

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

The University of Texas at San Antonio

Revised May 7, 2004

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 SAN ANTONIO (UTSA)¹⁴³

The University of Texas at San Antonio (UTSA), established by legislation passed in 1969, is a relatively young public university. It was formed to provide educational opportunities to “nontraditional” college students, particularly the historically underserved Hispanic population of south Texas,¹⁴⁴ and it is the only public four year institution of higher learning in the San Antonio area. Over the years, UTSA has successfully fulfilled its mandate from the state “to serve the needs of the multicultural population of San Antonio, south Texas, and the state, emphasizing programs that contribute to the technological, economic, and cultural development of the city, region, and state.”¹⁴⁵ The student population has grown from roughly 17,000 students in 1993¹⁴⁶ to almost 25,000 students today,¹⁴⁷ and we were told that it expects to grow to as many as 30,000 or more over the next five years.

UTSA aspires to extend its role significantly by increasing its ability to conduct research and provide graduate education and, in this manner, enter the ranks of nationally recognized research universities. UTSA serves an important, dynamic and growing community in the San Antonio area and across south Texas. It is certainly correct for the University to make bold plans for its future that can be of particular benefit to the region and its large and diverse population. Given the great changes in the regional economy and society, UTSA is well positioned for major new roles.

University Leadership

UTSA’s current President arrived on campus in May, 1999. President Romo is a credentialed academic scholar, a historian who was trained and taught at highly rated universities. He is a charismatic figure, and is thought of highly throughout the state for his intellectual attainments, the force and gravitas of the image he projects, and the vision he presents for the future of UTSA. President Romo is committed to moving this institution to a higher level of recognition for its educational and, particularly, its research programs.

President Romo’s first significant move to advance his plans was to revamp the University’s outdated organizational structure. Prior to the reorganization, UTSA was comprised of four colleges, each of which had divisions, rather than departments, and in several cases those divisions covered far too much territory.¹⁴⁸ The University now has seven colleges, each of which has a new dean and a mostly departmental structure. We were told that the restructuring greatly improved morale at UTSA and led to new research initiatives.

With the restructuring accomplished, UTSA now is focusing on building its stature as a research university. The President has assembled a team of decision-making administrators who are all committed to this goal. However, none have scientific or engineering backgrounds. Both aspiring and nationally recognized research universities have in common programs to build or

¹⁴³ 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.

¹⁴⁴ *UTSA Agency Strategic Plan for the 2001-2005 Period*, The University of Texas at San Antonio, June 200, page 7.

¹⁴⁵ <http://www.utsystem.edu/news/CampusDescriptions/UTSA.htm>.

¹⁴⁶ NSF WebCASPAR Database System, op. cit.

¹⁴⁷ Information provided to WAG by UTSA.

¹⁴⁸ For example geologists, physicists, and chemists were lumped into a single division, as were civil, electrical and mechanical engineering.

maintain excellence in their science and engineering programs. They are continually on the lookout for new, research proven faculty members to expand their research capacity, enter new fields, and replace retirees. To hire well requires knowledge of the current research scene in a variety of frontier fields, the ability to locate and discriminate between followers and innovators, and an understanding of the culture of funding agencies. To create an environment that promotes cutting edge research requires knowledge of the facilities and equipment that such research requires. All of this knowledge is best developed through years of personal research experience. We believe that, if the University is to make significant strides in science and engineering research, it is important to include at least one individual with a background in science or engineering research among the University's most senior administrators.

Research at UTSA

The University's total research and development expenditures in fiscal year 2001 were a modest \$11.3 million.¹⁴⁹ Of that total, roughly \$8 million came from federal sources,¹⁵⁰ \$3 million from state and local government, and the remainder from industry and the university itself.¹⁵¹ UTSA ranked 247th nationally in total research and development expenditures in 2001 (177th among public universities) and 235th in federal R&D expenditures (168th among public universities).¹⁵² The universities UTSA identifies as its peers – Georgia State, University of Alabama (Birmingham), University of Central Florida, University of Nevada, Las Vegas, University of North Texas, University of New Orleans and San Francisco State University – rank 117th, 28th, 82nd, 136th, 201st, 140th, and 218th, respectively, in total expenditures among public universities, and 137th, 15th, 113th, 129th, 218th, 163rd, and 194th, respectively, in federal expenditures among public universities.¹⁵³

In order to reach a level of research comparable to its aspirational peers, UTSA will have to increase significantly the amount of sponsored research conducted by its faculty. To achieve \$100 million in annual research expenditures, it will have to do even better. To do this in less than a decade is likely to be difficult, and will require that the University recruit a large number of research qualified faculty members and provide them, as well as current faculty members, with sufficient time to develop research programs and the requisite infrastructure. Competition for new research faculty will be fierce, and President Romo clearly understands that achieving national stature as a research university will depend entirely on the University's success in recruiting these individuals.

UTSA's administration is looking toward some aspects of biology/health sciences, national security technology, and environmental science and engineering as areas of intellectual challenge and potential sources of research support, believing these provide it with the best opportunities for achieving excellence in the near term. Each field presents broad research opportunities for faculty from all departments in the Colleges of Sciences and Engineering and also in the College of Liberal and Fine Arts, and for each there is an opportunity to link with a successful institution or company in the corresponding field and/or a growing federal grants program.

¹⁴⁹ NSF WebCASPAR Database System, op. cit.

¹⁵⁰ Federal allocations are a key marker used by rating organizations because such allocations are tend to be based on the quality of the proposals submitted.

¹⁵¹ NSF WebCASPAR Database System, op.cit.

¹⁵² *TheCenter* at the University of Florida data on American research universities, op. cit.

¹⁵³ Id.

As we understand UTSA's plans, academic disciplines that bear most directly on these areas of greatest interest, particularly biological and closely related sciences such as chemistry and biomedical engineering, are being emphasized for faculty recruiting and new Ph.D. programs. Given funding constraints and competing demands for resources and attention, it is appropriate for UTSA to focus on certain areas of science and engineering, at least initially. However, UTSA should not neglect the basic fields of science and engineering. As mentioned earlier in this report, the very focused approach taken by some universities to improve their research income and rankings has been described as "pumping money into marquee programs [that] could drain money from other departments leaving steeples of excellence surrounded by tenements of mediocrity."¹⁵⁴ UTSA should avoid such extreme approaches for a number of reasons, including the following:

- UTSA's desire to provide an underrepresented community with access to all of the science and engineering fields.
- UTSA's existing resources – the University already has departments of varying quality in the basic sciences and engineering.
- The desires and aspirations of the San Antonio community – San Antonio wants a recognized, broadly based, research university in its community.
- It would be unwise to tie the future of the University too narrowly to today's most attractive (and trendy) potential sources of research funds. Those research areas may turn out to be of short term interest to government funding agencies.

Every science and engineering department has something to offer in the niche areas identified by UTSA for near term priority, but only if they are kept viable. For example, some aspect of materials science, which is involved in all the high priority research areas, is typically covered in each of the basic science and engineering departments of research universities. Computer modeling of relevant physical and biological phenomena and processes likewise is now important to nearly all the sciences. Imaging systems and sensor arrays, which are key technologies in all three high priority areas, draw on experts from physics, chemistry, mathematics, computer science and engineering in addition to the scientists using such systems to advance their particular research areas. It is true that in some situations the traditional departmental structure can impede the development of leading edge interdisciplinary fields.¹⁵⁵ However, high ranking research universities have both flexible and strong departments and engage in developing research fields through new departments, centers and programs, with mutual benefits to both the traditional disciplinary departments and the new interdisciplinary programs.

As mentioned above, UTSA's student population is growing at a staggering pace –the student population has grown from roughly 18,000 in 1998¹⁵⁶ to nearly 25,000 today.¹⁵⁷ Over the next five years, enrollment is expected to increase by another 5,000 – 6,000 students.¹⁵⁸ UTSA's faculty can barely keep up with the teaching loads associated with this enrollment growth. Current teaching loads for too many are so high that they do not provide potentially research active faculty members with a realistic opportunity to carry out competitive research. And while

¹⁵⁴ M. Arnone, "The Wannabes," *The Chronicle of Higher Education*, January 3, 2003. Also see I. Feller, I., *Strategic Options to Enhance the Research Competitiveness of EPSCoR Universities*, <http://www.aaas.org/spp/rcp/epscor/Feller.html>.

¹⁵⁵ See, for example, Leshner, A.I., "Science at the Leading Edge," *Science*, February 6, 2004, p. 729.

¹⁵⁶ NSF WebCASPAR Database System, op.cit.

¹⁵⁷ Information provided to WAG by UTSA.

¹⁵⁸ Id.

instructors and adjunct faculty have an important role to play in teaching service and elementary courses, as UTSA grows to be a “full service” research university, the sophistication of many of its new course offerings likely will require that they be taught by tenure and tenure track faculty or adjuncts that are recognized experts in a particular area.

UTSA estimates that its faculty will grow by roughly 350 new slots over the next 6 years, and that approximately 200 of those will be allocated to science and engineering.¹⁵⁹ We note, however, that in the smaller science and engineering departments we studied (and even some of the larger ones), we believe the growth in tenure and tenure track faculty may have to double in order to reduce teaching loads to the point that faculty members have a chance of competing in research. For example, an additional 20 to 25 positions may be required to bring along the smaller departments of Earth and Environmental Science, Applied Mathematics, and Physics if a “two class” College of Sciences is to be avoided.

The University intends to offer competitive recruiting packages and to train its search committees to cast a wide net to find the best people. It is prepared to offer salaries as high as \$80,000 to \$100,000 for outstanding assistant professors in science and engineering fields with correspondingly competitive salaries for more senior professors.¹⁶⁰ To jumpstart the recruitment process, President Romo has identified an overlooked endowment fund that will enable him to create ten new \$1 million endowed chairs, a number of which will be used for candidates in biological and other science and engineering fields selected to build on local strength at linking institutions.

While the University stands ready to devote significant resources to faculty recruiting, recruiting the number of individuals that are contemplated will require a monumental effort on the part of faculty and staff who will be diverted from other important tasks. We do not believe UTSA can recruit as many individuals as quickly as it intends without compromising quality. Moreover, it is not clear where UTSA will put those individuals once they are recruited. UTSA’s capital plan calls for the completion of new teaching and research facilities in 2004, 2005, 2007 and 2009, but it was not clear to us that these new facilities are staged in a way that will accommodate the anticipated arrival of new faculty members. Also, the capital plan, which assumes an average lab size of 1,200 square feet, does not seem to take into account the fact that “one size does not fit all” and that different disciplines generally require different labs in terms of size and infrastructure. For example, theoretical researchers increasingly need access to high performance computing resources, and an organic chemist needs more laboratory space than a computational physicist. Plans for new research facilities and equipment should be made in close consultation with affected departments. Because these resource needs are best understood and planned by active researchers, such individuals must be included in the planning and decision making process.

The Lombardi Program at the University of Florida, which ranks American research universities based on several measures, has concluded that “money matters” in achieving high performance.¹⁶¹ UTSA will need resources at a time of fiscal stringency to improve its performance, and it has identified the following sources:

¹⁵⁹ Id.

¹⁶⁰ We note that salaries of \$80-100,000 for entry level assistant professors will create a salary gap of between \$20,000-\$30,000 when compared to current faculty at higher ranks. This could create some tensions.

¹⁶¹ *The Top American Research Universities, (TheCenter, 2002)* by J. V. Lombardi, et. al., August 2002, p. 19.

1. *Rapid enrollment growth.* UTSA is one of the fastest growing campuses in Texas. The University expects enrollment to grow from nearly 25,000 students today to over 30,000 in 2008. Graduate student enrollments have grown at twice the rate of undergraduate enrollments. This enrollment growth is supposed to provide the financial energy to transform UTSA, since Texas's system of higher education links student enrollment and credit hours to funds received from the state. Unfortunately, however, substantial increases in state funding cannot be counted on.

UTSA's leadership expects student generated resources (including possible tuition increases) to underwrite in significant measure an increase in the number of tenure track and tenured faculty who are research qualified, and to build the requisite classrooms, laboratories, and other infrastructure. It is thought that these new resources will provide for enough new faculty members to teach the larger student body and to conduct research, thereby enhancing UTSA's stature in both education and research. We are concerned that income from enrollment growth cannot be counted on to keep up with the facilities growth that will be needed to accommodate both the additional students and the ambitious research expansion.

2. *Linkages and partnerships.* UTSA wisely plans to begin expansion of its research programs in fields that provide opportunities to collaborate with leading research centers in San Antonio, or build on research being done at those institutions. It expects that its growing commitment to basic research will be facilitated by building partnerships and linkages to the several strong research institutions located in the community. These include: The UT Health Science Center – a well ranked center of research and education in the biomedical sciences; the Southwest Research Institute, a successful private, non-profit company that conducts scientific and engineering research for industry and government; and several DOD research centers.

These external institutions are rich in M.D. and Ph.D. level scientists engaged in basic and applied research in many important fields of science and engineering. For example, the UT Health Science Center is active in neurosciences, and this is an area that UTSA focuses on as well. The Southwest Research Institute is particularly strong in materials engineering, lubrication development and analysis, signal processing, and other leading edge technologies. Some of the military bases emphasize research in computer security and intrusion detection. All of these institutions could be sources of advice in recruiting; might provide support and access to facilities for newly recruited UTSA faculty; and might be sources of part time faculty for graduate courses or share in the training of graduate students. In exchange, UTSA could collaborate on joint proposals to NSF, NIH, and DOD and provide access to special funding programs for historically underrepresented minorities, appoint joint professors, provide access to graduate students engaged in research, and provide access to growing programs of research in scientific and engineering fields of interest to the potential partnering institutions.

3. *Philanthropy.* Because of the severe fiscal constraints faced by the state and federal governments, philanthropy will become particularly important in maintaining, let alone building, research universities over the next few years. Several universities and medical centers in Texas that have achieved national recognition were aided to a significant degree by large philanthropic contributions. UT Austin and UTSWMC, for example, have succeeded in finding affluent supporters in their local communities

and elsewhere. This has not been the case for UTSA, and the University will find it difficult, though not impossible, to find donors capable of funding chairs, buildings, fellowships and scholarships. San Antonio has a modest development program that needs to be strengthened considerably in order to reduce its near total dependence on student tuition and state support.

4. *Industrial Support.* At our request, community leaders were invited to meet with us. We found them to be successful founders or managers of small businesses or foundations, loyal to the university and supportive of its aspirations. We came away with the impression that President Romo enjoys their strong support, although none of the individuals seemed suitable to provide financial support on a par with the very large donors to UT Austin or the UT Southwestern Medical Center at Dallas. Nevertheless, industry could be a source of equipment grants, fellowships, and possibly endowed chairs.
5. *Federal research grants.* Eventually, as new faculty recruits come on board, federal grants should grow to be the major source of research support at UTSA, as they are at most nationally recognized research universities. We are concerned, however, that UTSA's expectations are unrealistic. During our meeting with the University Affairs Committee, we learned that UTSA's leadership is assuming a higher average research grant per new faculty member (\$500,000 per year) than we believe is reasonable, particularly in today's more difficult fiscal environment and in light of the fact that many of the new faculty members to be recruited will be junior and, although research qualified, may be untried in securing competitive grants of that magnitude.

As discussed above, it is extremely difficult to implement an integrated, large scale faculty recruiting and facilities growth plan of the type contemplated by UTSA. UTSA's plans rely on a number of assumptions, including: that it will be able to recruit very large numbers of outstanding researchers expeditiously; that those researchers will be able to secure, on average \$500,000 per year in sponsored research (more than double the national average of \$230,000 for academic researchers with some federal funding); that the number of new faculty positions will be sufficient to keep up with enrollment growth and at the same time increase sponsored research by a factor of nine; that UTSA's rapid growth will result in stable compensatory growth in formula derived income from the state; and that new facilities can be funded and constructed in time to match the arrival of new students and faculty. For reasons already mentioned, we believe these assumptions are unrealistic in certain respects.

UTSA should not give up its goal of becoming the home of a respected research university, but it should scale back its plans to achieve to top tier status by 2010. In this decade, UTSA might dedicate itself to building national research eminence in several niche areas of biological and health sciences, technology for national security, and possibly other fields (which might best be identified through a strategic planning process led by the Deans of the Colleges of Sciences and Engineering and involving science and engineering faculty). For the University to qualify as a Carnegie Research Extensive University by the end of this decade will be difficult. It would have to award 50 or more doctoral degrees per year across at least 15 disciplines. UTSA plans to have 15 doctoral programs in place by 2008 (it has 8 now) and the requisite 50 graduates by 2010.¹⁶² With this task accomplished, UTSA could then dedicate itself to becoming a more broadly based, Tier 1 research university.

¹⁶² *Action Plan for UTSA* revised 6/11/03, p.1.

UTSA's Academic Units

COLLEGE OF SCIENCES

The College of Sciences is important in the initial growth plans of UTSA. According to a publication issued by the College in Spring 2003, it currently is responsible for 75% of the sponsored research funds expended by the University. The College consists of the Departments of Chemistry, Computer Science, Applied Mathematics, Biology, Earth and Environmental Sciences, and Physics, as well as the Office of Instructional Mathematics and Science and Mathematics Education. Except for Biology and Computer Science, no department has an approved Ph.D. program of its own; all but Physics and Astronomy have masters programs and the Department of Earth and Environmental Science shares a Ph.D. program with the College of Engineering. Recognizing that Ph.D programs are essential to research departments and successful competition for federal grants, all of the departments seek Ph.D. programs. Their proposals are at different stages of internal and external review and their approval is of critical importance.

We met with faculty groups and departmental chairs from the School and generally found them to be dedicated, well prepared in their respective disciplines, and interested in research. They were aware and supportive of UTSA's goals to grow into a significant research university, but, for the most part, did not seem to be engaged in strategic planning or other activities directed toward the administration's growth plans.

The recent history of organizational and leadership changes at UTSA seems to have raised the hopes of many faculty members that the institution will improve, particularly individuals who have been at UTSA for longer periods of time. By all accounts, most of the changes, especially the move from a divisional structure to a departmental one, were long overdue and represent improvements. But some faculty members voiced concern that 'legacy' faculty members could hinder recruiting new research oriented faculty, at least until the new organizational structures and leaders prove themselves. We note that an interim Dean was recently appointed to the College of Sciences. As the University attempts to enhance significantly the quantity and quality of its scientific research, it will be critical to recruit a permanent Dean for the College.

Teaching loads for tenure and tenure-track faculty in the College of Sciences are high by the standards of successful research universities, particularly in departments outside of the areas that the University has chosen for immediate focus. The departments that have been given higher priority, for example, Biology and Chemistry, have lighter teaching loads. Outside of these departments, we found the typical load to vary from two to three organized courses per semester. At other research universities, teaching loads vary as well, but one or at most two courses per semester are the norm for those engaged in research. UTSA's heavy teaching loads all but preclude serious research programs in some departments, and are demoralizing to the faculty, ultimately redounding negatively on the administration's goals. The growing linkages between the biological sciences, physical sciences, and engineering that are occurring nationally, will be diminished at UTSA by this selective treatment and will hurt recruitment in all fields. It is especially important for young researchers to have sufficient protected time to attain early research prominence if they are to be able to secure continued funding through peer reviewed sources and to attract and advise graduate students.

Some of those with whom we met described a management tool related to the notion of a faculty member being "in deficit" with regard to teaching that we believe is counterproductive. As we understand it, a kind of net worth is computed for each faculty member based on the formula funding for each class taught and the number of students registered. The professor's salary is then deducted from the total "income" to the university derived from his or her specific courses. In cases where a faculty member does not "break even" (i.e., where the computed income is less than the salary), the faculty member is declared to be in deficit and must take action to rectify the deficit. This bean counting diminishes an institution aspiring to research university status. As a practical matter, it can only increase the difficulty of attracting and retaining research qualified faculty to the extent this practice is employed at UTSA. We strongly recommend that it be reconsidered. Top ranked universities in Texas subject to the same legislative prescriptions as UTSA have found ways to accommodate these regulations that are less detrimental to morale.

The science (and engineering) faculty view securing adequate research space as vital to the future of education and research at UTSA. The need for more space is driven by growing student enrollment in science, engineering, and health related fields and by San Antonio's ambition to join other major cities as the home of a nationally recognized research university. As mentioned earlier, UTSA's aggressive building plan, intended to keep pace with planned faculty and student growth, may be unrealistic in light of the University's ambitious hiring plans – new buildings might not be staged to coincide sufficiently with recruiting plans. For example, we were told of a young, newly recruited, research oriented faculty member who has waited months for her space to become available, and whose newly purchased equipment still sits in its original crates. In addition, certain assumptions underlying the plan regarding the amount of space that will be required are questionable. The plan assumes 1,200 sq ft per faculty recruit in science and engineering, but we were told that a recent recruit required (and was promised) four times that amount of space. These and similar issues led us, and faculty members in several science departments, to conclude that an individual with experience in building university research capacity and the infrastructure should be included in planning and decision making on these types of issues.

Department of Applied Mathematics

This Department has 11 tenure and tenure track faculty members,¹⁶³ and has no Ph.D. program. In fact, the Coordinating Board rejected its application for planning authority for this program last month, a decision that will impede the Department's research and education efforts. The Department has 220 undergraduate majors and graduate students, a number that would be respectable in many research universities. Unfortunately, the faculty teaching load is one of the heaviest we heard of – three courses per semester – leaving little time for research. Moreover, the break-even analysis described earlier has left faculty members in this Department in a state of distress, since they have been found to be "in deficit." We understand that other departments use adjunct faculty to generate revenue that allows a reduced teaching load for tenure track faculty, but this Department is unable to use this tool because of a University decision to put all math instructors – adjunct faculty – into the Office of Instructional Mathematics. Faculty specializing in science and mathematics education are housed in a separate department in the College of Sciences, and statistics faculty are housed in the College of Business. The dispersed nature of mathematics at UTSA seems to have created confusion over the respective roles and responsibilities of the faculty members in these departments.

¹⁶³ Information provided to WAG by UTSA.

Despite heavy teaching loads, the individuals with whom we spoke seemed eager to conduct research and publish results, and their publication list is impressive. Two of the Department's four recent hires have received research grants in a field that is highly competitive for research funding. One of those published six papers this past year alone. Some of the faculty members felt that people making fundamental research contributions are not well treated and as a result, these individuals might leave the University. This would be an unhappy consequence of current policies – a competent mathematics teaching and research department (which this department could become with more felicitous treatment) is an important component of almost all research universities, and the importance of applied mathematics as a growth area should not be underestimated in view of the contributions this field makes in areas such as bioinformatics, computational chemistry, physics, mechanical engineering and other the subjects. It has similar potential in medical imaging, structural biology, engineering, economics, computer science and computer engineering, and computational mathematics.

Department of Biology

The Department of Biology is the largest in the College of Sciences with 29 tenure and tenure track faculty members,¹⁶⁴ approximately 2,200 undergraduate majors, and 160 graduate students, including 120 MA students and 40 Ph.D. students. At present, the Department has the largest Ph.D. program on campus and the only one in the College of Sciences. This program's emphasis is on neurobiology, and another program in cell and molecular biology, including microbiology, are expected to be approved this year. Although the Department has some good graduate students, we were told that their overall quality is not high, due in part to noncompetitive stipends and inefficient recruiting policies.

Faculty members generally were enthusiastic and pleased with the direction of the University and its future prospects, and with their own Department which has the critical mass that allows it to make excellent new hires. The Department was described by some as a "favored child" and its members do have lighter teaching loads than faculty members in other departments. Those with external support usually teach one course per semester (1+1), and others teach 1+2. New recruits may be exempt from teaching the first year. The Department employs adjuncts as well as non-tenure faculty who do not do research but teach 3+3 or sometimes even 4 courses per semester.

Of the 29 faculty members in this Department, 15 were described as "grants capable," but only 9 or 10 have external grant support at this time. Clearly this situation must improve if the Department and the University are to move up to a new level of research prominence. The Department recently recruited an immunologist from the University of Texas Health Science Center at San Antonio (UTHSCSA), and it is in the final stage of hiring a senior microbiologist who is said to have three current NIH grants and several post-docs. This individual is being offered 4,800 sq. ft. of lab space and \$700,000 in start-up funds, which illustrates the problem in assuming that 1,200 sq. ft. of space will be adequate over the long run. Four additional searches are underway now, with start-up packages of \$350,000 at the assistant professor level and \$500,000 at the full professor level. This will probably be adequate for some, but not all, recruits.

The Department intends to focus its recruiting in its areas of strength. The strongest group is in neuroscience with an emphasis on vision, cognitive, developmental, and channel biophysics. The other areas are cell and molecular biology with emphasis on transcription, microbial pathogenesis, and bioinformatics and genomics. These are reasonable areas to build

¹⁶⁴ Id.

upon, but it would be advisable for the Department to develop a cogent, written plan of action for its future.

The Biology faculty feels space is adequate now and more will be available in the new building, but that there may be a crunch soon. With 25 new hires projected over the next 5 years, they believe they will run out of space in approximately 2 years. Animal space is said to be deficient. There are 7000 sq.ft. available for mice and rats, and they use the UTHSCSA facility for rabbits. They share a veterinarian with UTHSCSA.

Faculty members in this Department recently formed the Cajal Neuroscience Institute and 7 or 8 individuals are associated with it. It is anticipated that some salary funds will flow through this Institute and that the Institute will submit grants and receive indirect cost recoveries. In addition to fostering collaboration across the campus and hopefully with UTHSCSA, one of the goals of the Institute is to “present a good face” to the outside world. The faculty associated with this Center are among the best at UTSA, but since the Institute has been in operation only a few months, its impact is not yet clear. It is apparent that neuroscience, microbiology and immunology, and bioengineering, are opportunity areas where UTSA has the greatest possibility of succeeding.

Department of Chemistry

In contrast to some of the other departments, the Department of Chemistry is treated well and this shows in its faculty’s enthusiastic view of the future. The Department has 11 tenure and tenure track faculty members,¹⁶⁵ 8 of whom were hired since 1994, and 7 adjunct faculty members.¹⁶⁶ Three assistant professors were hired last year, and the Department currently is recruiting a senior researcher. All faculty members have research interests that include the study of biological systems, and UTSA’s administration wisely recognizes that chemistry is a growth area because of its intimate connection to almost every field in the biological sciences. The Department does not have a Ph.D. program at this time, a situation that has slowed its ability to improve. However, the Coordinating Board granted planning authority for this program last month and we hope the Ph.D. program ultimately will be approved.

We were told that the Department’s externally funded research exceeded \$1 million in FY 2003, or about \$100,000 per faculty member. The typical teaching load for faculty members in this Department is 1+2, or 3 organized courses over the full, two-semester academic year. While there are complicated logistics involving renovating and equipping labs, the Department expects to be able to count on 15 new laboratories as it grows over the next few years. However, it is not likely that they will be available in time for the new searches that currently are underway, and faculty members expressed some concern that the University’s building plans underestimate the needs for laboratory space in the experimental sciences.

The Department of Chemistry has developed a detailed hiring plan for the next four years that calls for two new tenure and tenure track faculty recruits per year until the Department reaches a level of 16 or 17 faculty members. The Department expects to reduce its number of adjunct faculty by one FTE for every 2 or 3 new researchers over the same period of time.¹⁶⁷ This

¹⁶⁵ Id.

¹⁶⁶ Id.

¹⁶⁷ We were told that the American Chemical Society is unhappy that too many adjunct faculty are teaching undergraduates. This opinion could threaten UTSA’s reputation and, perhaps, accreditation.

growth in the tenure and tenure track faculty will permit a continued teaching load of 2 or 3 courses per year per faculty member.

If the Department's doctoral program is approved, its space needs are met, and new, research active faculty members are recruited, it has the foundation to grow into a creditable research department. The Department has a base of researchers in organic/inorganic chemistry, biochemistry, polymers, and analytical and physical chemistry. They are active in exploring initiatives to participate in the biosensor effort in collaboration with Brooks City Base. These are appropriate areas of expertise for Chemistry to allow it to contribute to identified high priority research topics. New hires are projected in computational chemistry and the "base" areas of chemistry and biochemistry. These strike us as sensible areas that should provide good matches to the overall research opportunities and goals of the University.

Department of Earth and Environmental Science

The Department of Earth and Environmental Science has 12 tenure and tenure track faculty members¹⁶⁸ and a search underway for an additional slot. We were told that every faculty member has grant support, with total sponsored program awards of over \$400,000 in FY03.¹⁶⁹ This is a modest amount, and it is not clear how much the Department can increase its sponsored research volume given the small number of new hires it has been allotted. The Department's entry into research on the environmental aspects of Earth Sciences is laudable since this field is experiencing rapid growth in external research support and in student interest in research universities across the country. We note that this Department, like others at the University, is experiencing severe laboratory space problems, which in one case resulted in equipment for a recent recruit being held unused in a warehouse awaiting the availability of promised space.

Almost every earth science department in the country and every new earth science textbook emphasizes environmental geology, recognizing that environmental teaching and research are important growth areas.¹⁷⁰ As a result, for the first time in years, universities are giving these departments priority in receiving support, and we believe UTSA should do so as well. We estimate that UTSA's Department is about 5 positions short of critical mass. Forefront fields that present particular opportunities at UTSA are geobiology, environmental geochemistry, and hydrogeology.

The Department does not have its own Ph.D. program, but collaborates with the College of Engineering in the Civil Engineering Department's Ph.D. program in Environmental Science and Engineering. Currently, there are 16 Ph.D. students in this program.

Department of Physics and Astronomy

The Department of Physics and Astronomy has 6 tenure and tenure track faculty members¹⁷¹ and 6 adjunct faculty, not all of whom have Ph.D. degrees. The Department's sub-critical size does not allow it to function as a research department. The faculty members with whom we spoke pointed out that San Antonio is the only major city in the country that does not offer graduate courses in physics, and they still recoil from a statement of a former dean to the

¹⁶⁸ Information provided to WAG by UTSA.

¹⁶⁹ Id.

¹⁷⁰ For example, see F. Press, et. al., *Understanding Earth, 4th Ed.*, W.H. Freeman, New York, 2003.

¹⁷¹ Information provided to WAG by UTSA. In contrast, UT Austin's Department of Physics has 55 faculty members.

effect that Hispanics cannot do physics. The Department has proposed a Ph.D. program, but the status of its proposal is unclear.

Teaching loads average 3 courses per semester, and we were told that the Department has the highest ratio of semester-credit-hours per faculty member in the College of Sciences. (They teach a calculus based physics course to 1,000 students and earn more in contact hours than is paid out to them). The Department has one funded grant in laser physics and believes that a recently submitted proposal was not funded because of the heavy faculty teaching load.

Faculty members believe they have been excluded from University plans for new space, and told us that in an allocation by UTSA's administration for new equipment, the department received 1/20th the amount awarded to chemistry. The College's interim Dean recognizes the problem but does not think that resources are available for physics in the administration's current planning.

Considering the small size of the Department, faculty members represent a reasonably broad spectrum of backgrounds in theoretical and experimental physics, but all are directing their research interests toward areas of biophysics. The reasons for this focus in bio-related areas includes general excitement in these areas of science and the priority afforded to biology by the University's administration, both of which are related to the perception that biomedical research offers the best opportunities for near term growth and support. This raises a question of whether faculty are merely chasing money and working in fields selected by administrators rather than in fields that attract the individual or are in the forefront of physics research today. It does have collaborative programs with the Southwest Research Institute, providing another example of how important such linkages will be to strengthening research at UTSA.

Very few, if any, established research universities lack a viable physics department, and we would advise the University to build the required critical mass with roughly 6 additional research qualified faculty members as an investment towards the goal of building a nationally respected university. It is disappointing that UTSA's administration does not appear to recognize the importance of physics as an intrinsically basic science and as an important contributor to almost every field of science and engineering. Funding for physics is likely to grow along with funding for other physical sciences as Congress, the NSF and NIH, and the President's Science Adviser follow through on their public statements that the imbalance in federal budgeting favoring the biological fields over the physical sciences needs to be corrected in the years ahead.

Department of Computer Science

The Department of Computer Science has 17 tenure and tenure track faculty,¹⁷² 800 undergraduate majors, 80 Masters students, and 25 Ph.D. students.¹⁷³ During the course of our discussions, faculty members expressed some confusion over the goals and objectives of the University's strategic plan, and indicated they were not consulted in the development of the plan. They also were not aware of the administration's plans to hire new faculty members. For these reasons, and because the University budget process was not well understood, the faculty members with whom we spoke felt that their ability to develop a strategic and financial plan was limited, and that they were competing for resources with the Department of Electrical Engineering in the College of Engineering. A well functioning department of computer science is too important to the goals of the University to allow this state of confusion and lack of direction to continue.

¹⁷² Id.

¹⁷³ Id.

Student interest in the field of computer science is clear – enrollment has doubled over the past 6 years, and the Department’s 17 faculty members minister to over 900 students, with a student to faculty ratio of 47:1. This is too high a ratio to provide high quality undergraduate education. Faculty members expressed an interest in the joint development of a computer engineering program with the Department of Electrical Engineering. A third department, Applied Mathematics, also could play a role in the development of a computer engineering degree program.

The Computer Science Department is not one of the top departments at UTSA. Its research activity is relatively small. However, with appropriate investment in faculty, it has the potential to become more active in research in information, technology, security, networking, etc. Computer science is a field with student interest, available federal funding, and multiple opportunities for research and education. Unfortunately, the present state of the Department denies it the ability to vigorously pursue them.

We believe the capabilities of this Department, as well as of Electrical Engineering and Applied Math, should be harnessed better than they now are. While a merger might be difficult to achieve, and even counterproductive, a virtual faculty of computational science and engineering that share a common educational track and joint research might be helpful at UTSA, as it has been at other institutions.

Recommendations for the College of Sciences

Our general recommendations for the College of Sciences are as follows:

1. While we recognize that the approval of doctoral programs is not totally within the control of the University, we recommend that UTSA pursue approval of doctoral programs in the basic fields of physics, chemistry, earth and environmental sciences, and applied mathematics, and not in restricted, narrow specialties. Departments without such programs are impeded in the competition for federal research grants, and a lack of such programs ultimately hinders the University's progress towards national research status.
2. The Applied Mathematics Department is research capable but thwarted by heavy 3+3 teaching loads. Also, it is demoralized by having been found "in deficit" with respect to teaching. This situation, together with the dispersed nature of mathematics at UTSA should be corrected.
3. The Department of Biology’s 27 tenure and tenure track faculty members cannot deal with the teaching load associated with 2,200 undergraduates and 160 graduate students, and at the same time increase research efforts and achieving critical mass in its areas of research strength. Many more faculty members are needed. The 25 new hires projected for the next 5 years should, if possible, be research active individuals, and additional laboratory space will be needed after the first 10 hires.
4. The Department of Physics should be authorized to hire six or so research qualified new faculty members and should be provided with facilities support that it needs to grow to critical size.

5. The Department of Computer Science is not a strong one. Because the field is so important, this situation must be addressed by hiring additional research qualified faculty members and by examining the possibility of a computational science and engineering degree program that could be developed in coordination with the Departments of Electrical Engineering and Applied Mathematics.

COLLEGE OF ENGINEERING

The College of Engineering was created in the fall of 2000, when the University was restructured into seven colleges. Prior to the reorganization, engineering was a division within the College of Science and Engineering. Currently, the College's enrollment is 1,650 students, including 1,450 undergraduate and 200 graduate students. Engineering has 49 tenure and tenure-track faculty members distributed in four programs: Civil Engineering, Electrical Engineering, Mechanical Engineering, and Biomedical Engineering (inaugurated as a Ph.D. program in Fall 2003), with an undergraduate student-to-faculty ratio of 29:1, as compared to 18-25:1 in the top 50 institutions.¹⁷⁴ We were told that roughly 50 of the new faculty positions that will be created over the next 5 years will be in the College of Engineering.

The Dean expects the College's enrollment to grow by about 1,000 to 1,200 over the next 5 years. While this would result in a significant increase in the size of its student body, the percentage of UTSA's students going in to Engineering would remain relatively low. San Antonio and Texas will need well trained engineers as its economy and demographics change in the years ahead, and UTSA should think about whether it could or should be more ambitious in its undergraduate engineering recruitment plans for this College, especially for underrepresented minorities. To arrive at a firm conclusion on this question, one could survey business, high schools and community colleges, as well as the population and regional government agencies to obtain a more quantitative picture of what can be expected over the next decade.

The transformation of UTSA from a teaching to a research university is causing some discomfort in the College of Engineering. Faculty members exhibited a high degree of both excitement and nervousness related to the strategic goals of the University. The excitement derived from the eagerness of the faculty to be members of a high quality research university. The nervousness was caused by the perception that the University's goals and strategies may be unrealistic. For example, in order to become a credible research university, UTSA must reduce the teaching loads of its research qualified faculty. One way of doing this is to bring on more adjunct faculty members to shoulder some of the teaching load. However, there is no plan to add adjuncts at this time and, in fact, there is some pressure to reduce their numbers across the University. We were also told that UTSA plans to hire 50 new faculty members in the College of Engineering over the next 5 years, and such hires could ease teaching loads. However, while UTSA is able to offer competitive salaries, it is not at all clear that resources for start up packages are available and there does not appear to be sufficient research space to house these individuals at this time.¹⁷⁵ And given heavy teaching loads and other demands on faculty time, we believe the administration may have seriously underestimated the ability of faculty to staff the number of search committees that will be required to hire so many new individuals.

¹⁷⁴ Information from data distributed to Big10+ deans.

¹⁷⁵ The 225,000 square feet of new space planned for science and engineering faculty will not be sufficient, considering the numbers of new faculty members that will be recruited in those colleges.

Department of Electrical Engineering

The Department of Electrical Engineering has 14 tenure and tenure-track faculty,¹⁷⁶ and 4 adjunct faculty. It has 530 undergraduate majors, 100 Master's students, and 22 Ph.D. candidates, resulting in a student to faculty ratio of 38:1 (not counting adjunct faculty). As a result of this high ratio, the number of contact faculty hours per student is low, compromising the quality of education. At the same time, the teaching load for faculty members is high, with most teaching 3 courses a semester. This makes it nearly impossible to conduct research, and a lack of resources exacerbates this problem. Moreover, we were told that salary release funds generated by research done by faculty in this Department do not stay in the Department. Rather, they are held at the College level and used for other purposes. This practice takes away an incentive for faculty members to conduct sponsored research.

The Department will be hiring 3 new tenure track faculty members in the next academic year, which will improve the situation but will not resolve the problems of high teaching loads and large student-to-faculty ratios. This Department has the potential to grow a good research program, but this would require a substantial investment in new faculty positions and start up packages.

The most productive faculty in the Department support the biomedical engineering program, which is the only one that offers a graduate degree. The other areas of electrical engineering do not produce Ph.D students and as a result the quality of their research programs is compromised. In the area of computer security, there are a number of projects that are supported by congressional funds and performed in coordination with the Brooks Air Force Base. These have interesting practical applications but their innovative content does not seem very high.

Department of Civil Engineering

The Department of Civil Engineering has 9 tenure or tenure-track faculty members¹⁷⁷ and 2 adjunct faculty. It has 310 undergraduates and 50 Master's students, but no Ph.D. students. As is true in other departments, faculty members are expected to teach a minimum of 3 courses each semester and they have not been successful in attracting any substantial research funding. A number of these individuals have focused on their teaching responsibilities, and expressed frustration with the new goal of making the University a top research institution. They do not see how this transition will be accomplished and are not aware of any serious discussion of how to succeed in research and how to recognize the varying contributions of faculty members. A number of individuals indicated that they have not done research for many years, indicating this Department will find it very difficult to make a successful transition.

One of the Department's successful research areas is environmental engineering, which is primarily supported by very few faculty members who have been active in a number of outreach programs. This area should be expanded by hiring additional faculty and introducing a Ph.D. program.

¹⁷⁶ Information provided to WAG by UTSA.

¹⁷⁷ Id.

Department of Mechanical Engineering

The Department of Mechanical Engineering has 13 tenure and tenure-track faculty,¹⁷⁸ and 420 undergraduate students and 46 Master's students. Faculty members in this Department were not involved to any meaningful extent in the strategic planning process for the University, and appear at a loss as to how to proceed in the face of the University's goals with respect to research. For example, they have no idea how to start the process of developing a Ph.D. program. This, coupled with high teaching loads, has created a morale problem, and, for these reasons, the research potential for the Department is low.

Biomedical Engineering Ph.D. Program

The Biomedical Engineering Program is a joint UTSA, UTHSCSA Ph.D. program with approximately 15 faculty members, roughly half of whom are from UTSA's Departments of Electrical and Mechanical Engineering. UTSA is now recruiting for two endowed chairs in bioengineering and expects to have \$1 million in start up funds for these recruits in addition to space in a new building. The Biomedical Engineering Program was described as having been developed at the grass roots level of the faculty, not by direction from above. It arose from mutual interest of faculty at each institution, recognizing what the other had to offer, e.g., engineering and physical sciences at UTSA and clinical sciences at UTHSCSA. There was already a bioengineering unit at UTHSCSA, and after the faculty got together, the program "took off."

Faculty members participating in the Biomedical Engineering Program will focus primarily on research, and will not have to teach in the main engineering disciplines. Their teaching loads are one course per semester for the first three years of their appointments. After the first three years, they are evaluated on the basis of their productivity, with the ongoing load depending on research support. The program currently has 12 Ph.D. students who were selected from among 40 applicants, which was described as a good pool. Courses are taught at both UTSA and UTHSCSA, and students are free to select their faculty advisors wherever the fit is best.

The Biomedical Engineering Program is very important because it is an up and running collaboration with UTHSCSA, is addressing a key research field, and seems to be doing well. Good, actively working partnerships with UTHSCSA will be essential if UTSA is to achieve its goal of moving up to the research university level.

Recommendations for the College of Engineering

In general, the College of Engineering has good people on the faculty and among the staff and student body, but it appears that the development and communication of strategic plans for the University did not involve them to any significant degree. We recommend that engineering activities be expanded so that progress can be made in the priority fields of communications, information and security; transportation and environmental resources; bioengineering and biomaterials; computer engineering; and materials engineering. Research in these fields will address local and national needs and build on the Colleges existing strengths. We also recommend that the College undertake the following:

1. A survey to determine future regional demand for engineering graduates.

¹⁷⁸ Id.

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2. The development of plans for establishing closer relationships with local businesses and for increasing their support. These relationships are critical in helping the College develop new research directions and participate in technology transfer as needed to allow the institution to successfully contribute to the economic development of the City of San Antonio and the State of Texas.
3. The development of plans to attract more students into engineering fields.
4. The creation of Ph.D. programs in all engineering departments and research areas. Without these, the College cannot establish itself as a research oriented school and will not be able to take full advantage of research funding opportunities provided by NSF, DoD and NIH.
5. The nurturing of biomedical engineering as a focus area and the linkage to UTHCSA. The University should negotiate ways to make joint appointments with UTHCSA and explore possibilities of joint research proposals.
6. The development of a comprehensive strategy to take better advantage of computer related departments and groups so as to develop a more coherent approach to computational science and engineering.
7. An assessment of faculty needs and competitive recruitment practices in a tight labor market.
8. The development of comprehensive teaching and research labs. These are necessary to the training of undergraduate and graduate students and the ability to perform high quality innovative work.

COLLEGE OF EDUCATION AND HUMAN DEVELOPMENT

The College of Education and Human Development was established as part of the University reorganization three years ago, and consists of one division and four departments. The new Dean is knowledgeable in the field of education and dedicated to building up the College. Under her leadership, faculty salaries have increased following years of poor salaries, and several significant new hires have been made. Faculty members in this College have not been very successful in getting external funding, but the Dean recognizes that UTSA is “sitting on a gold mine” in terms of educational problems facing the nation in educating Hispanic children and is eager to capitalize on this.

The Dean recognizes the importance of research for her faculty and graduate students, is savvy about developing external funding, and understands the need to improve the "grantsmanship" capability of her faculty. All of this portends growth in sponsored funding for improving training and research capacity dedicated to preparing better teachers, and providing quality programs for counseling, curriculum development, language and literacy, and the development of education leaders in the region.

Department of Health and Kinesiology

The College's Department of Health and Kinesiology is unlike its other departments and divisions, in that faculty research is concerned with topics such as altitude physiology, motor

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control, impact of disabilities, adolescent risk taking, excessive effects on myocardial function, nutrition, diabetes, biomass index, etc. This Department has 7 tenure track members¹⁷⁹ and several times that many adjunct faculty. We met with four of the faculty members, including the Chair; all have been at UTSA for four years or less. They have heavy teaching loads (most teaching 2 + 3 courses), which they hope to reduce to 2 + 2.

Due to both the culture and resources in the College of Education and Human Development, the faculty in this Department have offices but no research space, and salaries that are significantly lower than faculty members in the College of Sciences. They need not only space, but also equipment, and there are no start-up packages for new recruits. All faculty members in this department do some research, but most do not now have external funding. Three faculty members are currently being considered for tenure. This is a crucial decision point for the Department, as tenure is needed if a faculty member is to have graduate students.

If this Department, which has some well trained and enthusiastic people, is to contribute to the overall research program of the University, it will have to be provided with these essentials of research – space, equipment, start-up funds for recruits, and reduction in teaching loads for research active faculty. One of the more impressive members of the group said that if things did not change, when his next grant is funded he will leave. This small group, whose members individually appear competent, cannot rise to the level of a significant research unit without a major injection of support. That seems unlikely under present circumstances.

Department of Psychology in the College of Liberal and Fine Arts

The Department of Psychology has 16 faculty members¹⁸⁰ who work in the areas of social, developmental, cognitive, health, behavioral, and clinical psychology. The Department has roughly 1,300 undergraduate majors and 30 to 40 Master's students, about half of whom do theses. Faculty teaching loads are heavy – most teach 3+2, although new recruits teach 2+2 the first year. Almost all of the faculty are engaged in research, but less than half have external support most of which comes from the NSF and the Army, and the amounts are not large (in 2001, total research expenditures in psychology were \$81,000¹⁸¹).

Space is a serious problem. Faculty members have offices, but no interview rooms, and the Department has only 100 sq.ft. of faculty research space which is shared and must be scheduled – an arrangement that is not compatible with productive research. Faculty members in this Department feel that the Colleges of Liberal and Fine Arts is not oriented toward research, particularly laboratory research, and the problems of increasing enrollment, teaching loads, and lack of adequate facilities may not be fully appreciated by the leadership of the College. As in other departments, rapidly increasing enrollments and heavy teaching loads work against the ability to conduct research. Department faculty members would like to have more collaboration with the neurobiologists on the campus, but thus far collaborations have not been extensive. There is a low level of collaboration with the UTHSCSA, where researchers can use the imaging center, and the General Clinical Research Center. There also is some collaboration on an individual basis with the School of Public Health at the University School of Public Health, UT Austin, and at UCLA.

¹⁷⁹ Id.

¹⁸⁰ Id.

¹⁸¹ NSF WebCASPAR Database System, op.cit.

It is possible that with enhanced space and support from the University, a doubling of the existing faculty, decreased teaching loads, approval of the proposed Ph.D. program, and significant increased collaboration with stronger units, i.e., with the neurobiologists in the College of Science and the Cajal Neuroscience Institute and with neuroscientists at the UTHSCSA, the Psychology Department could become a part of a successful neuroscience program in San Antonio. For the reasons discussed above and in the subsection on the Department of Biology, we believe that the life sciences field with the best chance of moving to the level expected of a first tier research university is neurosciences, broadly interpreted. Interactions among the entities mentioned above should be strongly encouraged at every level.

COLLEGE OF PUBLIC POLICY

The College of Public Policy consists of two departments – Public Administration and Criminal Justice – with a third (Social Work) in the process of creation. External funding for research is minimal – it is currently comprised of two grants, one from HUD and one from the Packard Foundation, totaling less than \$100,000. The Dean has high hopes that the central administration’s recent assignment of a full-time development officer to the College may bring some much needed expertise in identifying potential sources of grants and pursuing them.

The Dean feels that the greatest strength of his College in contributing to the research goals of the University is the recent recruitment of research oriented young faculty members, particularly in the Department of Public Administration. A related weakness, however, is that these newcomers are novices when it comes to the mechanics of grant writing and therefore need considerable additional training and infrastructure support. He adds that all the faculty need to be “socialized” to a more research oriented environment than they were accustomed to in the past. He sees an additional strength in the very recent creation of a Center for Non-Profit Management, offering non-credit training assistance to members of the local non-profit community, and he believes it has “rich potential” for a flow of external grants.

Both the faculty and the Dean agreed that the most urgent step toward the stated goals is the creation of a PhD. program, which is currently authorized and underway. The initial areas of focus will be environmental and development policy and administration and social policy and administration. The program will involve faculty from all three departments of the College, as well as sociologists, economists, and historians from other colleges at USTA. They see a big market for their future Ph.D.s, in government and think tanks as well as in academe, because of the dearth of Hispanics holding such degrees.

Department of Public Administration

This Department has 6 tenure and tenure track faculty,¹⁸² 3 of whom are active in research and publication, although without external funding at present. One faculty member had an NSF grant on science and technology policy in the past and continues to serve on NSF review panels. The Department offers a Master of Public Administration degree, and expects to exceed its goal of doubling MPA enrollment within five years. The teaching load in this Department is 2+2, which seems compatible with active research in this area.

¹⁸² Information provided to WAG by UTSA.

Department of Criminal Justice

This Department offers undergraduate and graduate courses: a BA in Criminal Justice and an MA in Justice Policy. It has 8 faculty members,¹⁸³ 5 untenured, all of whom have a 3+2 teaching load.¹⁸⁴ All appear to be genuinely engaged in some form of applied research, but none has external funding. Those recruited recently say they were attracted to UTSA primarily because of the level of commitment to the strategic plan shown by the University, the College, and the Department, and add that they are getting everything they were promised in terms of infrastructure support (e.g., 2 departmental shared research assistants, any software they ask for, and a little bit of travel money). They seek a reduction in teaching loads in order to have more time for grant writing as an immediate goal. In sum, this is an energetic, enthusiastic, “can do” but relatively untried group. The Department currently is conducting 2 searches and is authorized to hire up to 4 new faculty members, 2 at the associate level and 2 at the assistant level. A 50% increase in faculty size should help alleviate the teaching load burden.

Recommendations for the College of Public Policy

1. The newly authorized Ph.D. program in Public Administration needs to get underway both quickly and strategically, since it is key both for national recognition and to retain the young, research oriented junior faculty members who have recently been recruited. The goal of involving faculty from other colleges in UTSA in developing and implementing this program should be strenuously pursued.
2. The Dean should give high priority to finding resources that will enable him to reduce the teaching loads of the research active faculty, which, at least in the Department of Criminal Justice, are uncompetitive and, in most areas, not fully compatible with high level research activity.
3. Similarly, ways will have to be found to fund the initial crop of Ph.D. students at competitive levels, if a new and untried program is to attract high quality candidates who, once they go on the job market, will achieve placements that have a positive impact on the School’s visibility and reputation.
4. Since research savvy senior faculty to serve as mentors for their junior peers are in short supply, research active senior faculty with related interests in other Colleges should be encouraged to assist in this process.

COLLEGE OF BUSINESS

The Dean of the College of Business was recruited 3 to 4 years ago for the specific purpose of lifting the College to a higher research level. He believes that, of the 75 tenure and tenure track faculty in seven departments, the 25 hired during the past three years are seriously oriented toward research. He is concerned, however, about the availability of resources necessary to allow an expansion of the level of research in the College. Business schools are not traditionally the recipients of significant research grants; the University’s capacity to raise private money is very limited; and, with the deregulation of and anticipated substantial increase in University-wide tuition, the College’s ability to increase student fees (traditionally the primary source of money for infrastructure in this College) is severely constrained. In addition, the

¹⁸³ Id.

¹⁸⁴ Id.

infrastructure is inadequate for research oriented faculty (e.g., inadequate telephone allowances, little or no travel money and administrative support). The College's departments receive little if any of the indirect funding from grants, which currently amount to \$300,000 to \$500,000 annually according to the Dean, most of it generated by the Center for Infrastructure Assurance and Information Management.

Despite these financial constraints, the Dean informed us that he is raising standards for promotion to tenure, and has reduced the teaching load for tenure and tenure track faculty to 2+2 from 3+3 and, at the same time, is creating a cadre of full-time doctorate-holding non-tenure track faculty to teach a 4+4 course load. Departments tend to be small (7 to 14 tenure and tenure track faculty) and, even though some have grown very rapidly recently, all regard themselves as short of faculty to service course demands. In addition, as a major step toward the University's goals, four Ph.D. programs were inaugurated last Fall in Accounting, Finance, Management, and Information Systems, each with 6 to 9 students.¹⁸⁵ But the infrastructure is not evolving fast enough to keep up with these expanded activities.

The Dean is confident that the College is making steady progress toward the University's research goals, but the views of his department chairs and faculty are more mixed, with some faculty members feeling that there has been significant backsliding in the last year or two. One example given of this backsliding was the replacement of the Graduate Dean, who had tried to accelerate research oriented standards, with an individual seen as particularly vocal in her desire to slow the pace of change.

Department of Accounting

This Department of 14 tenure and tenure track faculty members¹⁸⁶ has a core of recently recruited faculty active in peer reviewed publication, all of whom have 2+2 teaching loads. They are able to provide their 8 Ph.D. students with \$15,000 per year in stipends, funded tuition waivers, and some health insurance, due in part to funds from KPMG's Ph.D. Project for minorities in accounting (4 of the 8 are minorities). The first year Ph.D. students serve as shared RAs; the second years as TAs (none are third year yet, but they may be assigned undergraduate courses of their own to teach at that point). The faculty complain, however, that because of recent faculty turnover and the fact that they have no authorized open tenure and tenure track positions, they are not able to keep up with course demands and are frequently required to teach uncompensated overloads.

Department of Management

This Department has 13 tenure and tenure track faculty members.¹⁸⁷ Those with whom we met were publishing in peer reviewed journals of varying quality; one is in his third year of a federal grant that yields about \$100,000 per year, and several of the doctoral students have presented papers at Academy of Management meetings (a nationally prestigious organization in their field). About 70% of the teaching hours are delivered by non-tenure track faculty. This is an unhappy and alienated group (perhaps in part because the displaced Graduate Dean referenced above is one of them), despite the fact it has 8 doctoral students and recruited two tenured full professors from good schools (e.g., Purdue) in the past 3 years. Faculty members feel that there is no correlation between the size of salary increases and research productivity (salaries are public

¹⁸⁵ Id.

¹⁸⁶ Id.

¹⁸⁷ Id.

information), and that totally arbitrary decisions are made regarding the allocation of hiring slots among Departments, without consultation with the faculty.

Department of Finance

This is a small but high quality department, as demonstrated by its publication record. It has 5 tenured and 3 tenure track assistant professors,¹⁸⁸ 5 Ph.D. students, and 2+2 teaching loads.¹⁸⁹ About 50% of classes are taught by adjuncts, a two tier system that is bound to grow, and undergraduate classes have gotten very large—the only way to square the circle, since teaching loads for tenure and tenure track faculty have dropped from 3+3 to 2+2 over the past three years and a PhD program has been added, all without any increase in faculty headcount.

The faculty recruited recently have on the whole come from high quality schools and seem to feel that the Administration is supportive and delivering what they were promised. The Chairman is proud to have “attracted people far better than I am”. There is general agreement that the recently hired faculty, all of whom are active in research, have put the Department and the College well on track to the University’s goals, but that a growing body of publications, more attendance by faculty at conferences, a cadre of completed PhDs, etc., will be required before UTSA acquires the desired reputation and visibility.

Department of Economics

This is a somewhat over-tenured Department. Of the 12 tenure and tenure track faculty,¹⁹⁰ the only Assistant Professor is leaving and they are recruiting for his replacement.¹⁹¹ Some of the senior faculty members are research active and some are not; teaching loads appear to be calibrated according to publication record (using a controversial system of journal rankings) and participation in the graduate program. The latter is currently an M.A. in Economics, inaugurated four years ago, which they plan to grow, as well as at some point to initiate an “independent” Ph.D. in Economics (rather than a Ph.D. in Business with an Economics concentration). So far, the faculty has been unsuccessful in grant proposals and has focused instead on writing for peer reviewed publications (there actually is some trade off between the two in Business fields), though one individual is working on several small grant proposals. The research active faculty members are publishing in peer reviewed journals, mostly not in the top tiers. These faculty reiterate the problem of an inadequate research support infrastructure.

Department of Management Science and Statistics

This is a very strong department, with 6 tenure and tenure track faculty¹⁹² (all with 2+2 loads), 5 in Management Science and one in Statistics (though several of the former are Ph.D.s in Biostatistics), plus 3 adjuncts with Ph.D.s. Most of the tenure and tenure track faculty (perhaps even all of them) either have grants from such agencies as NIH and NASA or have had them in the past and are in the process of applying for new ones. The Department is recruiting for 1 open position, and 2 instructors.

¹⁸⁸ Id.

¹⁸⁹ Id.

¹⁹⁰ Id.

¹⁹¹ Id.

¹⁹² Id.

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The Department has 2 recently approved masters programs, an MBA in Management Science and an MS in Statistics, and has been asked to prepare a proposal for a Ph.D. program – the most urgent next step in the upward climb, along with continued aggressive faculty hiring.

Department of Information Systems

Information Systems is the third area of real strength in the Business College (in addition to Finance and Management Science and Statistics), based on its reputation, publication record and the schools from which it has made its recent faculty hires. It has 11 tenure and tenure track faculty, including 6 assistant professors, 4 of whom were hired within the past year¹⁹³ – all “from good schools and with well known dissertation advisers” according to the Chairman. The Department has several authorized graduate programs: an MBA, two MS’s, one in Information Technology and one in Information Assurance, and a Ph.D. in Business. At present, 6 Ph.D. candidates in the Business Administration program are concentrating in Information Technology Program. First year Ph.D. students are supported as RAs; 2nd and 3rd years (when they get there) as TAs.

Unlike most other departments, this group does have successful grant getters. One faculty member has a large grant from the Air Force and a smaller one from DOD/NSA to establish a Research Center on Computer Security. We were told that another has just finished one grant in the vicinity of \$265,000 and has been awarded another of similar magnitude. These funds come through the Centers for Academic Excellence programs, and are focused on the yet-to-be-established Center for Infrastructure Assurance and Information Management. The faculty also hope to get grants in this area from U.S. Department of Homeland Security in the future.

Department of Marketing and Tourism

This Department has 7 tenure and tenure track faculty, 4 of whom are research active, and about the same number of adjuncts.¹⁹⁴ The newest, both associate professors, are among the research oriented group, and the Department has lines for two additional junior people (one just hired from the University of Pittsburgh) and one senior position. The research active faculty have 2+2 teaching loads; the others, 3+3. The Dean has been forthcoming with both faculty lines and salaries, as well as RAs and TAs, but there is a dearth of travel money. The Department hopes to build its research capabilities to the point where it can start a Ph.D. program within two years, but the faculty recognizes that any research oriented grants will have to come through interdisciplinary alliances that do not now exist.

Recommendations for the College of Business

1. The infrastructure support essential for a research oriented faculty must be made available to the College; both Dean and faculty are virtually unanimous in stressing the inadequacy of such support as travel funds, telephone allowances, assistance in grant proposal preparation and grants accounting, with the latter acting as a positive disincentive to applying for grants.
2. Both the Dean and the Provost need to be sure that the faculty have adequate access to them and that the message regarding a shift to a more research oriented

¹⁹³ Id.

¹⁹⁴ Id.

environment is clear and unequivocal; a number of the faculty members in the College feel they are getting mixed messages at present.

3. The Dean needs to make a special effort to dispel the notion among some of his faculty that resource allocation (especially in the form of authorizations for new hires) is a zero-sum game, with other departments gaining at the expense of theirs.

General Observations, Conclusions and Recommendations For UTSA

UTSA has set its sights on becoming one of the top 100 universities in the nation in terms of federal research dollars and becoming a Carnegie Doctoral-Research Extensive institutions, both by 2010. We believe a 20 year time frame would be more achievable. Nevertheless, we were positively impressed by the University leadership's evident motivation and drive to improve. Even if UTSA's plans do not proceed precisely on the pace outlined to us, and we are skeptical as to whether they can, there is good reason to expect that UTSA will become a much better university as it strives to achieve its aspirations as a Carnegie Doctoral-Research Extensive and Tier 1 research university.

The strengths upon which UTSA can rely as it pursues its ambitions are:

- A dedicated, prominent, goal oriented new President;
- The support of the San Antonio community which wants to be the home of a nationally recognized, full service, research university;
- Proximity and partnership opportunities with UTHSCSA, the Southwest Research Institute and DOD research laboratories; and
- The creation of 10 new endowed chairs, a good kick off for a development campaign.

The main weaknesses that must be overcome are:

- The currently low level of sponsored research and sub-critical size of many basic science and engineering departments;
- Lack of research experience in science and engineering among top administrators at the University;
- Lack of a realistic and detailed strategic plan for growing the research enterprise, including realistic plans for recruiting faculty and staging the construction of research facilities;
- Too few doctoral programs in basic fields of science and engineering;
- Heavy faculty teaching loads; and
- Uncertain sources of support for the University's growth plans, including too much reliance on tuition funds from rising enrollment and unrealistic estimates of the average grant funding that will be obtained by the research faculty.

UTSA's research strengths currently are in the biological sciences, and the University is wisely investing resources in that area. It also has a nucleus of research faculty in the following fields:

- Neurosciences;
- Cell and molecular biology;

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- Microbial Pathogenesis; and
- Bioinformatics and genomics.

These fields are in the forefront of current biological and biomedical research, and support for work in these areas is available from NIH.

UTSA's next high opportunity research areas are:

- Chemistry, as UTSA has a core of well qualified researchers that are poised to advance in stature; and
- Biomedical engineering, where UTSA has made a promising start through its joint program with UTHSCSA.

The research areas listed above provide UTSA with its best opportunity for enhancing the University's research stature and increasing the level of its sponsored research. However, fields such as physics, mathematics, earth and environmental sciences, the computational sciences and engineering cannot be allowed to deteriorate since they are vital components of any research university of national stature, and provide the underpinning for much of the interdisciplinary work that UTSA wants to do. If UTSA is to expand its research enterprise to the level of \$100 million in research expenditures each year, it must expand significantly its faculty size, facilities and infrastructure.

- The University estimates that if it recruits 200 new faculty members in science and engineering, it will be able to achieve its goal of Tier 1 status. In this analysis, the University assumes that each such researcher will bring in an average of \$500,000 in research expenditures annually. We do not believe that average of level of research expenditures is achievable. It is more than twice the national average. If one uses the national average of \$230,000, UTSA will have to recruit 434 researchers. With salaries and start up packages (which can be as high as \$500,000 or more), UTSA will have to identify a major new source of funding for its expansion. To achieve Tier 1 status in 6 years would require UTSA to recruit 70 new science and engineering faculty members each year – too many to sustain quality.
- UTSA has a capital plan that calls for roughly 265,000 square feet of space.¹⁹⁵ The Provost has assumed an average of 1200 square feet of research space for each new recruit, and believes the buildings described in the capital plan will be sufficient for the 200 anticipated hires. If UTSA winds up needing more than 200 researchers, or if the 1200 square foot estimate is low, it will need to identify and fund more facilities than are planned for currently.

As UTSA moves along the path it has established for achieving its research goals, it will have to establish clear priorities. We believe it must first:

- Develop an institution-wide strategic plan (including realistic timetables for achieving goals, realistic estimates of resource needs and identification of funding sources) with the participation of the University's research active faculty.

¹⁹⁵ Id.

- As the UT System's most rapidly expanding university, UTSA must address the problems associated with its rapid enrollment growth and the effect of that growth on its efforts to improve research capacity.

All of these issues, as well as many others, are discussed in more detail in the body of this report, where we describe a number of our observations and provide recommendations for the Institution as a whole and, in some cases, for schools and departments independently. Our most significant concern is that UTSA's upper administration has set goals for itself that are unrealistic in certain respects. UTSA's plan calls for recruiting and accommodating some 200 new faculty members in the fields of science and technology in 6 years. UTSA assumes a research efficiency for each new hire of \$500,000 annually in total research expenditures and this allows it to reach the \$100 million with 200 hires. We believe the national average of \$230,000 is more likely, although still optimistic, implying that 435 new faculty would be needed to reach \$100 million in research expenditures. As mentioned before, to do this in 6 years would mean that UTSA would need to recruit some 70 research active faculty each year. We believe that a hiring rate of 30 per year is the maximum that can be undertaken without impairing quality. Therefore, based on our estimates, it would take some 15 years to achieve Tier 1 status, more likely 20 years considering the small research base at present. Also, UTSA has to organize a campaign to finance these new positions and the ancillary facilities beyond the revenue they anticipate from enrollment growth, tuition increases and revenue bonds. Despite this, we are very supportive of the University's overall aspirations if not its timetable.

Our recommendations for UTSA are set out below:

1. *Scale Back Goals to More Achievable Levels.* The University's current plans seem overly ambitious and in certain regards, risky, and dependant on many questionable assumptions. Rather than trying to "become one of the top 100 universities in the nation in federal research dollars generated by 2010"¹⁹⁶ it is more realistic for UTSA to achieve, in the current decade, a respectable position in the selected niche areas of science and engineering in which it now has a base upon which it can build. In particular, biological sciences and engineering, the health sciences, chemistry computational science and engineering activities, electronics in the sensor and communication areas and well defined materials programs are candidates to pursue as research focus areas. In addition, all the basic fields of science and engineering should have doctoral programs, and UTSA should work to achieve Carnegie Research Extensive Status by the decade's end. Then UTSA can dedicate itself to building out into the other key research fields of science, engineering, and social science to fully achieve the community's goals of being home to a broadly based and nationally recognized Tier 1 research university.
2. *Slow Recruiting Plans.* UTSA's ability to achieve its goals depends on a number of factors, the most important of which is its ability to recruit outstanding researchers. These new recruits will bear disproportionate responsibility for fulfilling UTSA's research aspirations, and the University will have a difficult time competing with the top 100 research universities for these individuals. UTSA's goal of rapid hiring of

¹⁹⁶ *Action Plan for UTSA*, op.cit., p. 1. UTSA defines its goal to be "Texas' next premier university" and "top 100 ... in federal research dollars" rather than to achieve \$100 million in annual research expenditures. As shown in Table 1, institutions in the top 100 in federal research dollars also hover around the \$100 million mark in total research expenditures.

large numbers faculty members while improving quality is overly ambitious in light of the time and effort required to recruit research quality faculty, the tentative basis of funding for the research infrastructure underpinning those positions, and the uncertain timing of space availability.¹⁹⁷ Therefore, we recommend that UTSA slow down its recruiting plans so that it is able to take maximum advantage of the new positions and be selective in the hiring of key faculty. 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 without sacrificing quality.

3. *Include Scientists and Engineers among Senior Administrators.* UTSA's administration should include scientists or engineers among its highest ranks. UTSA's plans require that it be selective in phasing growth in judiciously selected, diverse and forefront fields of science and technology, and while its leaders are seeking advice from a various sources, invariably such advice will be diverse and, often, contradictory. We believe that the absence of a scientist or engineer experienced in building a research university, at the decisionmaking leadership level is a serious and worrisome flaw in the endeavor.
4. *Improve Strategic Planning Process.* The strategic planning process should be improved so that UTSA's research qualified faculty are involved in the process, and experienced outside researchers should be consulted. As part of the strategic planning process, UTSA needs to estimate the dollar amount of additional resources that will be required to meet its goals, and then match those estimates against what might realistically be expected to be raised from various sources: enrollment growth, increased tuition, external research funding, corporate and private philanthropy. Also, UTSA should improve its communications with its own faculty. Faculty members should be well versed in the overall goal of the institutions and the plans for their own colleges and departments, and they should have a responsibility in defining and achieving strategic goals. Finally, input from community leaders and other interested parties (e.g., students), should be solicited.
5. *Consider Slowing Enrollment Growth.* UTSA should consider slowing the extraordinary growth rate of its student population if it wants to significantly expand its research programs over the next five or ten years. While the income associated with enrollment growth may be slated to fund some of the expansion of research, the increasing teaching load that necessarily accompanies an increasing number of students may impede any increase in research activity. One sentiment we heard expressed was that faculty members are running as hard as they can just to stay in place.
6. *Ensure Critical Mass of Faculty in Key Science and Engineering Fields.* In anticipation of its build out in the next decade and in support of its activities in this decade, fields such as physics, mathematics, earth and environmental sciences, the computational sciences and engineering, should be kept viable and not allowed to decay. Teaching loads should be adjusted so that those who are research qualified

¹⁹⁷ Best recruiting practices involve much faculty and administration time and include search committee deliberations, multiple nominations for each position, selection based on recommendations and performance at invited seminars, interview with faculty and administration, finding spousal jobs, negotiating set up packages and finding lab space.

can engage in research. We believe that such steps are important to achieving the University's announced goal of national recognition.

7. *Review Capital Plan.* Staging the growth of new buildings to match the recruitment of new tenure track and tenured faculty members is difficult. Many faculty members believe that the current plans do not adequately account for the real needs of experimental scientists. We recommend an independent assessment of these plans by a combined external and internal committee consisting of individuals with research university experience.
8. *Discontinue Break-Even Analysis.* Some individuals with whom we met mentioned a sort of "break-even" analysis that is employed in some departments. Essentially, this involves a net worth computation for each faculty member, based on the formula funding for each class taught and the number of students registered. The professor's salary is then deducted from the total "income" to the university derived by his or her specific courses. In cases where the faculty member does not "break even" (e.g., where the computed income is less than the salary), he or she is declared to be in deficit and must take actions to rectify the deficit. This practice should be discontinued since it has caused unnecessary distress to hardworking research faculty who also have a role as teachers.
9. *Grant Support.* A number of individuals with whom we spoke found the University's grant infrastructure insufficient, and in some cases, obstructionist. We heard that researchers receive little support in the grant writing and submission stages, and then they have to manage their own grant accounting in the post award stage. UTSA should review its grants and contracts infrastructure, benchmarking these activities against those of other institutions, and improving them where appropriate.
10. *Expand Development Office.* UTSA will need to attract considerable private sources of funding to make its goals more secure, especially in these times of fiscal austerity in Washington and Austin. The task is difficult but not impossible, especially if the University portrays itself as a primary university in the nation providing access to higher education and research to the underrepresented Hispanic community. However, it will need to expand its Development Program Office and that Office's activities.
11. *Technology Transfer.* Technology transfer and intellectual property (IP) are only just becoming established at UTSA. A few patents have been granted, but little has been done on the licensing side. We commend the effort at UTSA to establish policies and regulations for this area. While this activity is at a low level today, as UTSA becomes more research intensive, this operation also should become more active, with a size and effort appropriate to its research volume.
12. *Graduate Students.* An increase in both the quality and quantity of graduate students is critical for the growth of the research enterprise at UTSA. This could be approached by increasing graduate student stipends, expanding recruiting efforts, and approaching recruitment in a coordinated fashion.

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.

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.