed. On the day of the seminar, students have the opportunity to meet with the speakers both before and after the lectures. This affords students the ample opportunities to explore the topic and have any questions answered.

In a short period of time, this program has demonstrated all the hallmarks of a vibrant academic program that generates intrinsic interest. Obtaining external funding has enabled us to expand and enhance our program. Using a competitive process, we have been able to provide financial support for faculty to develop new courses in Art History, English, and Geology (with another round of funding to be awarded for additional courses next year). These courses will be permanent additions to the EvoS curriculum and will provide a breadth of experience that will be valuable to our students. In addition, we have been able to fund four faculty-student research teams to work intensively over the summer on projects that explore evolutionary questions. Reflecting the diversity of scholarship that follows from evolutionary theory, note that these research projects represent the varied areas of (a) fossil collection to understand evolution in the Devonian era, (b) sleep and eating behavior in fruit flies, (c) biochemical approaches to phylogenetic relationships among species, and (d) the effects of human female ovulatory status on humor appreciation. Both students and faculty members who have been awarded these grants receive stipends for their work and will report their results in next year's EvoS seminar series.

Given the positive sense of community that permeates EvoS-New Paltz, there is no doubt that relationships between faculty members from different departments have been initiated and enhanced, despite the ever-increasing specialization in academe. In addition to highly positive interactions among members of the EvoS community, there have also been some negative reactions, especially to seminars on controversial topics such as human sexual behavior and religion. This has manifest itself in the form of critical questioning of the speaker following the talks, distribution of flyers protesting a speaker's work and a series of letters to the student newspaper. In these instances, the entire academic community has been forced to examine long-held assumptions and explore new, unfamiliar territory. As faculty, we are used to being "experts," and it is healthy (if not necessary) for us to explore radically new and/or different ideas, to hear other's perspectives and to articulate our own, just as we expect our students to do. While these attributes may be at the heart of scholarship within one's discipline, the thing that makes these interactions surrounding EvoS different is the cross-disciplinary nature of the discussion. These instances have allowed us to model this type of discourse for students as an example of life-long learning.

While the success of EvoS will be documented quantitatively at both the single course and whole program level as part of the NSF consortium grant, it is also tangible in the intellectual quality of life for both faculty and students on a day-

to-day level. It was for this reason that we decided to facilitate the creation of a multi-institution consortium.

Starting One's Own EvoS Program and Joining the EvoS Consortium

We have provided narrative accounts of the first two EvoS programs to give an intuitive "feel" for faculty at other institutions who might be interested in starting their own programs. We close this article with some final words of encouragement. For more detailed information, please visit the EvoS Consortium Website at http://www.evostudies.org.

- *Most* colleges and universities have the existing "parts" for starting an EvoS program.
- The EvoS consortium is designed so that new members can join at an entry level *without prior investment,* bringing them "into the loop" and allowing them to develop their programs in an incremental fashion.
- Smaller colleges might have fewer "parts," but they also have more to gain in terms of achieving a critical mass of faculty interactions across departments. Moreover, membership in the consortium can supplement the "parts" available at a smaller college.
- Even the largest research universities with the most distinguished programs in evolutionary biology still suffer from the lack of integration described at the beginning of this article, especially at the level of undergraduate education, and therefore have much to gain from adopting an EvoS program and joining the EvoS consortium. Major research universities currently involved in the consortium include Cornell University, the University of Kansas, The University of Arizona, and the University of California at Los Angeles.
- Community colleges educate approximately half of all college students. Not only can EvoS programs work at the community college level, but these schools can provide a mechanism for recruiting under-represented students from 2-year colleges to 4-year colleges and graduate education.
- The EvoS consortium deserves to be *international*. Religious creationism is largely concentrated in the United States (although it is growing elsewhere), but the lack of integration within academia that we described at the beginning of this article is worldwide. Institutions outside the US are therefore encouraged to start their own programs and to join the EvoS consortium. In addition, colleagues outside the US are invited to write consortium grants of their own, using our NSF proposal as a model.
- Graduate and undergraduate students can play an important role in the formation of new EvoS programs. Several programs that are developing at other institutions were started on the basis of student initiative. In addition, involvement in the creation of an EvoS program will be a *career asset* for students who plan on academic careers and can use their experience to establish EvoS programs at their future institutions.
- EvoS programs cannot be replicated in a cookie-cutter fashion but must be tailored to the constraints and opportunities of each institution. Thus, creativity is required on the part of each group starting an EvoS program,

even though the NSF-funded consortium grant can offer considerable advice and assistance. We explicitly think of the EvoS consortium as a process of academic cultural evolution, which relies upon *variation* among programs and *selection* of best practices based on rigorous assessment.

- We wish to stress, once again, that vibrant EvoS programs can be established on the strength of *modest intramural resources*. Moreover, although the creation of any academic program requires effort, the effort of creating an EvoS program is amply repaid in the form of an enhanced intellectual environment and a foundation for subsequent external funding.

REFERENCES

Burian, R. (2005). *The epistemology of development, evolution, and genetics*. Cambridge, UK: Cambridge University Press.

Dickens, P. (2000). *Social Darwinism: Linking evolutionary thought to social theory*. Berkshire, England: Open University.

Goodman, C. S. and Coughlin, B. C. (2000). The evolution of evo-devo biology. *Proceedings of the National Academy of Sciences, 97,* 4424-4425.

Jacob, F. (1977). Evolution and tinkering. *Science, 196*, 1161-1166.

Lemov, R. (2005). *World as laboratory: Experiments with mice, mazes, and men*. New York: Hill and Wang.

Miller, J. D., Scott, E. C., & Okamoto, S. (2006). Public acceptance of evolution. *Science, 313*(5788), 765-766.

Richards, R. J. (1987). *Darwin and the emergence of evolutionary theories of mind and behavior*. Chicago: University of Chicago Press.

Whitham, T. G., DiFazio, S. P., Schweitzer, J. A., Shuster, S. M., Allan, G. J., Bailey, J. K., & Woolbright, S. A. (2008). Extending genomics to natural communities and ecosystems. *Science, 320*(5875), 492-495.

Wilson, D. S. (2005). Evolution for Everyone: How to increase acceptance of, interest in, and knowledge about evolution. *Public Libarary of Science (PLoS) Biology, 3*(12), 1001-1008.

Wilson, D. S. (2007). *Evolution for everyone: How Darwin's theory can change the way we think about our lives*. New York: Delacorte.