



Science/Technology Education in Church-Related Colleges and Universities

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Feasibility of Developing Adequate Natural Science Programs in a Church-Related School

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Dr. J. Richard Chase



Institute for Theological Encounter with Science and Technology

Cardinal Rigali Center • 20 Archbishop May Drive • Suite 3400-A • St. Louis, Missouri 63119 • USA

314.792.7220 • www.faithscience.org • E-mail: mariannepost@archstl.org

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Dr. J. Richard Chase, President of Wheaton College since 1982 was President of Biola College, La Miranda, California. Dr. Chase earned a Bachelor in Theology (Biola), B.A.S. and M.A. degrees (Pepperdine) and a PhD in Rhetoric and Public Address (Cornell). Dr. Chase was listed among the 100 most effective presidents in America in a nationwide survey reported in the Chronicle of Higher Education.

Introductory Profile Of Wheaton College

The suggestions advanced in this paper are based on the experiences of Wheaton College (Illinois). This College is normally categorized as a national liberal arts college, with over 70% of its students coming from outside of Illinois. (All statistics are from academic year 1988/89 unless otherwise noted.) Its history of 130 years and current character place it within the context of church-related institutions. However, the College has never been controlled nor officially related to any church body. It is protestant and evangelical. It draws from a wide range of Christian communities, including both independent churches and mainline denominations. Though protestant in history and affirmation, the College attracts a handful of Catholic students.

The College limits undergraduate enrollment to approximately 2200 students. Some 144 students are majoring in music in our Conservatory and the remaining 2056 undergraduates are in the School of Arts and Sciences. Two-hundred and ninety-five students are majoring in our natural science programs, with an additional 124 freshmen intending to declare one of these areas as a major. If the freshman class is added, we list 419 natural science majors.

Our science enrollment (with freshmen included) is as follows: Biology 172, Chemistry 83, Geology 3, Mathematics/Computer Science 85, and Physics 76.

We are selective in our admissions. The 1988 SAT scores for incoming freshmen averaged 1150 (verbal 554, Math 596). Wheaton enrolled a total of 82 National Merit Finalists in 1988/89.

The College has a history of strong science programs, accomplished with limited resources. In the Franklin & Marshall studies on Baccalaureate-Origins of Doctorate Recipients from Four-year Colleges, Wheaton ranked 37th out of the top 337 colleges listed for the period 1920-1984 for all doctorates in all the sciences. It ranked 12th out of the top 339 when all academic disciplines were considered. Over the past 25 years, one out of four of our graduates in the natural sciences has gone on to complete a doctoral program in science.

Wheaton College is also a member of "The Undergraduate Science Group." The decline in science majors among this group of 48 liberal arts colleges is less than a quarter of the decline among colleges and universities generally. In 1980 this small cluster of colleges granted 54 out of every thousand bachelors' degrees in science granted in the United States.

Currently 26.5 FTE faculty (all with doctorates in the natural sciences) are assigned to the Wheaton College Science Departments, and their combined departmental operating budgets total \$1,429,594. This does not include library acquisitions, special equipment purchases, refurbishing, maintenance, and overhead.

The College also owns and operates a fifty-acre Science Station in the Black Hills of South Dakota. Facilities for lodging, food service, recreation, and academic work are suitable for up to 60 students and staff. Summer studies there are conducted in general biology, botany, ecology, geology, zoology, and astronomy.

Obstacles Confronted in the Development Of Science at a Church-Related College

In meeting the demands for a reasonable educational experience in science, church-related colleges confront several obstacles.

Science is expensive. Even apart from the cost of laboratories and the escalating cost of scientific equipment, the natural sciences are high cost centers. At Wheaton, for example, our four Science Departments rank 1, 2, 4 & 5, in departmental cost per student. To that may be added the high cost of scientific journals and monographs that are included in the library budget.

Interest in the natural sciences has been declining in the United States. This decline in numbers is a national phenomenon that is tragically accompanied by a decline in science and mathematics proficiency. *ETS Developments* (Volume XXXIV, Number 4, Spring 1989) reports on the results of an international assessment of math and science for thirteen-year-olds in five countries and four Canadian provinces. Three of the Canadian provinces were split into English and French-speaking categories, so there were twelve groups. The United States was last in Math and ninth in science. Lawrence A. Uzzell, Science Editor for *The Wall Street Journal* addressed this same theme in the Wednesday, October, 1989, issue of *The Wall Street Journal*. He writes,

The international Association for the Evaluation of Education Achievement reports that in 1982 the average Japanese student outscored the top 5% of U.S. students enrolled in college-prep math courses. In chemistry and physics, advanced science students in U.S. high schools performed worse than their counterparts in almost all countries studied. In biology they ranked dead last, behind such nations as Singapore and Thailand.

The general decline in college and university science enrollment will ultimately create a serious shortage of science teachers at all levels. Church-related colleges will need attractive programs in the sciences if they hope to recruit and retain excellent faculty.

Church/science issues continue to exert an influence on evangelical colleges. This is a centuries-old conflict. In the face of Third Century B.C. Greek genius that determined the earth was round (within 195 miles of its actual circumference) and that it turned on its axis and orbited the sun, the church persisted for centuries in suppressing those who accepted such notions.

Today's battlefield ranges from theories of the origins of our world to gene sequencing. For example, some critics within the evangelical community encourage their constituencies to repudiate evangelical colleges that refuse to support a 24-hour six-day time frame for the creation of the universe. And most have been caught in the crossfire on the abortion issue.

In the face of such obstacles as the costliness of science programs, a decline in enrollment, and pressures from the Christian public, church-related colleges must reassert their commitment to excellent programs in the natural sciences. For several reasons, strong science programs have never been more urgently needed than they are today.

The Case For Strong Science Programs in the Natural Sciences

Science is the engine that drives business. It is the basis of modern medicine and provides the background information for many of today's ethical choices. Tomorrow's college graduate will be confronted with a bewildering array of options provided by the ever expanding technology of biomedical practices, DNA technologies and environmental crises. Our graduates will eventually administer such technologies, make laws and regulations regarding such practices, conduct research, and teach the next generation of scientists, citizens, and parents.

Above all, a church-related institution that believes in God will truncate student's understanding of the very nature of God when the doing and understanding of science are neglected. Much is relative in our world, but a fertile area in which to explore absolutes and to understand an important aspect of the character of God is through interacting with His creation.

Further, the technologies of biomedical practices have already advanced beyond the average college graduate's ability to develop a reasoned response to the new choices that confront humankind. Pulling the plug on a seemingly lifeless child while holding hospital staff at bay with a gun is at once bizarre, shocking, and understandable. There is a crisis in thought and education at both the individual and national policy level. Educators have a major task before them. Those who believe in God and teach in church-related institutions need to be knowledgeable and active participants.

Developing Adequate Science Programs

Institutional commitment is the very heart of the development of science programs. It is a matter of priorities. Adequate programs can be developed, for example, if science programs are as important to a College as a successful athletic program or an attractive student center. If funds are limited (as they usually are), the sciences should still receive their full share if the institution is to be faithful to both the liberal arts and the school's Christian values.

Priority must mean reasonable action, and I believe it starts with a strong general education requirement in the natural sciences. All college graduates should know what a scientist does and should have sufficient laboratory experience to see first-hand how nature works. Much of life will be unintelligible to a graduate who misses this experience. In any age, and particularly in this age, illiteracy in the ways of scientific inquiry nullify the claim that a person is liberally educated.

The priority to teach science to all students and to develop a few strong programs in the natural sciences will necessarily call for other priorities. These include the recruitment of qualified and creative faculty who have the appropriate doctorates. Terminal research degrees normally assure us that the prospective faculty member has completed an extensive research project under the supervision of competent scientists. Such experience is essential in the teaching of the natural sciences at the collegiate level.

Such faculty need acceptable laboratories and modern analytical or recording equipment for the teaching of the natural sciences. In addition, adequate budgets must be provided for supplies, repairs, replacements, and the media and library resources for each science discipline represented in the curriculum.

Even with competent faculty and adequate teaching resources, the task of developing adequate science programs has just begun. Students need to be attracted to the program. Recruiting high school or community college students through scholarships based on *both* need and merit is only part of the task. With the minimal interest now seen in the natural sciences in such schools, adequate enrollment is not likely from this student pool.

Most liberal arts colleges have a large pool of freshmen and sophomores who have not declared majors. These students can be attracted to take additional science courses as electives and many can be encouraged to major in a natural science program. Here are courses of action that have helped us: stimulating teaching, effective advising, seminars that demonstrate the important role science must play in contemporary issues of concern to students, contact with professionals through the extensive use of guest speakers at forums and in class, field trips, museum visits, visits to the research laboratories of industry, visits to research university laboratories, and presentation of career options. Interdisciplinary approaches to science and the development of innovative curriculum have proved especially effective in attracting students.

Once attracted to science, students need to be encouraged and nurtured. This calls for student research opportunities where the excitement of discovery can be fostered. Often these can be developed locally, but we have found that there are excellent summer research opportunities for students across the country. In addition, we have developed internships both here and abroad. Wheaton has developed a program that places students in a third world setting for a semester or more. Our Human Needs and Global Resources (HNGR) program annually places some 20

students overseas. Biology has had the highest number of students enrolled since the program started about a decade ago.

Above all, it is essential that the natural sciences have the momentum and attractiveness that come when faculty and students are excited about what science can contribute to the improvement of our world. The faculty provide models for students by being dedicated to discovery, and the improvement of our environment and the quality of life, and by displaying an enthusiasm for the life of a scientist. Such faculty attract students and build the reputation of a college's natural science program.

Two major avenues for fulfilling priorities are resources and innovation. Resources can be found and committed. Most institutions, even very small ones, have learned that funds allocated for the writing of grants will produce a substantial net gain within a couple of years -- often within the first year. Even releasing a professor from one course for proposal writing returns an excellent profit. These are great days for such solicitation, since many foundations are committed to strengthen the teaching of science and to the encouragement of scientists in their personal research projects.

The enthusiasm and cooperation of faculty are essential. The development of science is a team project. A fair portion of Wheaton's success with foundations has come from leads, contacts, and proposal writing by the faculty. Even if the institution has an office dedicated to foundation solicitation, it will be ineffective without considerable assistance from the science faculty. Faculty who argue that they are not in the fund-raising business have a distorted view of how funds are raised. In short, faculty orientation must be an integral part of fund raising and some release time for faculty who are proficient in the development of grants will also prove beneficial.

Business and industry can also prove helpful in the provision of equipment. In my nineteen years as a college president, good pieces of equipment have come from industry research laboratories, hospitals, and sister universities that moved up to a higher level of sophistication. These contacts depend upon such continuing relationships as cooperative summer research projects in which both the college and industry benefit, and the normal contacts of the president and other college personnel.

Campus creativity can also produce funds for priorities. At Wheaton all year-end surplus funds are allocated to one time capital expenses. In recent years these have included laboratory renovation and special equipment purchases for the natural sciences.

The growing sophistication of equipment for the biological and biomedical and physical sciences needs to be faced realistically with both priorities and specific courses of action. Many campuses have booster clubs for athletic teams, "friends of the library," and similar interest groups. The natural sciences can also develop such relationships. We recently inaugurated a mini-campaign for our Chemistry Department that will draw on the loyalty of chemistry graduates.

Such graduates are now serving as physicians, teachers, corporate executives, and researchers. A representative group of such alumni now serve as a steering committee for this campaign.

Innovation is the growth industry of academic development. Innovation in curriculum and research experiences in the natural sciences can: a) provide the insights and procedures of science to a wider segment of our student bodies; b) help attract new majors; c) expand research opportunities for advanced students, and d) provide opportunities for both professional growth and contributions to science by faculty.

Joan Rodgers, a science writer and public affairs specialist now associated with the Johns Hopkins Medical Institutions, notes that "studies show that 40 percent of the adult public wants to learn more about science" (*Currents*, January, 1988, p. 24). If the general education requirements in science are viewed as opportunities to excite students about the significance and marvel of science, education will be enhanced and science enrollments will increase.

Many colleges are finding ways to strengthen their programs, attract students, and provide new challenges for faculty. For example, at Wheaton we now offer a general education course that is truly interdisciplinary rather than just multidisciplinary. The course, “Majestic Nature,” emphasizes discovery and involves various pedagogies to the virtual exclusion of the lecture method. Eight faculty have been directly involved in planning and/or teaching this course.

We are also developing a Brain Science program that will offer an interdisciplinary major in neuroscience. It will embrace psychology, biology, chemistry, linguistics, computer science and philosophy. It will acquaint the student with issues of mind and matter and the Christian response to a totally deterministic view of the mind.

Innovation can also enrich the generally limited research experiences of the average liberal arts college faculty member. Wheaton’s location in the western suburbs of Chicago provides us with excellent off-campus resources and support. If we were 500 miles from such resources, however, I would consider a summer science program in a science-rich metropolitan center as of equal importance to a European study center for the study of literature and history.

Selected affiliations that enrich our science program include both consortial arrangements and special research opportunities for both faculty and students.

Consortial arrangements of Wheaton College include the following:

Associated Colleges of the Chicago Area

This affiliation provides stimulation for professors who may find few colleagues on their own campus with similar interests, as well as expanded educational opportunities for students. Cooperative courses, colloquia and a spring symposium where students share reports on research projects are regular features.

Great Lakes Cluster Pew Science Program

Five colleges and Northwestern University comprise this cluster. The Pew grant is designed to enhance educational opportunities at each school and attract more students into the sciences. Freshmen science majors can apply for an eight-week “Pew Scholars Program” for the following summer. Five “Scholars” chosen from each school and distributed among all of the natural science disciplines will work and learn together the principles of scientific research. This is a forerunner to the “Pew Research Fellows” program, which is a summer research experience with a faculty member at one of the cluster schools. The “Fellows” must have finished their sophomore or junior year. Both programs award a stipend and provide free housing.

Christian College Consortium and the Christian College Coalition

These two affiliations provide faculty enrichment programs that enhance the teaching of the natural sciences.

Representative research opportunities are provided through arrangements with:

- Amoco
- Argonne Laboratory
- University of Kentucky
- Loyola University
- Northern Illinois University
- Ohio State University

Research strengthens teaching, and joint student-faculty research is the essence of quality science instruction. At a small liberal arts college the best faculty should be involved in both instruction and research projects for freshmen as well as honor seniors. Attracting and retaining such faculty calls for priorities, funds and innovation. Equally crucial is a college’s ability to attract quality students capable of serious work in the sciences. Such students add

an essential dimension to class discussion and experimentation and help retain outstanding faculty.

Liberal arts education will be impoverished if quality science instruction declines in our church-related schools. The signs of demise are all about us. They include lack of interest in the sciences among high-school students and a scarcity of competent faculty. At a recent conference in San Antonio, Texas, the President Elect of the American Chemical Society expressed his conviction that a large portion of the liberal arts schools will have to close down their Chemistry and Physics Departments in the next fifteen years for lack of good equipment and competent faculty.

It is my hope that this conference will encourage both faculty and administrators to renew their commitment to excellence in the natural sciences within the church-related college. It is more than just a concern for a balanced curriculum in the liberal arts, or even the proper education of our students in a technologically sophisticated world. It is, rather, a matter of educational integrity. The natural sciences are fundamental to the development of a realistic world view. Our understanding of life itself rests in part upon scientific knowledge. Our ability to change and improve life in this universe is the ultimate business of science. And, above all, our knowledge of God -- the reason for our institutional church-relatedness -- rests upon a proper understanding of His creation and its basic laws.

Excellence in science is not an option -- it is a necessity for a church-related liberal arts college.

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