

Report
of
The Washington Advisory Group, LLC
on
Research Capability Expansion
for
The University of Texas System

The University of Texas at El Paso

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The Washington Advisory Group, LLC

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**Report of the Washington Advisory Group on
Research Capability Expansion for
The University System of Texas
At Arlington, Dallas, El Paso, and San Antonio**

INTRODUCTION

The Washington Advisory Group (WAG) was engaged by the administration of the University of Texas System (UT System) to examine the research capacities and the potential for expansion at a number of UT System institutions, including The University of Texas at Arlington (UTA), The University of Texas at Dallas (UTD), The University of Texas at El Paso (UTEP) and The University of Texas at San Antonio (UTSA).

In particular, we were asked to review background information provided by the universities as well as information gathered independently, and to visit each of the four for a series of face to face meetings with senior administrators, research active faculty members and others. Based on our review of background information and our interviews, we were then to recommend strategies and tactics for using current resources more effectively, and for significantly expanding their research capabilities. In doing so, we were instructed to be mindful of the current state revenue shortfall and the fact that, even when the economy improves, it is not realistic to expect substantial increases in state appropriations. The Scope of Work is attached as Appendix 1.

This project was undertaken by a team of individuals whose biographical sketches are attached in Appendix 2. While, it was not feasible to assemble a team with specific expertise in each of the research areas covered by the UT institutions, the team members' backgrounds, experience and expertise are sufficiently broad to conduct the reviews and assessments contemplated by the UT System.

The Four Universities

Each of the four UT universities that are the subject of this report aspires to be in the uppermost tier of American research universities. To provide some context for this aspiration, we note that there are roughly 250 research universities in the United States, defined by a joint mission of undergraduate and graduate education linked to fundamental research and scholarly activity in scientific, engineering and other fields.¹ Despite numerous stresses, the American research university system by and large fulfills the dual role of training the next generation of scientists and engineers and maintaining the United States in a world leadership position. The success of this system derives, in part, from the following attributes:

- *Science, technology and education are generally recognized as public goods.* There is general recognition on the part of federal agencies², and, more recently, on the part of state governors and legislatures, industrial leaders, philanthropic foundations, the media, and the public, that fundamental university conducted research and the

¹ In 2001, there were 264 research institutions in the country with at least \$5 million in total research expenditures. Source: *TheCenter* at the University of Florida data on American research universities available at <http://www.thecenter.ufl.edu>.

² This is evidenced, for example, by congressional initiatives to double the research budget of NIH, NSF, and by support for Defense Department scientific research.

training of scientists, engineers, and managers are important for economic growth³, national security, public health and national prestige.

- *Merit based funding.* By and large, federal research funding, the largest source of research funding, is allocated competitively, based on merit review, rather than directed towards specific institutions.⁴
- *Departments and focal areas.* Typically programs of education and research in departments that cover all of the basic science and engineering fields as well as interdisciplinary and other new frontier fields located in departments, centers, institutes or other academic structures.
- *Multiple sources of support.* Research is supported by a multiplicity of federal agencies, state governments, businesses, and private non-profit and charitable organizations. This variety of sources reduces vulnerability from an over-dependency on one sponsor. It is noteworthy that federal support for university research has increased each year for the past 25 years. However, the federal share of total research funding in universities has declined from 67% in 1979 to 58% in 1999.⁵ During the same period, universities own funds dedicated to research increased from 14% to 20% of the total research expenditures.⁶
- *Mobility of faculty within the system.* It is not uncommon for a faculty member to move from one institution to another one or more times as he or she progresses up the academic ladder. This mobility mitigates inwardness, and brings fresh views to a campus. These advantages outweigh considerations of inefficiency and waste.
- *Competition for outstanding faculty.* Universities often engage in fierce competition for creative and productive faculty members. On occasion, this can lead to high salary offers and support packages and create bad feeling between research institutions. However, it can also promote the careers of the most talented and arguably makes them more productive because of the additional resources that become available to them.
- *Contribution to economic development.* In addition to the traditional mission of education, research and service, modern universities, especially public ones, are expected to contribute to the economic development of the a region and the nation. Among the ways in which they do this are the development of intellectual property and related patenting and licensing activities, incubator operations, and spin-offs of high technology companies.

One of the most important measures of a research university is its level of sponsored research expenditures, and particularly, its level of federal research awards. This is true because

³ In 2000, more than 60% of publications cited in industrial patents were the results of government financed research. National Science Board, *Science and Engineering Indicators 2002*, Arlington, VA: National Science Foundation, 2002, page 5-53.

⁴ Politically motivated allocations (“pork barrel” or “earmarked” allocations) represent a small percentage of the total of federal research funding, but are nevertheless troublesome. Information about such allocations is compiled by *The Chronicle of Higher Education* (on-line: <http://Chronicle.com/stats/pork>).

⁵ National Science Board, *Science and Engineering Indicators 2002*, op. cit., Appendix Table 5-3.

⁶ Id.

Research Capability Expansion at UTA, UTD, UTEP, and UTSA

federal research funding generally is allocated competitively, based on merit review, and therefore awarded to the most meritorious projects. Table 1 below shows levels of total and federal research expenditures for the institutions that occupied the 95th through 105th positions in total and federal research expenditures in FY2001, and comparable data for the four UT universities.

Table 1
Research Expenditures (in thousands)
and Rankings of Selected Universities
Fiscal Year 2001

	Tot. Research	Rank	Fed. Research	Rank
University of South Florida*	171,550	65	58,826	95
Rockefeller University*	145,571	80	55,362	101
Arizona State University – Tempe	118,763	86	56,616	99
Florida State University*	113,817	90	57,075	98
University of Alaska – Fairbanks	110,195	93	55,287	102
University of South Carolina - Columbia*	109,973	94	51,983	103
Dartmouth College*	109,096	95	69,844	83
Auburn University	106,347	96	40,097	119
Tufts University*	105,806	97	71,669	80
Indiana University – Bloomington	103,960	98	46,712	109
UT Medical Branch - Galveston*	102,722	99	64,682	90
Tulane University*	99,761	100	55,669	100
Washington State University - Pullman	99,302	101	43,989	112
Georgetown University*	99,228	102	93,626	66
Virginia Commonwealth University*	99,180	103	57,315	97
Wake Forest University*	98,343	104	78,021	75
University of Massachusetts - Amherst	97,976	105	49,576	105
Brown University*	91,636	110	58,367	96
George Washington University*	73,805	122	51,757	104
University of Texas – Arlington	17,486	221	9,413	221
University of Texas – Dallas	15,684	227	7,049	244
University of Texas - El Paso	21,889	204	16,167	182
University of Texas - San Antonio	11,331	247	8,012	235

* Institution includes medical school/specialized biomedical research curricula

Source: *TheCenter* at the University of Florida data on American research universities available at <http://www.thecenter.ufl.edu>.

As shown in the table, roughly 100 institutions had total annual research expenditures in excess of \$100 million in 2001,⁷ and annual federal research expenditures in excess of \$56 million. Thus, to be in the top 100 institutions, UTA will have to increase its total research expenditures by \$82 million and federal by \$46 million over 2001 levels; UTD will have to

⁷ *TheCenter* at the University of Florida data on American research universities, op. cit.

increase total expenditures \$84 million and federal by \$49 million over 2001 levels⁸; UTEP will have to increase total expenditures by \$78 million and federal by \$40 million over 2001 levels; and UTSA will have to increase total expenditures by \$89 million and federal by \$48 million over 2001 levels.

It is important to note that research expenditures at each of the four UT universities have grown since FY2001, the latest year for which comparative data is available. In FY2003, UTA had \$23 million in total research expenditures, UTD had \$28 million, UTEP had \$33 million, and UTSA had \$15 million.⁹ Of course, it is likely that research expenditures have increased at the top 100 institutions as well. UTA, UTD, UTEP and UTSA all aspire to achieve “Tier 1” research university status. The term “Tier 1” is not defined in any published documents, but it is clear that the UT universities regard \$100 million in annual research expenditures as conferring Tier 1 status – a logical conclusion in light of the data shown in Table 1. For purposes of this report, when we use the term, we also define it as \$100 million in total annual research expenditures.

The Path to Tier 1 Status

As discussed above, the four UT universities must increase the level of research on their campuses by from \$67 to \$85 million to achieve Tier 1 status. This will require a tripling, at least, of current research expenditures. It is possible (although unlikely) for a university to reach \$100 million in annual sponsored research expenditures by concentrating effort and resources on only a few, narrowly defined, focus areas that are popular with federal funding agencies. But if the basic science and engineering fields are neglected, a university could find itself technically fitting within the Tier 1 definition, but it would not have the stature of national research university and would not serve its community's educational aspirations very well. High ranking research universities also have intellectual breadth not only in the technical fields but also in scholarly fields with few funders, and it is important that the UT institutions not lose sight of this fact.

The four UT institutions that are the subject of this report have different characteristics and are starting at different places as they attempt to achieve their common goal of Tier 1 status. But all share certain challenges. The first is to recruit a large cohort of research active faculty members that are able to generate annual research expenditures of between \$67 and \$85 million.

One rather crude method for determining how many researchers will be needed to reach these levels assumes that each new recruit will bring in \$230,000 in annual research expenditures (\$230,000 is the average annual research expenditure for university researchers with at least some federal funding¹⁰). This \$230,000 figure is likely somewhat higher than the current comparable averages at the four UT institutions, but not so much so as to be unrealistic.¹¹ Calculations using

⁸ For reasons that are not explained, *TheCenter's* data for 2001 lists UTD's numbers as estimates (they are unchanged from the year before).

⁹ Information provided to WAG by the universities.

¹⁰ Information provided by NSF's Division of Science Resources Statistics in email communication to Erich Bloch, January 13, 2004 based on 2001 data (the latest year for which NSF has researcher data). The \$230,000 average was calculated with research expenditure data that excluded expenditures for clinical research.

¹¹ While we do not have directly comparable figures for the UT universities, according to data provided to us by those universities, the average annual research expenditures for UTSA faculty members in the Colleges of Sciences and Engineering is approximately \$80,000 and for UTD faculty members it is approximately \$70,000, while the average for research active faculty members at UTA is \$160,000 and at UTEP is \$210,000.

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this figure show that the four universities each will need to hire between 300 and 400 additional faculty members to achieve the desired level of research funding. Given the effort and resources that must be devoted to faculty searches in order to identify and successfully recruit quality, research active faculty members, we believe that no more than 30 new research active faculty members can be recruited each year (and maybe fewer), assuming that the space and research infrastructure is available to house them. Purely on the basis of this analysis, then, it would take between 10 and 12 years to recruit the necessary researchers to each campus. And this estimate is likely low – it assumes that that the facilities will be available to house the new hires; that each will achieve the \$230,000 average immediately upon his or her arrival on campus; and that all the additional FTEs will be fully supported by formula funding of enrollment growth and/or tuition increases. All of these assumptions have uncertainty associated with them.

The calculations described above could be repeated using other reasonable assumptions on dollar volume and timing, but the general conclusions are likely to be the same for all: several hundred high quality researchers will have to be recruited, and the construction and renovation of facilities be staged to accommodate this faculty growth. If there are any delays in hiring and facilities staging, or if funding assumptions are too optimistic, the process is likely to take well over a decade.

Significant new funding will be required to expand the faculties of UT's institutions. Not only will the universities have to fund FTE slots, they also will have to provide start up packages for new faculty members to equip laboratories, fund post docs in some instances, and provide initial seed funding for research. These packages likely will range from \$200,000 to \$750,000 or more, depending on the field and seniority of the researcher. Universities also will have to fund new buildings, facilities and equipment.

In addition to the challenges posed by the massive recruiting that must be undertaken, the progress and success of the four universities will depend on how they address the following issues:

- *Strategic Planning.* The development of a realistic strategic plan, with a specific agenda for prioritization of research and education programs, identification of funding sources, and a timetable for achieving the various goals, is of critical importance if an institution is to achieve its goals. The universities' plans should be developed with extensive input from administrators and faculty, partly because of their knowledge and experience and even more to ensure their buy-in.
- *Identifying Resources to Fund the Growth in Research Capacity.* As mentioned above, the state is not likely to increase significantly its appropriations to the universities, so universities must look elsewhere for the resources to finance faculty growth and the space, equipment and facilities that these researchers will require. In our view, tuition increases represent the only reasonable source of funding for FTE salaries, given the state's financial constraints. Industry and gifts from alumni and foundations can provide funding for other aspects of growth, including set up costs and facilities, as can tuition revenue bonds (although this would effectively reduce the tuition revenue available for salaries). Some UT institutions are pursuing earmarked funds in an attempt to grow their research capacity. In our view, the use of earmarked funds to support research is not an acceptable or useful long term strategy. It deadens the competitive spirit and undermines the merit review system that is responsible for raising U.S. research universities and their research

accomplishments to a world leadership position. Overplayed, earmarking reduces the performance of researchers and reduces the ability to evaluate their work. Earmarking triggers an angered response from colleagues, and can result in negative reviews of research proposals. Clearly, UT System universities must put their major emphasis on obtaining federal funds by the traditional competitive granting mechanisms as they attempt to expand their research capacity.

- *Competing for Faculty.* The recruitment process for research capable individuals is a highly competitive one and will require significant new resources. Nevertheless, recruiting outstanding faculty is the principal mechanism by which the UT institutions can assure research quality, and the universities must arrange its priorities so that it succeeds in this competition. If an institution is to be able to attract premier faculty, it is especially important that the university's senior leadership include individuals with knowledge and experience in science and/or engineering research.
- *Research Culture.* Each of the institutions that desires to elevate its research stature must foster a research culture on its campus. It must create an environment in which excellence in research is recognized and rewarded with appropriate incentives and where teaching loads are not excessive to the detriment of research productivity.
- *High Student Enrollment.* For the most part, the institutions we visited had large and growing enrollments, resulting in high student-faculty ratios and heavy teaching loads. The former is frowned on by ranking organizations and students alike, and the latter poses a significant barrier to research productivity. There seems to be growing recognition on the campuses that there should be limits on the size of the undergraduate student body, and that excessive enrollment, especially with low admission standards, can become a losing financial proposition, wasteful of resources and expensive to students and parents.
- *Unproductive Competition Among the Institutions.* During the course of our site visits, we sensed a certain degree of competition, turf fighting and zero-sum gaming among the various public institutions of higher education in Texas, and within the UT System as well. It is important for these institutions to find a way to lessen these unproductive activities.
- *Graduate Students and Programs.* Each of the institutions must find ways to attract the high quality graduate students so important to a university's research programs. These graduate students are also working scientists and can as much as double their professors' output. In this regard, we note that the various universities have been thwarted at one time or another in their attempts to develop new Ph.D. programs. We believe universities must be permitted to develop doctoral programs in all fields in which they can be accredited by the appropriate accrediting boards. Departments that lack such programs, in effect, are denied the ability to compete well for new research active faculty members and for research funds and national research standing. To the extent the UT System and the Texas Higher Education Coordinating Board can promote the development of these programs, we encourage them do so.
- *Research Infrastructure.* Faculty members at all four institutions expressed frustration with the lack of support for proposal preparation, grant administration and accounting, and the like. The vice presidents for research on each campus should

evaluate their research infrastructures and take actions to provide more support to faculty members who are trying to attract external research funding. Such actions should also include the development of incentives to encourage faculty members to apply for grants.

- *National Recognition.* Recognition from peers reflects well on the accomplishments of individual researchers as well as on the quality of an institution. Leading universities have outreach programs that focus explicitly on this issue, and so should the research universities in the UT System.
- *Technology Transfer.* Technology transfer is a forward-looking idea for many research universities. As these institutions increase the level and quality of their research, intellectual property is developed and that intellectual property can result in significant income for the university and its researchers, and it can contribute to the national economy. Although commercialization activities have been modest at the four universities that are the subject of this report, as they ramp up their research activities, they should establish explicit policies to address relevant matters including the granting of licenses, allowable rules for faculty and even students, and allowable commercialization activities. They also should establish effective organizations to deal with these issues.

In an important sense, there will be no winners and losers as these universities progress at differing rates to realize their ambitions. *All will steadily improve as they move forward.*

Strategic Planning

During the course of our campus visits, we found that the four UT institutions have not developed realistic or detailed strategic plans, identifying specific priorities for research, education and economic development or metrics and timelines for monitoring progress towards their goals. A lack of such plans will hamper these institutions as they attempt to achieve their overarching objectives.

Each university must articulate its vision and mission before it can undertake the strategic planning process. This is generally done by the institution's upper administration, through a consultative process that solicits input from the institution's schools and departments. Once the vision and mission have been articulated, the university can develop a detailed plan defining its goals and prioritizing its strategic objectives; describing the ways in which those objectives will be achieved; identifying the resources that will be used to achieve those objectives, and establishing a realistic timeline for various actions. Finally, the plan should include metrics by which the institution and the System can measure progress.

As these strategic plans are developed, it is of critical importance that the university involve all of its constituents in the planning process, including school and departmental leaders and faculty. This broad participation is important for a number of reasons – it provides the expertise needed to inform the planning process, and facilitates acceptance by the stakeholders of the strategic plan. Without this, universities will not be able to achieve their objectives.

The Significance of Collaboration

Each of the four universities we visited recognizes the importance of forming linkages and partnerships with other research institutions – medical centers, universities, government and private sector research entities, and with each other. These interactions can be mutually beneficial in several ways: many frontier fields are multidisciplinary and require contributions of human and facility resources not found in a single institution; many government projects are of a magnitude and complexity that call for teaming. And for universities in an expansion mode that are developing new strengths, they can find mentors in other institutions. The biomedical fields present special opportunities because there are renowned medical centers in Texas that recognize the advantages of joining forces with the basic science and engineering departments of universities. (It should not escape anyone's notice that the National Institutes of Health has become the most important financial supporter of research at American universities.)

We were particularly impressed with the extraordinary possibilities of research collaboration in the Dallas Metroplex region. The trio of UT institutions there – UTD, UTA and the University of Texas Southwestern Medical Center at Dallas (UTSWMC) – are in close proximity, and already are working together at the intersection of science, engineering and the biomedical fields. Together they can become a powerful force for organizing and mounting major research projects that are very competitive nationally. The three institutions, together with the UT System administration, should put in place a 5-year joint strategy focus in engineering and science, including the biomedical sciences. The joint strategy should include a mechanism for frequent status meetings attended by the deans of the schools involved, as well as a mechanism for frequent face to face dialogue between faculty members at the three institutions.

Role of the UT System Administration and Texas Higher Education Coordinating Board

The state authorities that administer higher education in Texas (including both the UT System and the Coordinating Board) have an opportunity to make a real difference for the UT institutions as they pursue Tier 1 status. The following actions all would help enhance research performance at those universities:

- The Coordinating Board should permit universities to undertake doctoral programs in all fields for which they can receive official recognition from a respected accrediting board. We cannot stress enough how important this is. Without such qualification, a department is, in effect, denied the ability to compete well for new, high quality researchers and research funds, and the ability to achieve higher research standing.
- The UT System and its constituent universities should participate in discussions and develop policies addressing the issues of undergraduate enrollment growth and admissions standards.
- The UT System should foster communication between universities and develop incentives for collaborations (research and programmatic) among the institutions. Communication and appropriate incentives can facilitate cooperative ventures which can accelerate a university's rise in stature.
- The UT System does not appear to have a uniform sabbatical leave program, and faculty members on campuses we visited would like to see one instituted that is similar to the one at UT Austin. Sabbatical or paid leaves should be supported on all campuses, as they are at most high ranking research universities.

- The universities' upper administrations should include individuals who collectively, have the background and expertise in science or technology to address and develop the universities' research and education missions and initiatives. This is important not only to the functioning of a university and the allocation of its resources, but also when competitively recruiting large numbers of new faculty in the scientific and technological fields. The UT System plays an important role in assuring appropriate balance through its involvement in presidential searches. Although leadership searches on the campuses (at the provost or dean level) should be the primary responsibility of the individual presidents, consultation with the UT System administration on these searches is recommended. This would allow the System to help ensure that appropriate individuals for these important positions are identified at an earlier stage.
- In light of the massive recruiting effort that will be undertaken over the decade at each of the four institutions that are the subject of this report, the UT System should consider actions that it can take to help these institutions recruit the highest quality faculty members. These might include:
 - Mounting workshops for search committees to expose committee members to best practices in faculty recruiting;
 - Following up with campuses to see how well recent recruits are performing; and
 - Encouraging the establishment of blue ribbon search committees with external members that can provide advice on searches for deans, endowed chairs and other high profile positions.
- The UT System can also provide some central support to help faculty members with their grant proposals. For example, the System might sponsor workshops on proposal writing; provide support in identifying funding opportunities; and, on occasion, hire a consultant to review proposals, especially large ones, before they are submitted to a federal agency.
- Throughout this report, we recommend that the four UT institutions develop sound, realistic, and achievable strategic plans. For these plans to yield results, however, goals must be stated explicitly and metrics must be established to permit measurement of progress and accomplishment. The UT System should ensure that appropriate metrics are articulated and it should judge institutional performance against those metrics, especially as the institutions recruit large numbers of new research faculty in their pursuit of research eminence. As the UT System develops research metrics, we believe it should adopt a relatively broad definition of research awards – one that encompasses peer reviewed awards for projects, equipment and student support designed to contribute to the creation of new knowledge. For example, in addition to the traditional individual and center research projects, we believe the following activities should be included in such a definition:
 - awards to support undergraduate and graduate students as research assistants;
 - infrastructure and facility awards supported by government agencies to maintain U.S. leadership in science and technology;
 - evaluative research dedicated to testing research results to validate or nullify research hypotheses; and

- data collection and field sampling that are critical elements of social and environmental science.

This type of definition would recognize the different styles and modes of research and scholarly activities undertaken across the science, engineering, humanities and social science fields. All of these contribute to the generation of new knowledge and understanding.

Evaluation of the Individual Institutions

We were asked specifically not to compare the four UT universities that are the subjects of this report, and as a result, we have not done so. The following sections of this report examine each institution's strengths and weaknesses as centers of research; review any special opportunities presented; assess the resources required for improvement and the potential for securing them; and evaluate the feasibility of the universities' own plans. Our general conclusions and recommendations for the universities are presented at the end of the applicable sections, while recommendations specific to individual schools and departments are in the subsections dealing with those schools and departments.

THE UNIVERSITY OF TEXAS AT EL PASO (UTEP)¹⁰⁴

The University of Texas at El Paso (UTEP) opened its doors in the fall of 1914 as the Texas School of Mines and Metallurgy, with a mission of fostering the economic development of far west Texas and northern Mexico. In 1919, the University became part of the UT System, and while the engineering and science curricula predominated, many other courses and programs were added over the years. UTEP is now a Carnegie Doctoral Research Intensive university located in the largest bi-national metropolitan area on the U.S./Mexico border.

UTEP's current president, Diana Natalicio, was appointed President in 1987, and during her tenure the University has experienced a period of remarkable transformation and progress on several fronts. In 1987, the University had \$3 million in external research funding,¹⁰⁵ just one doctoral program (in geological sciences), and a predominantly Anglo student body. Today, the University has nearly \$33 million in external research funding,¹⁰⁶ 11 doctoral programs, and a student population that is approximately 70% Hispanic, reflecting the demographic makeup of the region in which UTEP is located. The University is committed to providing access to a high quality education and to excellence in research and teaching. It rejects the traditional assumption that universities that aspire to excellence in research and graduate programs cannot also foster access to undergraduate education by students from a wide range of backgrounds.

Given the increasingly recognized importance of engaging the Hispanic population in higher education in general and in science and engineering in particular, UTEP's mission – to provide both access and excellence – is of national, as well as regional, importance. UTEP can be the model for a university that has a positive impact on the economic and social environment of a region that is challenged by increasing cultural and economic changes.

University Leadership

The two things that strike one upon visiting UTEP are how much it has been able to achieve over the past 15 years with a striking paucity of external resources, and the charismatic personality of President Natalicio, about whom one heard not a single negative word. President Natalicio has accomplished much over the years. She has energized and inspired the faculty, articulated a clear vision for the University, and made many friends for UTEP in the community.¹⁰⁷

Under President Natalicio's leadership, UTEP dramatically increased its external research funding, added ten new doctoral programs, successfully completed a \$50 million capital/endowment campaign (ultimately raising \$66 million), and became the second ranked U.S. college or university in terms of the number of its Hispanic graduates. UTEP is now ranked 5th among public institutions of higher education in Texas in terms of federal research activity.¹⁰⁸ and is ranked higher than any other non-health science center university in the UT System except

¹⁰⁴ This section of the report includes information that was provided to us during the course of our campus meetings. Where facts are given without citing to a particular document, that information was given to us orally during the course of those meetings.

¹⁰⁵ NSF WebCASPAR Database System, op. cit.

¹⁰⁶ *UTEP Overview*, chart briefing to WAG by The University of Texas at El Paso, November 10, 2003, unpaginated.

¹⁰⁷ In a meeting with community leaders WAG found universal approval and support for the President. The leading member reported: "Whatever Diana asks us to do, we do."

¹⁰⁸ *UTEP Overview*, op. cit.

UT Austin.¹⁰⁹ And the University has not limited its activities to expanding and enhancing its own research and education programs. UTEP has worked hard to improve schooling at the K-12 and community college levels in the area, and to focus much of its research on socio-economic and biomedical fields relevant to Hispanics and to residents of the El Paso and border region. President Natalicio is especially proud of the fact that TAAS (Texas Assessment of Academic Skills) math passing rates in the El Paso area have improved for Hispanic and African-American students from about 34% in 1992 to 88% today, and that high school graduation rates in the El Paso area are among the highest in the state, exceeding those of Austin, Dallas, Houston and San Antonio.

UTEP's administration understands what it will take to move beyond regional to national (and international) recognition, and if anyone is capable of successfully leading the University in these areas, it is the current President. One of the uncertainties UTEP faces is the question of how far into the next 10-year plan President Natalicio will continue to lead the University. The challenge when she steps down will be to attract candidates of equal quality to succeed her. We were positively impressed by the deans and department chairs with whom we met, but the University's upper administration did not appear uniformly strong. We understand that President Natalicio plans to make some changes in the administration's makeup. If she does, we suggest that she attempt to identify individuals with experience in enhancing the research stature of a university.

Research at UTEP

UTEP wants to create a new model of excellence based on three primary goals:¹¹⁰

- Creating an urban university that remains true to its values of serving an urban and predominantly minority community;
- Achieving early recognition as a Doctoral/Research Extensive university, and within 10 years rising in stature to a Tier 1 research university; and
- Achieving recognition as a Center of Excellence on U.S./Mexican Border Issues.

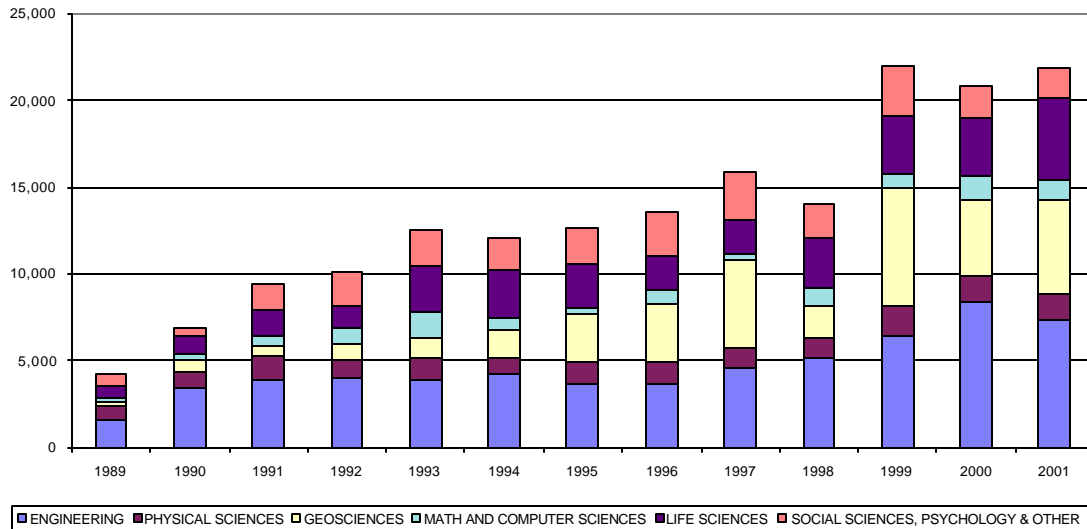
Its success in achieving these goals will be measured by the degree to which (1) its students graduate with solid academic credentials, qualifying competitively for careers in business, the professions, and for entry into the best graduate schools, (2) it expands its programs in graduate training and research, and (3) these programs meet the test of successfully competing for federal research grants and for grants from other sponsors. UTEP's strategy, at least to the extent that it relates to research, relies on the selection of certain fields in science and engineering for special emphasis chosen on the basis of their relevance to its mission, the ability to build on existing research strengths, and opportunities presented for linkages and partnerships with regional institutions.

To date, UTEP has been remarkably successful in expanding its research programs and garnering federal support, skillfully using funds from programs targeted towards underrepresented minorities to acquire research equipment and in this way jumpstart research programs. As shown below, its research expenditures have increased dramatically over the years:

¹⁰⁹ *The Top American Research Universities*, (TheCenter, 2003) by J.V. Lombardi, et. al., November 2003, pp. 206-209.

¹¹⁰ *Academic and Research Strategic Initiatives*, a draft discussion paper dated March 18, 2002; reaffirmed and extended in interview with President Natalicio on December 2, 2003.

Figure 1.
UTEP: Total R&D Expenditures by Academic Discipline, 1989-2001
 (\$'000)



Source: NSF WebCASPAR Database System

Of all of the institutions in the UT System (other than health science campuses), only UTEP and UT Austin even appear in *TheCenter's* rankings of the top 200 American Research Universities based on federal research expenditures.¹¹¹

UTEP's success in this area derives in large part from its ability to exploit the unique advantage provided by its location and the demographics of its student body. It has been able to capitalize on the availability of federal research funding geared towards minority institutions, faculty and students. For example, UTEP secured a \$9.5 million Border Biomedical Research Center grant from the NIH Research Centers at Minority Institutions Program, and this has provided it with funds to develop research infrastructure in the University, including core facilities, some animal facilities and monies for pilot projects. UTEP also has successfully pursued SCORE (Support of Continuous Research Excellence) funding from the Minority Biomedical Research program of NIH's National Institute of General Medical Sciences, and it is seeking funding for graduate student support from the Minority Office for Research at NIH. An NIH MARC (Minority Access to Research Careers) grant for undergraduate research has been funded, as has an AMP (Alliances for Minority Participation) grant from NSF for minority Master's degree students.

UTEP's strategy of pursuing this type of research funding is a logical one that will continue to pay dividends. However, to take the next big step, UTEP must visibly start to implement the goal of leveraging up its regional expertise to address issues of national and even international interest, using the "border zone as a laboratory for the U.S. of the future" model, as several faculty members we spoke with put it. Then UTEP must take the further step of increasing the visibility of such work, in order to become recognized as a general research institution that attracts competitive funding in the open competition for research funds with the

¹¹¹ *The Top American Research Universities*, op. cit., p. 209.

community of research universities. Finally, UTEP also must compete for private philanthropic support from outside its immediate neighborhood. This is of increased importance in these times of reduced state funding.

On several occasions, faculty members expressed a desire to wean themselves from sources of research support aimed at minority institutions and to attract competitively awarded federal research grants. In limited instances, they have been able to do this. For example, the Chair of the Department of Chemistry obtained an MBR award from NIH when he first came to UTEP. Since then, he has been awarded over \$12 million in research awards from NIH (RO-1), EPA, DOE and other government and industry sources. This augurs well for the future of the University, as does the fact that UTEP recently has hired a number of young, energetic faculty who are enthusiastic about the University and the direction in which it is moving. These individuals are already making a difference. Universities generally have trouble recruiting research qualified faculty since they must do so in competition with 100 or so other universities, but UTEP has developed some ingenious methods of recruitment.¹¹² In UTEP's case, we were told that once it settles on particular candidates, it does not have significant difficulty in actually hiring those individuals. The salaries it is able to offer are competitive, start-up packages are provided (although they may not be as competitive as the salaries), and the University is able to provide some first year teaching relief.

In its Academic Affairs and Research Strategic Plans, UTEP has identified seven research areas of emphasis, each of which "is conceived in interdisciplinary terms and emphasizes the bi-national, multicultural, and international dynamics of the U.S.-Mexico border region".¹¹³

1. *Biomedical and health sciences*, emphasizing the development and implementation of basic, applied and clinical solutions to regional, national and international biomedical, biomaterial, bioengineering, bioterrorism and health-related problems;
2. *Environment, energy and geosciences* addressing critical issues affecting the region including energy management, air quality, water quality and quantity, hazardous materials, affordable housing, commerce, ecological management, renewable energy, the development of multi-source power generating systems, and transboundary water issues;
3. *Materials and advanced manufacturing* focusing on materials and materials processing, nanotechnology and Micro-Electrical-Mechanical Systems (MEMS);
4. *Communication and information technology* focusing on a broad range of information technology including the theory of communication, high-assurance systems and parallel computation, human-computer interaction, architecture of high performance processors, signal and image processing, and neuro-fuzzy systems;
5. *Transportation policy and infrastructure* in areas such as improved cements and testing instrumentation, issues related to NAFTA and international trade interests,

¹¹² For example, UTEP holds seminars on best practices; it has, in a few cases, made offers of faculty position to outstanding graduate students at high ranking universities two years before their graduation; and it skillfully markets its campus and region.

¹¹³ *Academic Affairs and Research Strategic Plans Executive Summary*, undated document provided to WAG by the University, unpaginated.

and the transport of ideas and cultures through the communications media of print, radio, television and the Internet;

6. *Education*, and particularly K-16 education reform, emphasizing second and dual language acquisition in the border region; and
7. *Business, policy and social and economic development* emphasizing economic modeling, feasibility studies, demographic forecasting, law and society, and assessments supporting growth in business.

An eighth area, Defense/Security, was recently added to this list.

UTEP's initial emphasis on these interdisciplinary fields is a sensible way to build robust research centers that enhance the research foundation of the institution. But UTEP should not focus on these areas to the exclusion of maintaining viable research capacity in the basic fields of science and engineering.

In general, the faculty members with whom we met appeared to agree that the biggest challenge UTEP will face is in recruiting and retaining sufficient numbers of research oriented faculty to achieve Tier 1 status. They feel that the current faculty is too small, given its teaching responsibilities, to follow up on many opportunities for research grant funding. While other factors also undoubtedly contribute to the current faculty's relatively low research productivity, it is clear that UTEP must hire a large cohort of new faculty members in order to reach \$100 million in annual sponsored research expenditures.

In FY2003, UTEP had roughly \$33 million of annual research expenditures. If one assumes that new, research active faculty recruits will generate \$230,000 in annual research expenditures (a figure commensurate with the national average for academic researchers with at least some federal funding), then UTEP must recruit approximately 300 additional such individuals to hit the \$100 million target. Given the effort and resources that must be devoted in order to identify and successfully recruit the right researchers, we believe that no more than 30 new research faculty members can be added each year. Based on these assumptions, UTEP would not recruit the requisite number of individuals, and therefore generate the additional sponsored research expenditures, until about 2014. For reasons given later in this report, we believe 2015 to 2020 might be a more appropriate target.

Another factor that can limit or impede the hiring described above is the availability of adequate research space and infrastructure for those researchers. At this point, UTEP's core facilities in the biomedical sciences are good. Laboratory space has been tight, but a new Bioscience Research building is currently under construction which will have approximately 50,000 sq.ft. of assignable space. This is sufficient for UTEP's projected needs in biological sciences. However, space for the Department of Chemistry is extremely tight. If UTEP is to grow in the manner contemplated, additional research space and equipment will be needed, and sources to fund these facilities must be identified.

As UTEP pursues its goals, it will continue to employ the strategies that have worked for it thus far, but these will not be sufficient to elevate UTEP to Tier 1 status. There is no question that UTEP will need additional resources to improve its performance. In fact, UTEP believes that a lack of capital funding for renovation and construction of facilities and the acquisition of

technology and library materials has been the "the single greatest constraint on UTEP's development."¹¹⁴ UTEP also needs significant resources in order to recruit and retain the research active faculty that are crucial to its goals. These resource needs will be difficult to satisfy during these times of fiscal stringency. UTEP has identified the following potential sources of funding, although it is not at all clear that these will prove sufficient to fulfill UTEP's aspirations for the next decade:

1. *Student generated funds.* As is true with its sister universities, UTEP, which assumes 3% annual growth in its student population, is counting on student derived income to partially fund its rise to Tier 1 status. Supposedly, this income will rise as enrollment grows (although it is important to keep in mind the fact that enrollment growth brings with it additional costs). However, UTEP cannot count on formula funding of enrollment growth. UTEP's student generated income also could rise if tuition and fees are increased, but the depressed economic status of the community from which UTEP draws its students may limit UTEP's ability to increase tuition.
2. *Federal and other sponsored research.* UTEP has been very successful in attracting sponsored research funds from programs geared towards minority institutions, faculty and students. Ultimately, UTEP must move beyond funding programs geared at minority serving institutions if it is to increase substantially its level of sponsored research.
3. *Philanthropy.* UTEP has been surprisingly successful in raising monies from the private sector, considering the relatively depressed state of the regional economy. For example, UTEP completed a successful fundraising drive in 2000 that raised \$66 million. In addition, annual giving to UTEP has been impressive. In 2002, UTEP received about \$20 million in gifts, and was the only UT System institution other than UT Austin and health science campuses to appear on *TheCenter's* list of top 200 institutions in terms of annual giving.¹¹⁵ UTEP's endowment now stands at roughly \$103 million, and UTEP is working hard to increase that, as well as the level of annual giving. These results are very encouraging, but, at current levels, will not be sufficient to allow UTEP to grow its research enterprise in the way that it wants.
4. *Industrial Support.* Although UTEP is located in an economically deprived region, industry could be a source of equipment grants, fellowships, and possibly endowed chairs.
5. *PUF and other state funds.* The availability of PUF or other state funds could prove to be important sources of funds for UTEP. However, while UTEP's performance over the past 15 years and its potential for the future would warrant additional state funding, given the current fiscal climate, the State is not likely to be able to provide it in the near term.
6. *Partnerships and linkages.* UTEP actively pursues partnerships and linkages with other institutions, and currently has some 100 existing cooperative national and international academic and research agreements with research and education organizations, including Sandia Corporation's Regional Alliance for Manufacturing

¹¹⁴ *The University of Texas at El Paso, Model of Excellence and Equity*, undated document provided by the University to WAG, November 2003, p. 4.

¹¹⁵ *The Top American Research Universities*, op. cit., p. 217.

Project, the Research Center of Excellence in Biodefense and Emerging Infectious Disease (a 25 member consortium funded by NIH), the Materials Corridor Council (a consortium consisting of eight border higher education institutions led by UTEP and funded by DOE to focus on energy efficient, clean, sustainable materials industries on both sides of the border), joint programs on environment, health and materials research with the National Council of Science and Technology of Mexico, and collaborative research activities with the U.S. Army Research Laboratory. Despite its successes in this area, UTEP is disadvantaged because it is located in a remote, economically deprived region with no biomedical sciences center (related disciplines in these fields are the most rapidly growing and best supported fields in the U.S.). Effective cooperation at a distance in research involving joint appointments, shared research facilities and projects would be possible, but difficult to achieve. Stronger relationships and collaborative projects with the School of Public Health branch in El Paso could be beneficial.

Before turning to our discussion of the UTEP's individual colleges and departments, we want to raise an issue that is not directly related to the UT System's charge to the Washington Advisory Group, but that could have important implications for UTEP's future. We understand that there is a plan to expand the Texas Tech medical program in El Paso, which currently has clinical faculty and third and fourth year medical students, to a four-year medical school. We were told that the construction of two buildings is underway, for research and classrooms, and that \$2 million has been appropriated to get the development process going. At present, the Texas Tech program's faculty is essentially fully engaged in patient care and clinical teaching rather than research.

If the new school is established, then the State must devote sufficient resources to ensure its success. The creation of a four year school, even one that falls in the lower third of medical schools in the U.S., will require hundreds of millions of dollars. The reaction of the UTEP community to Texas Tech's expansion is mixed, primarily because there is a fear that the medical school might be under-funded. The concern is that, if this is the case, the school might try and draw on the UTEP faculty, which is already stretched thin, to help in teaching. Given the current fiscal status of higher education in Texas, this is a justifiable worry. On the other hand, a number of the faculty would welcome the opportunity to interact with colleagues in their fields at the medical school, assuming that there would be adequately funded significant research activities there.

Obviously, it is not within our task to review the decision to form a new medical school, but it can be noted that if a four-year medical school is created, it should be adequately funded in terms of both teaching and research functions. Indeed, the environment in which research is carried out is an important part of medical education. If the new school is established, then the state must devote sufficient resources to ensure its success. And it should consider whether it makes more sense to add it to the system in which UTEP is a part rather than to the distant Lubbock institution.

UTEP's Academic Units

COLLEGE OF SCIENCE

The College of Science plans to lead UTEP's transition to Carnegie Doctoral/Research Extensive status and beyond. We were impressed with the leadership abilities of the Dean and his depth of understanding of what it takes to build research quality. In 2003, the College accounted for 20% of the \$143.6 million in active research and sponsored project awards at UTEP.¹¹⁶ This is an impressive statistic, particularly since the Departments of Chemistry, Physics and Mathematics cannot award doctorate degrees at this time, and are, therefore, limited in their ability to compete for research funding. Although a major fraction of the College's funding comes from NIH grants targeted for minority programs, the Dean and faculty are committed to "weaning themselves away" from these sources and engaging in the open competition for federal research grants not specifically targeted to minority institutions (e.g., NIH RO1 grants and similar programs at NSF).

The College has 84 tenure and tenure track faculty members,¹¹⁷ approximately 20 of whom were hired in the last five years, mostly at the assistant professor level. The College's record of hiring young, research capable faculty impressed us, considering the national competition for these individuals. It uses sophisticated, best case recruiting practices, and all tenure and tenure-track faculty in the College of Science are expected to be research qualified. Promotion and tenure decisions are strongly influenced by research productivity and direction and there are mentoring programs to assist new faculty with their teaching and research loads. Some 43% of the faculty is research funded – an impressive figure for a university in early transition to Tier 1 research university status.

The College of Science has the smallest enrollment among UTEP's 7 colleges, with 7.2% of the total of 18,542.¹¹⁸ Clearly, this College has a head start in growing research programs, but it must do more (together with the El Paso schools) to attract students into science.

Research at the Ph.D. level in this College is conducted through two departmental programs (Biological and Geological Sciences) and through interdisciplinary programs in Materials Science and Engineering (MASE) and Environmental Science and Engineering (ESE). Environmental research is organized through the Center for Environmental Resource Management (CERM). The College expects to launch a Ph.D. program in computational science that will be focused in the areas of mathematical/computational physics. Research in this field will be carried out in a proposed Center for Computational Science and Engineering Research (CREST). The College also is beginning to develop a new departmental Ph.D. program in Chemistry.

Department of Biological Sciences

This Department is the most impressive among those in biologically related fields at UTEP. It has 23 tenure and tenure track faculty members¹¹⁹ and, at present, about half of them

¹¹⁶ *UTEP Overview*, op. cit.

¹¹⁷ *The University of Texas at El Paso Fact Book 2002-2003 (UTEP Fact Book 2002-2003)*, p. 6-5.

¹¹⁸ *UTEP Overview*, op. cit.

¹¹⁹ *UTEP Fact Book 2002-2003*, op. cit., p. 6-2.

have some research funding. In 2003, the Department had \$18 million in active grant awards.¹²⁰ The Department recruited several junior faculty in recent years, and they appear enthusiastic and capable. However, some of the senior faculty are not active in research and they also may be inhibiting a modernization of the curriculum. This problem might be alleviated through retirements.

The Department has approximately 550 undergraduate majors and most new faculty members are teaching one course per semester – a reasonable load. Indeed, one person volunteered to teach an extra course this year to prevent it from being dropped from the curriculum. The Department graduate program, begun in 1997, has steadily grown and now has 52 graduate students, including 24 Ph.D. candidates. However, as was the case in many departments we visited, there was concern about the quality of the graduate students. The Department recognizes that it must do more to attract students and this will require more effort and better packages. In its favor, the Department does expect to have five slots for minority students at the Master's level with \$27,500 packages through an NSF AMP grant, and believes it also will get an NIH RISE (Research Internships in Science and Engineering) grant. The Department also receive funds from CONACYT, the Mexican equivalent of the NSF, which provides up to 20 fellowships at the \$10,000-\$12,000 level for Ph.D. students from Mexico. With the increasing quality of the faculty, a new building under construction, and more focused efforts, the graduate student situation should improve.

UTEP in general, and the biological sciences in particular, has successfully attracted substantial federal funding from NIH and NSF in programs geared towards minority institutions, faculty and students. The Border Biomedical Research Center (BBRC) and SCORE program project grants were mentioned earlier. The Department also is part of a large multicenter NIH grant on bioterrorism led by the University of Texas Medical Branch at Galveston. The Department's greatest strengths are found in the quality and enthusiasm of the new junior faculty who are both research active and committed to the mission of UTEP, and in the great success it has had in attracting minority related funding. Faculty members also effectively collaborate with other departments, particularly in Chemistry (which recently made an important new hire in structural biology) and also in Mathematics (bioinformatics). Their current areas of research interest, e.g., immunology, bacteriology, particularly mycobacteria, virology, toxicology, metabolic disorders, drug targets, etc., appear to be well chosen, relating to the health and environmental problems of the region. They dovetail nicely with the interests of faculty members in the Chemistry Department in combinatorial and synthetic chemistry, and in structural biology. The members of the Departments of Biological Sciences and Chemistry work very closely together in immunology, bacteriology, particularly mycobacteria, virology, toxicology, metabolic disorders, and drug targets, and these areas overlap with interests of faculty in the College of Health Sciences as well. These departments should continue to build on these areas of strength.

To approach Tier 1 university status, this Department should double in size, which probably would require \$9 to \$15 million in start-up packages and 38,000-60,000 sq. ft. of additional laboratory space. If these resources can be mustered and appropriate recruitments made, the Department has a good opportunity to build an area of first tier excellence in structural biology and the related fields of combinatorial and synthetic chemistry, and drug targets that can be a "beacon" for UTEP.

¹²⁰ *Physical and Interdisciplinary Science*, UTEP briefing paper for WAG, November 10, 2003, unpaginated.

Department of Chemistry

The Department of Chemistry sets a high standard for itself. It has 14 tenure and tenure track faculty, 5 of whom have been hired during the past three years (of these, 4 are externally funded). Even though the Department does not have a Ph.D. program, essentially all faculty members are involved in research and publish in refereed journals. They contribute to interdisciplinary centers in environmental and materials science and to research in health-related areas. The total of active research grants associated with faculty members in Chemistry is approximately \$6 million in 2003,¹²¹ an impressive number for the size of the department. We were told that half of this funding was from grants made under programs geared towards minority institutions, faculty or students. This provides a good example of UTEP's effective strategy of using set aside funds together with competitive awards to advance a field.

Although Chemistry seems quite productive, it cannot expand much more because it lacks research space. Funding also is an issue – one individual did not receive his promised setup funds because of state imposed budget cuts. Others complained of the difficulty of producing research results while carrying a high teaching load. The Department may need 2 or 3 new hires of research qualified faculty to build up to critical size. We believe the Department has significant potential for growth in research because of its intrinsic research strength and the importance of chemistry to interdisciplinary programs in the materials and biomedical sectors. The environmental chemistry program has the kind of critical mass of faculty and staff researchers, post-docs and students that one expects of a lively research department.

Department of Geological Sciences

This is an exemplary Department. It has a Ph.D program of its own, and is also engaged in interdisciplinary doctoral programs in Environmental Sciences and Engineering and Material Sciences and Engineering. The Department has 13 tenure and tenure track faculty members,¹²² all of whom are funded as PIs and who published 30 papers in refereed journals in 2003 alone. The Department manages 28 grants¹²³ and is involved in 10 interdisciplinary/interdepartmental grants. It currently has \$9.7 million in active grants, a number that is impressive for so small a faculty. The awards mainly are from NASA and NSF, and were mainly won in open competition. The Department participates in large national earth science projects as a consortium member. It is strong in solid earth geosciences and would use new FTEs, if available, to expand into the frontier fields of paleoclimates and global change by adding an isotope geochemist and soil scientists. With a few more faculty members, this Department could be a respectable member of many Tier 1 universities.

Undergraduate enrollment in geological sciences is small, as is true in many earth science departments across the country. The Department should be recognized for its success in the open competition for research grants and not penalized in the allocation of faculty slots because of its small enrollment. It also should be allowed to grow by mounting its own undergraduate, entirely geology-based environmental degree, because it believes such a program would be unique (and different from the current interdepartmental offering).

¹²¹ *Physical and Interdisciplinary Science*, op. cit.

¹²² Id.

¹²³ Id.

Department of Mathematical Sciences

The Department of Mathematical Sciences currently has about 23 tenure and tenure track faculty members.¹²⁴ Ten years ago, it was significantly larger (~30), and the faculty describes itself as "swamped" by students. Given the limited educational resources in the El Paso region, it is difficult for the Department to hire adjunct faculty (instructors) when needed to support the service courses for which the Department is responsible. These instructors are shared with the single local community college, so students have no other options for introductory math courses; such courses are being covered by essentially a fixed pool of qualified teachers.

Over half of the faculty members in this Department have published research papers in the last three years. This is a good indicator of its potential. One area of traditional strength is statistics, but this strength is eroding due to retirements. Research active faculty members cover a respectable range of research topics in pure and applied mathematics and numerical methods. The total of active research grants held by members of the Mathematics faculty is well below \$1 million this year,¹²⁵ but the Department has the potential to increase this amount because of the important role that mathematics will play in a new degree in the computational sciences. Computational physics, biology, and engineering all rely heavily on new mathematical approaches, as demonstrated by recent breakthroughs in genomics.

Department of Physics

The Department of Physics has 9 tenure and tenure track faculty members, an implausibly small number for a field so important to the University's Tier 1 aspirations. In addition to the critical role of a physics faculty in teaching service courses, the tools, methods and ideas of front-line physics research often find important applications in other, multidisciplinary areas of research when applied by knowledgeable and imaginative researchers expert in their use. The Department currently is in the process of recruiting 2 additional faculty members, but this will only bring its numbers up to 11. Five years ago, the Department had 14 members. At the time of our visit, the Department was still reeling from a denial-of-tenure case involving a young faculty member with a national research reputation by the Provost. The already small size of the research faculty and this issue rendered the Department largely dysfunctional.

The Department's total research funding for this year is \$ 1.2 million, generated by about one-half the faculty. Roughly half that total comes from grants made under programs geared towards minority institutions, faculty or students. The research areas in which they are working include astrophysics, environmental science, materials and space science/plasma. The small research efforts in astrophysics and space sciences are probably the best areas on which to build critical mass research efforts over the short term.

The Department has invested considerable effort in recruiting undergraduate majors with outreach programs to local (including Juarez) high schools. As part of its outreach efforts, it produces an English/Spanish newsletter and it brings recognized speakers to local high schools on a regular basis. We are told that there has been significant growth in undergraduate majors as a result of these activities.

¹²⁴ *UTEP Fact Book 2002-2003*, p. 6-2.

¹²⁵ *Physical and Interdisciplinary Science*, op. cit.

Recommendations for the College of Science

1. The College should be authorized to apply for Ph.D programs in Chemistry, Physics, and Mathematics, (as distinct from interdisciplinary degrees) and should be allowed to grow to the critical faculty size that such programs will require.
2. The Geology Department, in view of its strength and performance in open competition for research funds, should be allowed to diversify its educational offerings as indicated above.
3. UTEP should bring the size of the Department of Physics faculty up to critical mass.

COLLEGE OF ENGINEERING

The College of Engineering has consistently ranked among the top five schools in the continental U.S. in the production of Hispanics receiving BS degrees.¹²⁶ Also, it has been identified as one of the top 20 universities in the U.S. with exceptional successes in education of minorities. The National Action Council for Minorities in Engineering has noted that UTEP is a model for engineering institutions who say that today's minority young people from low income families can't succeed in a rigorous math or science-based discipline.¹²⁷

The College has 62 tenure and tenure track faculty members¹²⁸ divided among 5 departments – Civil Engineering, Computer Science, Electrical and Computer Engineering, Mechanical and Industrial Engineering and Metallurgical and Materials Engineering.¹²⁹ It has an undergraduate enrollment of 2,099 students, representing a 23% increase since 1998.¹³⁰ Graduate enrollments are 486, corresponding to an 80% increase since 1998.¹³¹ Of that total, 100 are Ph.D. students and 386 are MS students. In 2003, Engineering is graduating about 220 BS degrees, 120 MS degrees and 10 Ph.D degrees.¹³²

At present, the College of Engineering offers degrees in technology areas emphasizing important border technology, social, and health issues. These programs are important to the mission of the University. Engineering, however, has many small departments which operate at the threshold point. The faculty is heavily loaded with teaching thus there is little time to devote to research. Moreover, faculty members support the teaching mission of their institution and do not want to see it displaced by demands for more research. Despite these hurdles, almost 60% of the Engineering faculty is research active. Currently, the College has roughly 90 active grants and contracts, with total annual expenditures of almost \$9 million (\$2 million in Education, \$1.5 million in Communications and IT, \$1.2 million in Materials and Manufacturing, \$1.1 million in Environment and Health, \$.9 million in Transportation, and the rest in Aerospace/Defense/Energy and Biomedical).¹³³

¹²⁶ M. Q. Baker, *The Baccalaureate Origins of Latino Doctorates in Science and Engineering*, Doctoral Dissertation, American University, 2000.

¹²⁷ *College of Engineering Overview*, presentation prepared by The University of Texas at El Paso for The Washington Advisory Group, November 11, 2003, p. 3.

¹²⁸ *UTEP Fact Book 2002-2003*, page 6-2.

¹²⁹ We did not meet with anyone from the Department of Metallurgical and Materials Engineering. Accordingly, that Department is not discussed individually in this report.

¹³⁰ *UTEP Fact Book 2002-2003*, p. 4-1.

¹³¹ *College of Engineering Overview*, op. cit., p. 8.

¹³² *Id.*, p. 8.

¹³³ *Id.*, p. 5.

In order to encourage interdisciplinary research, the College has established or is involved in five research centers focusing on subjects involving cross-disciplinary research – the Material Research and Technology Institute (MRTI), the W.M. Keck Border Biomedical Manufacturing and Engineering Laboratory, the Center for Transportation Infrastructure Studies (CTIS), the Future Aerospace and Technology Center (FAST), and the Institute for Manufacturing and Materials Management (IM3). As focal points for research themes, these Centers are effective in attracting both graduate students and research grants. However, their research output is not consistently high and some have an embryonic look and require further development.

The College of Engineering very wisely is focusing on efforts that address the needs of the region and that are aligned with the strategic research areas identified by the University, namely, biomedical and health sciences; business, policy, and social and economic development; communication and information technology; education; environment and energy; materials and advanced manufacturing; and transportation policy and infrastructure. Progress in these areas will hinge upon the quality of the 40-100 new faculty members the College intends to recruit over the coming five years. Attention to specific research activities should focus on topics relevant to the El Paso-Juarez Metroplex, and be reflected in recruiting new faculty. Appropriate fields mentioned during our visit were water resources, manufacturing, transportation, health, and applications of computational techniques.

Department of Computer Science

This Department has about 10 tenure and tenure track faculty members, 300 undergraduate students, and 140 graduate students.¹³⁴ The faculty members are all enthusiastic and supportive of the University plans for growth, and the Department Chair is a very energetic individual with an active attitude towards success. Computer Science has four focus areas: Software Engineering, Applications of Theory, Human and Computer Interface, and Interactive Systems. The quality of these programs is high in terms of both research and education. The Department wants to increase the size of its Ph.D. program, which makes sense if the region's demand supports such an expansion.

The Department's faculty has an interest and some strength in geo-informatics and bio-informatics. Both areas are computer intensive and in growing fields of research for computer applications. The Department needs to add approximately 20 new researchers to be able to contribute significantly to UTEP's goals. It also needs to recruit graduate students from other universities to create more intellectual diversity (currently, it admits students mainly from among UTEP's own graduates).

During the course of our meetings, we heard of a plan to split the Doctoral Program in Computer Science and Engineering into a separate Computer Science Program and Computer Engineering Program. Many people we spoke with feel this would provide little advantage and could be damaging to the department. Any decision to split the program should be driven by the demands of students, industry and regional needs.

¹³⁴ *UTEP Fact Book 2002-2003*, pp. 6-2, 4-1 and 4-7.

Research Capability Expansion at UTA, UTD, UTEP, and UTSA

Department of Electrical and Computer Engineering

This Department has 16 tenure and tenure track faculty members, 377 undergraduate students, and 93 graduate students, of whom 27 are working towards their Ph.D.s.¹³⁵ Student retention is a problem. The current retention level is only about 20% although the Department has been able to improve it to 50% by providing special tutoring and mentoring in courses that had resulted in high drop out rates. The Department's challenge is to change the culture so that faculty members improve their teaching and increase their research output. While the faculty shows an interest in research, most faculty members do not travel to conferences or other technical meetings and do not graduate many Ph.D. students. As a result, research is limited and individual researchers are not very competitive in seeking external funding. We are told that this is due, at least in part, to heavy teaching loads that leave little time for scholarship.

Department of Mechanical and Industrial Engineering

This Department has about 14 tenure and tenure track faculty members, and approximately 400 undergraduate students and 100 graduate students.¹³⁶ The Department Chair is very energetic and successful in motivating the faculty and communicating the University's strategic objectives. The Department's faculty seems to understand how to move forward and improve quality standards for education and increase research output. Its research capability is limited, however, by its lack of a Ph.D. program.

The Department sees research opportunities in computational mechanics – a fundamental field in which it has some strength – and its members are open to a more interdisciplinary approach to research. Faculty members in this Department realize they need an innovative plan in order to become successful in research.

Department of Civil Engineering

This Department has 12 tenure and tenure track faculty members, 127 undergraduate students, and 53 graduate students (all of whom are MS students).¹³⁷ Student enrollments have dropped in recent years, following a national trend. The Department does not now have a Ph.D. program, but it expects to start one in the spring of 2004. It also expects to grow to 20 faculty members from its current level of 12.

The Department's faculty members are participating in a number of community projects and are involving undergraduates in research projects. Like some of the other departments in this College, this Department's lack of a Ph.D. program has been a limiting factor in its efforts to expand its research programs.

Materials Research and Technology Institute

MRTI is a research unit whose participating faculty are members of other academic departments in the Colleges of Engineering and Science. The participants are cultivating research interests with the Stanford Linear Accelerator (Synchrotron radiation applications). One of the Institute's priorities is to train graduate students in materials research.

¹³⁵ Id., pp. 6-2, 4-1, 4-7.

¹³⁶ Id., pp. 6-2, 4-1, 4-7.

¹³⁷ Id., pp. 6-2, 4-1, 4-7.

Recommendations for the College of Engineering

1. The College of Engineering is a central academic resource for UTEP and its community as well as a potentially significant contributor to regional economic development. The College should develop a strategic plan with participation from faculty, staff, and students, to achieve its potential in these areas.
2. While focus must be directed at the expansion of tracks in the Engineering and the Computer Science curricula, the present undergraduate educational offerings should be expanded to include a Computer Engineering degree, co-sponsored by the departments of Electrical and Computer Engineering, and Computer Science in the College of Engineering, and the Department of Mathematic Sciences in the College of Science.
3. At present, the College of Engineering expects to increase the number of tenure track faculty by 40-100 individuals during the next five to ten years. This will be a difficult task if the quality of hires is to be maintained and it will be impossible if appropriate funding is not available. Therefore, a rational academic and business plan should be developed that encompasses space and facility needs, starting salaries, and a strategy to attract the required talent.
4. There is a perception that the University is not providing the financial support needed to allow faculty members to pursue research and scholarly activities. The Administration needs to take visible steps to restore the confidence of the faculty that it is serious about supporting the research component of its mission.

COLLEGE OF HEALTH SCIENCES

This College encompasses a variety of disciplines relating to health, health care, health education, including nursing, health science, pharmacy (in collaboration with UT Austin), kinesiology, clinical laboratory sciences, physical therapy, occupational therapy, and speech-language pathology. It is located in a separate facility about a mile from the main campus. Because UTEP does not have a medical school, and the El Paso-Juarez region is greatly underserved with regard to medical care, allied health services, and health education, this College has extensive interactions with the community in terms of both education and provision of services.

The College has 38 tenure and tenure track faculty members and approximately 1,900 students enrolled in the health education programs, both as Bachelor's and Master's degree candidates.¹³⁸ A proposal is pending for an inter-disciplinary Ph.D. program involving all disciplines and programs in the College. Teaching loads are heavy (3 + 3 is the standard, and many also must teach 3 courses in the summer session). Several of the groups listed above, particularly in the rehabilitation sciences, are very small and consist mostly of junior faculty.

The Interim Dean seeks to increase the level of research. It is estimated that about a quarter of the faculty members pursue research in their own fields, about half collaborate with others, and a quarter are not involved at all. The relative paucity of research is due to a variety of factors, including heavy teaching loads, the fact that some of the disciplines are not in research intensive fields; and the fact that efforts to create a research culture in the College are still in their

¹³⁸ Id., pp. 6-2, 4-1 and 4-7.

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early stages. There is not now a critical mass of researchers in any field that would enable a rise to a leadership level, and it appears unlikely that this situation will change soon. On the other hand, one of the two NIH RO1 grants in the University is based in this College. Other sources of research funds being tapped by this group are the NIH and NSF Minority institutional support grants, and funding from the Paso Del Norte Foundation which provides about \$4 million a year for grants on community health care and related research on a peer-reviewed basis.

Faculty members in this College have a number of collaborations, both across the University (mainly with Engineering faculty on environmental issues) and with the Texas Tech Medical School in El Paso, the University of Texas Medical Branch in Galveston, the University of Texas Houston in Public Health, the UT Austin in Pharmacy, the University of Arizona College of Public Health, and others. At present, this group's best opportunities with respect to research would appear to be in enhancing these collaborations while trying to recruit new faculty to both lighten the teaching load and to provide a source of some research grant funds.

COLLEGE OF BUSINESS ADMINISTRATION

As is clear from UTEP's strategic plan, the seven areas of strategic emphasis are defined not in terms of Departments or even Colleges, but rather in terms of interdisciplinary issue-areas. The Dean of the College of Business underscored this perspective, stating that UTEP cannot compete within traditional silos, therefore it is focusing on programs that cut across these silos.

The individuals with whom we met stressed their desire and intent to recruit and retain research-oriented faculty, but no single department appeared to be operating from a position of strength in this regard. Faculty members feel the faculty is currently too small, given teaching responsibilities, to allow them to follow up on opportunities for research grant funding. The College is recruiting 5 new tenure and tenure track faculty members this year, and those with whom we met generally feel that their five year goal for faculty increases is realistic. However, they stress that recruiting must be done strategically, rather than simply replacing those that retire with people in the same area/department. Most, if not all, of the faculty members with whom we met were active in publication and/or journal editing, but generally not in first tier journals.

INSTITUTE FOR POLICY AND ECONOMIC DEVELOPMENT (IPED)

This is a University-wide Center, established in 2000, but its fulcrum appears to be in the College of Business. It is also the unit by far the farthest along of any in the College in orienting itself toward the next leap forward. That is due mainly to the activities of the Border Region Modeling Project, a semi-autonomous unit within IPED but also claimed by the College of Business. We were told that this project, which produces and maintains current several quantitative economic models, has generated over \$300,000 in external research funding over the past 7 ½ years. These models appear to be unique and are clearly useful for a variety of forecasting and policy purposes. Graduate students, and even some undergraduates, are actively involved in the research conducted by this Project.

COLLEGE OF EDUCATION

The College of Education is a turbocharged engine propelling UTEP where external funding is concerned. It has built strong partnerships with K-12 schools and regional communities over the years as well as, more recently, interdisciplinary partnerships with faculty and programs in Liberal Arts, Health Sciences, Engineering, and Science/Mathematics. It has obtained and implemented numerous grants, mainly from the U.S. Department of Education.

While these grants have been focused primarily on teacher training and outreach services to schools and communities, the programs they have generated provide significant opportunities for publishable follow-up and outcomes research on student achievement. The Dean and faculty stress the inseparability of training/service and research. For example, the College recently received a \$5 million grant from the Carnegie Corporation (which will be shared with the Colleges of Liberal Arts and Science) focused on training/service, but opening up substantial areas for research.

The College has a well-articulated plan to build on existing activities and partnerships, exploiting the fact that the relatively isolated local area is virtually a “closed loop” in which to conduct research (that is, local students are primarily taught by UTEP-trained teachers, and a large proportion of students in the College of Education are products of local or regional primary and secondary schools). There are also exploitable opportunities for comparative research on education in the U.S. and Mexico. Among the specific potential sources of funding they are starting to pursue are interdisciplinary collaborations to respond to RFPs from NIH, NEH, etc. in the areas of health, education and community development; building on existing grants as seed money for larger research projects; and getting further grants from Carnegie and the Fund for the Improvement of Postsecondary Education, for example, for proposals to increase the retention of undergraduate engineering students (principally minorities) through innovative teaching. The College has a proposal for a new Ph.D. in Teaching and Learning (separate from the traditional Ed.D. in Education Leadership, which they already offer), stressing literacy, including bilingual literacy, in science and mathematics.

The College currently has 39 tenure and tenure-track faculty¹³⁹ and is actively recruiting for 10 new positions, all net increases. Apparently the new junior faculty are well oriented toward research, but the College is losing mid-level faculty and some of the more senior people need to be re-oriented and assisted in grant writing if an intellectually dynamic culture is to bloom. One estimate we heard was that only about 20% of the College’s faculty are actively engaged in research.

The challenges this College faces are the familiar ones: lack of research oriented tenured faculty to mentor the new junior recruits; 3+3 teaching loads for most faculty, including a lot of time spent in the field (many education courses are offered on-site in the El Paso Schools).

The College of Education has three separate departments: Educational Leadership and Foundations, Teacher Education, and Educational Psychology and Special Services, but virtually all of the research and grant-getting activity appears to be housed in the College’s interdisciplinary Center for Research on Educational Reform. This Center currently has some \$14 million in active grant funding (total, not annual expenditures). This includes a \$10 million five year grant from the U.S. Department of Education (ending this year), mainly to support 200 graduate students earning masters degrees in instructional technology, but the final year is devoted to research on the impact of the program and is providing research assistant employment for five doctoral students. Other grants include one from the NSF for a PETE (Partnership for Excellence in Teacher Preparation) follow-up impact study, and the Noyce Scholars program, also funded by NSF, again mainly for student support but also for follow-up research on teacher retention. The El Paso Math/Science Partnership is also funded by the NSF at \$28.6 million, and there are other grants from the Meadows Foundation and the National Board for Professional Teaching Standards, both oriented toward teacher training at UTEP.

¹³⁹ Id., p. 6-2.

What are described as “pending” Center grants total \$6.3 million, all from NSF. In order to increase its visibility, the Center is planning to celebrate its official inauguration via a research conference that will bring noted researchers to campus. It also aims to use Center-generated grants to support more doctoral students, as well as to build strong connections to doctoral programs in the social sciences.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts has for some time been bi-modal: favored departments have Ph.D. programs and reduced teaching loads for graduate faculty, while other departments’ faculties carry 3+3 loads and have virtually no research infrastructure support. Like the rest of UTEP, however, this College is currently moving toward a focus on interdisciplinary centers, where most research activity will be based. There are four such Centers now – the Sam Donaldson Center for Communications Studies, the Center for Civic Engagement, the Center for Law and Human Behavior, and the Center for Anthropology Research. The following discussion is therefore an amalgam of the two organizational frameworks.

The Dean of the College of Liberal Arts stresses the importance of continuing the interdisciplinary approach UTEP has been developing over the past 15 years, both to take advantage of and to compensate for the small size of most departments. While he describes UTEP’s relative isolation and “sense of place” as an advantage, he also cites as a major challenge the need to leverage the College’s (indeed, the University’s) traditional service focus into research opportunities, which means finding funding sources interested in taking advantage of the school’s comparative advantage in border region studies. New strategies are needed, furthermore, to increase significantly the number of faculty actively involved in funded research.

Department of Psychology

The Department of Psychology, with 13 tenure and tenure track faculty members,¹⁴⁰ has had a Ph.D. program since 1995. It currently has some \$2.5 million in active grants designated for minority health and health disparities programs to allow recruitment and incubation of junior faculty until they become competitive in the general pool of grant-seekers. This is already beginning to happen in some cases. Every member of the tenure track faculty has had external funding at some point, though none currently have individual funding.

The psychologists stressed that the local community provides ‘an incredible laboratory’ where research can be combined with providing services and care. Two new hires are anticipated in clinical psychology. Additional hires are planned for this area and that would appear to be the best opportunity to capitalize on the overall focus of the university and the community. The Department also aspires to create a Ph.D. program in clinical psychology which would strengthen their efforts. Increasing the present level of collaboration with faculty members in the College of Health Sciences could be beneficial.

This Department’s junior faculty appear to be the strongest, a frequent finding among the departments we visited. That is a good sign as long as they can be kept happy and supported. The senior faculty are said to be “winding down” and 4 are to retire soon. The new Chair has an informal commitment from the administration to increase the faculty to 20, and perhaps even 30. With the anticipated 4 retirements, growth to 20 or more would mean at least 10 new hires within the next several years. It is important that these be people active in research at a level of quality

¹⁴⁰ Id., p. 6-2.

that merits external support. If that were to happen, 20 to 30 faculty members could handle the current approximately 670 majors and 40+ graduate students, and also could have a significant impact on the University. In general, the start-up packages that the University has been offering may be adequate for those hires; however, space is said to be available for only 6 or 7 faculty members, beyond that would definitely require additional facilities, with the exact amount of space needed varying, depending on the nature of the research in the subdisciplines.

Faculty teaching loads are nominally two courses per semester, but most teach less, and these loads are not considered a problem. The Department has an active graduate education program involving both MA and Ph.D. students. However, as with most departments we visited, there is a need for more and better graduate students. More effort and resources at both the departmental and central levels should be put into achieving this. The major impediment to seeking grant funding, faculty say, is that little or none of the indirect cost funding comes back to the individual researcher or even to the Department to provide infrastructure support. This fact, plus the difficulty in accounting for teaching credits across units are bureaucratic obstacles—the flies in the ointment of a generally supportive environment for building a research program.

The greatest weakness for this Department is the fact that although all faculty members are said to be participating in some research, none currently has individual funding. Although they do draw some support from the large institution's minority support grants, this is clearly not enough. The success of this Department will be determined by the ability of the new Chair, with the support of the administration, to recruit faculty who can obtain independent support.

Department of Sociology (including Anthropology)

There are 11 tenure and tenure track faculty in this Department.¹⁴¹ We met with only 2 of them and thus it was difficult to evaluate the interests and quality of research, but it appears that this Department is unlikely to play a significant role in the overall research strength of the University. There is not a critical mass in their areas of interest, and their teaching load is heavy (3 + 3). They have some support from collective sources, but no individual grants.

The greatest need that they expressed is to forge collaborations and inter-disciplinary research partnerships, e.g., they are working on a proposal on water and health with engineering. With their heavy teaching loads, they are also said to suffer from inflexibility in accounting for credit for teaching in collaborative situations. This discourages interdepartmental and interdisciplinary undertakings. Interactions with other institutions are also said to be difficult to achieve. UTEP should endeavor to foster intra- and inter-institutional activities.

Department of Political Science

This Department has 15 tenure and tenure track faculty members.¹⁴² A number of these individuals are active in the Center for Inter-American and Border Studies. The Department has had 3 faculty departures recently and no authorized replacements, leaving them with a bi-modal structure of research oriented junior faculty and senior faculty who by and large are not. One commented that “you can't build a viable Ph.D. program on the backs of untenured faculty”. They also complain of 3+3 teaching loads, and a highly bureaucratized system that occupies a lot of faculty time. More differentiation of teaching loads between research active and non-active

¹⁴¹ Id., p. 6-2.

¹⁴² Id., p. 6-2.

faculty members would relieve some of the teaching burden placed on young, research oriented faculty.

Center for Inter-American and Border Studies

This is a University-based rather than a college-based Center, implying that its interdisciplinary focus extends beyond the Liberal Arts to other Colleges. Its Director defines the intellectual *raison d'être* of this Center by place, specifically, the U.S.-Mexican border, viewed from two different perspectives, as a line of separation and as a zone of attraction. Using this paradigm, his goal for the Center is to focus initially on practical regional issues in such diverse areas as economics, environment, health, education, culture, language, political and governmental systems, and the tradeoff between homeland security and economic development, but then to leverage up from there to more theoretical, analytical issues relevant to the nation and the world – i.e., using the border region as a “laboratory” for how the U.S. deals with the rest of the world.

The intellectual case is well thought out and articulated, though it does appear to overlap with the goals of some other centers in UTEP. There are, however, significant practical constraints on its implementation. In addition to increases in both the quantity and quality of UTEP faculty in general, structural changes are needed that would stimulate more effective interdisciplinary forms (this Center has just made its first appointment jointly with a Department) and reduce current tensions between centers and departments regarding how funds are allocated. More flexibility on teaching loads is also an issue; again, one that would be alleviated by more external funding.

Center for Civic Engagement

This Center’s goal, according to its Director, is “to connect faculty and students to community organizations to deepen learning and enhance responsiveness to the (bi-national) regional community”. The Center has very limited infrastructure (it operates with one-half of a staff person), and its Director is a Professor of Political Science who was previously Chair of that Department. She is extremely active in publication and research, and got the Center going 5 years ago with a \$1.4 million grant from the Kellogg Foundation which she coordinated.

Center for Law and Human Behavior

This Center, like so many of UTEP’s projects, focuses on border issues, dealing with cross-border legal, immigration, and homeland security issues. It is attempting to enlarge its service/intervention focus to encompass research as well, and its Director feels that there are ample opportunities for external funding.

General Observations, Conclusions and Recommendations For UTEP

As is evident from the foregoing, we all were impressed by how much UTEP has been able to accomplish over the past 15 years. UTEP’s vision is nontraditional but exciting, with the twin goals of providing high quality education in a socially responsible way, and at the same time achieving national research prominence. If excellence is measured both by a University’s research prominence and education programs, and also by its impact on the intellectual, social and economic well being of a community, then UTEP clearly has great potential.

The University’s research strategic plan identifies opportunities for excellent research programs. They draw on traditions and strengths already in place to some extent at UTEP and

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they represent areas with substantial federal funding. How they develop depends, of course, on the quality of the people recruited to carry out the research.

Based on the information provided to us both before, during and after our campus visit, we found UTEP's major strengths to be:

- Its demonstrated ability to attract federal research funding by exploiting the advantages of its location and the demographics of its student body;
- Its determination to win federal research grants in open competition with other research universities;
- A modest but good research base on which to build and a demonstrated ability to recruit quality new faculty;
- Well chosen interdisciplinary focus areas;
- UTEP's remarkable fundraising success; and
- The strong support it enjoys from the El Paso community.

The major challenges that it will face are:

- The few potential sources of support available to UTEP to fund the faculty recruitments (including set up costs) and capital projects that would enable UTEP to go beyond Carnegie Doctoral/Research Extensive status and achieve Tier 1 status;
- UTEP's lack of Ph.D. programs in certain basic areas of science and engineering, including Physics, chemistry, mathematics, electrical engineering, and mechanical engineering;
- The fact that UTEP's faculty members must wean themselves from sources of research support aimed at minority institutions and researchers and attract a larger proportion of competitively awarded research funding;
- Student retention; and
- The economically depressed nature of the El Paso community.

UTEP's confidence in its ability to achieve its goals is rooted in the remarkable progress it has made over the past 15 years. Although federal funds targeted towards programs for underrepresented minorities were important in the extraordinary growth of UTEP research endeavors, UTEP has begun to wean itself from these sources in some areas. As it expands the research areas in which it is able to compete successfully, its stature will grow, and the University will have access to a much larger pool of external funding. Its current research strengths and best opportunities are in the following areas:

- UTEP's strongest scientific research group is in geophysics; three recent hires came from top ranked departments in the field;
- Social and economic development, with a strong cross-border focus is an interdisciplinary area with great promise that involves the Colleges of Business, Education and Engineering, and several departments in the College of Liberal Arts;
- Biology, environmental chemistry and education are additional centers of strength and opportunity; and
- UTEP should consider building on its existing engineering strengths to develop research activities addressing border issues such as border transportation and border

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security. These areas are relevant locally and also have the potential to establish UTEP as a national leader.

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- The fields that can be the next high opportunity research areas for UTEP include:
 - Health related sciences focusing on infectious diseases. The new biomedical sciences building together with the Border Biomedical Research Center (BBRC) grant, which provides 6 new positions over three years, each with \$150,000 in setup funds, makes this a next high opportunity field.
 - Structural biology, an important new frontier of the biological sciences. The University recruited an excellent new faculty member who is now in place and is in the process of adding a new hire in biophysics. The research group in this area will include faculty from the Departments of Physics, Chemistry, and Biology; with 3 or 4 new positions this can become a nationally ranked research effort. We note that the Coordinating Board unfortunately rejected planning authority for a Ph.D. program in biosystematics.

In order to pursue the opportunities described above and achieve Tier 1 status, UTEP will have to expand its faculty and provide it with the necessary research facilities and infrastructure. Specifically, UTEP will have to:

- Increase the number of its research active faculty members. The University estimates that it will need to hire an additional 150 or so new faculty members (in addition to those who are replaced) over the next 10 years. This number seems low, if UTEP is to achieve \$100 million in annual research expenditures. If one assumes that each such researcher will generate the \$230,000 national average for active academic researchers, then UTEP will need approximately 290 new research active faculty members. Using UTEP's current average annual expenditures per research active faculty member of \$210,000, it would need roughly 320 such individuals.
- Provide new researchers with the facilities they will need to do their work. UTEP estimates that it will need new facilities for the College of Health Sciences (\$70 million), Engineering and computer Sciences (\$20 million) and Chemistry/Physics (\$25 million), in addition to other campus renovation and upgrade projects (\$95 million). These estimates appear reasonable. The challenge will be to secure funding for these projects.

In terms of establishing priorities, we believe UTEP should:

- Recruit health related biology researchers with the resources available from the BBRC;
- Join meaningful national consortia to enhance its capabilities and research stature. It has done so recently in joining a multicenter consortium on bioterrorism led by the University of Texas Medical Branch; and
- Launch a Centennial Endowment/Capital Campaign with a minimum goal of \$100 million.

As stated above, UTEP estimates that it will require roughly 150 new faculty members to achieve Tier 1 status. We believe that roughly double that number will be necessary, unless the productivity of the existing faculty increases substantially. Using the 300 estimate, and the fact that we believe that no more than 30 high quality researchers can be recruited each year, it will take at least 10 years for UTEP to achieve Tier 1 status – longer if the estimate of new faculty needs is low, or if the estimate of their research efficiency is too high. Considering these uncertainties and the present lack of doctoral programs in basic fields of science and engineering, we believe 15 years would provide a more realistic time frame for achieving Tier 1 status.

UTEP has successfully secured substantial federal set-aside funds to jump start its research expansion campaign and its private sector fund raising ability has been impressive considering the resources available in the greater El Paso area. UTEP also has shown the capacity to recruit well and to take advantage of the unique opportunities arising from its border location. Taking this into account, we believe that UTEP can become a Carnegie Doctoral Research Extensive university, and receive national recognition as a research capable, urban university in this decade. If it can secure the resources for the new faculty positions we mention above, and for the facilities they will require, UTEP should be able to reach Tier 1 status in 15 years or so.

Having provided these general observations and recommendations, we now turn to specific recommendations for the University as a whole:

1. *Ensuring a Critical Mass of Faculty in Key Science and Engineering Fields.* UTEP intends to emphasize certain targeted research areas with relatively narrowly defined interdisciplinary focus areas. However, unless UTEP also has critical faculty mass in the basic science and engineering departments that will keep research viable, it will be difficult to rise to national status in funding and recognition. Obviously, UTEP must make choices of which research areas to pursue initially, but ultimately strong foundations in chemistry, mathematics and physics are needed to support most, if not all strategic areas. These, in themselves, will continue to stimulate excellent students and provide substantial research opportunities. The President understands this.
2. *Development of Strategic Plan with Faculty Participation.* UTEP's Research Council developed a draft Strategic Research Plan that identifies certain strategic research areas for focus and development. Those areas appear logical, but our conversations with faculty members from several departments within the College of Science revealed certain tensions over the formulation of this strategic plan and the interpretation of which research areas would fall within these strategic research areas under the plan. By all accounts, the plan was developed by the upper administration with little or no input from departments and regular faculty. If this is the case, comments should be invited from department chairs and faculty.
3. *Planning for the Necessary Faculty Growth.* As mentioned above, in order to achieve Tier 1 status, we believe UTEP will have to add nearly 300 new research faculty members over and above the number that it will need to replace departing faculty. To recruit these individuals will require a great deal of money, both for salary and start packages, and also for new research space and infrastructure. UTEP should develop a realistic and detailed plan showing the various ways these costs might be funded (e.g., student generated income, philanthropy, and other state funding) and the corresponding levels of faculty that they will permit. The plan also should include realistic timetables for achieving its desired research growth.

4. *Add Ph.D. Programs in Chemistry, Physics and Mathematics, Electrical and Mechanical Engineering and Computer Science.* In order to build strong interdisciplinary programs, institutions must have a foundation of research strength in the basic disciplinary fields of science and engineering. To do this well, requires doctoral programs in those fields.
5. *Organization.* UTEP should rationalize the current conglomeration of colleges, departments, centers (at several levels) and institutes in order to evolve a more effective structure for inter-disciplinary work, which is a major strength for the University. The current situation is a confusing mish-mash, which has led to considerable confusion about resource allocation and some unnecessary turf battles.
6. *Improve Graduation Rates for Undergraduate Students.* Only 25% of UTEP's entering classes graduate from the University within 6 years, although perhaps as many as 60% have graduated from UTEP or another school, or are still enrolled at UTEP within 10 years. The reasons for this are clear – many students have outside jobs and many may not be prepared for college level work. (It must be said that the top students are superb and the faculty over and over again expressed their enthusiasm about these students and how gratifying it was to teach them and to work with them in the research laboratory.) Nevertheless, the fact that more than 40% have not received a degree 10 years after entering the University is troublesome. UTEP's administration is well aware of this problem and is working on developing ways of addressing it. It should redouble its efforts in this area, and continue to work with the local community college to develop solutions.
7. *Indirect Costs.* The general consensus among those with whom we met was that the amounts of indirect cost recoveries distributed to departments were low, on the order of 5-10%, and while large amounts of money are not involved currently, when an institution is striving to increase the amount of external research funding, which requires greater activity on the part of faculty in submitting grants, the return of some indirect costs to them and their departments can be an important incentive. The faculty expressed concern about the issue, and the administration should review its policies in this area.
8. *Graduate Students.* High quality graduate students are a critical component of a robust research enterprise. Like the other UT institutions that are the subject of this report, UTEP must take the steps necessary to ensure a high quality graduate student body.
9. *Endowment/Capital Campaign.* One of the key determinants of UTEP's success in achieving Tier 1 status will be its ability to mount a successful Centennial Endowment and Capital Campaign with a goal of \$100 million. UTEP must deploy adequate resources to assure success in this endeavor.

APPENDIX 1

SCOPE OF WORK

The Consultant shall perform the following Work in connection with the development of a detailed plan (the “Plan”) to significantly expand the research capabilities of the following eight (8) academic institutions (the “Institutions”) of the University:

Group A

The University of Texas at Arlington
The University of Texas at Dallas
The University of Texas at El Paso
The University of Texas at San Antonio

Group B

The University of Texas at Brownsville
The University of Texas – Pan American
The University of Texas of the Permian Basin
The University of Texas at Tyler

In accordance with Section 4.d. of this Agreement, Consultant shall assemble two teams of individuals to perform the Work:

- One team, composed of seven or eight members, shall conduct and supervise the Work at the Group A Institutions.
- A second team, composed of six members, shall conduct and supervise the Work at the Group B Institutions.
- Team members shall include nationally recognized leaders with demonstrated competence, knowledge and experience in developing research capabilities for scientific, technological or higher education enterprises.

Consultant, through its teams, shall:

- Review background information provided by the Institutions as well as information developed independently, and shall request additional information from Institutions as the Work progresses.
- Visit Institutions during September 2003, October 2003, November 2003, December 2003 and January 2004. Analyze and evaluate the information gathered and formulate strategies to significantly expand the Institutions’ research capabilities.
- During January 2004 and February 2004, both teams shall identify their major findings and conclusions, answer questions in this Exhibit, and provide recommended strategies and tactics for using current resources to greater effect and for future development of the Institution, and for significantly expanding the Institutions’ research capabilities, in light of constraints and opportunities described in this Exhibit.

Consultant shall include the following work product in the Plan:

- 1) A set of strategies and tactics for using current resources to greater effect and for future development of each Institution.
- 2) Highly focused solutions to significantly expand the research capabilities of each Institution that are aligned with national and state research priorities.

Consultant shall address the following questions concerning each Institution in the Plan:

- 1) What are the current research strengths of the Institution?

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- 2) What are the possibilities for further expansion of the research profile at the Institution, using its existing strengths?
- 3) What are the next high-opportunity research areas that the Institution could develop? Explicit recommendations concerning numbers of faculty, target departments, and specific disciplines or sub-disciplines shall be addressed.
- 4) What are the additional resources that the Institution needs to pursue its high-opportunity research possibilities? Specifics of support personnel, graduate students, space, and equipment shall be provided.
- 5) In what order should actions be taken to develop research at the Institution? What is the set of priorities, and why are these the priorities? What is a likely time frame for the research enhancement?
- 6) Are there partners (local, state, or national) who could help the Institution increase its research profile?

Consultant shall address the following questions for the group of Institutions as a whole in the Plan:

- 1) To what extent do the strengths of the Institutions overlap?
- 2) Are there obvious opportunities for collaboration among the Institutions that should be pursued?
- 3) Are there shared resources that should be developed for the Institutions?
- 4) What are the high potential possibilities for collaboration with a nearby medical or health science campus?

Consultant shall address the following constraints in the Plan:

- 1) Each Institution's enrollment is expected to grow. Largest growth is anticipated at U.T. Arlington and U.T. San Antonio. With the exception of U.T. Dallas, the Institutions do not currently pursue selective admissions policies. The pressure of enrollment, however, may lead to greater selectivity at all campuses over the next five years.
- 2) The principal basis for state appropriations is formula funding, based on semester credit hours of instruction, with a two-year lag. The formula provides additional funding for graduate and upper-division courses, and the formula also funds engineering and science courses at a higher rate. Because of the lag in formula funding, increased growth will not pay for itself in the short term.
- 3) The State faces a current revenue shortfall of approximately \$9 billion. Part of this shortfall will be met with a budget cut in appropriated funds. Even when the economy improves, it is not realistic to expect substantial increases in state appropriations.
- 4) Although six of the Institutions are entitled to share in the proceeds of the Permanent University Fund ("PUF") endowment, recent losses in the stock market make additional distributions from the PUF unlikely in the short term.
- 5) Current State law does not permit the University to waive tuition for graduate students. Research and teaching assistants who are appointed at least half time have been eligible to pay resident (in-state) tuition, and, were eligible for staff benefits, including health benefits. Recent legislative changes impact this eligibility. Funds available for graduate fellowships are quite modest.

Consultant shall address the following opportunities in the Plan:

- 1) The local communities are very supportive of the Institutions.
- 2) There may be philanthropic support from foundation or individuals for research expansion.

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- 3) The Texas Legislature recently deregulated tuition. Authority for setting tuition, for the first time, will be delegated to the Board of Regents, allowing for a more differentiated tuition structure.
- 4) The state legislature recently approved legislation that will allow the Institutions to retain all of their indirect costs reimbursements. Formerly, these Institutions were permitted to retain only 50% of their indirect costs.
- 5) There is a possibility of some special item funding from the Governor's Office.

In addition to the forgoing questions, constraints and opportunities, the Consultant shall identify and respond to any additional issues relevant to the specific challenges of each Institution.

APPENDIX 2

THE WASHINGTON ADVISORY GROUP TEAM

Erich Bloch is a Washington Advisory Group principal who advises on corporate R&D management and strategic planning for academically based research enterprises and other not-for-profit organizations. He is also serving as a member of the President's Council of Advisors on Science and Technology, and is the Distinguished Fellow at the Council on Competitiveness. As Director of the National Science Foundation from 1984–1990, he oversaw the Foundation's \$3B annual budget. Previously, he was Corporate Vice President for Technical Personnel Development at IBM. He received the National Medal of Technology for developments that "revolutionized the computer industry," and is the recipient of the 2002 Vannevar Bush Award.

Purnell W. Choppin, M.D. is a Washington Advisory Group principal who advises on biomedical research organizations, foundations, and on medical research organizations, life sciences academic research and education programs, foundations, and other philanthropic endeavors. Dr. Choppin is President Emeritus of the Howard Hughes Medical Institute (HHMI), a medical research organization that is among the largest philanthropies in the world. During his tenure as President of HHMI from 1987 through 1999, its programs were greatly expanded and strengthened: the number of HHMI investigators increased from 96 to 330; the number of host institutions from 19 to 71; and a major grants program was established to further science education at all levels and provide support for international biomedical research. Prior to joining HHMI as Vice President and Chief Scientific Officer in 1985, Dr. Choppin was Leon Hess Professor of Virology, Vice President for academic programs, and Dean of graduate studies at The Rockefeller University. Dr. Choppin is a member of many scientific and professional societies, including the National Academy of Sciences, the Institute of Medicine, and the American Philosophical Society (currently vice president).

Edward E. David, Jr., is a Washington Advisory Group principal who advises on R&D strategic planning and management, intellectual property, technology transfer, enhancing corporate research programs, and developing corporate-academic research partnerships. Dr. David was Science Advisor to the President and Director of the White House Office of Science and Technology from 1970–1973. From 1977–1986, he was President of Exxon Research and Engineering Company. Dr. David spent the first two decades of his research career at Bell Telephone Laboratories, latterly as Executive Director. He was also the U.S. Representative to the NATO Science Committee.

John E. Dowling received his A.B. and Ph.D. from Harvard University. He taught in the Biology Department at Harvard from 1961 to 1964, first as an Instructor, then as Assistant Professor. In 1964 he moved to Johns Hopkins University, where he held an appointment as Associate Professor of Ophthalmology and Biophysics. He returned to Harvard as Professor of Biology in 1971 and is presently the Llura and Gordon Gund Professor of Neurosciences and Harvard College Professor. He was Chairman of the Biology Department at Harvard from 1975 to 1978 and served as Associate Dean of the Faculty of Arts and Sciences from 1980 to 1984. He was Master of Leverett House at Harvard from 1981-1998 and currently serves as President of the Corporation of The Marine Biological Laboratory in Woods Hole. Professor Dowling is a Fellow of the American Academy of Arts and Sciences, a member of the National Academy of Sciences and a member of the American Philosophical Society.

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Linda P. B. Katehi joined Purdue University in January 2002 as the John A. Edwardson Dean of Engineering and professor of electrical and computer engineering. Before joining Purdue, Dr. Katehi served on the faculty of the University of Michigan, where she was the associate dean for academic affairs in the College of Engineering and a professor of electrical engineering and computer science. Dr. Katehi holds a master's degree and doctorate in electrical engineering from the University of California at Los Angeles and a bachelor's degree in electrical engineering from the National Technical University of Athens. She has received a number of awards and honors, including the Distinguished Educator Award of the IEEE Microwave Theory and Techniques Society (2002), IEEE's Marconi Prize (2001, Best Paper Award), the Third Millennium Medal of the IEEE Microwave Theory and Techniques Society (2000, Best Paper Award), the 1997 Best Paper Award by the International Microelectronics and Packaging Society; the Microwave Prize of the IEEE Microwave Theory and Techniques Society (1996, Best Paper Award), selection as an IEEE fellow (1995), the Humboldt Research Award (1994), the Presidential Young Investigator Award of the National Science Foundation (1987), and the Schelkunoff Award of the IEEE Antennas and Propagation Society (1985, Best Paper Award).

Micki Leder serves as Chief Operating Officer of The Washington Advisory Group. Drawing on her background as an Associate Dean at the Stanford University School of Medicine, COO and general counsel of a healthcare related REIT, and legal counsel with both government (the National Science Foundation) and private firms, she focuses on projects involving R&D strategy and implementation in both the private and public sectors. Ms. Leder holds a B.A. in Political Economy from The Johns Hopkins University, and a J.D. from the University of Pennsylvania.

Frank Press is a Washington Advisory Group principal who advises on R&D strategic planning; management and research scenarios for new undertakings in industry and academia; and international research opportunities. He was President of the U.S. National Academy of Sciences and Chairman of the National Research Council from 1981–1993; and Science Advisor to the President and Director, Office of Science and Technology Policy from 1977–1980. Previously, he was at the Massachusetts Institute of Technology and the California Institute of Technology. He is a recipient of the U.S. National Medal of Science and the Japan Prize. He has been awarded thirty honorary degrees and holds decorations from the German and French governments.

Roy F. Schwitters is the S.W. Richardson Foundation Regental Professor of Physics and Chair of the Department of Physics at the University of Texas at Austin, where he teaches and conducts research in experimental high energy physics. From its founding in 1989 until canceled by Congress in 1993, he was director of the Superconducting Super Collider (SSC) laboratory in Dallas, TX. Before moving to Texas, he was professor of physics at Harvard University. Dr. Schwitters is a fellow of the American Academy of Arts and Sciences, the American Physical Society and the American Association for the Advancement of Science. He received the 1980 Alan T. Waterman Award of the National Science Foundation, the 1996 Panofsky Prize of the American Physical Society and was awarded a Research Prize by the Alexander von Humboldt Foundation of Germany in 1998.

Marina v.N. Whitman: Dr. Whitman is Professor of Business Administration and Public Policy at the University of Michigan. From 1979 until 1992 she was an officer of the General Motors Corporation, first as Vice President and Chief Economist and later as Vice President and Group Executive for Public Affairs. Prior to her appointment at GM, Professor Whitman was a member of the faculty in the Department of Economics at the University of Pittsburgh. She served as a member of the President's Council of Economic Advisers in 1972-73, while on leave from the University. A director of Procter & Gamble, and Unocal, and recently retired from the boards of

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Alcoa and JPMorganChase, she serves or has served on numerous national boards and committees dealing with economic and governmental issues, as well as on the Boards of Harvard and Princeton Universities. She holds honorary degrees from more than twenty colleges and universities and is a member of a number of honorary associations, including Phi Beta Kappa and the American Academy of Arts and Sciences. She is the author of many articles and several books, most recently *New World, New Rules: The Changing Role of the American Corporation*, published by the Harvard Business School Press in 1999.