

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

**Revised May 7, 2004**

*The Washington Advisory Group, LLC*

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University consulting is a major field of activity for The Washington Advisory Group. A common thread in our university engagements is the improvement of an institution's national standing as a university that engages in both education and research so it can thereby contribute more to the cultural and economic growth of their community and the nation. Concomitant with this goal is improved ability to raise funds from federal and state agencies, philanthropic foundations, and industry.

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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.<sup>1</sup> 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 agencies<sup>2</sup>, 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

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<sup>1</sup> 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>.

<sup>2</sup> 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 growth<sup>3</sup>, 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.<sup>4</sup>
- *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.<sup>5</sup> During the same period, universities own funds dedicated to research increased from 14% to 20% of the total research expenditures.<sup>6</sup>
- *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

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<sup>3</sup> 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.

<sup>4</sup> 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>).

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

<sup>6</sup> 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 95<sup>th</sup> through 105<sup>th</sup> 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,<sup>7</sup> 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

<sup>7</sup> *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 levels<sup>8</sup>; 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.<sup>9</sup> 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 funding<sup>10</sup>). 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.<sup>11</sup> Calculations using

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

<sup>9</sup> Information provided to WAG by the universities.

<sup>10</sup> 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.

<sup>11</sup> 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.

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

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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 ARLINGTON (UTA)<sup>12</sup>**

The University of Texas at Arlington (UTA) has had a succession of names, affiliations, ownerships and assignments over its 109 year history, and it has evolved into a large, broadly based, university offering educational opportunities in all the key fields of the liberal arts, humanities, sciences, and engineering. Over the past 30 or so years, the University has applied for and received approval to create 30 doctoral programs in many of these fields. Today, it is the only university in the UT System other than UT Austin that has achieved Carnegie Doctoral Research Extensive status. UTA now aspires to Tier 1 research status as well – that is to say, \$100 million in annual research expenditures.

The next decade will be critical in determining whether UTA can achieve this goal. Despite the breadth of its coverage of research fields, only 114 out of 531 tenure and tenure track faculty (21%) and 28 non-tenure track faculty are research active.<sup>13</sup> As a consequence, UTA's annual research expenditures (\$23 million in 2003)<sup>14</sup> are among the lowest of the country's Doctoral Research Extensive public universities.

**University Leadership**

UTA – in the midst of a leadership change – is at a crucial cross roads. The new President, James Spaniolo, arrived on campus on February 1<sup>st</sup>. He was preceded by an Interim President who served for roughly a year, and before that by President Robert Witt. President Witt was primarily focused on reversing enrollment declines the University had experienced in the mid-90s, and dealing with the resulting financial crisis that those declines created. He gradually restored enrollment levels and left the University in 2002, along with many in his upper administration. The Interim President, Charles Sorber, has done an admirable job in raising morale and aiming the University in the right direction to raise its research stature, but much remains to be done if UTA is to become a Tier 1 research university.

The recent instability in the University's leadership and the financial crisis UTA experienced has adversely affected morale among the faculty. One of the first things UTA's new President will have to do is to fill permanently the positions of the Provost and Vice President for Research. The individuals currently in these positions are serving on an interim basis. The interim Provost is widely respected by the faculty and we were impressed by both of these officers. If they, or other well respected senior administrators, were to leave the University at this point, their departures would prove quite unsettling for the faculty, and would set back the institution's efforts to enhance its research stature. In this regard, we note that the Dean of the College of Science, also very well respected on campus, will be leaving UTA for a new position. There is a very real danger that the resulting uncertainty may lead to an exodus of good, young faculty (a process that has already begun in the Department of Biology). The fact that President Spaniolo, in one of his first actions, extended the appointment of his interim Provost for 18 months is a positive development.

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<sup>12</sup> 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.

<sup>13</sup> R.L. Elsenbaumer, Interim V.P. Research, *Research Analysis for UTA*, presentation dated December 16, 2003.

<sup>14</sup> *Id.*

### **Research at UTA**

Because of the many leadership changes at UTA in recent years, the University does not now have a coherent research strategic plan. If it is to move up in the rankings, the new President must develop such a plan as quickly as possible, and the process should involve faculty in addition to the University's senior leaders. The plan must address issues such as how to increase and improve research capacity, how to identify and prioritize growth initiatives, and how to fund the growth in faculty and related facility needs. In addition, the plan must address issues related to student enrollment – the quality of the students admitted and the extent to which enrollment growth should be limited. The development of this plan will take some time, and getting the process started should be one of the new President's first priorities.

Despite the understandable lack of a true strategic plan, the University's interim leadership has developed a coherent approach to growth and improvement in research capacity, capability and impact. This appears to have been done with faculty participation, and their "buy in" was evident during the course of our meetings. In essence, the University intends to build on certain major research thrusts that already exist on campus.<sup>15</sup>

- Nanotechnology and materials research
- Automation Research and Robotics Institute (ARRI)
- Research relevant to the Texas Manufacturing Assistance Center
- Research related to transportation, planning, design, construction, maintenance and operation of transportation facilities through the Texas Department of Transportation (TxDOT) Cooperative Research Program
- High energy physics

UTA is a broadly based university with some strength (albeit uneven strength) in all of the basic science and engineering fields. UTA's status as a Carnegie Research Extensive university puts it in good position from which to pursue higher national status. Its proximity to UTD also provides it with an advantage. Both UTA and UTD are building quality research programs in materials science including nanotechnology and other areas of chemistry and physics, and in electrical engineering and computer science and engineering. The proximity of these two institutions creates obvious opportunities for partnership. In addition, the Dallas-Fort Worth Metroplex is home to one of the best health science institutions in the country, the University of Texas Southwestern Medical Center at Dallas (UTSWMC). The combined strengths of these institutions are formidable and joint activities should be encouraged. The trio of institutions has the potential to secure funding for sizeable projects of the type frequently initiated by federal mission agencies. There is little evidence at this point of significant collaborations between UTA and UTSWMC or UTA and UTD. Significant collaborations may require a change in mind set and, as discussed in earlier sections of this report, we recommend that the three institutions develop a 5 year joint strategy focusing on engineering and science, and the biomedical sciences.

UTA, like its sister institutions in the UT System, aspires to reach the level of \$100 million in annual research expenditures. This will require that it more than quadruple its current research expenditures (which were \$22.9 million in 2003).<sup>16</sup> We generally were favorably

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<sup>15</sup> R.L. Elsenbaumer, Interim V.P. Research, *Advancing Research at the University of Texas at Arlington*, presentation dated December 16, 2003, p. 1.

<sup>16</sup> *Id.*, p. 17

impressed by the quality of the faculty with whom we met and by the breadth of their research and teaching. This raised an obvious question: if the faculty members are so good, why aren't their departments better regarded and better funded for their research?

The answer, which we do not claim to understand in detail, surely is rooted in the complex history of the institution. We have little doubt that the transition in attitude and expectations from a broadly based teaching institution to a modern, competitive research university largely has taken place. However, other factors such as turnover in University leadership, instabilities in overall enrollment, and financial pressures have stunted the emergence of UTA as a potential Tier 1 research university. Perhaps even more significantly, while enrollment levels were 4% higher in 1990 than they were in 2002, faculty levels were 12% higher.<sup>17</sup> Thus, at a time when UTA is trying to become more research active and generate larger amounts of sponsored research funds, the size of its faculty is smaller than it had been. This, presumably, is resulting in higher teaching loads – a situation that is inconsistent with increasing research productivity, and is also resulting in a high student faculty ratio.<sup>18</sup>

UTA's Interim Vice President for Research presented to us an interesting study on faculty size and research support based on experience at 73 doctoral research extensive public universities without affiliated medical schools. His results show a correlation between research support per faculty member and the overall student/faculty ratio, with more than a three-fold increase in support for a reduction in student/faculty ratio by one-half. The present size of the UTA faculty is 531, of which 142 are considered research active. Scaling in various ways, the Interim Vice President's analysis suggests that if UTA doubles the present faculty size, while fixing enrollment of 25,000, and eventually moving to a fully research qualified faculty, UTA will be able to reach \$100 million a year in research expenditures. This analysis assumes that the current level of research awards per research active faculty member of \$175,000 would be achieved by the faculty. We note that the national average total research expenditures for researchers who have federal grants is \$230,000 per year. Using this figure, the number of faculty members that would be required to generate \$75 million in research expenditures (the approximate difference between UTA's current research expenditures and \$100 million), is 325. Whether the number of additional faculty members UTA will need is 530, as suggested by the Interim Vice President's analysis, 325, or some other number, UTA's major challenge will be to recruit, support and house the necessary individuals.

As described earlier in this report, the level of an institution's sponsored research programs is one major criterion by which it is rated. Another is the quality of its undergraduate students. Continuing pressure to increase undergraduate enrollments can eventually impact the quality of both education and research programs on a campus. When students delay graduation because they are under-prepared or must work, the expense to them and their families rises. During the course of our conversations with UTA's administrators, we found them ready to address the policy issues of raising admissions standards and limiting enrollment growth.

It is clear that UTA must increase substantially the size of its faculty to keep pace with its teaching responsibilities, to say nothing of expanding its research. This will require significant

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<sup>17</sup> In 1990, the total student headcount was 24,783 and the total tenure and tenure track faculty size was 594. In 2002, those numbers were 23,821 and 529, respectively. Source: Information provided to WAG by UTA.

<sup>18</sup> The Interim Vice President for Research told us that, while the current student/faculty ratio is 40:1, the minimum requirement for a research university is 25:1, and most top-tier universities have ratios on the order of 10-12:1.

new sources of funding. The UT System has stated that “it is not realistic to expect substantial increases in state appropriations” and “...additional distributions from the PUF [are] unlikely in the short term.”<sup>19</sup> This leaves enrollment growth, tuition increases, industrial and philanthropic contributions, and sponsored research grants as the major resources of funding available to UTA.

1. *Student Generated Income.* UTA’s student body has grown substantially over the past several years, and there is pressure for enrollment to grow even further. So long as the state continues to fund universities based on their student contact hours, enrollment can lead to funding increases, although perhaps not to the extent necessary to cover the costs associated with the enrollment growth. We are concerned that, in the present fiscal climate, the level of this funding stream cannot be counted on, and, in any case, too large an enrollment may cause the quality of teaching and research to suffer. In a climate of fiscal stringency in the state, tuition increases are a one of the few potentially large sources of new funds available to UTA and, for that matter, to most of the other public universities in the country.
2. *Industrial Support.* UTA’s current levels of industrial support are modest at best and must be raised. During our campus visit, we met with industry representatives who appeared to be midlevel corporate officers. These individuals are at an appropriate level for project-oriented cooperation. We hope UTA also has relationships with individuals at the highest levels of industry to deal with mutually important strategic issues.
3. *Philanthropy.* UTA has been deficient in philanthropic fund raising. In its 109-year history, the institution has never mounted a capital campaign, and its annual fund drive yield is small. Little has been done to solicit gifts from UTA’s 110,000 alumni. UTA’s Development Office has assembled an outside development committee consisting of well-positioned UTA alumni who are interested in helping UTA. However, raising substantial funds from alumni and non-alumni philanthropists is a slow process and it is likely to be five years or longer before substantial funds can be raised. This will slow the University’s progress to Tier 1 status. Nevertheless, a start must be made and UTA has begun.
4. *Federal and Other Sponsored Research.* UTA’s current level of sponsored research is not high, and the average annual research award of UTA’s research active faculty members is only about \$175,000 per year. UTA will have to look towards its new hires as the basis of success or failure in securing federal and other research grants. Federal agencies in general, and NIH in particular, are the largest source of research funding of successful research universities. Until this year, only one substantial NIH research grant had been received by a UTA faculty member. According to the Interim Vice President of Research, some 10-15% of UTA’s research support comes via the earmarking process which can be useful, especially for construction and instrumentation purposes. However, obtaining earmarked funds to support research is not an acceptable or useful long-term strategy. Clearly UTA must put more emphasis on obtaining federal funds by the traditional granting mechanisms and from the traditional granting agencies in order to achieve significant growth.

UTA has a distinctive head start at significantly improving its research standing in some fields, since it begins its campaign as a Carnegie Doctoral Research Extensive institution. This

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<sup>19</sup> *Request for Proposal: Consulting Services Related to Research Capability Expansion for The University of Texas System (RFP NO. AA062003)*, The University System of Texas, June 6, 2003, p. 15.

achievement should translate into know-how in identifying and recruiting research active faculty, particularly in the areas of UTA's existing coverage – almost all the basic disciplines of the physical sciences and engineering (but not necessarily in the biological sciences). Given UTA's history as a broadly based teaching university, its standing in the community that derives from carrying out that teaching role well over many years, and its more recent strides toward becoming a research-centered university, the prospects for substantial improvement in UTA's standing are positive. However, effective leadership and sustained continuity of purpose will be essential.

### **UTA's Academic Units**

#### **COLLEGE OF SCIENCE**

UTA's most direct and practical way to enhance its research standing is through strengthening and growing the existing departments in its College of Science. At present, this College contributes 22% of the University's total research awards,<sup>20</sup> and 40% of its tenure and tenure track faculty are research active.<sup>21</sup> This ratio is relatively low compared to top tier research universities.

The University's history as a broad based teaching university has endowed these departments with the depth to serve as foundations for growth and excellence in research. The reductions in faculty size over the past decade (we were told that 24 positions were lost) and increases in undergraduate enrollment, and the fact that these departments are already largely research qualified, justifies sensible growth in faculty positions in this College. Indeed, some of its departments – Chemistry, for example – are close to becoming sub-critical in size and risk losing the excellent people that are already onboard.

New vitality in biological science and initiatives that could bring broad segments of the College into collaboration with UTSWMC appear to be particularly good targets for investment. One could imagine, for example, expertise in chemistry, mathematics and physics being brought to bear on instrumentation, detection, analysis and imaging technologies that could be of great common interest and benefit.

Research in nanomaterials is one of UTA's priorities, as it is at many universities and research centers across the country. This is probably a necessary investment, but the competition in this area is very strong. Recruiting a Welch Chair in the Chemistry Department to help lead this effort will be important to the development of the Nanotechnology Research and Teach Facility. The recent recruitment to the Physics Department of a young experimenter working in magnetic nanomaterials appears to be an excellent move.

Other popular and competitive research areas where there is good potential for growth include grid computing and numerical simulations of physical systems. These areas involve collaborations between the Physics, Mathematics and Engineering Departments, as well as with outside institutions and national programs (e.g. LambdaRail). Finally, geology and environmental science with an emphasis on the north-Texas region is of potential interest to students, both undergraduate and graduate, and has important research potential.

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<sup>20</sup> *UTA Office of Research Fiscal Year Report*, October 31, 2002.

<sup>21</sup> *The Total Number of Tenure and Tenure Track Faculty by Department for Fall 2002*, UTA Office of Research.

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

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### *Department of Biology*

The Department of Biology has 23 tenure and tenure track faculty members although 4 of these hold administrative positions, effectively leaving 19. These individuals must deal with 1,500 undergraduate majors (out of a total of 2,200 in the College of Science) and 85 graduate students, 23 of whom are Ph.D. students. Although there are 5 non-tenure track instructors to help with teaching, the teaching load is heavy; many faculty teach 3 courses each semester (3+3) and sometimes 4.

This Department needs to be greatly strengthened. In recent years, the number of research faculty members has declined, and morale has suffered. Four good young faculty members with research support left in recent years for the University of Iowa, Texas A&M, Oregon State, and Indiana. Fortunately, a new chairman has been appointed who has the respect of the Dean and the faculty, and he has moved to rebuild the Department. Four promising young faculty members have been hired in the past two years, and two more hires are slated for next year.

Despite heavy teaching loads in the Department generally, the Department has been able to provide new research faculty members with a 1+1 load for their first two years. However, over the next five years, a number of faculty members are due to retire, and others may fail to achieve tenure. The individuals most likely to depart are carrying heavy teaching loads. The new chairman estimates that the Department must increase the total number of research active faculty to 30. In our view, in light of the Department's heavy teaching obligations, that number should be closer to 50, which still would leave a student faculty ratio of 30:1.

On the positive side, the Department's recent hires are well trained, enthusiastic and optimistic, and believe they can flourish at UTA with new leadership. They have grant support, mostly from NSF. However, faculty members' current research strengths are in traditional fields such as systematics, ecology, evolutionary biology – areas outside of “modern biology” that attract very little NIH support. There has been recent interest in building research capability in genomics and some of the Department's new hires are in this field, but while this is a very good move that should continue, these individuals tend to focus on comparative and evolutionary genomics. It will be important that future hires in genomics focus on molecular, cell and developmental, or neurobiological related areas, which are not only cutting edge fields, but also where NIH support is available.

The Department's current faculty appears satisfied with the research infrastructure, particularly in electron microscopy and confocal microscopy. But these individuals do not have as much need for other modern instrumentation as will new recruits who do more cellular and molecular research. The creation of the Emerging Biotechnology Center which will have equipment and services to support cutting edge and interdisciplinary research, including genomics, proteomics, computational biology, and bioinformatics, etc. is a very significant step towards satisfying these needs. However, the funding of this center is in part dependent on a pending federal earmark proposal, the outcome of which is not yet certain.

As with all other departments, Biology must increase the quality of its graduate students which this will require increasing the number of research and teaching assistantships, increasing stipends, and developing better recruiting.

In summary, the Department of Biology at UTA has enormous needs in terms of faculty members and facilities. According to the Dean, only 3 of its 23 faculty members have grants.

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

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The Department must expand its research horizons significantly as discussed above. In addition to the inherent importance of modern biological research, the predominant source of biomedical research funding is the NIH and little of the current research in the Department falls into the major NIH funding areas.

### *Department of Chemistry and Biochemistry*

The Department of Chemistry and Biochemistry has 14 tenure and tenure track faculty, down from its "normal" size of 18 to 20, which it had in the early 1990's. The decrease is attributed to a university-wide hiring freeze that was in place during the previous administration. The Department is now recruiting for two assistant professor positions and one senior position which will be assigned to a Welch Chair, the only such endowed position in the College. The holder of the Welch Chair is expected to take a major leadership role in the College's Center for Nanostructured Materials. The Department's long-held goal is to have 25 tenure and tenure track faculty members, a reasonable number for such an important field that contributes so much to materials science and modern biology.

All faculty members except the Department Chair (who has been funded in the past) have research funding. The FY2003 average total of research awards per faculty member was \$101,000.<sup>22</sup> The Department expects all of its faculty members to secure research grants. Their major sources for research funding are NSF, NIH, DOE, and the Welch Foundation. Typical teaching loads are 1+2.

Our impressions of the quality of this Department's faculty, and of their energy, breadth of research interests and commitment to research, are positive. Their focus areas are in materials chemistry, molecular recognition, and nanostructured systems; synthetic chemistry; solar energy research; and cancer research. All of these present particular opportunities for expansion and external sponsorship in view of the current national interest in them, and the faculty resources devoted to them. The most critical issue the Department faces relates to its size – faculty members worried that the Department could soon diminish to sub-critical size, and without a continuing and credible recruiting/growth plan many of its excellent young faculty will be lured elsewhere. Furthermore, the faculty already has difficulty in covering its necessary course offerings. The Department Chair told us that the very high student/faculty ratio is one of his biggest problems.

### *Department of Geology*

This Department of 7 faculty members (all tenured) is of sub-critical size. It is the only department in the College of Science that lacks a doctoral program, and in 2002, it had research awards of just \$130,000.<sup>23</sup> The faculty includes one of the world's leading experts in creating maps and computer animations of the positions of continents and oceans over the past 500 million years related to plate tectonic processes. It also includes an outstanding, well funded, recently hired faculty member in the important field of chemical hydrogeology. We suggest the Department be given the opportunity to submit a staged plan outlining future growth in student enrollment, high opportunity research areas such as environmental earth sciences, initial resources needed to pursue this path, and sources of external research support that might become available. Failing this it is difficult to divine a possible future for the Department.

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<sup>22</sup> *Advancing Research at the University of Texas at Arlington*, op cit., p. 10.

<sup>23</sup> *Awards and Source of Funding by Department*, UTA Office of Research, August 29, 2003.

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

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### *Department of Mathematics*

The Department of Mathematics has 24 tenure and tenure track faculty members, 10 lecturers, 26 graduate teaching assistants and 25 to 30 part-time teachers to cover its large teaching responsibilities. The faculty teaching load is 2+2. Essentially all tenure and tenure track faculty members are research qualified, in that 80% of them have grants (including all of the assistant professors). One of the Department's key strengths is the diversity of research interests of its faculty. There is a core group involved in "pure" mathematics research – geometry and algebra – and a substantial number in applied mathematics involving statistics and mathematics applied to simulation and modeling.

The Department is critically constrained because of its small faculty size, and the 100 undergraduate majors, 25 Ph.D. students, and 6,000 students in math classes that it must teach. We were told that a lack of a critical mass of researchers was responsible for the recent departure of a well-regarded faculty member.

### *Department of Physics*

The Department of Physics has 16 tenure and tenure track faculty. It is presently searching for a new departmental chair (the tradition at UTA is to hire senior researchers from outside the institution to be the permanent departmental chairs). Fifteen faculty members have research funding (12 from federal sources, 3 from the Welch Foundation); the single faculty member not currently funded has been a strong researcher who now is focused on teaching. With \$2 million per year in annual research expenditures, the average FY2003 research award per faculty member was \$104,000. All members of the Department publish regularly. The Department's philosophy for continuous improvement is to demand that any person they promote would be capable of being promoted at a Tier 1 university.

The teaching load for faculty members in Physics is 1+1. UTA resources support a mechanical shop with two permanent machinists and two part-time technicians. This shop is used extensively by departmental researchers and is a conspicuous "in-kind" contribution by the University that benefits UTA faculty in grant competitions, as well as in their research efforts.

The Department's major research group is engaged in experimental high energy physics. The group has wisely concentrated on large international collaborative efforts at frontier accelerator facilities in the U.S. and Europe. It is involved in an operating experiment at Fermilab in an experiment under construction at the CERN laboratory in Geneva, Switzerland which begins in 2007, and it plans for a future international linear collider that may be built sometime after 2010. The UTA group has made effective use of its past experience in constructing particle detectors and the research infrastructure of the Physics Department to find productive, albeit relatively small roles in major international collaborations.

A second focus of the high energy physics group is grid computing. The large analysis efforts required for the Fermilab and CERN experiments rely on grid computing, and UTA's physics group is collaborating with faculty in the Department of Computer Science and Engineering and has received a NSF MRI (Major Research Instrumentation) award to support this work.

Another important area pursued by physics faculty members is condensed matter science, both experimental and theoretical. The Department's most recent faculty hire is taking a national leadership role in the emerging area of magnetic nanomaterials.

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

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The Physics Department impressed us as being well positioned for substantial growth in research capacity and stature because of the quality of its faculty and the fields it has chosen to emphasize. The Department presented us with a thoughtful and realistic strategic plan for a five year program of growth and improvement. In this plan, it seeks 50% growth in the number of faculty members, based on present research strengths with continuing developments in nanophysics and grid computing, and increased collaboration in UTA biotechnology and engineering programs.

### *Department of Psychology*

This Department seems to be thriving and on the upswing. It has an effective chairman who has built a good department that continues to improve in both size and quality. It has 17 tenure and tenure track faculty members who, for the most part, are research active. It also has 400-500 undergraduate majors and approximately 60 graduate students; 25 M.A. and 35 Ph.D. students. Faculty teaching loads are generally 2+2, but new hires teach 1+1. The Department recently made 3 new appointments, 2 of whom are senior, productive researchers who are well funded. A third recruitment of a senior faculty member (from UTSWMC) is being processed.

Six of the Department's current faculty members have significant research support, a total of \$2.5 million in awards at present, including NIH and NSF grants, and when all of anticipated new recruits arrive, this total will grow to around \$10 million. In addition, in collaboration with colleagues at Cornell University and Claremont College, faculty members in this Department have applied to the NSF for a Center of Science of Learning grant. If this application is successful, it will bring about \$10 million to the Department over 5 years. While this success is by no means assured, the application, together a number of individual grant applications that are in the works, demonstrate that the faculty members are actively pursuing sponsored research funding.

The Department's research strengths are in several areas of cognitive, social, and behavioral psychology, personality studies, learning and memory (including false memory), and pain, including neuroscience aspects of pain. The Department has been quite traditional. For example, there is little or no brain imaging going on right now (an important area in cutting edge neuroscience) although several faculty members are interested in this approach.

The neurosciences presents a real opportunity for growth, and the Department is attempting to capitalize on this opportunity. It currently has 2 neuroscientists and its new senior appointment from UTSWMC has an interest in neuroscience of pain. Additional hires are anticipated in this area. The fact that this Department is in the College of Science (which is not always the case in research universities) facilitates interactions with the Biology Department and others in the College as well as with the College of Engineering. For example, we were told that there is interest in neuroscience in the Departments of Mathematics, Physics, and Computer Science. Thus, this field could become an important area of interdisciplinary research at UTA, and one in which collaborations with UTSWMC could be developed.

We believe this Department has a good chance of becoming a nationally recognized Department of Psychology if it continues its development and adds several additional research active faculty over the next 2 to 3 years.

*Recommendations for the College of Science*

1. No university today can aspire to first tier research status without a first class biology department. The University must increase the number of research oriented faculty members in its Biology Department, and it must cover a broader array of cutting edge fields in modern biology. We recommend recruiting in fields that are well supported by NIH such as molecular, cell and developmental biology, and/or neurobiology and related fields which also are the cutting edge of science.
2. Without a University strategic plan, it is difficult to comment on resource planning, but our impression is that every department in College of Science needs to grow. The Dean believes a 50% growth in the faculty (50 individuals) is needed if the College is to contribute \$50 million in annual research expenditures. As discussed earlier, we believe this number is on the low side.
3. The Department of Psychology should consider submitting an application to the NIH for a training grant. The Department is sufficiently strong and its research program sufficiently coherent to develop a very competitive proposal. Psychology, like every other department, has difficulty in attracting and supporting good graduate students. An NIH training grant could be of great help and provide a model that other departments could strive to emulate.

COLLEGE OF ENGINEERING

This College is active and up-to-date in its research and is central to the comprehensive nature of UTA in terms of the variety of degree programs it supports and the range of research efforts it sustains. Its enrollment in the fall of 2003 was 4,159 students, including 2,088 undergraduate and 2,071 graduate students, 18% of whom are enrolled in the Ph.D. program.<sup>24</sup> It has 10 different Ph.D. programs, and in 2003 awarded 20 Ph.D.s.<sup>25</sup> The College has 5 academic departments (the Departments of Civil and Environment (CE), Computer Science and Engineering (CSE), Electrical Engineering (EE), Industrial and Manufacturing Systems (IMS), and Mechanical and Aerospace (MA)) and two academic programs in Biomedical Engineering, and Materials Science and Engineering. It also has over 35 research centers and groups,<sup>26</sup> including the Automation and Robotics Research Institute (ARRI), and the Nanotechnology Research and Teaching Facility (NanoFab).

The College has 108 tenure and tenure track faculty members and 20 full-time non-tenure track faculty members.<sup>27</sup> Of those, we were told that 44 are research active, producing annual research expenditures of \$8.8 million as of fall 2003. This results in an average of \$81,480 per faculty member. These levels are well below the average research expenditures per faculty member for highly ranked engineering programs, public or private,<sup>28</sup> and this disparity is indicative of the development effort that will be required to bring UTA engineering up to parity with Tier 1 research institutions.

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<sup>24</sup> *Overview of the College of Engineering*, presentation by Dean to WAG, December 16, 2003, pp. 8 and 9.

<sup>25</sup> *Id.*, p. 4 and 10.

<sup>26</sup> <http://www.uta.edu/engineering/research.php>.

<sup>27</sup> *Overview of the College of Engineering*, op. cit., p. 5.

<sup>28</sup> Research expenditures per faculty member in the top 50 engineering schools ranked by *U.S. News and World Reports* ranged from \$225,200 to \$988,400 and averaged \$465,400 (based on 2002 data). <http://www.usnews.com/usnews/edu/grad/rankings/eng/premium/main/enrank.php>.

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

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### *Department of Computer Science and Engineering*

CSE has 24 tenure and tenure track faculty members, and 1,166 enrolled students, including 520 graduate students (439 MS students and 81 Ph.D. students).<sup>29</sup> It offers undergraduate programs in Computer Science and Engineering, Computer Science, and Software Engineering. It also offers MS and Ph.D degrees in Computer Science and Computer Science and Engineering.

This Department has shown significant initiative in developing programs, and its active research grants amount to \$8.32 million.<sup>30</sup> The Department has developed a research plan that aims to improve research performance so that it becomes one of the top 25 Computer Science and Engineering programs<sup>31</sup> in terms of research, academic excellence, and recognition. Since the fall of 2000, this plan has helped draw in \$2 million support, and has resulted in a 40% increase in the size of its tenure track faculty.

The Department has demonstrated strength in database and information technology, embedded systems, high performance computing, intelligent systems, software engineering and telecommunications and networking. Also, it has shown recent strength in multimedia and video processing and pervasive computing. These areas are funded at modest levels by both federal, state and industry sources. Considering the Department's existing strengths, and local and national needs, possible areas for future focus are in bioinformatics and security. CSE faculty members are enthusiastically working towards meeting the Department's "Top 25 Initiative" goal and we believe it has the momentum and collective energy to accomplish this goal.

### *Department of Electrical Engineering*

This Department has 32 tenure and tenure track faculty members,<sup>32</sup> and its fall 2003 enrollment was 1,237.<sup>33</sup> Of these, 749 are graduate students, including 123 doctoral level students.<sup>34</sup> CSE and EE together accounted for 58% of the Fall 2003 enrollment of 4,159 in the College of Engineering and 48% of the tenure and tenure track faculty.<sup>35</sup> The Department's total research activity is \$4.4 million, little more than half of that CSE for almost the same number of tenure and tenure track faculty.<sup>36</sup>

The faculty's research subject matter indicates an imaginative approach. For example, Department researchers are doing work on "smart skin" – micro infrared sensors, laser machined installed on flexible substrates that have demonstrated imaging capability mimicking human skin – that is sponsored by NSF and the Army Research Office. Other activities include DSP (Digital Signal Processing) and image processing, remote sensing, and power electronics. VLSI (Very Large Scale Integration) and semiconductor devices is another field of activity. When augmented

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<sup>29</sup> *Overview of the College of Engineering*, op. cit., pp. 5, 8, and 9.

<sup>30</sup> *Id.*, p. 12.

<sup>31</sup> According to information at <http://www.cse.uta.edu/About/Top25.asp>, "The National Research Council, in its most recent rankings (March 2000 issue of *Computing Research News*), ranked CSE@UTA in the "36 and below" category." The rankings are based on information collected in the 1995 NRC assessment of research and doctorate programs in the U.S.

<sup>32</sup> *College of Engineering 2003 Annual Report*, The University of Texas at Arlington, undated, p. 1.

<sup>33</sup> *Overview of the College of Engineering*, op. cit., p. 8.

<sup>34</sup> *Id.*, p. 9.

<sup>35</sup> *Id.*, pp. 5 and 8.

<sup>36</sup> *Id.*, p. 12.

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

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by MEMS (micro-electromechanical systems) technology, miniaturized structures can be synthesized, incorporated into functioning processors, and utilized in medical, communication, and control applications. These research areas and others display a desirable flexibility which can lead to student involvement in research and additional research funding.

The Department's performance in terms of research and academic competitiveness is below the average for top electrical engineering departments. Recently, it was able to recruit very good researchers with expertise in microelectronics and MEMS and who have the potential to generate competitive federal funding. The Department's clean room facilities are supported by a congressional grant and other federal and industrial grants and provide an environment for the researchers to perform very high quality work. The Department has the potential to improve its standing by continuous recruiting in the areas it has identified as areas of growth. The addition of new faculty members will bring new ideas, add strength to its intellectual capacity, and help grow its graduate programs.

### *Department of Civil and Environmental Engineering*

This Department has 12 tenure and tenure-track faculty, 365 undergraduate students, and 163 graduate students (135 MS students and 28 Ph.D. students).<sup>37</sup> Its research funding comes primarily in the form of state grants in amounts of less than \$50,000 per faculty member per year. There seems to be some disquiet among the faculty, with complaints grounded in ABET (Accreditation Board for Engineering and Technology) requirements which call for substantial involvement of the faculty in teaching related activities (such as the development of design courses, lab courses, etc.); and for addressing the lack of integrated goals and programs, the lack of cost sharing, heavy teaching loads (6 courses a year is usual), and inadequate support from the Office of Research for research proposal activities.

The Department does not seem to be pursuing an overall theme for research or curriculum, and has not developed a plan to allow for the development of areas which can leverage future funding by the federal government or the state. The current areas of research focus are environmental, geotechnical, hydrology, structures, and transportation.

Overall the Department is in need of a strategic plan that will identify appropriate research education areas that will address local and national needs and build on existing strengths. Some suggested themes are programs and research areas related to geophysical disciplines and water resources (ground water remediation). To improve the Department's performance both in research and education will require a substantial funding increase and additional faculty of stature.

### *Department of Industrial and Manufacturing Systems Engineering*

With only 9 tenure and tenure track faculty members and overall enrollment of 260 students (46 BS, 164 MS and 50 Ph.D),<sup>38</sup> the academic and research activity in this Department has been fairly limited. The total level of active contracts and grants in the Department is low (\$268,000 in 2003<sup>39</sup>) although the Department ostensibly covers research areas for which funding is available. The Department has declared the research areas of manufacturing, transportation, health care, and environmental analysis as both programmatic and research focus areas.

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<sup>37</sup> Id., pp. 5, 8 and 9.

<sup>38</sup> Id., pp. 5, 8 and 9.

<sup>39</sup> Id., p. 12.

However, the biggest research activity for this Department is from faculty members who are actively participating in ARRI.

The Department wants to increase the number of undergraduate students to 300 from 246 in the next two to three years, and increase the number of degree programs and courses offered. It wants to improve the quality of the educational programs; develop a research agenda that generates adequate funds and publications; and establish a Center for the Aerospace and Defense Enterprise that will cover the research areas of pervasive computing in manufacturing, autonomous systems for defense applications, manufacturing systems, simulations and analysis, enterprise engineering, reconfigurable manufacturing systems and systems engineering in aerospace. This latter program targets \$500,000 per year from federal and corporate sources to support 10 Ph.D. students. While the concept of such a center is excellent, the expected level of research is very modest and its scope in terms of future directions is very limited. The Department needs a more comprehensive and aggressive plan.

The ambitious program agenda laid out in the UTA/IMSE presentation, dated December 17, 2003, is inclusive but not convincing since space, funding, student demand, and industrial interests are not yet adequate to improve research performance. A development effort of at least several years will be required encompassing new faculty hires and the development of research directions relevant to areas funded by federal agencies and private industry.

*Department of Mechanical and Aerospace Engineering*

This Department has 25 tenure and tenure track faculty members<sup>40</sup> and a 25 year history of research and teaching. It has almost doubled its enrollment since 2000 to over 800 in the fall of 2003,<sup>41</sup> and increased its graduate student headcount from 136 in 2000 to 225 in 2003 (187 MS students and 38 Ph.D. students).<sup>42</sup>

Currently Active research grants and contracts will bring in a total of \$1.7 million over their lives – not enough to finance the Department’s ambitious research agenda. Between September, 2002 and August, 2003, faculty members published only 36 papers in journals and conference proceedings. This research output is very low and should be improved substantially. One reason for this poor showing is that faculty research interests tend to be dated or very applied. Several projects are conducted jointly with the Automation and Robotics Research Institution (ARRI) with an emphasis on micromachining and embossing and have resulted in interesting and potentially important applications for manufacturers of micro and nano components of systems.

Faculty members are doing research in flight mechanics and control, aerodynamics and propulsion, heat transfer, boiling and condensation heat transfer, MEMS and mechatronics, and telecommunications packaging. Some of these topics such as heat transfer and boiling and condensation heat transfer are outdated. We recommend that MAE focus its research on areas most likely to lead to tech transfer and economic development and most likely to be funded by federal agencies and industry, especially in cooperation with ARRI. Together, they could form an active research consortium including industrial members.

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<sup>40</sup> Id., p. 5.

<sup>41</sup> Id., p. 8.

<sup>42</sup> Id., p. 9.

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The Department has identified a number of challenges including its low percentage of junior faculty, low percentage of Ph.D. students, low federal funding support, imbalanced faculty salary levels, limited funds for scholarships, and limited lab space. Progress in these areas will be critical in order to improve the quality of education and research. A detailed strategic plan should be developed to address these issues.

### *Materials Science and Engineering (MSE) Program*

The MSE Program is administered by the Colleges of Engineering and Science and has 7 full time (core) faculty members, over 15 associated faculty members, and 70 graduate students.<sup>43</sup> It is a graduate program only and is of small size; last year it produced 7 Masters and 1 PhD. graduates.

The Program supports a very broad spectrum of research topics indicating an inability to focus on a few key initiatives. Also, it supports five different centers, a surprisingly high number considering that the Program has only 7 core faculty members. MSE has an active research activity centered on electronic materials, but more focus would improve it. This can be achieved in two ways: (1) reducing the number of research centers, and/or (2) increasing the number of faculty and students. The process to achieve better focus and better performance should be determined through extensive strategic planning. The Program's instrumentation is modern, but requires continual upgrading since the relevant technology is developing rapidly. MSE has extensive industrial relations and has contracts and grants from federal, state, and industrial sources. Its research activity is about \$1 million for the total duration of the contracts, and annual research funding is less than \$500,000, leading to the conclusion that many of its centers are relatively inactive.

### *Biomedical Engineering Program*

The Biomedical Engineering program collaborates with the UTSWMC. This cooperation appears to be productive but the Program is small and not well funded. At UTA, there are 7 Biomedical Engineering faculty members, and 8 degrees (all MS) were granted in 2002-03.<sup>44</sup> The Program's active research grants amount to \$686,000 and its research themes are imaging, tissue engineering, bioinstrumentation and human performance, biomechanics and orthopedics, and molecular and computational biomedical engineering.<sup>45</sup> These subjects allow for an active research program in biomedical engineering that should have funding from NIH and other appropriate federal agencies.

### *Automation and Robotics Research Institute*

The Automation and Robotics Institute's (ARRI) mission is to improve the competitiveness of manufacturing and related enterprises through excellence in research and the sharing and deployment of knowledge. ARRI is located in a 48,000 sq.ft. building in east Fort Worth about 10 miles from the University campus. It employs 21 professional staff and is

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<sup>43</sup> Id., p. 9.

<sup>44</sup> Id., pp. 5 and 10.

<sup>45</sup> These themes require better definition. Imaging for human patients' diagnoses is one objective, for example three-dimensional representations of organs, but imaging widely has many applications beyond those in biomedicine. How widely is this theme going to be applied and in which applications? The same questions are relevant to tissue engineering. So far, the answers to these questions are not being used to animate the programs and themes.

supported by 6 tenure track faculty members. Its grants and contracts last year were close to \$4 million. About 25% of this funding was from the state.<sup>46</sup> This Institute has been in existence since 1983 and has focused on a variety of research areas including process automation, autonomous systems, enterprise engineering, free form fabrication, controls and sensors, MEMS, and pervasive computing. While the primary value of the Institute is in technology transfer and engagement with the business community in Fort Worth, it also provides funding for basic research.

### *Recommendations for the College of Engineering*

Overall UTA Engineering has strengths in a number of departments and centers that can be further developed, including Computing Science and Engineering, Electrical Engineering, Mechanical and Aerospace and ARRI. Others showing potential, but with more significant hurdles to overcome, are Biomedical Engineering, Industrial and Manufacturing Engineering, and Civil and Environmental Engineering. The key to realizing the potential of this College is the development of a comprehensive plan that will allow UTA to build on the existing strengths and reach the level of quality required to place UTA in the Tier 1 group of institutions.

Our specific recommendations for the College are as follows:

1. UTA and UTD seem engaged in unproductive competition with each other. We suggest that UTA Engineering and UTD Engineering collaborate rather than compete. These two universities have unique strengths that can lead to a great coordination of activities and very exciting research. Areas for potential collaboration include microelectronics and biomedical engineering.
2. Most departments, other than Computer Science and Engineering and Electrical Engineering, are understaffed in terms of both faculty and technical personnel. The faculty feels unsupported and sees many roadblocks in its efforts to improve the quality of research programs and increase research output. UTA needs to make adequate investments in new faculty hires, graduate student fellowships, facilities, and technical support.
3. UTA has extensive facilities for work in microelectronics, MEMS, and materials, but no staff to provide support for this equipment. We recommend that UTA consider hiring staff so that faculty members can spend their time writing proposals rather than servicing equipment.
4. It is very important for the College to develop a strategic plan that identifies areas of future focus. The College's faculty now seems to go after opportunities in an uncoordinated way.
5. Important subjects of materials engineering and science need to be reworked to improve their presentation in the curriculum and their place in research. The size of the faculty is inadequate in these areas (7 full time core faculty members) and the research program appears diffuse and underfunded. The subject matter is too central to engineering and industrial requirements to allow it to remain in its current state.

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<sup>46</sup> *Automation & Robotics Research Institute*, The University of Texas at Arlington, undated presentation to WAG.

SCHOOL OF NURSING

The School of Nursing is large, with over 1,000 students, 400 of whom are juniors and seniors (the junior and senior years are considered the professional nursing years after 2 years of general education and biological background). The School receives applications from many more individuals that it can admit (600 applications for 200 spots). Perhaps as a consequence, students in this School have a relatively high average GPA of 3.4. We were told that the School's graduate program is the largest in Texas with over 300 students, most of whom are MA candidates with a Nurse Practitioner focus, and some in an MA program for Nursing Administration. This fall, the School instituted a new Ph.D. program with two areas of study, academic role development and clinical research.

The School has approximately 90 faculty members (76 FTE's) with average teaching loads of 3+3 for undergraduate level courses and 2+2 for graduate level courses. The faculty to student ratio for clinical years is 1:10; however, it should be noted that faculty teaching in this program have many contact hours – 50% of faculty time is spent in direct contact with students and about 20% in preparation. The Dean believes that the addition of 6 tenure track and 3.6 non-tenure track positions would bring the student/faculty ratio to the desired level. She cites the relatively low level of faculty salaries as an impediment to recruiting.<sup>47</sup>

The School appears to have competent and enthusiastic leadership and a thriving undergraduate and graduate education program. There is a definite and increasing interest in research with the new Ph.D. program. The School had approximately \$1.02 million in awards last year with the vast majority (\$0.9 million) in education grants, and \$43,431 in research grants. About 6 of the School's faculty members are research active and interacting with various medical institutions in the area. Although the faculty is heavily engaged in teaching, it did manage to produce 47 publications last year, 21 in refereed journals.

The School of Nursing appears to be thriving and, although it is unlikely to be a major player in research, an investment in additional faculty with research interests would be worthwhile and might significantly increase the external funding for the School.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts has 160 tenure and tenure track faculty, of whom about 140, the Interim Dean estimates, are active publishers in peer reviewed journals of varying quality. Teaching loads are generally 3+3 or 3+2, salaries are not competitive, and infrastructure to support research is lacking. This may be part of the reason that the College has lost some 30 tenure and tenure track faculty members in the past 6 years (through non-promotion and retirement as well as departure). Fifteen authorized searches are underway at this time.

By far the strongest departments are Political Science, with its associated Center for Mexican-American Studies, and History and the affiliated Center for Greater Southwestern Studies. The graduate-only Linguistics Department has an excellent reputation and was the recipient of a substantial grant several years ago, and the Department of Criminology and

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<sup>47</sup> The Dean informed us that the School's full time faculty salaries are moderately below the regional and national means for academic nursing faculty and substantially below the salaries provided at the hospitals in the surrounding Metroplex area.

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Criminal Justice also is well-regarded. One of its faculty is a co-PI on a grant (\$148,000 in 2002, \$15,000 in 2003) that appears in the total for School of Urban and Public Affairs (SUPA).

The most successful research active faculty members in Political Science are involved in the Center for Mexican-American Studies (which also includes faculty members from other departments, such as Sociology, and has a close collaboration with the College of Education). The Center's participants enjoy much lighter (1+1) teaching loads than are standard for the College. The Center receives some State support through special-item funding of \$50,000 per year and also receives NSF funding through a subcontract with Southern Methodist University (SMU). One faculty member who works on a variety of Mexican immigration issues has brought in a total of \$400,000 in grants over the past three years, a little less than half of which has come to UTA – some of this money has come from the Mexican government equivalent of the NSF. For FY2002, the Political Science Department received approximately \$64,000 in federal research funding, which accounted for 77% of the external research funds received awarded in the College of Liberal Arts.<sup>48</sup>

Participants in the Center for Greater Southwestern Studies, which is staffed primarily but not entirely by faculty from the History Department, also enjoy relatively low 1+2 teaching loads and receive some travel money and RA support to assist research in the Center's own special collections, which are also the focus of most of the Center's research projects. External funds for this Center come primarily from private foundations in Texas (e.g., \$68,000 from the Houston Endowment and \$30,000 from the Summerlea Foundation of Dallas, both to improve the teaching of Texas history).

### *Recommendations for the College of Liberal Arts*

1. Individual faculty members, departments, and the College as a whole all need to focus on developing collaborative proposals for larger grants. The College is in the early stages of developing an interdisciplinary effort to attract federal funding for research on the social implications of homeland security. Collaboration with faculty in other universities, particularly those in the Dallas area, should also be pursued.
2. Much of the work to change the incentive structure to facilitate and reward research must be done at the University-wide level, but the College leadership should also continue, and if possible intensify, its efforts to establish such a structure.
3. Every effort should be made to raise endowment money for the College's two Centers, which are clearly the focal points for research grants, to enable them to operate on a less catch-as-catch-can basis.

### COLLEGE OF EDUCATION

This College has 28 tenure and tenure track faculty members<sup>49</sup>, and more than 100 adjuncts, lecturers, etc. (mostly part-time). The Dean estimates that some 15 to 20 of the tenure and tenure track faculty are doing high quality research. Though highly ambitious for her school, she estimates that it will take 10 to 12 more years "to build the College we want," as well as additional funds to hire new faculty, give them teaching loads consistent with active research, and

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<sup>48</sup> *Awards and Source of Funding by Department*, op. cit.

<sup>49</sup> *The Total Number of Tenure and Tenure Track Faculty by Department for Fall 2002*, UTA Office of Research.

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to fund TAs and RAs, particularly in the new PhD program in K-16 Educational Leadership that the College is proposing. Currently, resources for reduced teaching loads are available only to new faculty for the first year. The College is authorized to hire 5 new faculty members this year.

Areas of particular strength include the Department of Kinesiology, which has a number of research oriented young faculty members who are in the process of developing partnerships with various medical centers and the Department of Curriculum and Instruction. The latter has a 5 year \$1 million-plus grant from the U.S. Department of Education for bi-lingual education, but this is primarily a training grant. We were told that a couple of the smaller grants (one funded by the Sid Richardson Foundation), again focused on bi-lingual students, and are more research oriented. Research funding awarded to the College in FY 2002 totaled \$1.5 million<sup>50</sup> but, despite the “research” designation, this included the 5-year training grant described previously.

The Dean puts heavy emphasis on collaboration with other parts of UTA, including the Center for Mexican-American Studies, the College of Science, and the College of Engineering, as well as with other institutions of higher education, from UTSWMC to nearby community colleges, and with many of the independent school districts within a 60-mile radius of UTA as well. One aspect of this last collaboration is an ambitious proposal to fund a Center for Collaborative PreK-16 Teacher Education Research (CCPTER) based at UTA. Funding is being solicited from the U.S. Department of Education under the No Child Left Behind Act; the direct grantees would be the School districts rather than UTA itself, but the Center would recruit, coordinate, oversee, report on and disseminate results of the research conducted by 64 students, educators and other professionals.

### *Recommendations for the College of Education*

1. The Dean stated at one point in our discussion that “we are creating a new [research oriented] culture here.” She should continue to send this message as clearly as possible in all directions: downward to the faculty, in the form of support and reward structure; upward to the central administration in the form of steady pressure to create the necessary infrastructure; and horizontally to the various groups that are potential collaborators, either as funders or as co-investigators in research.
2. The outreach for partnerships and collaborators, both inside and outside UTA, should continue to receive high priority, and both the Dean and the faculty actively involved in creating such relationships.
3. The proposed Ph.D. program in Educational Leadership should be pursued. It is a natural complement to the proposal for a Collaborative Research Center described above, and would provide a graduate research niche for the College that would build on existing strengths and interests.

### COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration has some 70 tenure and tenure track faculty. According to the Dean, about 65 are publishing in peer reviewed journals, with perhaps 50 hitting the major (either “elite” or “high quality” in the ranking system they use) journals in their respective fields. Teaching loads vary from 2+2 for the most research active faculty to 4+4 for those who are not producing research at all. The Dean considers salaries competitive at the junior

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<sup>50</sup> *Awards and Sources of Funding by Department*, op. cit.

but not at the senior levels, creating a compression or even inversion problem. He also believes the support provided for the College's Ph.D. students (there are 88 currently) is not competitive for high quality students.

There is at present no externally sponsored research in the College of Business. The Dean mentioned that he hopes to raise \$5-6 million of outside funds with the aid of his newly-created Advisory Board and an outside fundraising consultant. He adds that grant-writing "is not part of the Business School culture," a view that is quite general among business schools.

*Recommendation for the College of Business Administration*

In light of the situation just described, it is not realistic to expect the College of Business to become a significant generator of externally sponsored research, although many of the tenure and tenure track faculty are active in research and publication on an individual basis.

SCHOOL OF URBAN AND PUBLIC AFFAIRS (SUPA)

This is a small but high quality School with 12 tenure and tenure track faculty, most or all of whom are publishing, primarily in peer reviewed journals. Teaching loads seem to range from 2+2 to 3+3, but can be reduced by grants. Salaries are competitive for the state but not nationwide, according to the Dean. The School has been designated by the U.S. Department of Commerce as one of the nation's Centers for Economic Development Research Excellence, through which it receives an annual appropriation designed to assist local communities with their economic development plans. It also has been designated by the State of Texas as the state's only Institute of Urban Studies and, as such, has received special item funding since 1967 to carry out its mandate.

In FY 2002, SUPA received research funding of just over \$400,000, slightly less than half from a federal agency and the other three from State, local, and private sources.<sup>51</sup> In FY 2003, the School's research awards totaled \$785,000.<sup>52</sup> SUPA offers two Ph.D. programs, one in Public Administration and Urban Affairs and one in Urban Planning and Public Policy (a version of the latter is offered jointly with Universidad Autónoma de Nuevo León (UANL) in Monterrey, Mexico). It also offers four MAs, 6 MAs jointly with other UTA schools, three undergraduate minors, and six certificate programs.

SUPA also has three research centers: The Institute of Urban Studies (IUS), established in 1967 by an act of the Texas Legislature; the Center for Economic Development Research and Service (CEDRAS), established in 1994 under the auspices of the U.S. Economic Development Administration, and the Center for International Research, Education and Development (CIRED), established in 2001 under contract with the U.S. Department of State University Partnership Development Program, focused primarily on universities in Eastern Europe. The majority of the grant funding received by SUPA comes through one of these centers and, as is generally the case in such fields, it isn't possible to separate the research from the training-outreach components of these various activities. CEDRAS is currently in the process of establishing a socioeconomic data center and an input-output model adapted to local and regional needs.

The concerns of the Dean and faculty are similar to those voiced by many of the other groups we interviewed: lack of funds to support full-time Ph.D. students (currently most are part-

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<sup>51</sup> *Awards and Source of Funding by Department*, op. cit.

<sup>52</sup> R.L. Elsenbaumer, Interim V.P. Research, op.cit.

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time working professionals), absence of infrastructure to assist to faculty in writing grant proposals and managing grants, the non-availability of matching funds that would make UTA grant proposals more competitive with proposals from institutions in states that do provide such funds. The Dean and faculty also argue that with a larger faculty the School could generate substantially more externally funded grants and contracts. Given the national standing of the School and its uniqueness in the State of Texas, they could very well be correct, although at present, only about 4 or 5 of the faculty have such grants.

### *Recommendations for the School of Urban and Public Affairs*

1. SUPA already partners with a number of other UTA Colleges and Schools in offering degree programs, and with universities in Mexico (offering a joint Ph.D. in international comparative policy and administration) and in Eastern Europe (under the State Department program described above). It may want to explore more specifically research oriented collaborations, both with its current internal partners and UANL and with other schools of public policy, both in Texas and elsewhere.
2. Currently, no new hiring is authorized for SUPA. Some strategic hiring of high quality research oriented junior faculty would very likely increase opportunities for additional external funding for research, particularly if it were combined with some increase in research infrastructure available to these new hires.

### SCHOOL OF SOCIAL WORK (SSW)

The SSW has 32 faculty members who, according to the Dean, have a strong record of publication in peer reviewed journals. Teaching loads in the School are 2+2 and, according to the Dean, salaries are not competitive, particularly at the full professor level. The School offers a Ph.D. in Social Work as well as a dual Ph.D. in Comparative Social Welfare with UANL in Monterrey, the first Ph.D. Program in Social Work in Mexico.

The Dean estimates that 22 of the School's faculty members are actively engaged in some aspect of externally funded projects, and that they generated some \$3.2 million this year (largely from federal granting agencies), or \$100,000 per full-time faculty member. These grants, again, represent a mixture of research, training, and service components. With a good base to build on, one of the Dean's goals is to make these activities more research oriented (e.g., through greater use of clinical trials). The School's partnerships with faculty at UTSWMC and the North Texas Health Sciences Center are critical to this thrust.

The SSW's Center for Research and Technology serves as the nucleus of a research infrastructure for the School to attract external funding. The SSW faculty have both research interests and recognized strength in such areas as cognitive behaviorism, child abuse, domestic violence and anger management, substance abuse, mental health, biofeedback therapy, and IT applications in human services. The Dean would like to see the School establish a partnership with Nursing to develop expertise in gerontology, which he sees as an area of rising research interest.

The Dean has established a research initiative, in the form of some funds for RA support and grant development travel, in order to encourage the research activities of new faculty. The Dean adds that obtaining externally funded research grants, as opposed to simply publication, is a relatively new priority for his School, originating within the last 5 years, and that the necessary change in faculty culture is still in its infancy.

*Recommendation for the School of Social Work*

The SSW's strongest partnerships at present are with various service providers, and these have been the source of a number of mixed research-training-outreach grants (with the research often taking the form of program evaluation). However, in order to bring in funding from federal research granting agencies like NIH, partners who have a track record with these agencies are essential. Given this fact, and the strong health related character of many of the faculty's research strength and interests, initiation and expansion of partnerships with the medical and health sciences institutions in the area should be given high priority.

**General Observations, Conclusions and Recommendations For UTA**

As stated earlier, it is of overarching importance that UTA's new President expeditiously install his senior leadership team and announce a vision for the future of the University. UTA's history as a broadly based teaching university, its standing in the community that derives from carrying out that teaching role well over many years, and its more recent strides toward becoming a research centered university, enhance its prospects for substantial improvement in standing. However, effective leadership and sustained continuity of purpose will be essential.

UTA's current major strengths are:

- The fact that it is a broadly based, Carnegie Research Extensive University;
- The broad base of research potential in important areas of science and engineering that can provide a foundation on which to build research capacity and compete for federal research grants;
- UTA's location in a technologically advanced industrial region;
- The possibility of partnership and joint research proposals with the trio of UT System institutions in the Greater Dallas Region; and
- Outstanding engineering graduates that are in high demand by local industry.

The areas which pose the most significant challenges to achieving Tier 1 research university status are:

- The faculty's heavy teaching loads (often 3 courses a semester) that leave little time for research;
- UTA's lack of a strategic plan with timetable for recruiting research qualified faculty, staging construction of facilities, and realistic estimate of funding needs and sources;
- Weakness in biology and in other NIH fundable research fields;
- UTA's late start in organizing development campaign;
- Instability of leadership in recent years; and
- The low level of sponsored research funding despite comprehensive coverage of basic fields in science and engineering.

Although the levels of sponsored research at UTA are relatively low, those funding levels are not always indicative of the quality of research. UTA has strong research groups in the following areas:

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- Chemistry;
- High energy physics;
- Psychology; and
- Computer science and engineering.

The fields that provide the next high opportunity areas for UTA are:

- Genomics; and
- Nanotechnology related to semi conductor fabrication (which would support the needs of local industry).

In order to maintain its current research strengths, pursue new ones, and reach Tier 1 status, UTA estimates that it will need to:

- Hire between 400 and 450 new research qualified faculty members, assuming each generates research expenditures equal to the average for UTA's current research active faculty of \$161,000 per year. If such faculty members were able to generate \$230,000 in research expenditure a year (which is the national average for federally funded faculty members) the total number of new faculty members needed would drop to approximately 320.
- Provide start up packages for new research faculty members, which are likely to range from \$300-\$500,000.
- Complete the new science building that already is funded; add an annex to the engineering building that will double the amount of space there; and, after that, build two additional 120,000 square foot science buildings, each at a cost of approximately \$80 million.

UTA's estimates appear reasonable to us. Its major challenge will be to identify and secure the sources of funding to support this growth.

As UTA pursues its goal of Tier 1 status it must establish certain priorities – it cannot undertake simultaneously all of the actions that must be taken to achieve success. We believe the following should be among the first that UTA undertakes:

- UTA's first priority should be the development of a strategic plan that, among other things, identifies and prioritizes research focus areas, lays out a specific timetable for achieving goals, and identifies sources of funding.
- Once the strategic plan is developed, UTA will be in a position to mount its capital campaign and begin recruiting the faculty necessary to achieve its vision.

Assuming UTA is able to address the issues we raised in this report, we agree with its conclusion that it will take some 15 years to recruit the 400-450 additional research active faculty who are the key to UTA's aspirations. This assumes a hiring rate of 30 per year. If the national average for research efficiency of \$230,000 is assumed about 325 additional faculty would be needed and this would take more like 10 years to complete. With all the uncertainties in assumptions it is reasonable to use 10 to 15 years as a target. The difficulty in achieving this goal

will be in obtaining state support for the additional FTEs, financing their set up costs, and financing the required teaching and laboratory facilities. UTA needs to organize a campaign to find these resources.

Our specific recommendations for UTA are as follows:

1. *Strategic Plan:* The development of a strategic plan, with a specific agenda for prioritization of research and education programs, is of critical importance. It should be done with extensive input from administrators and faculty, partly because of their knowledge and experience and even more to insure their buy-in, and also with input from community leaders and other interested parties. The plan also must bear a strong stamp of the new President's own vision for the Institution.
2. *Communication and Development:* The administrators in charge of the Offices of Government Relations and Development both feel strongly that the University has not told its story effectively to alumni, foundations, corporations, or the community in general. In order to do so, UTA needs not only a long term vision for itself and a strategic plan to go with it, but also a specific development (fundraising) plan, and investment in a development infrastructure.
3. *Partnerships:* Forming research partnerships, not only with other North Texas academic institutions (particularly UTD and UTSWMC), but also with major corporations (e.g., Lockheed, Texas Instruments, Vought Aircraft), and government research labs like Sandia and Fermi would greatly increase opportunities for obtaining research grants from federal agencies, and would also increase the likelihood of getting corporate money for research from companies that hire UTA's graduates in large numbers.
4. *Faculty Recruitment:* UTA should study and then employ the best faculty recruiting practices of successful research universities, including the establishment of a network to identify outstanding prospects, and seminars to tutor faculty that serve on search committees.
5. *Uneven Distribution of Strength:* UTA's broad portfolio of departments in basic science and engineering fields offers it an advantage, but the departments are of uneven strength, and eventually this must be corrected. Not all departments need to be equally strong, but for UTA to exploit fully its broad portfolio, it should raise its weaker departments to a level capable of doing fundable research.
6. *Graduate Students.* UTA should allocate resources to improve the uneven quality of its graduate students. Factors that have contributed to this uneven quality include non-competitive stipends, problems with tuition remission, and a lack of a good central recruiting policy.
7. *Matching Funds:* Finding money to allow the University to match external grant funding would greatly enhance the probability of getting such funding.
8. *Government Relations.* Although not discussed in the body of the report, we note that the Office of Governmental and Community Relations has a one person staff. The current Director appears competent and effective at local and state levels but has

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no experience at the Washington level and federal relationships have been left to the UT System. UTA might want to consider more of a federal presence.

9. *Support for Common Equipment.* A number of researchers mentioned the fact that the University has certain specialized research equipment available to them, but it has no staff to support the equipment, and researchers must maintain the equipment themselves. UTA might consider whether it would be possible for UTA, UTD and UTSWMC to develop a common pool of technicians for this type of equipment.

**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.