

SWOT Comments re the School of Biological Sciences

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Summary:

Over the past 25 years, the School of Biological Sciences has greatly increased its research activity and profile, but has failed to address the critical problem of human resource capture and development, especially as that problem is manifested in the introductory program and in faculty engagement in mentoring at all levels. In essence, UNL is working overtime to diversify both its student body and faculty, while SBS has allowed its curriculum to become constrained and its faculty resources to become disengaged from the central mission and idealism of American higher education. The institution's desire for a "unified curriculum in life sciences," with the attendant design of a common educational experience, is fundamentally flawed because of this purposeful attempt to diversity both consumers (students) and producers (faculty). In other words, we're trying to impose conformity upon diversity without the human resources (faculty) to accomplish this near-impossible task, and certainly without faculty time or desire to acquire the breadth and interpersonal skills necessary to accomplish it. This paper outlines a strategy and provides the rationale for addressing this problem through a combination of faculty hires, re-vitalization of the field program, curricular modification, and faculty engagement in the introductory program.

Introduction:

The comments below are in response to the request from Diana Pilson for faculty reaction to recent SWOT conversations in the School. Although I understand that I am no longer a faculty member, I also understand that institutional memory and experience are relatively important in these conversations, thus the comments, recommendations, and rationale. The recommendations can be summarized as follows:

- (1) Immediately make BIOS 101, 109, and 112 available for majors credit, all in addition to BIOS 102 and 103.
- (2) Immediately hire two tenure-track invertebrate zoologists with active research programs and interpersonal skills (one could be a protistologist with research interests involving heterotrophic taxa or a microbial ecologist), with the intent of revitalizing the introductory program and the field station.
- (3) Immediately return the Cedar Point program to a 3-5-5-week format so that the two invertebrate zoologists can convert that facility into the asset it was previously was (from the liability that it has become in recent years) and also have enough free time to pursue their own research in addition to serving as in-residence research role models for CPBS undergraduate students.
- (4) Rotate all tenured faculty members through at least one of the courses mentioned in (1) above at least once every three years (faculty can choose which one[s] they are comfortable with).
- (5) Drop BIOS 207 as a required course and infuse all other SBS courses, from BIOS 101 on up, with as much evolutionary and ecological content as possible (an approach that may require some faculty development activities). Such infusion is as close as our diverse faculty can come to delivering a common life sciences experience.
- (6) Re-establish lecture faculty responsibility for, and power over, laboratories in the introductory program, including assignment of TAs in those semesters a faculty member is assigned to an introductory course.

- (7) Begin a strategic assault on the Oldfather Hall pre-health advising system and summer New Student Enrollment as part of an overall, long-term, human resources management and development plan.
- (8) Convince a few faculty members to begin exhibiting some intellectual leadership, especially in the introductory courses, and especially relative to the field station program.

Explanation and Rationale behind the above recommendations:

(1) Introductory program in biological sciences:

SBS has a major human resources problem in the sense that over the past 25 years, the school has neither hired, nor developed, faculty members who have the language skills, stage presence, idealism, and desire to make the world a better place from in front of a large auditorium like Henzlik Hall. This human resource development failure means that existing faculty resources are not congruent with institutional needs and mission, at least as manifest in the introductory program. The first step in resolving this problem is to open up the system, make it flexible enough so that faculty desires, interests, talents, and willingness can be matched to existing curriculum opportunities and needs in a way that is most rewarding for the faculty members involved. In other words, overlay diversity with diversity.

Extensive conversations with students in all those courses, provided the correct questions were asked, would quickly reveal that the “majors and non-majors tracks” concept is an absolute myth. Student talents, abilities, short- and long-term goals, and attitudes are only very loosely mapped onto our curriculum designed to separate majors from non-majors (whatever those words—majors, non-majors—actually mean). Furthermore, the university is working overtime to diversify its student population, and BioSci has, either by default or on purpose, significantly diversified its faculty. The first rule in human resource management is to *map your resources onto your mission in a way that maximizes the use of those resources, maximizes the intangible rewards for the people involved, and minimizes the compliance burden*. Thus the recommendation: open up the curriculum, open up the opportunities for student-faculty intellectual engagement, broaden the spectrum of biological experiences available to students, and start this process at the earliest possible stage, namely, with the 100-level courses.

SBS also has a major human resource problem derived from the fact that only a small fraction of the faculty has experience in the introductory courses, especially in BIOS 101, and thus has no idea what kinds of people actually walk into our front doors by the thousands every academic year. Furthermore, recent hiring practices, in which professors of practice are hired to service our introductory courses, will make this problem worse, mainly because we don't have a tradition of actually listening to PoP in faculty discussions of anything, especially teaching, unless it's on matters of technology (content delivery). The net result is that whenever SBS makes decisions regarding the introductory program, those decisions are made from a position of ignorance. The only way to get the faculty as a whole educated about the lower division program, and to generate a vested interest in that program, is to eliminate the privileged classes (not assignable to BIOS 101, 102, 103, 109, or 112 for whatever reason).

SBS has also moved, in recent years, to a separation of lecture from lab. Although the rationale for making such a separation is discussable, the result are fairly obvious, namely, disengagement of tenured faculty members from introductory laboratory design, pedagogy, and practice, with attendant loss of vested interest. As a minimum, faculty members assigned to BIOS 103, 109, and 112 lecture should also be expected to review laboratory exercises and

practices well before the semester begins and make adjustments as desired. Faculty members assigned to those courses should also have complete control over the choice of laboratory teaching assistants, instead of accepting personnel assigned from the Vice Director's office.

(2) New faculty resources, especially those potentially linked to Cedar Point:

CPBS was, from its inception in 1975 until about 2001, a truly major asset for the School in a variety of ways (produced broadly educated undergrad TAs and grad students who are now successful in academia, inspired some endowments [e.g. Blair Udale], produced LOTS of state-wide publicity for BioSci and UNL, etc.). Since 2001, that role has declined sharply, and the result has been loss of quality in our undergraduate teaching assistant corps, loss of potential graduate students with enough breadth to function in many different roles, loss of undergraduate honors researchers with multi-year commitments to a particular lab, and, over a 20-40 year period, *extreme* loss of potential for private funding. Regardless of the impression that CPBS is "for ecologists," (or worse yet, a "parasitological playground"), the simple truth is that most of our entering students, and most of our CPBS students, are pre-health wannabes, and they also are the ones who will see a legitimate CPBS experience as a major contribution to their undergraduate careers, and who will, in later life, most likely have the personal resources to support this program. A long-term SBS goal should be complete endowment for the field program, a goal that is certainly attainable, but not with the present human resource management philosophy. As an alternative, get rid of CPBS, turn it over to IANR, or sell it to a Denver hunting and fishing cartel and put the cash into a graduate student research and travel fund.

The first step in returning CPBS to the status of asset, from its present status as liability, is to hire two tenure-track invertebrate zoologists with active research programs (although one could be a protistologist with research interests involving heterotrophic taxa or an environmental microbiologist with the right kind of research program and interests), and these individuals should (= must) be broadly educated, with obvious interpersonal skills, high levels of idealism, and see CPBS as a research opportunity bonanza instead of a logistical pain in the rear or interference with his/her private life. As disciplines, invertebrate zoology, protistology, and environmental microbiology have the following inherent characteristics that match completely the needs and resources provided by CPBS:

- a. Minimal, if that, contact with, use of, and especially maintenance of, vertebrate animals (= greatly reduced compliance burden associated with research).
- b. At CPBS there is a massive supply of conceptually interesting, easily accessible, research problems for such faculty members, and those problems can be approached at levels ranging from class projects to doctoral dissertations, thus maximizing the potential engagement with human resources (= teaching materials, undergrad researchers, grad students, post-docs).
- c. Research problems in invertebrate zoology, protistology, and microbial ecology can often, if not regularly, use a variety of techniques ranging from modern microscopy to molecular ones, thus fostering integrative approaches to research, especially evo-devo and phylogenetic ones. In addition, it is often easy to build massive data sets amenable to modeling activities because some invertebrate taxa are so common and cooperative (okay, others are uncommon and/or uncooperative, but there are LOTS to choose from).
- d. The very nature of research with small organisms, especially invertebrates, means that a creative scientist can multi-task, getting in productive research time while also teaching

(but not with a 3-week, every day, 8:00AM-10:00PM schedule). There are also lots of opportunities, with such compatible research programs, to bring materials back to campus either preserved or in culture.

For the past 25 years, we have hired for expected research performance or because of spousal commitments, with little regard for other attributes. In the immediate future, faculty hires should bring some combination of talents, abilities, and interests that are now missing from SBS, and the intent behind these hires should be capture of the considerable human resources that walk into our front door every August. SBS is in dire need of faculty with broad, organismic expertise, language skills, stage presence, idealism, understanding of the role that human resources play in long-term success of both scientists and departments, and ability to both teach in the introductory program and do publishable research. In other words, SBS needs a couple of high profile work horses, ones that within a few years can assume leadership positions, especially as Director of CPBS.

(3) Cedar Point Biological Station (CPBS):

For certain kinds of biologists, especially those interested in ecology, development, and phylogenetics of microscopic and submicroscopic taxa, CPBS is an ideal working environment, source of research materials, and recruiting tool for engaging students at all levels (undergraduate to doctoral). However, the current 3-week sessions allow no time for multi-tasking, especially if an individual fulfills his or her instructional obligations in the true field station spirit. Furthermore, the current 3-week course structure allows no time for instructor homework (a particularly damaging situation in certain years, depending on weather and habitat changes), generates a lot of potential for vehicle competition (which can compound the instructional problems produced by bad weather or changed habitats), and segregates students intellectually.

By comparison, the 5-week sessions, with courses taught M/Th, T/F, or W/S, (a) allowed for faculty homework and research activity, (b) allowed for faculty travel if necessary, (c) prevented vehicle competition because classes were guaranteed vehicles on their class days, (d) allowed undergraduates to complete 8 cr in 5 weeks by taking two courses, (e) promoted intellectual interactions between students because they were not segregated into separate classes, (f) allowed enough time for students to assimilate results from their field work, (g) helped faculty and students deal with vagaries of weather, and (g) allowed some recreational time and social interactions between faculty and students (recreation and social activity at a field station are NOT liabilities regardless of the fact that they've been treated as such in recent years.)

The 3-5-5 format also returns CPBS to what it was for the first quarter-century of its existence, namely, *the* bargain in American higher education. An undergraduate could pick up eight upper division credits in five weeks, thus sixteen in ten weeks, with greatly reduced student fees, only about 65% of the time an equivalent experience would take on city campus, and a much reduced room and board expense, compared to the regular school year on campus. With two 5-week sessions at CPBS, a students could (and many used to, prior to 2000), enter their junior year at UNL with sixteen credits of upper division coursework they would not otherwise have, buying significant time for honors thesis research and TA positions during the academic year, all in addition to serving as peer role models.

A reasonable goal for SBS should, and could, easily be for a total attendance of 100 at CPBS each summer, hopefully with most students attending during either their first or second summers

after entering UNL. Out of those 100, if UNL could support 5 per academic year in an OTS course, then within two years of such human resource management, SBS would have a significant group of rather extraordinary students, peer role models, teaching assistants with unusual experiences and maturity, and potential graduate students coming into the program with great breadth. Within five years after accomplishing these goals, SBS could be a major supplier of superb graduate students to other institutions, and UNL would benefit from reciprocating scientists. The current three-week sessions, SBS faculty dis-engagement, lack of intellectual leadership on the part of CPBS administration, and outright negative impact of the pre-health advising system in Oldfather Hall, preclude the achievement of such goals.

CPBS will continue to deteriorate as a SBS program, with faculty dis-engagement, until a distinct effort is made, by a couple of high profile UNL faculty members, to exert intellectual leadership, especially in the introductory program. UNL has very strong, well-established, and well supported systems for diverting students *away* from valid intellectual experiences and funneling them into vocational tracts, namely, the Oldfather Hall pre-health advising system, and the New Student Enrollment system that operates during the summer. When talking about summer plans with students, a faculty member constantly hears phrases such as “it’s not required for my major,” “My adviser says the med school doesn’t really like us to be science majors,” and “I was advised to go to CPBS as a senior so I could get a good letter of recommendation.” The simple truth is that *in a global context, anyone intending to enter the health professions needs to get his or her hands on as many different kinds of living organisms as possible, as early as possible, and as often as possible.* Opening up the introductory program and re-vitalizing CPBS are the quickest, easiest, and most economical ways to accomplish this task.

(4) Rotate all tenured faculty members through at least one of the introductory courses on a regular basis.

This recommendation has one very important goal: to build an institutional understanding of what happens to the thousands of undergraduates, a large fraction of which have ACT scores of 28 or higher, who walk into our front door annually. Over the past quarter century I have seen, time after time, our faculty carry out discussions of education from a position of ignorance. Unless someone has actually encountered 250 first year students in Henzlik Hall, in BIOS 101, and done so repeatedly, talking face-to-face with a reasonable sample of those students, then followed that semester with a second large lecture section with majors, that individual is completely ignorant of what actually happens in that setting, what the opportunities and constraints are, and how the human resources that flow into UNL are subsequently directed into various channels by diverse forces, only some of which we can control. As a consequence, we seem to focus on content delivery, especially the techniques for content delivery, instead of the face-to-face human interactions that form the core of any human resource capture and development strategy.

A quick review of the tenured or tenure-track faculty members in SBS reveals that 22 of them are perfectly qualified, scientifically, to teach BIOS 101 and 13 of these also are perfectly qualified to teach the most difficult of our introductory offerings, BIOS 103. In other words, if a parasitologist can do it, regularly, and still publish, regularly, and finish and place graduate students, regularly, then any of these 22 and/or 13 people should be able to do the same. Yet in the spring, 2012, SBS has recruited a non-tenured faculty member from Entomology and a new professor of practice to do BIOS 103 and a professor of practice plus one tenured faculty member (who has taught BIOS 101 before), to do BIOS 101. *Clearly SBS is missing a major*

opportunity to engage its faculty with its most valuable resources, namely, the human resources that walk into our doors annually. The long-term benefits of such engagement are several:

- a. Individual faculty members have an opportunity to build up a clientele, thus a campus-wide reputation for high quality teaching, and thus elevate the Biological Sciences profile, too.
- b. SBS will develop, over a 2-3 year period, a cadre of tenured faculty members who actually understand the challenges and opportunities associated with the introductory program. Currently SBS lacks this body of experience, although there is a semblance of expertise among those who have taught in the introductory program, one of the 100-level courses, a few times over the past decade or two. *As of fall, 2011, there are no tenured faculty members in SBS who have taught both BIOS 101 and a follow-up introductory majors course in the same academic year, and since 1975, there has been only one [now retired] faculty member who taught BIOS 101, and a following second semester large majors course, AND a CPBS field course, and who at the same time constantly recruited students for the field program in general.* (For the first 20 years of CPBS existence, there were at least three such faculty members.) Thus there is no institutional memory, or personal experience, that can explain to the faculty what it means, in terms of intellectual rewards, to be able to build a clientele and engage that clientele in upper division coursework and/or research.
- c. Upper division courses will benefit considerably from tenured faculty participation in the introductory program, especially if faculty members actively recruit their better students into those upper division courses, and especially into the field program, while convincing those students that certain educational experiences are important regardless of what the Oldfather Hall advising system claims.
- d. Ongoing interpersonal interactions between students and faculty members is the only means SBS has of tapping into the long-term success of our students through endowment. The SBS goal should be to produce graduating seniors who remember individual faculty members, and special mentoring, as pivotal to their long-term success, and who do not forget such engagement. Students from Cedar Point, 1975-2000, are an excellent example of such alums, and we have never tried to follow up on their meaningful experience for political or financial support.
- e. A few truly exceptional students, captured and provided with the broadest education we can provide (CPBS early, honors research later in any sub-discipline, presentation at scientific meetings, interaction with diverse practicing scientists, publication, etc.), will end up either as our own grad students (it's okay to have our best in our labs; the athletic program would never reject a superior product just because it comes from Nebraska [indeed quite the opposite is the case]), or as grad students at other institutions. If we only capture five of these people a year, then in 10 years there will be fifty of them in graduate programs and academic institutions around the country working to send *their* best students back to UNL as appropriate. This student capture activity is exactly the reason that the parasitology program has never had to actively recruit graduate students and instead has filled the positions simply by answering requests.

(5) Drop BIOS 207 as a required course and infuse all other SBS courses, from BIOS 101 on up, with as much evolutionary and ecological content as possible.

Such infusion, with evolutionary and ecological content, is about as close as our diverse faculty can come to delivering a common life sciences experience to the extremely diverse student population and to provide a common intellectual framework for students who are constantly assaulted by thousands of communications daily. As a reminder, consider the following (from *Intelligent Designer: Evolution for Politicians*):

Types and sources of diversity among typical mid-western state university students in a large (~250) introductory course:

Economic diversity: From very wealthy, well-dressed, and comfortable, to poorly dressed, struggling, and working at least one job.

Religious diversity: From absolute atheists to radical, charismatic, fundamentalist Christians, as well as Muslims, Buddhists, Catholics, Hindus, and a variety of sects within each.

Family history: From orphans and foreign adoptees to strong nuclear families with multiple generations interacting regularly.

Employment: None, to two, sometimes three, jobs, varying from library help to bar tender and waiter or waitress to hospital orderly, etc.

Military service: Combat veterans to peace activists, both men and women, including some in the National Guard or Reserves, and perhaps a few still on active duty.

Major, career goals: The full range; you name it, someone is majoring in it, or planning to make a career of it.

Co-curricular activities: None, a reclusive existence, to an overload of campus organizations and Greek houses, to scholarship athletes in revenue-generating sports.

Ethnic background: Far more diverse than most people realize. A typical large university biology class could easily have students from a dozen different countries, including those in Africa, the Middle East, and Latin America.

Gender and sexual orientation: A large class (~250) will have flaunty heterosexuals, both male and female, as well as gays, lesbians, and probably some transsexuals and bisexuals.

Appearance: Drop-dead, head-turning gorgeous to plain as a blank piece of typing paper to downright ugly to an appearance that obviously causes the individual some pain, especially given the show-biz standards to which young people are exposed nowadays.

Talents: As varied as those of the human species—superb athletes, artists, musicians, actors, and writers.

Drug and alcohol use: Absolutely none to hopelessly addicted, and everything in between.

Significant others: None, and proud of it, to obsessive and possessive to the point of being in constant cell phone contact, even (maybe especially!) during class.

Age and maturity: Seventeen to seventy, although the usual age is 18-40, with maturity not necessarily matched to age.

Reading skills: Superb to almost non-existent.

Superimposed on this diversity among students is an almost equally diverse, but more importantly pervasive and constant, exchange of information. This information comes in a wide variety of forms, in many media, and from almost every imaginable source—from immediate and sometimes intimate interactions with fellow humans to global news to images, sounds, and stories from imaginary worlds. This array of information sources and content, listed below, is which I call the “intellectual environment,” using the term “intellectual” in its most general sense, namely, as anything having to do with the mind, thoughts, or actions stemming directly from thoughts.

Information sources and content typically experienced by an American college student during any 24 hr period.

iPod, etc.: Personal music, voice audio, video, memos, of an incredible diversity and amount.

Podcasting: Commercial stations and media outlets providing free audio and video content, as well as digital audio files provided by instructors, institutions, etc., as part of a class or other educational activity.

Cell phones: Cell phone conversations are so common nowadays that they constitute a kind of background noise throughout much of our public space.

Text messages: These communications are now so common and frequent that the medium is being used as a public warning system.

Ring tones: An amazing diversity, used to customize one's cell phone, and used as a cash cow for telcom companies.

The Internet: This source of information and constant messages does not need to be explained. Indeed, words are inadequate to explain its impact on society, especially younger people in developed nations.

Blackboard, etc.: Course management software, of which Blackboard is one example, multiplies the power of both students and teachers to communicate, design activities that can be done electronically, conduct online discussions, and do assessment.

Free downloads: There are hundreds, ranging from updates to existing software to new kinds of software that puts various kinds of powers in the hands of students.

E-mail: E-mail allows almost instant communication between any two people on Earth who have an Internet provider and access to a computer.

Digital images: The number of these images that are made and transported daily must be astronomical, and the diversity in hardware used to make such images is almost indescribable.

YouTube, Facebook, etc.: Web sites that allow digital creativity and structured communication in a multitude of ways and are used heavily by younger people.

Electronic library access: Most colleges and universities subscribe to a number, often a very large number, of content providers that quickly make decades of original published research in all disciplines readily available.

Sound bite reporting: "News" is highly structured, sometimes if not often in decidedly political ways, because there is so much of it and air time is exceedingly expensive. So in the media, an exceedingly complex world becomes highly abbreviated and simplified.

Political stridency: Political discourse has now become a theater of personal attack. It may always have been such, but information age technology establishes this type of discourse as "normal" because everyone does it.

PowerPoint: This pervasive and ubiquitous software has taken much of the incentive for in-class writing and creativity away from both students and faculty; students watch the show instead of actively getting engaged with the material.

Wireless networks: When a student can get online from anywhere on campus, then that student is inclined to get online and stay online with the illusion that he/she is actually becoming a scholar by doing so.

Video games: This massive industry creates a virtual world that may have absolutely nothing at all with reality, at least as lived by a typical student.

So the mixture of heterogeneity (extreme, even in the heartland) and virtually indescribable complexity of the intellectual environment creates a challenge that American education has yet to meet successfully, at least on a broad scale, and especially in the sciences. We do an excellent job of training people for specific careers that require an ongoing, but nevertheless discreet, set of learning activities: physical therapist, physician's assistant, dentist, neurosurgeon. We do a miserable job of educating people for life in a world that is rapidly becoming depauperate in terms of natural resources, including water, petroleum, and arable land.

Anyone who believes that a common life sciences curriculum can, or even should, be delivered to this clientele by an equally diverse faculty, increasingly characterized by specialization, is quite naïve. At present, we have excellent students majoring in Biochemistry, Psychology, etc., at least in part to avoid a class dealing specifically with evolution, and we also have 2012 American Presidential candidates who are embarrassingly scientifically illiterate. If a basic understanding of evolutionary principles and the data set supporting evolutionary theory are essential elements of scientific literacy (which I believe they are), and a willingness to admit, without fear, that the evidence *Homo sapiens* has evolved from non-human ancestors is simply undeniable and overwhelming is a litmus test for scientific literacy, then a single majors course in ecology and evolution is not adequate for a School of Biological Sciences, or a major university (think Big Ten peers), to fulfill its obligation to society as a whole.

A similar argument can be made for basic ecological principles, and failure of our elected representatives to address the consequences of climate change is but the most recent, and visible, evidence that we biologists have failed to deliver adequate education to our nation. The solution to this problem, at least at our local level, is to open up the curriculum then infuse it thoroughly, from the introductory to upper division courses, with evolutionary and ecological content. This approach is a whole lot easier to deliver than any other one; every faculty member has control over what is presented and required in class; we just need to use that control for the betterment of our society as a whole and all of us bear this responsibility.

(6) Laboratory in the introductory program:

For a variety of reasons, over the past couple of decades we have separated laboratories from introductory courses, especially BIOS 103, 109, and 112. Some of these reasons involve teaching load analysis, some involve faculty whining, and some involve lack of idealism and intellectual leadership on the part of faculty members. In the case of BIOS 101, separation of lab from lecture occurred much earlier, and the logistical burden of laboratory, coupled with the fact that lecture was taught in several sections by different faculty members, was clearly the driving reason for making BIOS 101L a separate course. In the case of those other three courses, however, either faulty human resource management and/or faculty laziness were contributing factors. In all cases, separation of lecture responsibility from lab responsibility creates a number of problems:

- a. Control over teaching assistant assignment is now in the Vice Director's office instead in the faculty member's. Thus there is no incentive for a faculty member who regularly lectures in BIOS 103, 109, or 112 to either be involved in lab exercise design or to recruit and train a cadre of teaching assistants who can and will deliver high levels of laboratory or instruction. The same case could probably be made for recitation leaders in BIOS 102. Just to play corridor politics, I know of one specific case in which an undergraduate who had taken several organismic biology courses (including BIOS 103), spent two summers at CPBS, done honors thesis research, won student paper awards at three different scientific meetings, and unlike some of our graduate students had superb microscopy skills, was strongly recommended as a laboratory instructor in BIOS 103 for this fall semester. This individual was hired to take care of animals at a wage of ~\$4.58/hour. What we missed was the opportunity to provide a strong role model and peer intellectual leadership in a critically important core majors course. *We are missing a whole lot of these kinds of opportunities, and the quality of our teaching suffers accordingly.*

- b. Laboratory content, lecture/lab correspondence, and especially pedagogy, all suffer unless lecture faculty members take responsibility for them. All four of our introductory laboratories (BIOS 101, 103, 109, and 112) have ample opportunity for investigative design, integrated and comparative content, and use of resources outside Manter or Beadle (e.g. Morrill Hall). What's lacking is tenured and tenure-track faculty input into those labs, meaningful input, so that our students leave with a clear understanding of the scientific enterprise and mindset instead of a set of canned exercises that work within three hours, controlled electronic testing, and TAs without adequate microscopy skills.
- c. Any course that is taught in only one lecture section a semester, e.g. BIOS 103, 109, and 112 (although that might change in the case of 103), provides a unique opportunity for intellectual leadership on the part of tenured or tenure-track faculty members through visitation of lab, casual conversation with students, and perhaps even a short participation in the exercise being done. Although it's impossible to put a dollar value on this kind of activity, anyone who's done it regularly can attest to the intangible benefits: enhanced engagement of faculty, improved understanding of what actually happens in our courses, erosion of the fear factor (in students, of low grades) that seems to be operating nowadays, appearance of faculty concern for quality of instruction, etc., i.e., intellectual leadership, one thing that is largely missing from our current program.

(7) The Oldfather Hall pre-health advising system:

This system captures large numbers of entering students and under the guise of customer service pre-empts faculty engagement and directs human resources into career tracks and curricular decisions that are not necessarily good for SBS, the University of Nebraska, the State of Nebraska, or the nation. Here are the principles to consider:

- a. There is nothing inherently wrong with a career in nursing, physical therapy, occupational therapy, etc., but there is plenty inherently wrong about a system, especially one at a major (read "Big Ten") university, that diverts human talent away from a relatively broad and extensive education, with a degree as goal, and into a vocational path prior to a degree.
- b. A "broad and extensive education" ideally includes a college degree with courses in the arts, humanities, and social sciences, as well as the sciences, some original investigative experience, and on-going intellectual contact with at least a few faculty members.
- c. The present pre-health advising system in Oldfather Hall diverts human resources away from the kind of education described in **b.**, and often the students diverted early on into vocational paths are those with relatively high ACT score (when I was teaching BIOS 101, there were at least 10 such students per semester per class).
- d. It is very obvious from interacting with such high-performing diverted students that there are family influences involved, but nevertheless, it is in the vested interest of both SBS and UNL to keep our better students on campus, making progress toward a degree, engaged with faculty members, and exploring the many educational opportunities provided by a large university, insofar as possible. At the moment, we are not even thinking about this human resource development problem.

This advising situation does not work to the advantage of SBS because it separates a student's university experience, especially the intellectual experience, from the faculty. "My

adviser says . . .” and “It’s not required for my major . . .” are two phrases one hears frequently from students. I’m not advocating a return to the faculty adviser system (although it worked well and never prevented anyone from publishing), but rather a return to the faculty influence condition, in which faculty members are the source of valid information and advice on matters of intellectual development, returning the advising system to its role as a source of [sometimes] valid information on requirements. Intellectual leadership is the key to success in these two roles.

(8) Intellectual leadership:

The term “intellectual leadership” as used here refers to faculty members taking the responsibility for face-to-face conversations with students on a wide range of subjects related to biology and professional development, faculty members seeing themselves as role models both in the classroom and outside the classroom, faculty members promoting, encouraging, and even participating in, peer leadership opportunities, and faculty members finding ways to promote individual student professional development, breadth of experiences, and pursuit of a degree program in biological sciences regardless of that student’s stated career goals. Specific examples of such leadership include (but are not limited to):

- a. Field station director actually teaching in BIOS 101 and 103, as well as at CPBS, and actively recruiting students into CPBS courses via one-on-one conversations.
- b. Faculty members teaching in the introductory courses actually calling the top 15% of their students in for private conversations after the second exam, and asking the five critical questions so few students ever get asked:
 1. Are you on scholarship, and if so, what kind?
 2. What is your major?
 3. What are you going to be doing 20 years from now?
 4. Has anyone at UNL ever suggested ways to multiply the value of your educational experience here?
 5. What are you doing this summer (as a lead into a CPBS recruitment discussion)?
- c. Faculty members developing a set of responses to the student answers to those five questions, responses that in some way enhance the quality of UNL and in some way that the student knows he/she is being advised informally on ways to enhance the quality of his/her educational experience.
- d. Faculty members finding some way to use resources outside of class for instructional purposes, thus promoting integration of class material with students’ lives outside Henzlik Hall (or other large auditoriums).
- e. Faculty members finding some way, in large lecture sections, to get students into the primary literature, using that literature in some graded activity at their levels, so that students develop information retrieval and analysis skills, and come to actually understand what is meant by the term “original science.”
- f. Faculty members visiting labs or recitations in their 100-level lecture sections, then carrying on short, but biologically interesting, conversations about the material.
- g. Faculty members allowing time for some undergraduate researcher to present his/her work in the large introductory lecture sections, and follow that presentation with a Blackboard discussion forum related to the work, as well as a few exam questions based on it.
- h. Faculty members keeping a list of other faculty members they know work well with undergraduate honors students and suggesting students contact those individuals (see b. above).

- i. Faculty members finding some way to spend a little bit of time in lecture on the biological aspects of important current events and making sure there are at least a couple of questions on an exam about such coverage.
- j. Faculty members suggesting the best ways to actually study the subject, as presented and examined over in a faculty member's particular section.
- k. Faculty members having guest lecturers periodically in the large introductory classes, then following up on those lectures with some kind of meaningful activity (short writing exercise, Blackboard discussion, etc.)
- l. Faculty members actually saying "hello" to students on campus, and encouraging students to do the same instead of looking down when they see a faculty member coming along the sidewalk (maybe phrase this encouragement in terms of possible letters of recommendation).
- m. Faculty members providing students with suggested reading lists, books for use over the holidays, etc., along with an explanation of why the titles are on the faculty member's personal list.
- n. Faculty members asking other faculty members, perhaps at social occasions, whether any of these intellectual leadership suggestions have been tried, and if so, what the results were.

Conclusions:

The UNL School of Biological Sciences is uniquely positioned to make a truly major contribution to the development of our nation's scientific human resources, but various factors, particularly the existing human resource capture and development model, clearly prevent UNL-SBS from making this contribution. The primary problem is lack of congruence between a highly diverse student population, a very diverse faculty population, and a highly constrained curriculum that is, in many ways, controlled by forces outside the School. The secondary problems are lack of faculty interpersonal skills, stage presence, idealism, and creativity. The result of these problems, in combination, is a focus on content delivery instead of on human-to-human contact and the development of those strictly human attributes—persistence, curiosity, discipline, communication skills, and breadth of interest—that are largely independent of major or research focus. Indeed, it is this set of attributes that provide capacity for future intellectual growth and advancement in any chosen career. The field station (CPBS) is a truly major asset for solving these problems, but that program has become a liability because of faculty disengagement and a suite of curricular and advising issues. There is no reason to believe that the recommendations above will destroy the research status of SBS; there is every reason to believe that the kinds of engagement outlined in this document will, over the long run, greatly enhance faculty morale, encourage creativity in both teaching and research, promote faculty career development activities, and build endowment potential.

JJJr