STRATEGIC PLAN
DEPARTMENT OF PHYSICS
GUSTAVUS ADOLPHUS COLLEGE
May 10, 2009

Section 0 Prologue

The exercise in strategic planning in which we have been asked to engage this year must be approached with care. On the one hand, the Administration has made it clear that they believe the successful production and communication of institutional and academic strategic plans to be necessary precursors to a large fundraising campaign that will take place in a few years. We have been told, in no uncertain terms, that if we want to be at the table for whatever bountiful harvest is eventually to be shared, then it is this strategic plan that may earn each of us a seat there.

To the credit of the Provost, who has designed and implemented it, the planning process in which we are engaged is intentionally a bottom-up one. We have for years suffered from top-down strategic plans written by former administrators who were almost completely out of touch with the actual academic program and its strengths, weaknesses, opportunities and challenges. (For all the lip service they have paid to statements like, "What really matters at Gustavus is what goes on, among you and our students, in your classrooms and labs, each and every day", they never bothered to understand what really was going on.) However, a bottom-up planning process is by its nature one that begins from fragments (individual departments and programs) and so the challenge is to eventually create a synthesis in the form of one, whole academic (or institutional) strategic plan.

Caution must be exercised in writing the strategic plan for any individual department or program, in that we risk not seeing the forest for the trees. We all trust in the skills and wisdom of those in the Provost's office to work on a synthesis of our individual plans, and we have confidence in them and their good intentions. But, at the starting point for the whole planning process, if we present only a series of narrow ideas tied specifically to our own department or program, we risk missing out on the most important elements needed in a final strategic plan.

Another note of caution stems from the fact that the very planning exercise in which we are engaged has its roots in the corporate world. Abstractly, of course, one may argue that the exercise can be applied just as well to Gustavus Adolphus College as it can to Target Corporation. At some level we are a business, we have a budget, we offer a "product", and we need to improve and to successfully market that product. But the academy is <u>not</u> the corporate world. This is a college. What we do, and aim to do better every day, is to educate young men and women. Rather than use the template we were given to begin our strategic plan with our individual departmental mission statement, we should turn first to the College's mission statement, and recognize that what we do in our department is, at the root level, exactly what is done in every other academic department. **Our daily mission is to have supportive and skilled faculty members successfully engage talented and receptive students in the dialogue and modes of instruction which lead to effective learning. In four years, through a comprehensive general education core and a rigorous major specialization, we aim to fulfill all of the goals enumerated in the College's mission statement.**

As we look to the future, our strategies must be those which provide for those things to actually take place. At the core, this means that we must:

1. Recruit and retain a talented faculty of sympathetic and highly-skilled teachers;

2. Recruit and retain a capable student body, consisting of eager and able learners; and

3. Provide the facilities, environment and activities that allow the most appropriate pedagogies to be used to foster effective learning.

If we lose sight of these three, most basic elements in our strategic planning process, then we will not move in the direction of better fulfilling our mission. These are the pillars around which any strategic plan must be constructed. They should form the core of the strategic plan for the College, and certainly do for the Department of Physics.

But the Physics Department's plan is only one of dozens of plans that will be submitted and used in an attempt to forge a College-wide plan. Many of those plans will contain elements that, to some constituencies, seem important. There may be new concert halls, coffee shops and fitness centers. There may be beautiful landscaping and new sports venues. There may be calls to hire new administrators and support staff to oversee all the new facilities. At the micro level, any one of those things may be seen to contribute indirectly to the College's mission. But for too long we have neglected the core, macro elements that are directly responsible for fulfilling our mission – the three items given above. (As proof of that neglect, one need only look to the College's annual budget. In the years 2000-2009, the faculty salary pool has grown by 47%. During the same time period, the administrative salary pool for has grown by 72%.) If the priorities that come out of the overall strategic plan do not put these three essential elements first, then we will have failed in our planning exercise. Because it really is the quality of what goes on, every day, in our classrooms and labs, directly, between the students and the faculty, that allows us to fulfill our mission.

Section 1 Description of the Department of Physics

1.1 Mission, vision, and goals

The Physics Department, in its curriculum, its student-centered research projects, and its co-curricular activities, endeavors to fulfill the immediate and future needs and interests of a variety of students. The faculty members in the physics department share a philosophy that guides them and can be summarized in the following statements:

We believe that an education in the Liberal Arts, in which we include the sciences, not append them, is the best preparation for a life of intellectual growth and service. We believe in the importance of our discipline, and that communicating and extending it are worthwhile and compatible life goals. We design our program of courses for the different constituencies of students we serve, and we gauge the effectiveness of our efforts by internal and external measures that are appropriate for each of these audiences. Given the three distinct student

constituencies for which we provide a part of their education, there are three distinct kinds of outcomes that specify what we hope to be our department's impact on students.

For those students who enroll in the program to become physical scientists or engineers, we provide a comprehensive, unified, rigorous curriculum of courses, collaborative research, and mentoring that will prepare them to succeed in graduate studies at institutions of high standing and in flexible careers thereafter. Before graduating from Gustavus, we expect them to obtain the quantitative reasoning abilities and mathematical skills required to solve upper-level physics problems at the level of vector calculus and linear algebra. We expect them to have familiarity and expertise with the experimental apparatus and instrumentation used in contemporary physics laboratories, including standard electronic test equipment, lock-in amplifiers, nuclear instrument modules (NIM), standard optical elements, lasers and optical detectors, GPIB and other interfacing, and programming in LabVIEW. For those going on to graduate study in physics or a related area, we expect them to have a working knowledge of the important concepts in the areas of classical mechanics, electrodynamics, optics, quantum mechanics, thermodynamics and statistical mechanics. The manifestation of these outcomes could be admission to and success in a graduate program and obtaining an advanced degree in physics or a related field. Alternatively, it could mean finding and succeeding in technical employment after graduating from Gustavus.

For those students who study physics as a cognate discipline or in preparation for careers in teaching or interdisciplinary fields, we provide distinct courses to engage and enhance their skills for seeing the connectedness among physical phenomena and theories and their primary fields. For students majoring in the areas of biology or chemistry who take general physics as an adjunct to their major, we expect them to obtain the quantitative reasoning abilities and mathematical skills required to solve introductory-level physics problems at the level of basic algebra and/or calculus. We also expect them to obtain a basic knowledge of the important concepts in the areas of classical mechanics, electricity, magnetism and electric circuits, waves, sound, optics, elementary quantum physics and thermodynamics. A specific outcome desired for many of these students is also an acceptable score on the physics-related portion of the Medical College Admission Test (MCAT). For students majoring in education who take one or more courses in our department in preparation for a teaching career, we expect them to obtain the quantitative reasoning abilities and mathematical skills required to solve introductory-level physics problems at the level of basic algebra. We also expect them to obtain a familiarity with the important concepts in the areas of classical mechanics, electricity, magnetism and electric circuits, waves, sound, optics, elementary quantum physics and thermodynamics. We also expect that they will have sufficient knowledge of the experimental techniques and apparatus needed to explain and demonstrate these concepts via simple phenomena that are accessible to K-12 students.

For those students whose experience with physics and astronomy is through its role in their general education, we again provide distinct courses whose purpose is to convey the substance and excitement of our never-ending quest to understand the physical universe. We expect them to obtain a familiarity with the important concepts in the area of physics addressed by their particular course. Importantly, we expect them also to achieve an understanding of "how we know what we know" in science, to examine the relationship between scientific knowledge and other types of knowledge, and to understand the social context of science, both historically and

contemporarily. We also expect them to obtain the quantitative reasoning abilities and mathematical skills required to solve introductory-level problems, related to the concepts that they have learned, at the level of basic algebra.

In a typical academic year, the Department of Physics enrolls about 500 students in its courses: about 100 of them in courses for general education; 150 of them in service courses for other majors; and the remainder in courses for the physics major.

Our vision for the future is to build upon the strong program that we have already developed, but to improve and expand it. Our specific goals are to:

1. Hire and retain a physics faculty of the size, breadth of training, shared sense of mission and teaching prowess to provide our students with the best undergraduate physics education in the nation.

2. Recruit annually a quality incoming class of students eager to major in physics.

3. Provide our students with better access to 21st-century facilities, equipment and pedagogies in their courses.

4. Provide our students with increased and enhanced opportunities for participation in scientific research.

5. Provide our faculty and our students with closer connections to the world of science outside Gustavus.

1.2 Programs

The Department of Physics offers either a major or a minor in physics. We also offer a major with honors that involves additional coursework, a minimum GPA requirement, and the writing and defense of an honors thesis.

The department is home to a chapter of Sigma Pi Sigma, the national physics honor society. Sigma Pi Sigma is a member honor society of the Association of College Honor Societies and a member of the American Institute of Physics. It exists to honor outstanding scholarship in physics; to encourage interest in physics among students at all levels; to promote an attitude of service of its members towards their fellow students, colleagues, and the public; and to provide a fellowship of persons who have excelled in physics. Nomination and election to membership are by the faculty, based upon a combination of student achievement in course work and research, and participation in department and activities associated with our chapter of the Society of Physics Students (SPS).

Within the broader curriculum of the College, physics faculty members are active participants in both Curriculum I and Curriculum II general education programs, including the FTS program.

1.3 Support relationships

First and foremost, the physics department relies upon the **Admissions Office** to identify and recruit a quality incoming class each year. Without the fine work done by Mark Anderson and his staff, we would, literally, have no program.

We certainly rely upon the **Provost's office** to provide annual salaries and benefits sufficient to attract and retain faculty members of the highest quality. We also rely upon that office, currently by way of the **Kendall Center for Engaged Learning**, to provide funds for faculty development in order that each faculty member can have access to the resources necessary for professional development and enhancement. Without a talented and engaged faculty that is constantly improving, we cannot provide the best education for our students.

We rely upon the **College** to provide an annual **budget** sufficient to maintain the day-to-day operation of our department, in terms of facilities, lab equipment and supplies.

For decades, we have been forced to rely upon outside funding agencies, principally the **National Science Foundation** and its grant programs, to provide virtually all of our research facilities and the majority of our major laboratory equipment.

In the process of identifying outside grant opportunities and carrying out the work of grant writing and administration, we rely upon the assistance of the **Office of Corporate and Foundation Relations** in the Institutional Advancement Office. Bob Weisenfeld, despite his heavy workload, has always taken the time to work closely with the faculty members in our department in the proposal writing for and the administration of our outside grants. His assistance has been a great asset.

Within the College, although we essentially maintain our own departmental information-technology infrastructure in terms of hardware and software, we rely upon **Gustavus Technology Services** (GTS) for core services like network infrastructure and lecture-hall technology. We have also been forced for years to rely indirectly upon GTS, via the Instructional Infrastructure Advisory Committee (IIAC), for any major purchases or even routine replacement of computer hardware or software.

Within the academic program, we rely heavily upon the **Department of Mathematics and Computer Science** to provide the foundational mathematics courses needed by all of our student majors.

On the other side of the coin, the Department of Physics provides support in the form of service courses, including our General Physics sequence, which primarily targets students majoring in the departments of **Biology** or **Chemistry**, but also some **Education** majors and a few others, mostly in pre-health professions. We provide other service courses for Education majors, including PHY100 or PHY101, Physical World, and PHY102, Astronomy.

Section 2 Strategic Review

2.1 Strategic issues

This year the Department of Physics is undergoing its every-ten-year external review, and as a part of that process has produced a self-study document. Discussions within the context of the review and over the longer term have identified a number of issues that confront us in our continued quest to improve.

Strengths:

Strengths of the department include a dedicated faculty, which has had stability and continuity for at least fifteen years. Since 1991, the Physics Department has also been well-housed and reasonably well equipped in the 64,000 square-foot Olin Hall of Physics, Mathematics, and Computer Science.

We have had incoming major classes of sufficient size, and have worked hard at the retention of student majors, so that we now graduate an average of 15 physics majors each spring. According to the annual reports from the Statistical Research Center at the American Institute of Physics (AIP), this number has put us in the top ten among baccalaureate intuitions nationwide in recent years. About 70% of our graduating majors go immediately on to graduate studies in physics or a related area (most often engineering). According to the data in the NSF WebCASPAR database, Gustavus ranked 5th in the baccalaureate origins of Ph.D.s in physics (per 1000 enrolled students) during the five-year period 2001-2005, compared with all colleges and universities in the United States. (The top five institutions were, in order, Harvey Mudd College, Caltech, Reed College, MIT and Gustavus.) During that time period, 17 Gustavus alumni received a Ph.D. in physics. Historically, a similar number of our physics graduates go on to receive Masters' degrees and professional certification in some branch of engineering.

We have an active program of student/faculty research that has been supported by both internal and external funding. In the past decade that funding has exceeded $650,000 in external (NSF and ACS) funds and $50,000 in internal (Gustavus Presidential Student/Faculty Collaboration) funds. Our faculty members strive to be current, not only in their particular area of research expertise, but in the broader sense needed by those who teach at a liberal arts college. We therefore have a faculty that values its connections to professional societies, both those related to their research (e.g. APS, OSA, ASA, and IEEE) as well as those that represent the interests of the larger community of scientists and teachers (AAPT, CUR and AAAS). We constantly seek innovations in teaching pedagogy, and have implemented a number of the reforms that have been supported by the growing body of work in Physics Education Research (PER).

Weaknesses (internal):

Gender diversity is a major issue for the physics community. Nationally women have been, and continue to be, underrepresented in most of the science, technology, engineering and mathematics (STEM) disciplines. Nowhere is the disparity greater than in physics. According to data from the AIP, in the graduating class of 2005 women accounted for just 20% of the

bachelors' degrees granted. While this was an improvement from 1990, when women obtained just 15% of the undergraduate degrees in physics, it is still obvious that women in physics are in short supply. The same trend is reflected in the AIP statistics for the awarding of Ph.D. degrees in physics, where the percentage of degrees received by women was only 15% in 2005, up from 10% in 1990. However, the physics program at Gustavus has seen a notable increase recently in its number of women graduates, and in the number of alumnae who are pursuing advanced degrees in physics or a related area. In the classes of 2003-2005, Gustavus graduated 7 women physics majors, accounting for just 15% of our majors. However, from 2006-2008, we graduated 13 women in physics, accounting for 31% of our majors. Nevertheless, we find the recruitment and retention of women majors to be a particular challenge for an all-male faculty. We believe that we could do significantly better in this area if we were able to hire a woman physicist into a permanent position on our faculty. Given the increasing number of women students in our department, it is important to have someone who can be both their role model and mentor.

Although we have had tremendous continuity by having the five tenured members of the department teach together for 15 years, the College's regularized sabbatical-leave program has meant that, in five out of every seven years, we need to hire a temporary leave-replacement adjunct to cover the teaching load of one of our faculty members on leave. In any particular year, this leaves us subject to the vagaries of the hiring market in physics. The results here have been uneven, and clearly one of our weaknesses has been the need to hire temporary, usually early-career faculty to teach. While the department does play a positive role within our profession in the sense that we mentor young teachers who frequently go on to get tenure-track jobs elsewhere, the impact of their teaching on our students has not always been quite so positive.

Another potential weakness of our faculty is the fact that all of us are experimentalists. (In physics, the distinction between experimentalists and theorists is well defined.) The lack of a theorist on our faculty may limit the number of research projects available to students whose interests tend toward theory.

In terms of obtaining major equipment for our teaching labs, we have had to rely almost entirely on outside grant funds and internal matches. Within the College, the annual operating budget for the department has been essentially flat funded since 1991. Taken together, our equipment and supplies budgets (which contain the only real discretionary money in the entire budget) total about $13,000. Currently our Electronics Lab, which was constructed and equipped almost entirely under the auspices of a 1992 NSF-CCLI grant, is woefully in need of a 21st-century upgrade in terms of both layout and equipment.

Our repair budget is insufficient to fix anything major in the way of equipment, and so we have, from time to time, relied on discretionary funds from the Deans' office to cover major repairs. Additionally, we have no line for the purchase of any significant computer hardware. At Gustavus, all requests for computer hardware for departments must be channeled through a faculty committee (the Instructional Infrastructure Advisory Committee, IIAC) which has an annual budget of around $100,000 to cover all requests for hardware from all departments, including faculty and staff offices, classrooms, and instructional labs. So, while we have enough funds to meet the annual needs for laboratory consumables and supplies and for the day-to-day operation of the department, we have no alternative but to rely on the uncertainty of a dwindling

pool of NSF funds if we hope to modernize our laboratory infrastructure in any meaningful way. We can't even count on keeping the computer equipment in our labs up to date, and have to hope that, when the need becomes urgent, the IIAC will have enough funds to enable us to limp along, often with slightly newer computers recycled from some other department or office on campus. in terms of long–term, site-license purchases for computer software, we have nowhere to turn for money, except perhaps to beg from the Director of GTS.

Faculty members striving to stay current in their discipline in terms of research, teaching pedagogy and issues at the intersection between science and society, need to be actively involved with their colleagues in professional societies. In addition to expensive membership dues, this necessitates travel to professional meetings on a regular basis. The increasing costs of travel, registration and lodging for such meetings means that the current Gustavus support for faculty travel ($500 per year, at present administered by the Kendall Center) is almost a joke. Even when supplemented by an additional $700 (which is available if one is presenting a paper or chairing a session at the meeting), these funds do not fully cover the cost of traveling to one national meeting a year.

Within the physics department, and for College faculty as a whole, there is a recruitment, retention, and morale issue over the declining state of Gustavus faculty compensation in comparison to our peer institutions. An almost 25-year-old goal from the College's Board of Trustees, renewed by the Administration ten years ago, was to achieve average salaries for all ranks at the 80th percentile of baccalaureate schools nationwide. We moved very close to that goal in 2001 (when we were approximately $160,000 shy of the goal in what was a $9.5M salary budget), but have receded swiftly in recent years. Today we are closer to the 70th percentile (and about $1.6M behind the goal in a $13M salary budget). While in 2001 two Professors - one at St. Olaf and one at Gustavus - would have made essentially the same salary, today the Gustavus Professor averages $10,000 less per year. Additionally, those employees at Gustavus who need family health insurance coverage must pay over $9,000 per year for the employee's share of the premium, about double the average for employees at other Minnesota private colleges.

In our major curriculum, there is a weakness in the articulation of the mathematical preparatory courses and our students' physics courses. All students complete MCS121 and MCS122, Calculus I and II, and then, at present, must take MCS222, Multivariable Calculus. MCS222 does cover topics that our students need to learn, but is too heavy in terms of mathematical theory and proofs, and not as applied as we would like it to be. We have had to abandon altogether having our students take MCS221 Linear Algebra because of its emphasis on theory and proofs, and instead offer our own course in mathematical methods, PHY230, which covers topics in linear algebra and differential equations.

Research opportunities for our students on campus during the academic year are severely limited by the constraints of the heavy academic loads they carry and their many outside commitments (music, athletics, forensic, etc.) Research opportunities are also limited by the workload of the faculty, who are actively involved in faculty governance and committees in addition to teaching full time.

Opportunities:

The department has recently hired Dr. Jessie Petricka (B.A. Carleton, Ph.D. Yale, currently a postdoctoral researcher at Duke), who will start in a tenure-track position in Fall Semester 2009. His expertise in experimental atomic and molecular physics and his plan to build a laboratory producing beams of ultracold atoms and molecules in Olin Hall are exciting prospects for broadening our faculty expertise and providing more research opportunities for our students.

Our sincere desire to hire a female faculty member led us to apply in 2008 to the Henry Luce Foundation for a Clare Booth Luce Professorship in physics. Our pre-proposal was successful, and we were invited as one of four schools in the nation to submit a full proposal to the foundation. The proposal was completed in July of 2008, following an encouraging site visit from two members of the foundation's board. We were originally informed that two professorships would be awarded for hiring this year, with the positions to begin in fall 2009. However, the board's meeting to decide on awards did not take place until late October 2008, by which time their endowment had suffered a setback in the stock market crash. They did not award any professorships that could be hired this year, but did award one (to another institution) that will be hired next year to start in fall 2010. Significantly, however, we were told that our full proposal (modified if we choose to do so) will be resubmitted for consideration by the foundation's board during 2009.

The PER results which continue to be refined and reported in such forums as AAPT conferences, offer our faculty members and students the chance to benefit from changes in pedagogy that have been proven to teach more students more effectively in more ways. The ability to better reach and teach diverse styles of learners is an opportunity to improve the education that we provide.

The NSF CCLI grant program presents us with a possible funding source to upgrade our teaching labs and, in particular, our Electronics lab.

The NSF RUI and MRI programs continue to offer us possible avenues to pursue funding for research equipment and summer stipends for our faculty and students.

The Gustavus Faculty/Student Collaboration grants provide an opportunity for some of our faculty members and students to work together on advanced research projects in the summers.

For our department and for the Natural Science division as a whole, our annual Nobel Conference is a tremendous opportunity to focus our attentions and those of our students and the public on important issues in science. Recent conferences have been outstanding, and with newly endowed funding and new leadership now in place, we are excited about the prospects for the future of this signature event.

Membership and participation in organizations like AAPT and AAAS provide us with increasing opportunities to engage at the intersections of science and society. This engagement improves the quality of our teaching within the context of the liberal arts.

Challenges (external):

Science in general and physics in particular are dynamic disciplines. Both for the quality of our teaching and for our advising on potential career options, it is important for our faculty to remain current and to keep in touch with rapidly changing subdisciplines within physics.

High-school graduates today come to us with very different backgrounds, learning styles, and career aspirations than they did just a decade ago. We as a faculty need to learn how to adjust our instruction methods to be most effective with the students we have.

Although Gustavus' program is ranked 10th in the nation for the annual production of undergraduate physics majors, other schools appearing in the top 20 include Carleton, St. Olaf, Bethel, and Grinnell, all of which are similar schools, very near geographically and, in some sense, in competition for prospective students who seek to major in physics.

Although the use of technology is now ubiquitous in the teaching of physics, not all of its uses lead to effective teaching and learning. It is important for our faculty members to be current in the PER studies that evaluate the uses of technology.

The economy at large and the state of the College budget in particular, present formidable challenges in any attempt to plan strategically for our future. Clearly more resources are needed, but neither the potential sources nor the time frame for obtaining them is clear.

2.2 Barriers

The most significant barriers to achieving our goals are budgetary ones. Our faculty members are increasingly underpaid in comparison with peer schools.

Our equipment budgets are an order of magnitude too small to carry out needed upgrades to our aging laboratories and equipment.

There are insufficient finds to provide our department with regular replacement of its computer equipment. We are given no budget of our own to buy them. Computers purchased with College funds are somehow not considered to be "equipment", although that is certainly not the case with purchases made under the auspices of external grants from agencies like NSF. This College policy stems in part from the archaic notion that, in order to be supportable, all computer hardware has to be identical or purchased from the same vendor. (Such is patently not the case in the purchases made by the College today.) It also stems in part from a single director who historically has shown the desire to gain increasing control over everyone else's budget and staff.

The Gustavus Faculty/Student Collaboration awards, while serving as a nice bridge for faculty members who want to try a new area of research in an area that has yet to obtain outside funding, are of insufficient duration or dollar amount to attract our best students. They pay for only eight weeks of summer work at $400 per week for a total of $3200. They provide room but not board. On the other hand, the outside summer research opportunities available to our students at other

colleges and universities through NSF, DOE or other agencies are all ten-week awards that pay $4000-5000 per summer along with travel costs, room and board.

After an across-the-board 3% budget cut in 2003, there is no longer any money in the department budget for a colloquium and outside-speakers program, and our entertainment line is not even sufficient to cover the annual cost of taking our visiting speakers to dinner.

Faculty workloads make research work almost impossible to carry out during the academic semesters, and the uncertainties in procuring funding make summer research difficult as well.

Travel costs make faculty attendance at professional-society meetings difficult. Furthermore, the cost of membership dues for the number of societies to which each faculty member should belong has increased tremendously over the past decade while our department budget has remained flat.

Concerns over declining high school graduating class sizes, coupled with the increasing costs of Gustavus tuition, make recruitment of future classes of students more difficult.

Gender trends in physics enrollment show little sign of improvement, with fewer than 25% of the potential majors in our first-year, introductory physics class being women, even though the gender balance of the College as whole is almost the reverse.

Section 3 Strategic Initiatives and Recommendations

Goal 1: Hire and retain a physics faculty of the size, breadth of training, shared sense of mission and teaching prowess to provide our students with the best undergraduate physics education in the nation.

Strategic Initiative 1.1 - Increase Gustavus faculty salaries to the level at which the average salary for each rank is at or above the 80^{th} percentile of all baccalaureate institutions nationwide, and maintain this level.

Strategic Initiative 1.2 - Decrease the employee portion of the premium for medical insurance to the average level paid by employees of Minnesota private colleges.

Strategic Initiative 1.3 – Working together with the Office of Corporate and Foundation relations, obtain a Clare Booth Luce Professorship in order to hire a female, tenure-track faculty member in physics. Because such professorships are only granted for new (not replacement) positions, she would be the sixth tenure-track member of the department.

Strategic Initiative 1.4 – After obtaining the Luce Professorship, hire a seventh, full-time, tenure track faculty position in physics, and use it to cover all annual sabbatical leaves in the department. Having seven persons on a seven-year leave cycle would mean that there would be six, full-time faculty members to teach every year. We would avoid the expenditure of time,

money and effort to hire a visiting faculty member in six out of every seven years, and our program would be fully staffed by competent, experienced teachers.

Strategic Initiative 1.5 – Increase faculty travel funds to allow each faculty member to attend at least one national research organization (APS, OSA, ASA, etc.) meeting per year. In reality, travel to one national meeting costs between $1200-$1500.

Strategic Initiative 1.6 – Increase faculty travel funds even further to allow each faculty member to also attend at least one national AAPT or AAAS meeting per year. In reality, travel to one national meeting costs between $1200-$1500.

Goal 2: Recruit annually a quality incoming class of students eager to major in physics.

Strategic Initiative 2.1 – Work more closely with the Office of Admissions to identify ways in which our faculty members and our current students can partner with them in marketing and outreach to prospective students.

Strategic Initiative 2.2 – Work with the St. Peter School District and others in the area to establish a more regular and robust program of outreach sending our faculty and students to schools to interact with K-12 students in order to encourage interest in the sciences and physics in particular.

Goal 3: Provide our students with better access to 21st-century facilities, equipment and pedagogies in their courses.

Strategic Initiative 3.1 – Create a restricted endowment for scientific equipment, to be shared across the Natural Science division of the College. The amount of this endowment should be around $2M, yielding about $90,000 per year for the purchase and repair of major pieces of equipment, including computers. The chairs of the departments in the division would meet annually to plan for equipment purchases, and a regular cycle could be established allowing for advanced planning. Additionally, the College should implement and fund a plan for the regular maintenance and repair of scientific equipment, at the level of 10% of each department's annual equipment budget.

Strategic Initiative 3.2 – Remodel several of the teaching rooms in Olin Hall (in particular the lecture hall, Olin 103, and our Electronics Lab, Olin 213) to make them more suitable for instruction using modern classroom pedagogies that involve cooperative learning exercises.

Strategic Initiative 3.3 – Increase faculty travel funds to allow each faculty member to also attend at least one national AAPT or AAAS meeting per year. (This is identical to Strategic Initiative 1.6.)

Strategic Initiative 3.4 – Add a computer equipment line to the physics department annual budget sufficient to allow us to implement a 4-year replacement cycle.

Goal 4: Provide our students with increased and enhanced opportunities for participation in scientific research.

Strategic Initiative 4.1 – Under the auspices of the Gustavus Faculty/Student Collaboration grants, provide increased availability of student summer stipends for conducting collaborative summer research projects with our faculty members. These should include ten weeks of summer salary (at a rate competitive with the money offered at NSF sponsored REU's across the country) along with ten weeks of room and board at the College.

Strategic Initiative 4.2 - Provide an annual budget line for our best student majors who have done significant research projects to allow them to attend a national research meeting (APS, OSA, ASA, etc.). This should cover two students annually at a cost of $1000 each in 2009 dollars.

Strategic Initiative 4.3 – Work together with the Office of Corporate and Foundation Relations to identify and secure more outside grants for scientific equipment and research.

Strategic Initiative 4.4 – Increase faculty travel funds to allow each faculty member to attend at least one national research organization (APS, OSA, ASA, etc.) meeting per year. (This is identical to Strategic Initiative 1.5.)

Goal 5: Provide our faculty and our students with closer connections to the world of science outside Gustavus.

Strategic Initiative 5.1 – Increase the department's annual budget to include a line to fund a program of colloquia given by visiting speakers. Such a budget should provide for four speakers annually (two per semester) at a cost of around $1000 each in 2009 dollars. This includes the cost of their travel, honorarium, and meals while they are here.

Strategic Initiative 5.2 – Provide an annual budget line for some of our upper-division student majors to attend an annual AAPT or AAAS meeting. This should cover four students annually at a cost of $1000 each in 2009 dollars.

Strategic Initiative 5.3 – Work with the St. Peter School District and others in the vicinity to establish a more regular and robust program of outreach sending our faculty and students to area schools to interact with K-12 students and encourage interest in the sciences. (This is identical to Strategic Initiative 2.2.)

Strategic Initiative 5.4 – Increase the physics department's Dues and Memberships budget line by $800 annually to allow all faculty members to become members of the AAAS or other professional societies.

Strategic Initiative 5.5 – Increase faculty travel funds even further to allow each faculty member to also attend at least one national AAPT or AAAS meeting per year. (This is identical to Strategic Initiatives 1.6 and 3.3.)

Section 4 Assessment

Goal 1: Hire and retain a physics faculty of the size, breadth of training, shared sense of mission and teaching prowess to provide our students with the best undergraduate physics education in the nation.

Strategic Initiative 1.1 will have been met when the annual AAUP salary report published in the March-April issue of *Academe* reveals that the average salary at each rank for faculty members at Gustavus is at or above the 80th percentile of the reporting baccalaureate institutions nationwide.

Strategic Initiative 1.2 will have been achieved when a survey of the member schools of the Minnesota Private College Council reveals that the premium for medical insurance paid by Gustavus employees is at or below the average level paid by employees of all Minnesota private colleges.

Strategic Initiative 1.3 will have been achieved when the College has obtained a Clare Booth Luce Professorship and hired a female, tenure-track faculty member in physics to fill that position.

Strategic Initiative 1.4 will have been achieved when the College has hired a seventh, full-time, tenure track faculty member in physics.

Strategic Initiative 1.5 will have been achieved when the College's annual faculty travel allowance has increased to $1500 per person.

Strategic Initiative 1.6 will have been achieved when the College's annual faculty travel allowance has increased to $3000 per person.

Goal 2: Recruit annually a quality incoming class of students eager to major in physics.

Strategic Initiative 2.1 will have been achieved when the incoming class of first-year students includes an enrollment of 50 students in Classical Physics I.

Strategic Initiative 2.2 will have been achieved when Gustavus physics faculty and/or students make (or host) at least six annual visits to (or by) K-12 classes.

Goal 3: Provide our students with better access to 21st-century facilities, equipment and pedagogies in their courses.

Strategic Initiative 3.1 will have been achieved when there is in place a $2M restricted endowment for scientific equipment, to be shared across the Natural Science division of the College, and when each science department budget also contains an annual equipment-repair line equivalent to 10% of its major equipment line.

Strategic Initiative 3.2 will have been achieved when Olin Hall rooms 103 and 213 have been remodeled.

Strategic Initiative 3.3 will have been achieved when the College's annual faculty travel allowance has increased to $3000 per person.

Strategic Initiative 3.4 will have been achieved when the Physics Department annual budget contains an additional, $6,000 line for the purchase of computer hardware.

Goal 4: Provide our students with increased and enhanced opportunities for participation in scientific research.

Strategic Initiative 4.1 will have been achieved when there are one or more Gustavus Faculty/Student Collaboration grants available annually to students majoring in physics, each providing $4,000 (in 2009 dollars) for ten weeks of work along with ten weeks room and board at the College.

Strategic Initiative 4.2 will have been achieved when the physics department has an additional annual budget line of $2000 for student travel to national research-society meetings.

Strategic Initiative 4.3 is an ongoing one, and will have been partially achieved whenever the department secures NSF CCLI or RUI grant funds.

Strategic Initiative 4.4 will have been achieved when the College's annual faculty travel allowance has increased to $3000 per person.

Goal 5: Provide our faculty and our students with closer connections to the world of science outside Gustavus.

Strategic Initiative 5.1 will have been achieved when the physics department has an additional annual budget line of $2000 (in 2009 dollars) for its departmental colloquium program.

Strategic Initiative 5.2 will have been achieved when the physics department has an additional annual budget line of $4000 (in 2009 dollars) to cover the costs of student travel to meetings.

Strategic Initiative 5.3 will have been achieved when Gustavus physics faculty and/or students make (or host) at least six annual visits to (or by) K-12 classes.

Strategic Initiative 5.4 will have been achieved when the physics department's Dues and Memberships line in the annual budget is increased by $800 without decreasing any other budget lines.

Strategic Initiative 5.5 will have been achieved when the College's annual faculty travel allowance has increased to $3000 per person.

This plan was submitted by the tenured members of the Physics Department faculty on May 10, 2009:

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