CHAPTER 7

Strategies to Foster Interdisciplinary Teaching and Research in a University

J. William Schopf and Werner Z. Hirsch

INTRODUCTION

In tomorrow's world, universities, and in particular those with a strong research orientation, will face a new environment that carries new challenges to their traditional way of doing business. Already, the Information/Technology (IT) Revolution is having a profound influence on universities, as is the ever-greater complexity of social and scientific problems facing today's world, developments that can only be expected to become more pervasive in the future. In the near-term future, both the society in general and academia's prime product, the students it is charged with educating and helping to develop into knowledgeable contributing citizens, are likely to make new and increasing demands on the teaching, research, and public service functions of universities. In response, universities will of necessity be forced to adjust to a decidedly new set of circumstances. Some such changes are already underway. In particular, the past decade has witnessed new emphasis, evident at virtually all levels of academia, on multidisciplinary, or even truly interdisciplinary, teaching and research. While this new thrust carries with it the promise of providing importantly increased understanding of problem areas that previously "slipped through the cracks," it embodies also the potential for unforeseen deleterious results—the production of students, of teaching programs, and of research results that, though broadly based, are intellectually shallow, lacking in the depth of knowledge fundamental to proper understanding.

There can be little doubt that throughout the academic world, walls between disciplines and departments are becoming increasingly permeable. But as this development takes place, as universities organize themselves to carry out this nontraditional role, it presents a potential peril that can be offset only if institutions of higher education find means to avoid sacrificing their commitment to in-depth excellence while at the same time meeting their mission to educate effectively the future leaders of society and its citizenry. It is easily predictable that the societal and scientific problems of tomorrow will be even more complex and multifaceted than those of today. In recognition of this, academia has begun to prepare the next generation to address such problems by establishing programs, both in teaching and in research, that combine knowledge of two or more of the conventional disciplines with an understanding of how such multidisciplinary concepts intermesh. In the future, the crossing of boundaries between conventionally academic disciplines, and comfortably doing so, will have become commonplace. The prime questions are: how best can this transition be eased, and how, in a university setting, can the potential pitfalls inherent in interdisciplinarity be avoided?

THE CASE FOR (AND AGAINST) INTERDISCIPLINARITY [1]

Most would agree that the defining mission of a university is to contribute to the understanding, advancing, and transmitting of knowledge and culture. In carrying out this all-important (if daunting) task, those who are engaged in the effort have carved the huge territory of human knowledge into a set of seemingly discrete subdivisions, each of which have themselves developed into independent fields, the various disciplines that define a university's departmental structure. Yet in many cases, these supposedly disparate fields are not truly independent. The natural world, for example, is made up largely of biology, chemistry, and geology—but taken together, not as separate entities as they are represented by the traditional departmental structure. Indeed, the real world is composed neither solely of the "life sciences" nor of the "physical sciences"—it is an interlocking mix of both. Yet on almost all university campuses, the natural sciences are divided into these same two great tribes—each with its own "homeland" and each with its own set of lore, rules, and a common understanding of what, for it, constitutes "good science." With the exception of an occasional student (but almost never a member of the faculty), few forage from one homeland into the other. There can be no doubt that this tribalism makes things simpler for all—learning the

1 This section has benefited from discussions with Professor Daniel Kivelson, Department of Chemistry & Biochemistry, University of California, Los Angeles.

ropes in a single subject is far easier than grappling with many. And it is undeniable that this structure has returned great dividends; the strategy of learning more and more about less and less has worked well. But in the process, a price has been paid, and the cost has been particularly high for those studying the natural world, where the life and physical sciences and their numerous component disciplines are intimately interconnected. In essence, the academy has fooled itself by partitioning Nature into intellectually manageable units that because of their constrained focus have served to inhibit understanding of how the units come together to form the whole. Over time, traditional boundaries both of fields and of departments change, sometimes leading to the emergence of new hybrid disciplines—biochemistry, biophysics, geochemistry, geophysics, and biogeology are good examples. The need for and very existence of such hybrids well illustrates the inability of traditional academic structures to address adequately important interconnections in the world around us.

The boundaries defining departments and the subject matter that each explores have developed over a long history. Fostered by the traditional conservatism of the academic community, this structure seems to have been maintained largely by a commitment on the part of its practitioners to protect their discipline-defined turf and, hence, to preserve the status quo, even when the structure thus protected has come to be outmoded and less than optimal. By and large, dividing lines between departments have been based on a combination of discipline and methodology, a means of subdivision that brings together faculty and students having shared interests and that enables them to communicate with one another and to formulate a coherent core curriculum. But, as intellectual interconnections between disciplines become increasingly recognized as salient and important, the traditional departmental structure and its inherent lack of flexibility will more and more be seen to be wanting. Turf fights, already not uncommon, will become an accepted cost of academic life; conflicts between nontraditional young turks and the firmly ensconced old guard will increasingly become prevalent.

A lack of flexibility is not the only weakness of the traditional departmental structure. Indeed, some would argue that an even more pernicious aspect is that it fosters rampant overspecialization. As such, it is unable to accommodate, let alone encourage, promising efforts in areas overlapping among two or more interrelated disciplines. This is not to deny that throughout much of the post-World War II period, markedly specialized single disciplinary endeavors have produced beneficial results, both in education and in research. Yet, again, a price has been paid. It is of course important to "see the trees" and even to know the workings of a given tree in cell by cell detail; but, if in that process the forest and the surrounding landscape are overlooked, then only a miniscule part of the picture will have been viewed and

important understanding—knowledge easily accessible were relevant questions asked—will have needlessly been lost.

In many respects, the discipline-defined departmental structure has served academia well. But it has also failed, most notably in its lack of flexibility and its inherent drive toward ever-increasing specialization. Clearly, a move away from a structure based solely on single-discipline methodologically defined studies to one that is more flexible, inclusive, and that provides elbow room for interdisciplinary broad-picture investigations, is very much in order. Our call for such a move echoes Glion colleague, Hans van Ginkel's catchphrase that "life is not divided into disciplines," a perceptive admonition to which we would add that great intellectual challenges are not neatly divisible, either.

In recent years, interdisciplinary teaching and research have been encouraged widely, and though this plea has obviously been heard, the product generated can most generously be characterized as mixed (a not unlikely outcome of single discipline-trained faculty having to retool themselves to deal with ancillary disciplines in which they previously had little knowledge and only limited interest). Yet such interdisciplinary scholarship can be, and in some universities already has been, stimulated in major ways. Viewed from the vantage point of an economist, on the input, "supply side" of the equation are included such factors as the rapid increases in scientific knowledge and technology (developments part and parcel of the IT Revolution), as well as those in molecular biology, biotechnology, and the exploration of space. And on the outcome, "demand side," is the increasingly growing need to educate government officials, scholars, and the population at large so that they can more fully understand and effectively formulate solutions to already emerging problems of tomorrow's world. In such a view, both the supply side and the demand side of the equation constitute stimuli—one pushing and the other pulling toward the same result—and taken together, they are likely to be reinforced by other pressures emanating from the body politic, as well as an overall concern that the system be cost-effective. The world of tomorrow will require broad-gauged men and women, knowledgeable not only about particular "trees" but about the forest such trees comprise and the landscape in which they thrive—contributing members of society who can see and understand the interconnectedness of the world around them and adapt themselves readily to new circumstances and challenges.

Let us hasten to stress, however, that it would be an error to view interdisciplinary scholarship as something totally new, some novel, heretofore unimagined breakthrough in higher education. Indeed, breadth of knowledge has been a prime goal of educated societies over the millennia, just as breadth of scholarship has been a principal goal of universities worldwide. Even today, the modern "Renaissance Scholar", broadly educated and able to

apply that breadth to great multifaceted problems, is both a hallmark and icon of Western cultural imagery. The Leonardo DeVincis of the past, and the Carl Sagans and Stephen Jay Goulds of modern times, have distinguished themselves by being able to draw on the knowledge of a number of disciplines and to bring together and interconnect the diverse concepts and insights those disciplines encompass.

So, breadth of knowledge is not an attribute newly valued in academia. Nor are collaborative efforts among scholars and scientists of differing backgrounds. What is new is the drive toward more and more productive interactions and a realization that however desirable such interactions may be, they are actively discouraged by the current department-dominated structure of universities and can be accomplished effectively only if the interacting parties are conversant with, and appropriately knowledgeable about, the differing disciplines involved.

Given the current structure of universities, and the deeply ingrained loyalties of university faculty to their disciplines, it is abundantly clear that the transition toward increasing interdisciplinarity must take a form that is consonant with the continued important role of departments in university affairs. Indeed, the transition can be eased only if it is seen to enrich departments in ways they regard as beneficial and supportive, rather than being viewed as irrelevant fluffery that occupies faculty time and effort to no good cause or, even worse, as a tangible threat to the continued existence of the department structure. In other words, the transition should be evolutionary, rather than revolutionary, based on the realization that because universities are ruled largely by what Frank Rhodes, President emeritus of Cornell University, has aptly termed "the tyranny of the department," to gain a foothold any new structure must not only coexist with departments, but must be viewed by faculty as being overtly supportive of departmental goals. And though to some traditionalists it may seem counterintuitive, it is in fact true that in many respects interdisciplinary programs can benefit departments in important ways. Carried out properly, such programs can not only broaden and deepen departmental perspectives and enhance the effectiveness of departments by playing the role of an effective symbiotic partner, but they can also provide a useful vehicle for exploration of previously uncharted territory, of intellectual *terra incognita* that, if explored successfully, can lead to establishment of new departments and new structures that benefit the university as a whole. Altogether, heightened interdisciplinarity can help universities not only to better prepare students for the world of tomorrow, but by advancing the dynamic character of a university can help it to achieve its full potential.

A few caveats, however, are in order. Although interdisciplinarity clearly is not a passing fad, it is not a panacea, either. Teaching and researching sub-

jects at the heart of a discipline should, and no doubt will, continue to be basic to the finest in higher education, even as the crossing of academic boundaries gains increasing acceptance.

For the good of the academy, and the benefit of the society as well, the steps taken in this new direction should be deliberate, measured, and—above all—designed to assure academic excellence. As universities pursue this new path, academic rigor must continue to be the gold standard by which such institutions are judged. A great challenge will be to foster a sound flexible balance between the already well-founded efforts within a given discipline and the newer ones that seek to expand the scope of inquiry in an interdisciplinary direction, and at the same time assure the maintenance of rigor and excellence in both.

WHAT CAN WE LEARN FROM EXPERIENCE TO DATE?

While attempts to introduce full-blown interdisciplinary programs in a university setting have to the present met with rather mixed results, it would be a mistake to overlook the lessons learned. Indeed, some such arrangements have worked reasonably well, though given the single-discipline backgrounds of most of the faculty involved it would be naive to imagine that in the not-so-distant future even better programs having far better results will be in the offing. The successes with which we are most familiar are those that have taken place at our home institution, the University of California, Los Angeles (UCLA). There, for example, the departments of Chemistry and of Biochemistry, both widely regarded as world-class, merged some years ago into a single interdisciplinary department. Similarly, the Departments of Botany and Zoology merged to become Biology, later to be reorganized into two decidedly interdisciplinary units, the Departments of Organismic Biology, Ecology & Evolution and of Molecular, Cell & Developmental Biology. In other instances at UCLA, members of previously established departments have expanded their allegiances to form the core of new interdisciplinary organizations. Examples include the Molecular Biology Institute, the Institute of Geophysics and Planetary Physics, the Institute for Social Science Research, the Institute of the Environment, and numerous centers (e.g., the notably interdisciplinary Center for the Study of Evolution and the Origin of Life). Other universities have established similar structures—for example, in 1996, Stanford University founded its Center for Comparative Studies in Race and Ethnicity, an interdisciplinary unit that by 2001 had attracted from various departments nearly one hundred faculty engaged partly or wholly in interdisciplinary teaching and research (Stanford University Center for Comparative Studies in Race and Ethnicity, 2001). Examples such as these are not uncommon and often involve faculty of the professional schools—of

business, planning, engineering, medicine, law, and education—, teachers and researchers who themselves have backgrounds in diverse academic disciplines.

Thus, while at least limited opportunities for interdisciplinary teaching and research already exist in many universities, in years to come more and more internal walls will be breached. The shift toward greater interdisciplinarity must be gradual rather than abrupt, a natural evolutionary development that reflects the changing times rather than being a structure put in place by fiat. Indeed, for such a transition to come to fruition, it cannot simply be mandated by a university's administration or by such bodies as a Board of Regents or a state legislature. Rather, the impetus for such a shift should come ideally from those who are destined to carry it out—the teaching and researching faculty. In great American universities, it is usual for the decision-making process to be shared by administrators and faculty, an arrangement termed "shared governance" that is not only common but is universally accepted as being necessary for the assurance of academic excellence. Thus, now, at the beginnings of the transition, the collective wisdom of the administration and faculty, both, should be marshalled to define an appropriate balance between single discipline and multidisciplinary units, and to begin to chart a path by which this balance can most fruitfully develop in the future. Because a university administration controls the purse strings of the institution, advocacy of the transition by university administrators will prove crucial to its success. It will be important for the university administration to assume a strong leadership role by providing a climate favorable for faculty to engage increasingly in interdisciplinary endeavors. But, as in virtually all changes in academia, even more significant is the faculty's support, since it is they who will need to rethink their traditional allegiances, retool themselves to effectuate the change, and, most importantly, carry it out.

Encouragement of the changes envisioned can take a variety of forms. Perhaps the least intrusive and least controversial approach is that involving activities of individual faculty who seek out others in one or more other departments with whom to carry out interdisciplinary teaching and/or research. A second approach can be more formal and take place under the aegis of an umbrella organization, such an an interdisciplinary institute or center, giving rise to collaborative activities in teaching and/or research that break down traditional barriers. Under an arrangement such as this, faculty members may either retain their departmental association or be members solely of the interdisciplinary unit (the latter affiliation being preferable in some situations, inasmuch as it serves to negate misgivings rather common on the part of departmental colleagues that those involved in such endeavors have "divided loyalties"; are engaged in scholarship beyond the scope the

departmental faculty can comfortably evaluate; and are likely to be "jacks of all trades but masters of none," scholars less able than full-fledged department members). In this regard, young faculty are particularly vulnerable. Because the youngest in academia are often closest to the society from which they have only recently emerged, they are also often the most insightful about the emergent trends and needs of that society. But if such young members of the academic community fear that formal association with multi- or interdisciplinary endeavors or units may interfere with their promotion within a department, they may be reluctant to assume such a risk—an understandable position that nonetheless is detrimental to themselves, the future of their university, and the society in general.

ACADEMIC BORDER CROSSING IN UNDERGRADUATE EDUCATION

Despite the recent upsurge in multidisiplinary or interdisciplinary activities in academia—or, perhaps because of this very upsurge, and the threat it is perceived by some to represent—we use here the more neutral phrase "academic border crossing," a terminology that we hope can be viewed as devoid of the negative connotations associated with the more commonly used buzzwords. As stated earlier, it is our view that the world of knowledge is not neatly divided into distinct compartments, the academic disciplines that form the basis of modern university departments. Thus, it seems to us that a forward-looking undergraduate education requires that significant parts of its curriculum be interdisciplinary, and we see this as being particularly important both at the beginning of undergraduate education—when a student is most likely to be open to new ideas and new ways to explore the world and can most profitably be made aware of the interconnectedness of the various disciplines—and at the conclusion of that education, preferably in a small-class seminar format where the disparate fields and facts to which a student has been exposed can be brought together into a meaningful whole. And we think also that such courses must be taught by a new breed of faculty who have been educated in, and are themselves knowledgeable about, the diverse disciplines involved. In short, we believe that in this or some similar manner, universities can begin, now, to prepare students to function effectively in tomorrow's ever-changing multifaceted and increasingly complex world, where they will be confronted with a need for understanding knowledge that often crosses today's traditional disciplinary boundaries.

Such a curriculum would begin to give students the sort of solid foundation they are certain to require, not only in their professions but for their development as productive, contributing citizens equipped to lead richly satisfying lives. Toward this end, we think that undergraduate education should

expose students to the knowledge and workings of the natural and social sciences, as well as the humanities and the arts. In particular, undergraduates should in the sciences become acquainted with paradigms, tools, and their analysis, so they can appreciate their usefulness and apply them as critical thinkers; in the humanities, be introduced to and inspired by "primary sources," particularly works of enduring value; and in music and the visual arts, be stimulated to value and understand how the beauty and aesthetic power of such creative contributions give life meaning and pleasure. Moreover, we think it important that programs be established to enable students to gain appreciation of the defining values, necessary rigor, and inherent excitement of participating in a learning/discovery environment in which they are stimulated to make a logical assessment of qualitative and quantitative information and to define not only the contours but the center of challenging problem areas and to engage in their analysis.

Further, and while we envision an appropriate undergraduate curriculum to be based on, and in great measure to be keyed to the core knowledge of the basic disciplines, we think that it is imperative also for it to include thematic courses that emphasize intellectual interconnections. A pilot program that involves just such an approach has recently been introduced at UCLA, a Freshman-Year "Cluster System" of courses that received its impetus from a 1997 faculty-administration study that sought to update and improve undergraduate education. Its centerpiece is a First-Year Cluster Course, a integrated, team-taught, interdisciplinary series of three courses to be taken sequentially over the three academic quarters of the Freshman year. Students are permitted to select one such course from among ten or more offered each year, with each cluster being devoted to a broad theme.

This endeavor provides a vehicle for emphasizing such fundamental intellectual principles as the interconnectedness of the traditional academic disciplines; the importance to sound scholarship of critical thinking, integrative learning, and use of primary scholarly works; the overriding need to an educated person for mastery of basic communication skills, both verbal and by use of the written word; and the value to a participatory democracy of cultural diversity, pluralism, equality of opportunity—citizenship. It is common for these courses to present the fundamentals of as many as four or five traditional disciplines, providing an introduction to the subject matter that forms the basis of various departments and thus serving as a potent departmental "recruiting tool." Moreover, at their best, the courses are designed to stimulate the students' imagination and intellectual creativity, factors crucial to their development that too often have been largely expunged during preuniversity years by its emphasis on memorization and "learning to pass the test." During the first two academic quarters, instruction consists of lectures by faculty taught in concert with graduate student-led discussion sections

and intensive English composition tutorials. In the final, third, course in the sequence, each student enrolls in one of a number of small "satellite courses"—each of which focuses on topics that radiate from a cluster's theme and which most commonly take the form of a "graduate level" seminar experience but, depending on the subject matter, may involve hands-on laboratory studies (e.g., in clusters centered on aspects of biology, chemistry, or computer science) or involve extensive fieldwork (e.g., in those focusing on geology or archaeology) (University of California at Los Angeles, 1997).

A prime example of such a cluster course is that entitled "Citizenship and Ethnicity in the United States," a course that takes as its central problem the question of what it means, and has meant, to be an American. (The faculty involved approach the subject from perspectives that link sociological and anthropological theory with literature interpretation, constitutional law, and historical analysis. In preparing and teaching the course, faculty with backgrounds in sociology, anthropology, ethnic studies, English, foreign languages, law, and history collaborate in an effort that emphasizes the points of convergence, as well as those of conflict, among their various fields).

Other such recent examples have focused on the immigrant experience (from the perspectives of literature, anthropology, law, history, and various social sciences); the theater as a projection of political power (an examination of Greek drama, French drama during the reign of Louis XIV, and the Chinese dramatic tradition—a cluster taught by faculty from theater arts, history, political science, classics, and various language departments); the meaning and nature of democracy (involving faculty from the arts, humanities, social sciences, and law); and a cluster entitled "Origin and Evolution of the Cosmos and Life" (encompassing subject matter extending from the origin of the universe to the origin and evolution of life, including humans, and taught by faculty with expertise in astronomy, geology, atmospheric sciences, biochemistry, genetics, biology, and anthropology—a subject and faculty quite effectively bridging the gap between the physical and life sciences).

Altogether, these cluster courses are designed to stretch students' minds beyond the confines of any single discipline and to encourage them to consider a more global and inclusive view of key events, phenomena, concepts, and methods. The joint efforts of the faculty involved emphasize both the points of intersection and of opposition among the various fields considered. Where such theory, methods, and findings diverge, students can learn how different approaches may complement one another and investigate the implications of the intellectual dissonances that separate them." (University of California at Los Angeles, 1997).

Teaching of interdisciplinary cluster courses can and often does have far reaching side-effects for the faculty participating. In particular, their horizons can be broadened markedly, as they become increasingly knowledgeable

about other interrelated disciplines and the concerns, theories, and methods of analysis typical of ancillary fields. Moreover, the teaching experience can have a "spillover effect" by fostering useful interactions that lead to productive interdisciplinary research collaborations. In short, given the balkanization typical of today's universities, involvement in such a program can have decidedly beneficial results.

MOUNTING A UNIVERSITYWIDE EFFORT TO FOSTER ACADEMIC BORDER CROSSING

As we suggested earlier, it would be both inappropriate and unwise for a university president or other high administrator to mandate the adoption of interdisciplinarity; in most excellent universities, any such order "from on high" would be met with unrelenting stiff resistance. Indeed, in American universities, shared governance has become such a major driving force that no self-respecting faculty would permit itself to be so dictated to. This is not to suggest, however, that the aims of the university administration are not only salient, but are crucial to the success of such a venture. In fact, an administration convinced that such a move is in the best interest of its university could—and we think, would, if that administration is sensitive and perceptive—offer its faculty enticing opportunities and funding that would encourage them to voluntarily join and participate in such an undertaking. Encouragement would have to be public, advocacy strong, and funding would have to be at a level high enough to command the attention of a critical mass of the university's most distinguished faculty.

However, raising the overall interest of a university faculty in interdisciplinary undertakings requires more than public encouragement and more than mere funding, even at a generous level. The leadership of the university must generate enthusiasm—for key faculty, in particular, an enthusiasm probably best shown by example. Thematic focuses must be found and effectively articulated. Faculty of the highest quality, especially those having multiple talents and diverse interests, must be attracted to the program, so that the bar delineating success is set high and academic excellence is upheld. Success will be facilitated as the value and rigor of the program become generally appreciated across the university, and as departments see both that their participating faculty have benefited from involvement in the program and that students emanating from it are appreciably more perceptive, insightful, and better able to tackle the standard academic disciplines than those who have not participated.

Given what we perceive to be academia's certain answer to the needs of tomorrow's society—an inexorable shift toward increasing emphasis on interdisciplinarity in university education—yet coupling that perception with

what we view to be a natural reluctance on the part of departmental faculties to embrace this changing emphasis, we suggest that special impetus may be required to bring this change to fruition. In particular, it seems to us that the change could be facilitated, and encouraged to occur in a way that would assure the success both of departments and of new interdisciplinary initiatives, were a structure established to coordinate, guide, and fund faculty-initiated interdisciplinary incentive centers. The principal goals of such a coordinating unit would be two-fold:

- To foster increased interdisciplinary collaboration among faculty of diverse academic disciplines, both in undergraduate and graduate teaching and in scholarly research, and to thereby break down long-established departmentally defined barriers.
- To foster innovation in education and research by encouraging dissemination of understanding about, and investigation of, emergent fields of knowledge, novel areas of inquiry that do not fit comfortably into the traditional discipline-defined structure.

To attain the first goal, faculty from diverse departments could construct courses and teaching programs that bring together, "coalesce," traditionally disparate areas of inquiry, and by doing so, show the interrelatedness of such areas and the commonality of the various approaches needed to achieve firm knowledge of the subject matter addressed. Such team teaching would pay special attention to the interconnections among the disciplines involved, and the emphasis of the course and curriculum thus constructed would be thematic rather than primarily methodological. The same would hold for the collaborative research, where such coalescence of investigative efforts by faculty and graduate students from diverse backgrounds would be fostered. In both teaching and research, work at the peripheries of the traditional disciplines, and in their many areas of overlap, would be emphasized and encouraged.

Attainment of the second goal—that of stimulating deeper understanding and active investigation of areas of knowledge that because of their very newness are far removed from the heart of the traditional disciplines—would be more difficult. Yet progress in this direction is achievable, if the right set of people from the right set of disciplines can be brought together at the right time and place. Clearly, there would be a need to engage faculty who represent diverse disciplines. But the faculty involved would also have to be able to "think out of the box," able to identify emerging fields, to place those fields in the context of a future that is as yet unknown, and on such bases to outline how academia might best prepare for that future, however it develops. (Clearly, this is asking a lot. Many academics are reasonably skillful at

thinking about and understanding the past. But what is required here—a matter of looking toward the future—is a rare talent. Still, it is just such thinking that academia now needs. The future is sure to be different from the past or present, and academia must adjust. Those universities that have the foresight to now become prepared will have placed themselves in a position to make a difference in the years to come.) Difficult and as unorthodox as such thinking may be, the intellectual adventure it entails—crucial to the ability of academia to respond to the needs of tomorrow's world—could be encouraged by administrative funding of novel thematic undertakings that represent promising terrains for future intellectual development.

Initially, arrangements toward such ends would necessarily have to rely on voluntary participation of the faculty involved and be understood to be both experimental and (in terms of normal university operations) relatively risky. Thus, we suggest that from their inception, such arrangements be viewed as pilot projects, programs from their start are established as having firm "sunset clauses" that call for their disestablishment at dates fixed. From the outset, therefore, such programs would have only a temporary charter, and could not become permanent fixtures of the university structure. And though formally disestablished at the end of their tenures, if rigorous and thorough review were to show that one or another of these centers had during its existence proved all but indispensable to meeting the goals of the university (or, perhaps, if it had attracted sufficient extramural funding to justify its continued existence), it would be permitted to evolve into a new more permanent unit—the relatively few such projects judged worthy of having permanent status would become transformed into regular academic units, departments or some other construct more consistent with future university organization. An arrangement such as this carries the potential for no less than a rebirth of higher education, for providing a mechanism that not only copes with but enhances in an appropriate and innovative way the need of academia to adjust to the changing world.

Other requirements of the arrangement we envision include a symbiotic relation between any such newly established construct and existing departments; a robust mentoring of students who join faculty in exploration of the novel, "risky," research areas involved; participation of faculty of the highest quality; and sufficient funding to support the enterprise. One example of such a program is a recent undertaking at the University of California, Irvine, which addresses the novel question of whether—and if so, how and in what specific ways—music contributes to development during childhood. Broadly interdisciplinary, the research carried out has involved physicists, chemists, psychotherapists, musicians, and others. Additional examples could be cited (e.g., a study at UCLA of the policy implications of genome research, which brought together geneticists, ethicists, biochemists, psychologists, political

scientists, and economists), but the point seems clear—as the title of this volume suggests, the walls of academia are tumbling down; like a tsunami, emphasis on interdisciplinarity is the wave of the future; universities that have the foresight to now become prepared will have placed themselves in a position to make a difference in the years to come.

REFERENCES

Stanford University Center for Comparative Studies in Race and Ethnicity (2001). *News Letter*, Spring.

University of California at Los Angeles (1997). *General Education at UCLA—A proposal for change*, Los Angeles, June 12.