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Department of Physics and Astronomy
Michigan State University

Planning for 2005

A Departmental Consensus

v2.2

December 18, 1998

I.Introduction-comment from the Chairperson

The following is the result of a month-long effort by the Physics and Astronomy Department to develop a plan which will carry us halfway into the first decade of the next millennium. The issues are complicated, in part because of the structure we have enjoyed for 25 years of having specifically 3-4 Interest Groups. While this has served us well from the perspective of internal harmony and governance, it has obvious drawbacks when dealing with issues which demand flexibility. The field of Physics, in particular, has grown and broadened during this period. It was important that our department accommodate these changes, acknowledge that the benefits of our structure may be more important than our broadening, or find a middle ground which allows for both a broadening and a retention of our group identities.

I had come to the growing recognition that we had to find ways of expanding the scope of our research areas and evolve our academic program to match. We have spent an enormous amount of time on our service teaching program. This effort was well-spent as our credit hours continue to climb. However, our undergraduate major and graduate programs required serious study and needed to be in line with our research program. We conducted a full-blown study of the Ph.D. program 2 years ago which resulted in a much more flexible examination structure. This, in turn, allowed us to contemplate multidisciplinary Ph.D. degrees which would be tailored to the thesis problem and unique to the particular student, but crossing departmental boundaries. Similarly, we are currently near the end of a complete review of the undergraduate Physics degree. In a rather natural way, we have found a series ofspecified, joint applied physics programs which are of interest to other units on campus and I suspect that soon we will begin to offer multidisciplinary B.S. degrees in Physics as well.

What remained in this triplet of in-depth looks at ourselves was a study of our faculty research areas. We have many varied commitments, and obviously we must maintain them which limits the level of broadening. However, it is possible if done by targeting specific, incremental directions. In order to make progress we had to understand our individual group problems, opportunities, and important commitments. Then, as a department, we had to create a flexibility that will allow for the sort of expansion within our boundaries which is consistent with the exciting new areas which are available, the opportunity that will exist with our new building, and the flexibility which has now been built into our degree programs. I believe that we've succeeded. This document outlines our results and highlights where we reached consensus - no votes were taken, indeed I discouraged them. Rather, we found consensus on every item.

So, our group structure is intact, although slightly bent. Our horizon is now more extensive and this document outlines the directions we intend to pursue.

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II.UnitMissionStatement

The department revised its Mission Statement last year. It now reads:

Mission and Goals of the Department of Physics and Astronomy

The mission of the Department of Physics and Astronomy is to investigate, apply, and communicate the laws of physics and astronomy, the fundamental sciences, to the benefit of the nation and all humanity.

Goals:

1.Perform innovative and fundamental research on physical systems ranging from the smallest to the largest and from the simplest to the most complex. Train postdoctoral, graduate, and undergraduate students to become leaders in physics and astronomy, cross-disciplinary research, and in industrial development.

2.Provide high quality teaching, at undergraduate and graduate levels, to physics and astronomy majors and to students in other disciplines.

3.Communicate physics and astronomy concepts, and our research results, to the broader community, and participate in cooperative projects that help industry, colleges, and schools to solve problems that they face.

To accomplish these goals, the Department must continue to attract and retain first class researchers who are eager to communicate, and able to communicate well, and to provide an environment supportive of research, teaching, and service.

III.WhereWeAreToday

Much of what will be reported as current status and more importantly, future plans, emerged from a 3 week long exercise which the Department has used to plan its future through the year 2005. The culmination of intense work within the groups was a day-long meeting on Saturday, December 5th, 1998 in which we agreed on the blueprint for our research future.

A.Faculty/Staff

Our situation with respect to faculty vacancies has become more fluid as a result of our workshop. More on these results will be presented below. Simultaneous with our research and teaching discussions, our service staffing is also undergoing a review by our ADCOM and myself. Definitive results on the staffing situation are not available yet.

1.Faculty

Our departmental faculty count is currently 57 FTE (including Gelbke and Brock, but not including Hansen), with unfilled openings for two (Foiles and Carlson). We are divided into four broad subgroups: Astronomy and Astrophysics (6 observers and 1 theoretician; acronym AA), Condensed Matter Physics (8 experimenters, 8 theorists, plus 2 unfilled experimenter positions; acronym CMPE and CMPT), High Energy Physics (7 experimenters and 6 theorists; acronym HEPE and HEPT), and Nuclear and Beams Physics (10 experimenters and 6 theorists; acronym NPE and NPT). In addition there are two professors who are currently mortgaged against current faculty (Kovacs and Signell) and one faculty member on disability leave (Kemeny). Our current plan is the following:

When Kovacs, Signell, and Kemeny retire they will not be replaced (again). When Austin retires, his position will not be replaced. The old agreement that earmarked the Cowen position for non-replacement has been changed: when he retires we will replace him. The overall result is a net decrease in our department size by one position: the long term asymptotic faculty size for the Department of Physics and Astronomy will be 56, which is down from a high of 62.

2.Staff

We have sufficient technical and support staff to see our way clear to accomplish our goals, except in the area of computer support. Our staffing consists of:

Management and Budget Support:Marc Conlin-Business Manager*

Janice Ridenour-Office Assistant, Administration*
Lisa Ruess-Departmental Secretary*
Ann Kirchmeier-Administrator, MRSEC
Academic Program Support:Debbie Simmons-Secretary, Graduate Program*
Shelley Kimewon-Secretary, Undergraduate Program*
Mark Olson-teaching lab technologist*
Darlene Salman-teaching lab technologist*
John McIntyre-lecture demonstrations*
Group Support:Janet King-CMPT secretary*
Cathy Cords-CMP secretary/dept. secretary
Jeanette Dubendorf-HEP secretary*
Lorie Neuman-HEP secretary/travel & conf. Secretary
Alvarado Amparo-AA secretary*
Teresa Gilbert-Abrams Planetarium Secretary
Darla Conley-MRSEC secretary
Shop/Services/Lab support:Sandy Teague-Store*
Dan Edmunds-Electronics Engineer*
Barry Tigner-Electrical Engineer*
Bob Raine-Electronics technician
Tom Palazzolo-Mechanical Shop Supervisor*
Tom Hudson-Mechanical Shop technician*
Jim Muns-Mechanical Shop technician*
Baokang Bi-MicroFab Lab Manager
Maggie Wilke-Computer Services Systems*
George Perkins-Computer Services Systems
Reza Lolee-Safety officer and CMPE specialist
Ron Richards-HEP lab specialist
Mike Nila-HEP lab specialist*

The names with a single star are wholly supported by the department. The rest are partially supported by either grant funds or outside work-for contract. We do not yet seem to suffer significantly from the NSF/NIH difficulties with secretarial support. While the NSF has attacked secretarial lines of a few percent, other groups are still successful in continuing to include programmatic secretarial lines of more significant fractions.

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B.Academic Programs

1.Undergraduate Programs

a)Majors

The Department of Physics and Astronomy currently offers three different undergraduate degree options: Bachelor of Science degrees in Physics and in Astronomy and Astrophysics, as well as a Bachelor of Arts degree in Physics. During the last decade, the number of majors enrolled in these three tracks has fluctuated between roughly 15 and 30 per year. Since 1989/90 a total of 150 MSU undergraduate students have obtained their degrees in our programs. On average, five or six of our students go on to study at graduate schools, some of them very prestigious (Berkeley, MIT, Oxford, ...), about one per year obtains the teacher certification.

b)Service Courses

Our service course offerings are divided in several major categories. We offer astronomy courses, which had approximately 140 students enrolled during the fall semester 1998. Our main physics service courses are PHY183/4 and PHY231/2, both offered with accompanying laboratory courses. The enrollment in these courses ison the order of 2500 students. Our Department also has several courses in the Integrated Studies Program, ISP205 (*Visions of the Universe*), ISP209 (*Mystery of the Physical World*), ISP211 (*The Structure of Matter*), and ISP215 (*The Science of Sound*). The first two in this list also have corresponding laboratory courses. Total enrollment this semester was slightly above 1200, mainly concentrated in ISP205. And finally, we also teach LBS164 and LBS267, both with laboratory courses. Here the enrollment is over 200 each in the lecture and laboratory courses.

c)Honors

Our main honors course offerings are PHY193H and PHY294H. Typical enrollments are 70 and 30 students, respectively. Our own majors and engineering majors constitute the bulk of the enrollment in these courses.

d)Research Opportunities

Since the Department of Physics and Astronomy has several very active and internationally renowned research groups, we offer a very large and diverse program of research opportunities for our undergraduate students. We have one of the largest groups of professorial assistants in the university. For example, this semester 10 freshmen have selected to work with physics and astronomy faculty as professorial assistants, with only 7 of them coming from a declared physics major. Stephanie Palmer, MSU's most recent Rhodes Scholar [1], for example, worked as a research assistant with one of our faculty. In addition, we offer research summer programs, such as our Research Experience for Undergraduates. This program has existed for almost a decade and receives annual funding from the National Science Foundation, is open to students after their sophomore year, and typically accommodates 20 students, both from within MSU and from other universities.

e)Virtual University

Our Department has along tradition of innovation in instructional technology and non- traditional course-delivery formats. The Competency Based Instruction (CBI) and Physnet projects have received external funding and have resulted in over 10 courses offered by the Department of Physics and Astronomy. During the 1998 fall semester, a total of almost 270 students were enrolled in the CBI system.

The Computer Assisted Personal Assignment (CAPA) system for computer-graded and individualized homework delivery was also developed by our faculty, is now widely spread across many U.S. universities, and is used by approximately 30,000 students during this semester.

Our most recent innovation in instructional technology is MultiMedia Physics (MMP). This system has led to the collaboration with the Laboratory for Instructional Technology in Education (LITE) within the Division of Science and Mathematics Education. Tangible outcomes of this collaboration are the LectureOnline system and the Virtual University classes PHY231C and PHY232C. During its two years of existence, the LectureOnline system has already been used in the development and construction of approximately 15 university courses, has had more than 3,000 students enrolled in it, has been exported to other universities such as the University of Washington and the University of Minnesota, and has recently beenlicensed by a private company with plans to market it nationally. PHY231C and PHY232c are currently the two courses with the largest enrollment of all of MSU's Virtual University offerings.

2.Graduate Programs

Our graduate program is as diverse as our faculty. Currently, we have approximately 120 graduate students in all phases of the program. This number is down from the historical high of 170 (1991) and below our historical average of approximately 140. Our research program is capable of absorbing more students than have been recruited in the recent past. The faculty have been slow to react, frankly, to this problem and only within the past two years has a more significant effort been employed to improve our success rate in attracting more and better graduate students. Last year was the first of what is expected to be a more vigorous recruitment venture. It was successful in numbers and in quality. For example, in previous years, we have typically offered 7-10 CNS and Graduate School Fellowships, with enrollment of only 1-2 per year. This past year, through a variety of inducements such as early appointment and multiple year commitments we were successful with 4 Fellows admitted. We believe that an even more aggressive approach in offering fellowships, risking possible oversubscription, is necessary in future years. Money left over in the fellowship budget is not a good idea.

The number of entering and graduating students in the physics/astronomy graduate program are as follows.

Table 1 Entering classes and graduating classes in the graduate program in recent years.

	94/95	95/96	96/97	97/98	98/99
#entering		21	30	16	28
#MS grads	15	3	6	3	
#Ph. D. grads	20	18	17	16	

Currently it takes an average of 6 years for a student to obtain a Ph.D. in our program. We aim to reduce that number to closer to 5 years, provided that the students' graduate experience and research performance are not compromised. We also aim to increase the number of graduating Ph.D.s and Masters students to roughly 25 and 10 respectively. Our graduate students are finding qualityjobs both in the academic and industrial sectors. The demand for academic physicists is increasing from the recently publicized lows while the demand for physicists in "non-traditional" areas (e.g., biotechnology, finance, geophysics, etc.)is quite strong and projected to increase.

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C .RESEARCHANDSCHOLARSHIP

The Department continues to do well in research, as evidenced by our publication record, extramural research funding patterns, and continued leadership roles within our various professional societies and major collaborations.

1.Publication Record

Table 2 shows the publication rate and invited talk totals for faculty in the Department for the last calendar year.

Table 2 Publication rate and invited talk totals for 1997 from faculty in the Physics and Astronomy Department. Shown are the numbers of faculty with greater than 5 and 10 publications for the total, as well as by rank.

	PA total	Prof	AProf	aProf
Published papers/faculty	5.2	4.8	7.5	4.4
#> 5 papers	25	15	7	3
#> 10 papers	9	6	2	1
Invited talks	118	61	44	13

As can be seen, the publication rate continues to be more than 5 papers per faculty member, with that distribution fairly evenly distributed throughout the faculty as a whole, as well as through the ranks.

2.Extramural Funding History

The research funding history for the department continues to be strong. The approval of the NSCL upgrade, the renewal of the MRSEC, and the awarding of NSF Atlas (CERN) construction grants are major contributors to our outside resource totals. However, we are also continuing to be successful in gathering continuing grants from NSF, DOE, NIH, and NASA. Our overall funding has increased every year during the last half-decade which is noteworthy, given the dire predictions of previous years. Our situation is summarized in Figure 1, which breaks out by group the last 5 year funding history.

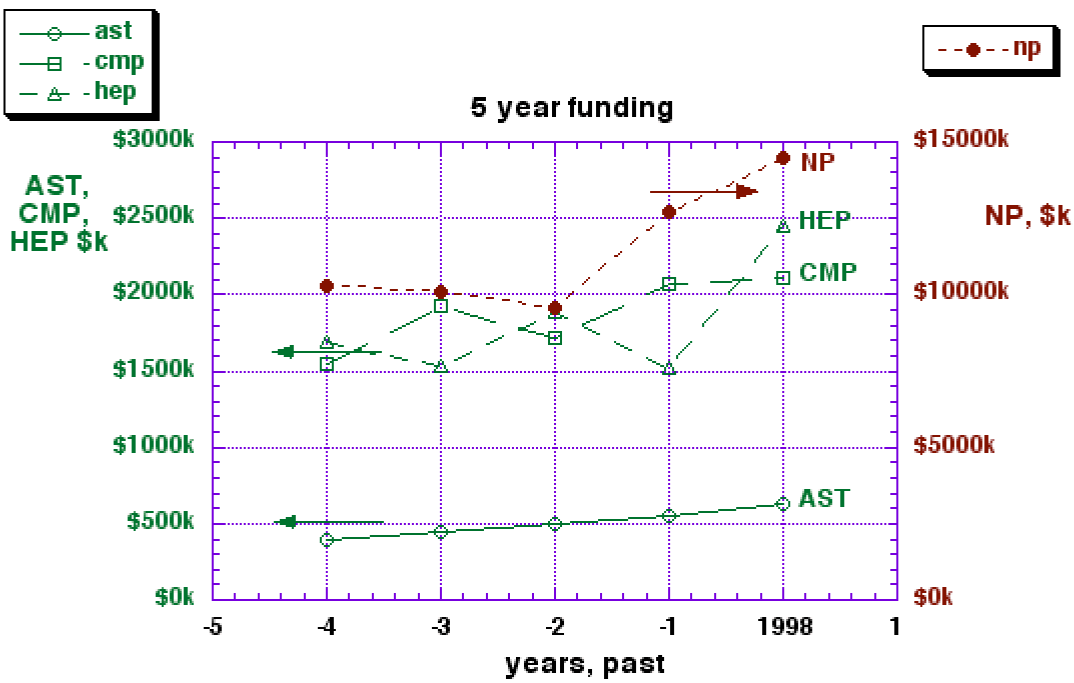

Figure 1 Five year funding history for each group within the Physics and Astronomy Department.

We have compared our record for the current year with a variety of peer institutions. We chose as our peers: the Big 11 universities plus Maryland, Stony Brook, and Washington. The figures2 through 5 present these comparisons in faculty size and externally, peer- reviewed research grants (NSF and DOE). As is clearly seen, except for Nuclear Physics, for each of the individual groups in Physics and Astronomy, we are above or within the "Main Sequence" in group size and subsequent funding. For Nuclear Physics, we are clearly the premier institution among this comparison group. Where large collaborative grants are shared within MSU (e.g. MRSEC), an appropriate fraction of the total grant size is apportioned to PA .

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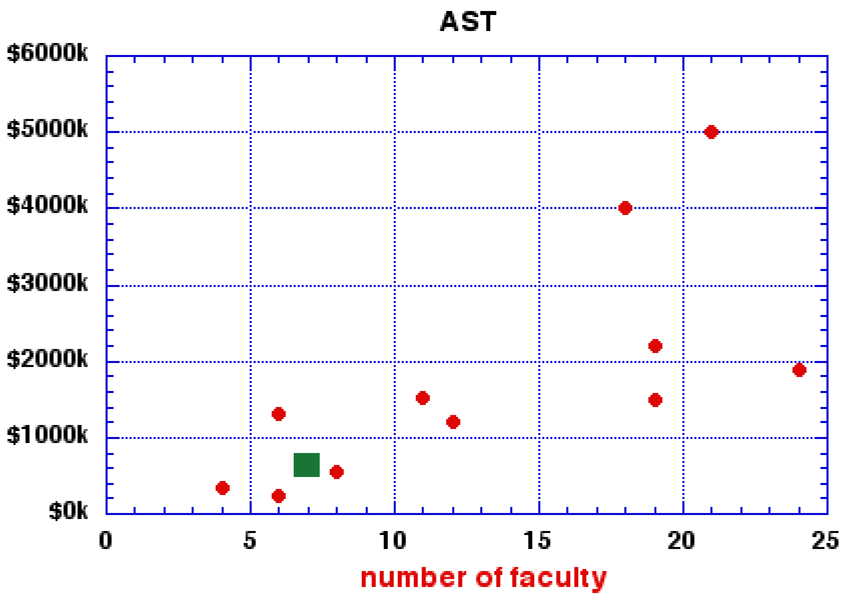

Figure 2 Extramural funding vs. faculty size (theory plus experiment) for comparison institutions in Astronomy and Astrophysics. The (green) square indicates MSU's AA group

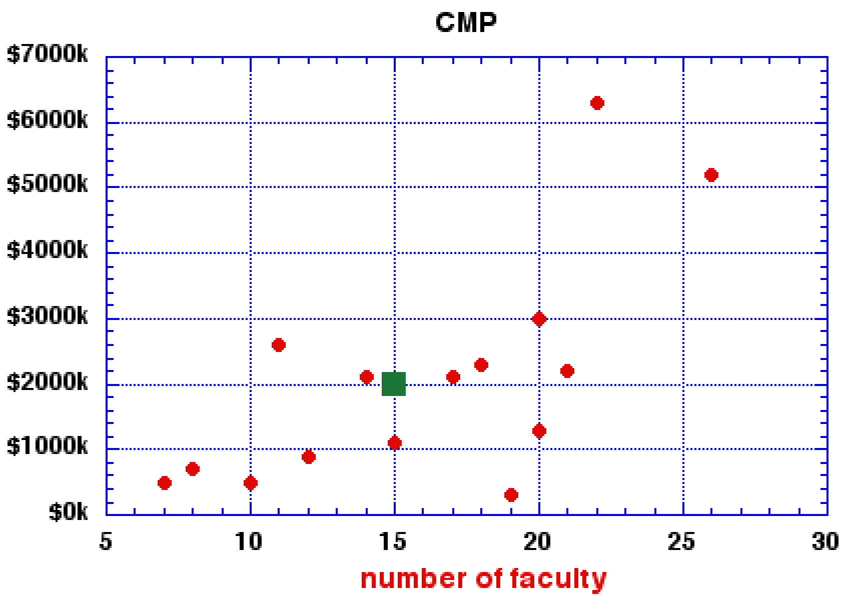

Figure 3 Extramural funding vs. faculty size (theory plus experiment) for comparison institutions in Condensed Matter Physics. The (green) square indicates MSU's CMP group.

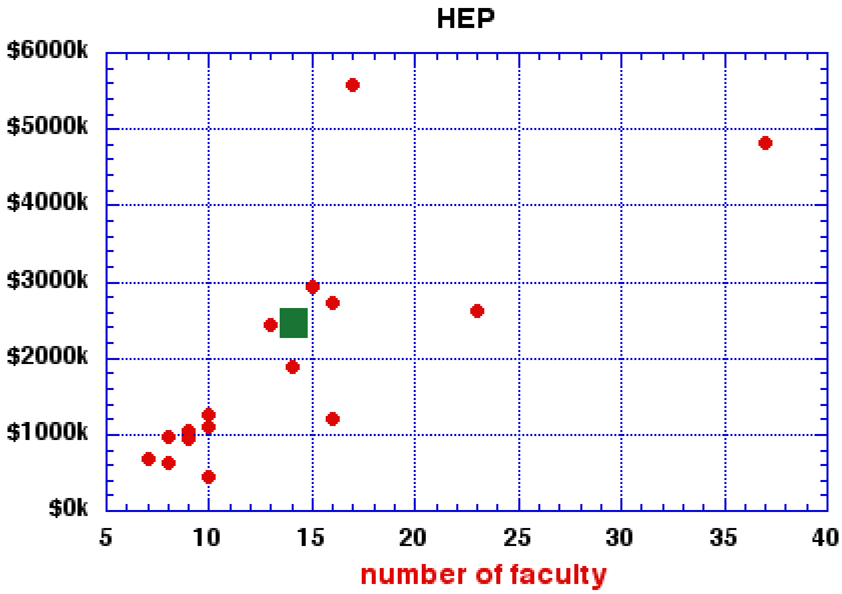

Figure 4 Extramural funding vs. faculty size (theory and experiment) for comparison institutions in High Energy Physics. The (green) square indicates MSU's HEP group.

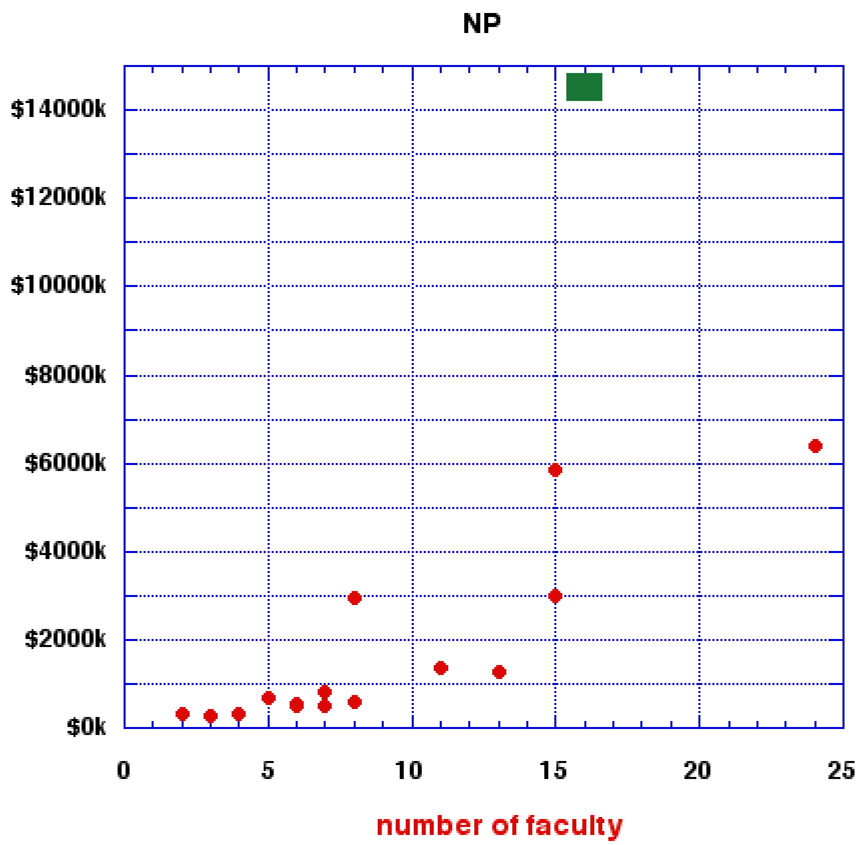

Figure 5 Extramural funding (theory and experiment) for comparison institutions in Nuclear Physics. The (green) square indicates MSU's NP group.

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3.Leadership Roles

We have a number of faculty who are recognized as leaders within their professional societies and by peers. More than half of the faculty are Fellows of the American Physical Society (among them, some of the youngest). We have a Member of the Norwegian Academy of Science and Fellow of the Royal Danish Academy of Science and Letters. We have two editors for Physical Review, the Vice President of the Acoustical Society of America, and the scientific spokesperson of one of the two largest High Energy Physics experiments in the world. A variety have served recently on specially convened American Physical Society study groups. Our faculty are regularly appointed members of national society and federal government advisory panels, one is the current chairperson of the DOE Nuclear Science Advisory Committee.

The combined total of these achievements resulted in the Physics and Astronomy Department's ranking within the upper quartile of all physics departments surveyed by the National Research Council review of programs [2]. It is one of the most productive departments on the MSU campus, and in the country.

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IV.WhereWeWanttobein2005

Obviously, determination of our trajectory for the future is difficult for a department as diverse as is ours. In order to prepare for this, the groups were all charged with determining their future needs based on a strict set of guidelines which include an overall premise of no-growth in FTE counts during this period. The age distribution of the department suggests that half-dozen or more vacancies may become available between now and 2005. Figure 6 shows the distribution of faculty ages at the beginning of 2005.

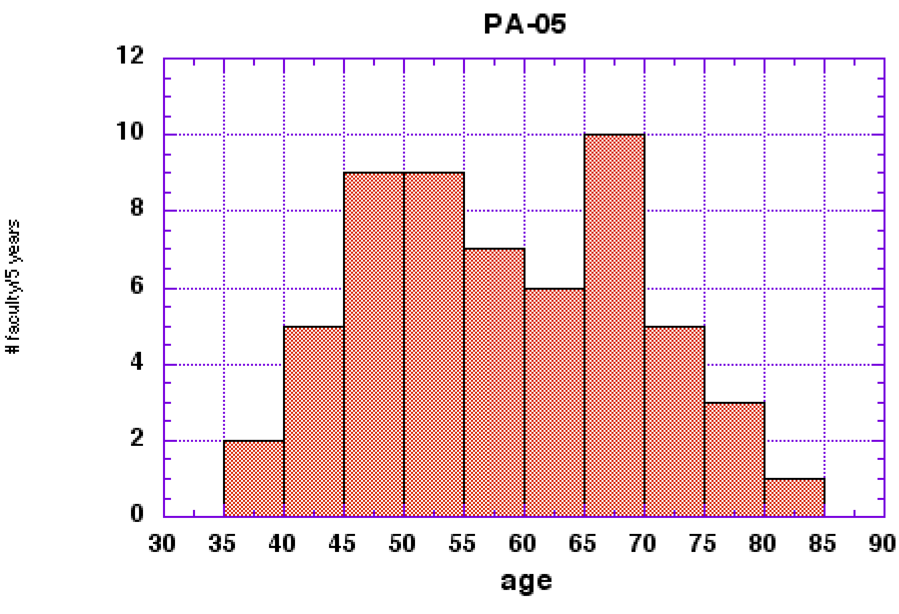

Figure 6 Faculty ages on 1/1/05. The entire faculty roster is represented.

These vacancies will be filled with careful attention to the programmatic needs of the department as a whole. The vacancies, however, do not necessarily come from within the groups in which the most complicated programmatic problems are anticipated. Hence, this was a particularly tricky situation which required a measure of give and take ... we had to think in ways which are broader than our traditional 4 group structure. Growth was set apart as an unlikely possibility. The Chairperson opined that only in the area of bio- physics would there be any likelihood of overall growth at MSU.

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V.Faculty/Staff

The overwhelming discussion and effort has gone into a projection of our facultyand research group evolution. Staffing is much less of a difficult problem and will be dealt with below.

A.Faculty

The information presented by the groups, including commentary that ensued in discussion is presented below. Here each group's important future dates, funding likelihood, vacancy structure, opportunities, plus any concerns that they or the department have are listed. At the end of each group's summary are noted briefly the department's items of consensus on their future plans.

> ***Departmental Consensus #1.***The first general departmental consensus is unprecedented: there are currently two filled theoretical physics positions(Borysowicz and Hetherington) which were both hired into groups different fromthe one in which they currently practice. The department concluded that these two positions are to be floating - to be filled according to departmental needs when they become vacant or bridged upon a promise of their vacancy as negotiated in the chairman's reappointment package.

1.Astronomy and Astrophysics

Clearly the overriding programmatic issue is the SOAR telescope - preparation and eventual use dominate all aspects of this group's current life. The preparation involves fundraising, internal SOAR design groups, and instrumentation design and construction. If full-force, the AA group is capable of handling these responsibilities. In particular, the team of Kuhn and Loh is particularly strong in instrumentation. Recently, they submitted a proposal for external SOAR review, along with one from CTIO, Brazil, and UNC for separate first-light instruments. The MSU proposal was strong, well engineered, and reasonable and received approval for proceeding to the next steps. The CTIO proposal received approval, but with some specific concerns attached. The other proposals were not approved and the proponents were given more time, delaying the consortium discussion on credit toward financial commitments. Hence, currently, the approval paves the way for only minimal pre-engineering design. The situation with Kuhn away and being recruited by Hawaii results in serious concern regarding the viability of this particular project.

The instrument at question is a state of the art Infrared Imager using a 2kx2k IR chip under development at Rockwell Corp. (in an R&D contractual arrangement with Hawaii and MSU). This project is the first of what is hoped to be the beginning of a recognized astronomical instrumentation expertise - all of the personnel and facility necessities are in hand. Because the IR instrument is expected to offset a considerable fraction of the MSU SOAR commitment, this project must succeed.

The five remaining faculty and one visitor are faced with these burdens and their considerable nearly specialized teaching responsibilities. There is an admitted uneasiness about the future of their on-leave colleagues and while contingency plans seem prudent, without a departmental plan that included vacancy flexibility, nothing could be done.

TOC *a)Summary*

Important dates:

Funding until 2005:
spring: better understanding of short term faculty retention
Now - 2001: IR imager, design and construction
2002: first light for SOAR
experiment: judged probable that funding will continue at current level
Theory: judged probable that funding will continue at current level

Vacancy structure: 6E+1T+1T visitor; 1T ≥ 65 on 1/1/05

Figure 7 shows the age structure of the AA group at the period of the end of this study.

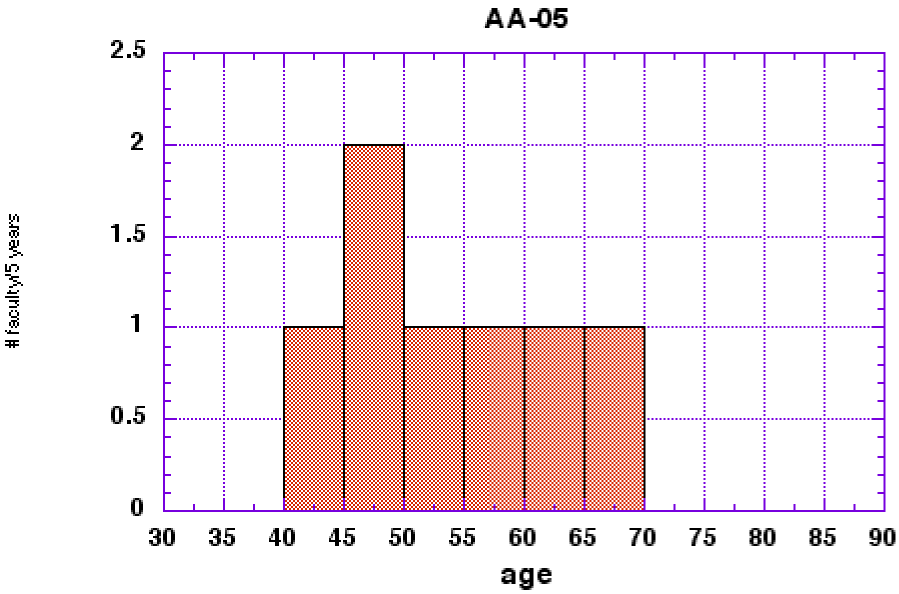

Figure 7 Age distribution of the AA group on 1/1/05.

The AA group is particularly strong in variable star astronomy, instrumentation (solar and optical),stellar magnetic structure, metallicity of stars, radio/optical correlated observing, spaced based observation, and solar modeling.

What must be preserved:*SOAR involvement during construction.*This is primarily related to the design and construction of the IR instrument.
Ongoing programs.
*Capability to make timely and aggressive scientific use of the SOAR telescope upon completion.*This implies a concern (below) about the overall current strength of the group.
Opportunities:mostly related to SOAR:
IR observing
space-based observing
instrumentation design/construction infrastructure creation
Concerns:stretched very thin given leaves
teaching overburdened
IR instrument is subcritically manned with only Loh available - it cannot fail
the future of the group manpower is uncertain

A fully functioning SOAR telescope would suggest that the AA group is undermanned. However, the current situation makes a future commitment difficult.

> ***Department Consensus #2:***The current size of the astronomy group is to be maintained until perhaps late in the 1998-2005 period. Upon successful completion of SOAR and its subsequent productive use, then an argument to increase the size of the AA group by one might be appropriate. One of the floating positions might be used to support such an enhancement.

The uneasiness about the opportunities which face Professors Kuhn and Hawley have led the department to conclude that short term issues are dominant and require action.

> ***Department Consensus #3:***The uncertainty with the Kuhn and Hawley positions leads to a dilemma. While the teaching of the ISP course is problematic, it is generally thought that a temporary dip in enrollment necessitated due to SOAR construction and fundraising could be tolerated. What cannot be tolerated is an inability to complete the approved IR instrument on time and consistent with SOAR's needs. The

department concludes that we should immediately post an recruitment advertisement for an instrumentally-skilled astronomer, using one of the open CMP positions. Conditional language in the ad will be used, much like is often done by UCLA. The plan is: 1) either one of the astronomers on leave do not return in August, in which case a successful AA hire would be internally charged against that departing position - CMP would recover the newly opened astronomy position, or 2) the astronomers both return or commit to return and the search ends.

The current problems, nonetheless are overwhelming and could be greatly alleviated by a lecturer or instrument-capable post doc.

Department Consensus #4:The department's financial SOAR commitment will continue at a lesser level in order to hire an annual, term astronomer for either teaching ("lecturer status") or instrumentation duties. The chairperson will seek to arrange such an acquisition with the AA group immediately, pending financial availability. The AA group will share in the financial burden in a manner to be determined.

b)Discussion.

Clearly, the department is very concerned about this year's reduction in force of the astronomers by two principals and what that might portend, long term. While both are on 1 year leaves, both are in situations which could eventually go either way. The department has stressed the need to make a timely transition should we find ourselves short-handed.

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2.Condensed Matter Physics

The CMP group is continuing to do well according to all standard measures. Especially noteworthy are the successes in interdisciplinary efforts: MRSEC, the CRG, and DARPA grants. Indeed, in conjunction with few-PI grants, the CMP funding has doubled since 1991. These interdisciplinary efforts are recently expanding into biomedical areas in protein structure, transport, and medical epidemiology. Other evidence of interdisciplinary efforts are embodied in the successful Campus Theory Seminar series involving faculty from engineering, mathematics, chemistry, statistics, and physics. The new building feeds this expanding cross-disciplinary group directly.

There are vacancies on the horizon and the CMP group plans to fill them using the following guides: 1) hire the best people, 2) hire in areas which have exceptional funding potential, and 3) hire in areas which enhance collaborations within CMP and/or other disciplines on campus.

a)Summary

Important dates:new building, 2002
MRSEC renewal, 2002
Beginning of senior search, 1999

Funding until 2005:experiment: judged assured to probable that funding will
continue at the current level
Theory: judged assured to probable that funding will
continue at the current level
Vacancy structure:8E+8T+2E open; 4E+4T>=65 in 2005

Figure 8 shows the age structure of the CMP group during the period of the end of this study.

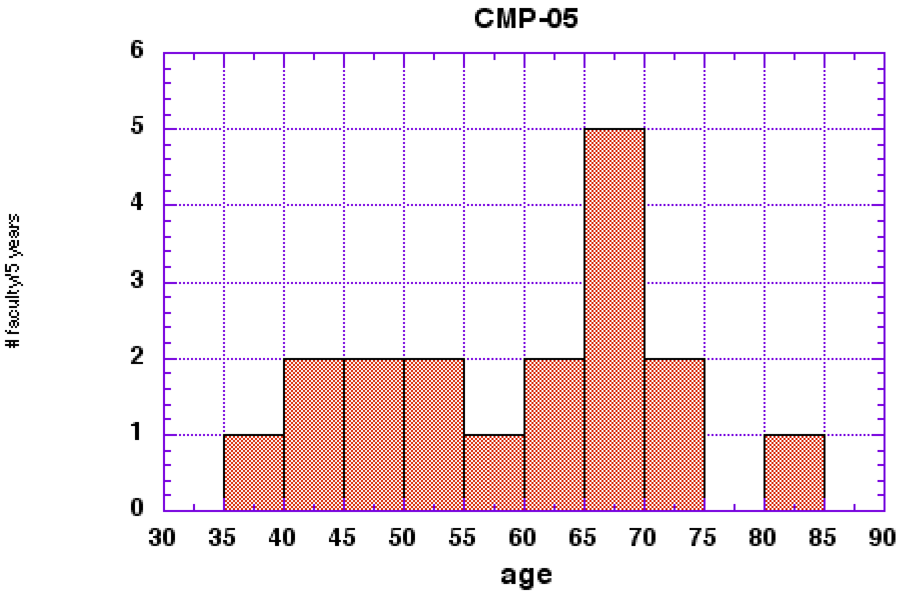

Figure 8 Age distribution of the CMP group on 1/1/05.

The CMP group has experimental expertise in mesoscopic systems, low temperature properties of disordered systems, glass transitions, transport, and electronic/atomic structure of novel materials. The CMP theorists have expertise in disordered systems, electronic structure theory, magnetism, stochastic dynamics, low dimensional transport, biophysics. As a whole, the group is particularly strong in promoting, leading, and carrying forward cross-disciplinary efforts with chemists, engineers, computer scientists, materials scientists, biochemists, epidemiologists, and industrial scientists.

What must be preserved:*The ability to be nimble.* This group of experimenters is still capable of changing directions to follow the physics, while also venturing into larger scale efforts at national facilities.
*MRSEC.*The MRSEC is not restricted by NSF in its ability to request renewal. It is important that the position of the department to support a strong renewal is not inadvertently weakened.
*CFMR.*This REF effort has paid back many times and its strength is essential. The directorship has migrated back to PA.
A strong, entrepreneurial theory group.
Opportunities:molecular electronics
Nanostructure, self-assembly
Biophysics
Polymer physics
Quantum optics
Nonequilibrium phenomena
Concerns:level of department-supported technical expertise

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b)Discussion.
The CMP group has been especially concentrated on determining the directions which most naturally complement the existing expertise. There are a number of experimental and theoretical positions which could conceivably become vacant in the timeframe of this study. The plan is to hire in an area which is new to PA and to hire at a level which is significant from the beginning. As senior hires pay back very quickly, the plan is to hire a senior person, with 2 junior

positions as a package, and to do so in a timeframe which matches our move into the new building.

Department Consensus #5:The department intends that all experimental CMP vacancies will be replaced in the directions outlined in Table 3.

The CMP group has made a detailed study of its prominent thrust areas and determined that their evolution and a broadening into complementary areas can be accomplished with recruitment into a few basic subdisciplines. There areas are listed in Table 3.

Table 3 Planned recruiting areas in CMP.

Area	Experimental hires	Theoretical hires
Growth and properties of new materials	1	
Quantum optics	1	
Molecular electronics and/or self assembly of nanostructures	1	1
Soft condensed matter physics	1	1

Department Consensus #6:The department is very supportive of the CMP plan to broaden the expertise by acquiring group-level strength in one of the listed areas of condensed matter physics.

Department Consensus #7:The department supports the group's plans to begin a search in the fall of 1999 for a senior experimentalist in one of the following areas: Growth and properties of new materials, Quantum optics, molecular electronics, self-assembly of nanostructures, Nonequilibrium phenomena, and "soft condensed matter physics [3]".

Department Consensus #8:The department supports the designation of the next two experimental hires as a part of the package of offer to the senior person.

As the group evolves, they foresee two needs. The reliance on optics will play an increasing role and therefore a need for an optics specialist to oversee the increasingly complex instrumentation is anticipated. The increasing coherence of theoretical physics and theoretical science in general on campus makes the desirability of the formation of a Campus Theory Institute more immediate.

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3.High Energy Physics

The HEP group faces an unusual set of circumstances as it confronts the future. The lead times for experimental efforts are now much longer than a single assistant professor's probationary period. Planning must take place over these long timeframes, and commitments must be honored. Indeed, HEP presents the department with one of the trickier problems in this planning exercise. Currently, the Fermilab accelerator and detectors are completing a $260M upgrade which will lead to at least an order of magnitude more particle collisions than the previous 3 year running period. During that run only a handful of top quark events were acquired - barely enough to establish the discovery. The next running is focused on establishing why its mass is more than 20 times the next lightest bit of matter. It is certain that both collider experiments will see 3 years of guaranteed exposure, with about a 3 year long analysis responsibility to follow. The prospects for continued running depend on a variety of factors, including the potential for still more luminosity upgrades and the hint of exciting physics. The latter possibility has become stronger over the last couple of years which could lead to a full program of analysis until perhaps 2005 or 2006. MSU has such a deeply entrenched presence at this lab, only 4 hours away, that playing this out completely is certain.

In the meantime, the Large Hadron Collider at CERN is moving ahead with early running anticipated in around 2006-2007. MSU is currently committed to two serious construction projects. The group is therefore on a trajectory to splitting, with 5 experimenters currently committed to both Fermilab and CERN and 2 experimenters not committed to CERN. Intellectually it would not be healthy for all of the group to be on a single experiment. Also, essential to maintaining the technical expertise within the group is a steady program of construction, which necessitates multiple programs which are out of phase in time. This has been successful for more than two decades. Hence, it is important that the HEP group begin to establish a new program in the timeframe of ~2002, be it at Fermilab or elsewhere. Two faculty, who will still be committed to the Fermilab analysis will not be sufficient, so the group needs to increase by one junior person to join them in a new venture.

a)Summary

Important dates:

Funding until 2005:

now: to decide on the Riken opportunity (see below)
2000-2004: Run II at Fermilab
2006: LHC startup
~2003: last chance to join new initiative
experiment: judged probable that funding will continue at current level
Theory: judged probable that funding will increase beyond current level

Vacancy structure: 7E+6T; 1E and 1T$\geq$65 in 2005

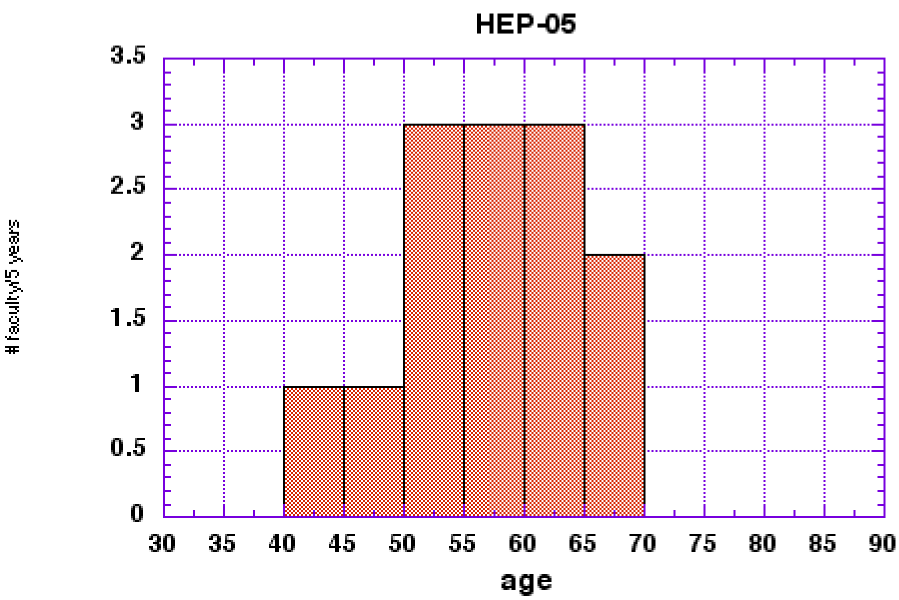

Figure 9 Age distribution of the HEP group on 1/1/05.

The HEP group is particularly strong in the areas of perturbative QCD, applications of gluon resummation, EW and QCD phenomenology, the design and construction of high- speed trigger electronics, design and construction of large-scale hadron and electron calorimeters, and unusually strong in experimental and program leadership.

What must be preserved:*strong hardware design and construction.*This is primarily true in electronics, where a particularly strong electronics engineering staff of 3 has been steadily employed for 10 years.

*Significant responsibilities in priority international programs.*The group intends to be strong in numbers and participation in whatever effort it ventures into.

*Strong, active theoretical group.*It continues to be a priority that strong theory-experiment collaboration be the hallmark of the MSU effort.

Opportunities:improvements and continuation of the Fermilab program, driven by discovery

New electron collider, expected in Hamburg, Japan, or Fermilab (the "Next Linear Collider", NLC)

The Pierre Auger Project, a large scale northern and

southern hemisphere effort to study the highest energy
cosmic rays
Bottom quark physics at Fermilab
Muon collider at Fermilab
Neutrino oscillations at Fermilab, or elsewhere

Some unspecified underground or cosmic ray program
Riken opportunity at BNL (see discussion below)
Theoretical particle astrophysics
Concerns:Being in time and strong in an experimental effort which
will be out of phase with LHC
Need to insure committed strength to LHC, which might
require vacancy replacement detailed to that program
Riken opportunity is complicated
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b)Discussion
The issue of a move to a cosmic ray initiative is intriguing in many respects. The physics is interesting and of primary astrophysical importance. There is clearly something to be said for an "accelerator" in which the "beam" is on all the time. However, the primary discovery physics anticipated in the next decade in this field at Fermilab, LHC, or LEPII will involve the further unraveling of questions which are of the most fundamental nature. To opt out of this exploration would be a difficult thing to do. These efforts will not be LHC efforts or Fermilab efforts, rather they will be the role of the NLC or the Muon Collider, which may require the discovery in order to be properly designed, but paradoxically enough will be forming collaborations long before that.

> ***Department Consensus #9:***The department supports the notion of MSU's moving into a new experimental venture in the ~2002 timeframe. It supports the use of one of the floating positions to support a junior recruitment in this direction, with possible payback from a future retirement.

The HEPT group is the right size and has a moderately flat-to-high age distribution. Their efforts are well-matched to the issues of importance in High Energy Physics. However, an opportunity has presented itself which requires timely response. One of the outstanding theoretical problems is the strong interaction sector. The HEP community has tools which rely on a perturbative prescription, good only at scales which are quite small. The nuclear physics community has a different set of tools which are relevant for scales much larger. The two approaches do not match in the middle and it is generally thought that new tools, and new ideas are required to completely understand the physics of the strong force.

Because of cultural and funding differences between NP and HEP, a small group of leaders have tried to take the matter into consideration as they prepare for the early running of the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory(BNL). In particular, Nobel Laureate T.D. Lee has arranged that the large Japanese commitment to the RHIC program be prepared to support extraordinary faculty appointments at U.S. universities specifically designed to attach these difficult physics problems. The Japanese have established a U.S. arm of its prestigious Riken Institutes at BNL and have offered half-time support for 5 years to a small number of universities in exchange for a promised tenure home for the holders of such a position in this difficult area of research. MSU is one of the first institutions offered this opportunity which would require our beginning a search immediately.

> ***Department Consensus #10:***The department suggests not committing to the Riken initiative. It suggests that the Chairperson write to Professor Lee indicating an interest in reviewing possible candidates in a seminar setting, but not committing to the posting of a vacancy for this purpose, at this time.

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4.Nuclear Physics
Nuclear Physics is very strong at MSU, and is probably the strongest academic group in the nation, among the strongest in the world. The evidence is apparent in all standard measures, but most directly apparent in the successful approval - in direct competition with the University of Indiana, one of the other strong U.S. groups - for the single available NSF

accelerator upgrade.

There are vacancies on the horizon, and they are likely in good timing with the need to be ready when the upgrade is complete and the physics program resumes, in about 2 years from now. Accordingly, replacement of vacancies will be important.

There is a small group set to take advantage of the Relativistic Heavy Ion Collider (RHIC) at BNL. This group consists of one faculty member with an outside DOE grant. There is no room for expansion of this group from within the current or anticipated vacancies. The accelerator physics program is essential for the far future evolution of the NSCL and nuclear astrophysics is a central theme of the upgrade physics program: both of these areas seem likely candidates for enhancement.

a)Summary

Important dates;this summer - 2001: upgrade
2002-2010?: exploit the physics of the upgraded NSCL
1999: RHIC begins operation
Funding until 2005:experiment: judged assured that funding will continue at
current level
Theory: judged assured that funding will continue at the
current level
Vacancy structure:10E+5T+1T accelerator; 4E and 1T>= 65 in 2005

Figure 10 shows the age structure of the NP faculty at the end of this study.

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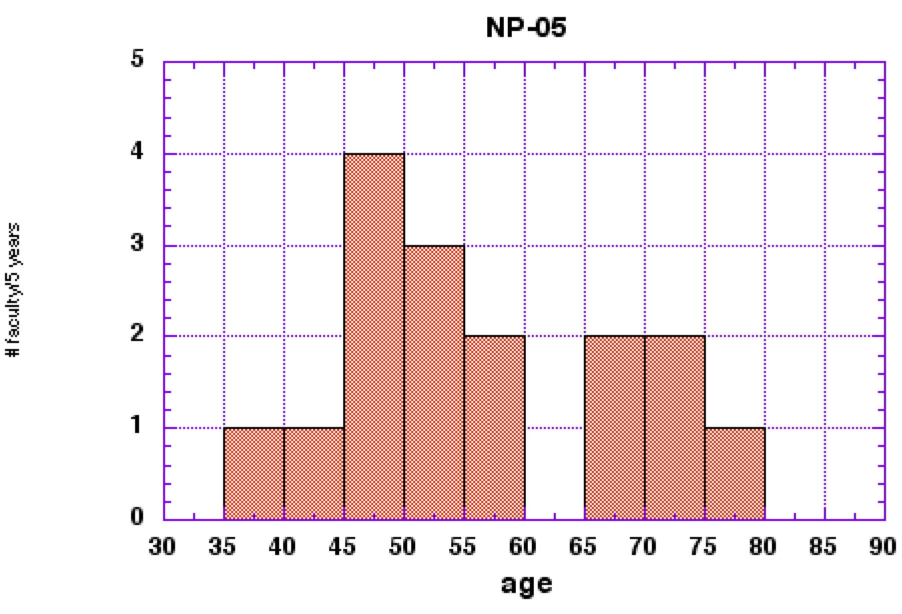

Figure 10 Age structure of the NP group on 1/1/05.

The NP group is particular strong in the areas of heavy ion physics, nuclear structure, heavy ion theoretical physics, computer modeling, chaos/self-organization, experiment- theory collaboration, experiment and program leadership, and beams physics theory.

What must be preserved:*Critical-mass exploitation of the upgrade.*This implies a
dedicated, young experimental faculty.
Critical-mass exploitation of other national priorities. This

implies a successful RHIC program.
*A strong applications-oriented beams physics program.*The long term future of the NSCL requires breakthrough advances in accelerator physics.
*A strong theoretical group.*Support of the NSCL program is crucial, but also a group which continues to be independently aggressive in its pursuit of all thrust areas of nuclear physics is important.
Opportunities:physics with high-intensity radioactive beams
Heavy ion experimentation and theory in other facilities
Accelerator physics as an expanded academic program
Nuclear astrophysics as complementary to the radioactive beams program and other departmental programs.
Concerns:Full manpower dedicated to the upgrade program
Below-critical mass effort at RHIC
Below-critical-mass effort in beams/accelerator physics
Space

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b)Discussion

The dilemma faced by the NSCL and department faculty is one of too many opportunities coupled with the clear priority to succeed with the local NSCL program.

> ***Department Consensus #11:***The department supports the replacement of upcoming vacancies within the NPE group toward programs which benefit and support the program and the future of the NSCL. This includes anticipated recruitment in radioactive beam physics experimentation, accelerator physics, and nuclear astrophysics. The currently open position will be advertised with these areas explicitly mentioned.

The effort in accelerator physics as an academic program is sub-critical with only one faculty member involved in the theoretical and mathematical aspects of beams physics. The loss of Professor Nolen, while he has played a role in the recent efforts in the Virtual University, has nonetheless left a hole in the department in the applications side of this field. The department has a Ph.D. program approved and functioning in Beams Physics, but it needs an experimental component which will couple to the NSCL program as well as the labs within sight of East Lansing, namely Argonne and Fermilab.

> ***Department Consensus #12:***The department encourages exploration of the means by which a stronger accelerator physics academic program might be melded with the currently excellent NSCL accelerator program. Hiring with the explicit attempt to increase and strengthen this popular and nationally critical need for accelerator physicists is encouraged. While this is not a NP discipline, *per se*, it is clearly a critical need of the NSCL that such an effort be strong. The department notes that there are less than a half-dozen universities in the US which offer Ph.D. level training in this field and that MSU has become significantly visible in this area in the last 3 years and that it should continue to grow.

There are overlaps with physics interests with the department as a whole, with astrophysics being a clear underlying theme worthy of exploitation. Indeed, as intriguing as the Riken program was, it is in competition in many people's minds with nuclear/particle astrophysics. This is a subfield which is well-supported nationally, with an abundance of fundamental and exciting problems to study.

> ***Departmental Consensus #13:***The department looks with interest at the potential for cross-fertilization of efforts in nuclear physics (theory and experiment), high energy physics (theory and experiment), and astronomy in the area of nuclear and particle astrophysics. Consideration of ways to broadened in this direction, perhaps with use of retirements, perhaps with use of the remaining uncommitted floating position is encouraged.

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5.Staff

The staffing situation in the department is undergoing detailed review during the last month. The issue is how best to increase the computing support, department wide. The plan is to hire another professional into the computing group without an additional tax on the research groups for funds. There is currently no solution, but a number of ideas. None will involve the College or MSU support beyond that graciously provided through the chair negotiations of this fall.

Outreach has been a difficult program to support. The current outreach coordinator did not appear to meet the needs of the faculty engaged in these efforts and her permanent position was reduced to a half-time term one. We may rely increasingly on College outreach staff for large-scale effort coordination.

The staffing situation at the Abrams Planetarium is a problem, as has been discussed. It is important to find an Assistant Director and an effort is underway to induce a retirement, against which this position might be leveraged. Such a hire would greatly enhance the ability of the planetarium staff (Batch) to produce new Digistar shows for world-wide distribution, in addition to the 2 which have been done in the last 3 years. The right hire, along with Dr. Batch might lead to some relief for the ISP astronomy teaching. Batch is capable now of teaching in the undergraduate program.

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B.ACADEMIC PROGRAMS

1.Undergraduate Programs

a)Majors

Physics Majors typically have the choice to either go on to graduate school, become secondary teachers, or select from a wide variety of employment opportunities in the private sector. However, there is a widely spread perception that a physics degree does not lead to direct employment opportunities in the same way that an engineering degree does. One of the goals for our Department is to actively participate in correcting this misconception. We intend to take two basic steps towards this end. The first is relatively straightforward, a recruiting poster and brochure. We intend to distribute this material to all (or at least a large fraction of) Michigan high schools. The second step we are planning to take is a much more ambitious one. Our Department intends to study and then possibly develop several options of concentration for physics majors. A committee to study these options has been put in place. Options under consideration are degrees in:

1. Computational Physics: The transformation and additions may be similar to the recently approved program in Computational Chemistry. We are rather well prepared to teach some of this ourselves. For example, a possible capstone course for this program is PHY480, Computational Physics. In addition, we have recently established the course sequence PHY101,201,301,401, intended to teach the computational tools of physics to our undergraduates.

2. Biomedical Physics: Intended to be attractive to pre-medical students and people who want to build medical instrumentation. This program may have to be a collaborative effort with, for example, the Microbiology or the Physiology Departments. The new science building, which will house these departments and ours, might aid these collaborative efforts significantly. The Physiology chairperson is enthusiastic about this possibility.

3. Materials and/or Electromagnetic Physics: Materials science is an Applied Physics option offered by many physics departments. Coordination with our own MSM Department is a possibility and an opportunity. Our existing research collaborations with engineering departments, in particular the CFMR and MRSEC, might prove beneficial in this effort and provide attractive possibilities for industrial internships. The recent recruitment of Professor Nogami (a physicist) into MSM offers a natural professional link.

4. Environmental Physics: In view of our land grant mission, this is a particularly attractive option. Our great research strengths in nuclear physics and condensed matter physics afford us possibilities to set up a rather unique program emphasis.

5. Geophysics:This is another option, where there is an obvious department - Geology in this case - within the College of Natural Science that would be a candidate for a strong collaboration. The Geology chairperson is enthusiastic about

this possibility.

We think that a program in applied physics with the above specific options will attract students with practical interests and concerns about preparation for a career for which there is a demand and give the Physics and Astronomy Department a specific set of programs that can be advertised widely.

b)Service Courses

During the last few years, our department has developed several rather attractive course in the Integrative Studies Program. Our ISP205 offering, *Visions of the Universe*, is usually fully subscribed, with three lecture sections in each semester. However, our other ISP courses, are quite under-utilized. In particular, *Guide to the Atom*has had disappointingly low enrollment. A casualty of the failed Transcollegiate Program was that the historically popular quarter offering, *Science of Sound,*disappeared after considerable effort was wasted in transforming it into the Transcollegiate framework. We have abandoned that effort and have recently recast it as ISP215 with its first offering scheduled for this spring. Now more than a generation of advisors and students exist with no knowledge of this course whose enrollment required the large physics lecture hall. We intend to increase our efforts to promote these courses actively to students and their advisors.

c)Virtual University Courses

Our department has taken a leading role in the development of virtual university courses and instructional technology. We intend to build on this strength by strengthening our intensive collaboration with the Laboratory for Instructional Technology in Education within the Division of Science and Mathematics Education.

We have begun to investigate ways to combine the strengths of our CBI, CAPA, and MultiMedia Physics approaches with the DSME/Light's LectureOnline system. This should enable us to continue our leading role in the development of instructional technology. We have joined with the LITE staff and professionals from CBI and CAPA to evolve LectureOnline to a platform designed for all college use. Called, LearningOnline, this program will be the primary vehicle by which CBI and virtual classes will be produced and offered.

The Virtual University courses PHY231C and PHY232C are already utilized by a few high school students from neighboring communities to obtain advance placement college credits. Properly promoted, this constitutes a huge growth opportunity and a perfect recruiting tool for our Department, College, and University.

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2.Graduate Programs

We are renewing our commitment to a strong physics/astronomy curriculum as well as to providing opportunities for a broader variety of"physics-based" interdisciplinary
programs. The following plans reflect these priorities.

a)New initiatives

We have begun a variety of new initiatives in the graduate program, building on our newly implemented internal recommendations.

(i)Interdisciplinary programs

The modern research environment is very dynamic, with many research opportunities lying at the interfaces of more mature research areas and academic disciplines. To enable faculty and students to develop Ph.D. programs in areas of opportunity, with the blessing of the Dean of the Graduate School, we have developed a flexible set of guidelines for Interdisciplinary Ph.D. and Masters degrees in "Physics and X" or "X and Physics". The first if these is now in place: we have an agreement with Biochemistry and will develop programs with other departments when faculty and students identify appropriate research areas. Two Ph.D. students have recently begun the physics/biochemistry program.

We planto use this framework to expand considerably the interdisciplinary opportunities available though the physics/astronomy graduate program. Several other physics students are involved in dual Ph.D. programs (e.g. accelerator physics and mathematics) *(ii)Professional Masters*

There is a strong push on campus to set up a viable "Professional Masters" degree program in the sciences. Professor Crawley played a large part in initiating this program on the MSU campus with the acquisition of a Sloan Foundation Grant. The Physics and Astronomy Department plans to admit its first students into this program in the fall of 2000. An industry project, cross-disciplinary courses, and 10 one day workshops in business and communications are what make these programs "professional". Most of the increase in our masters enrollment is expected to be in this program. We also plan to develop a 5 year Masters program which will have strong overlap with our Professional Masters program and possibly the joint undergraduate degree programs mentioned above in the undergraduate discussion.

(iii)Accelerator physics

Professor Berz continues to develop a www based program in accelerator physics. We anticipate a more aggressive promotion of our program in accelerator physics due to a concurrence of education, research, and employment opportunities in this area. An ambitious program, linking MSU graduate students with accelerator physicists at NSCL, ANL, and FNAL has been discussed. The Department of Energy has been very supportive of Berz's multi-continent program of academic offeringsand has indicated a willingness to experiment. One idea, enthusiastically received, was that DOE would sponsor fellowships for students entering this program which they could carry with them to these national facilities to support their thesis research. Remote instruction would continue with them in residence elsewhere, with adjunct faculty at these institutions participating in the course delivery.

(iv)New courses/restructuring of old courses

Due to a recent overhaul, our basic graduate physics and astronomy course sequence 810,820,831,841,842,851,852 is now more standardized (there is a quite well defined set of topics that should be covered). The graduate astronomy courses AST801, 802 and 840 are also now offered regularly. We plan an overhaul of the advanced and specialized course offerings within the next couple of years.

We are planning a course in computational physics (perhaps identical to, or cross- numbered with the specialty PHY480) at the senior undergraduate/graduate level. A graduate laboratory in experimental physics is also being reconsidered and will likely be initiated in the next year or two. This will be joint with the second semester of the advanced undergraduate lab. (PHY452) which is already offered. These courses will form part of our standard graduate program as well as being key parts of a professional masters program based in physics.

C .Research and Scholarship

Here we will simply summarize our current plans for our research structure and groups. Overall, the theme is a broadening of our current programs, building on the expectation of significant vacancies. We believe that, has been shown above, that our group sizes, and hence the overall size of the department is adequate and appropriate for the research efforts of a large, research intensive public institution. The steady state size, then, of 56 faculty is expected to remain firm into the foreseeable future.

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1.Summary:

The department will use two currently occupied positions as floating vacancies, targeted to departmental needs and market opportunities. We anticipate having generally worded advertisements running nearly constantly to see what develops, using the open positions as the basis, but internally managing the vacancies.

a)AA:

The AA group will remain the same size for now and the immediate problems associated with the IR instrument and teaching responsibilities will be addressed. Any near-term vacancies will be replaced with observational astronomers or astrophysicists. Observationalists will be sought with instrumentation backgrounds.

b)CMP:

The CMP group will continue with its plans for recruiting a senior physicist next fall. The search will be targeted to the areas mentioned above and 2 junior positions will be offered as a part of a startup package. Overall, in the fullness of time, we anticipate 6 experimental recruits, including 1 senior and two coupled junior positions (a fully formed subgroup), plus 2 junior theoretical recruits. In order, we expect: senior, then coupled junior(s), to be followed by targeted junior searches in the areas outlined above. ***c)HEP:***

The HEP group will not immediately accept the Riken opportunity, rather it will invite potential candidates for seminars as a means of giving the whole department a look at the physics and the people. The HEPE group will begin to search for an additional project in ~2002 with the recruitment of a junior faculty person charged against one of the floating positions. (A future payback against vacancies may be required, depending on circumstances.) In principle, any vacancies will be replaced into the program that suffers the loss. Any theoretical vacancy may be replaced by someone with a particle astrophysics emphasis.

d)NP:
The NP experimental group will endeavor to replace all vacancies in areas that span the needs of the NSCL and the department: experimenters with general interests, experimenters with specific nuclear astrophysics interests, and experimenters who are accelerator physicists with an interest in the academic accelerator physics program. Any vacancy which occurs in theoretical nuclear physics will be replaced into that area.

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2.Replacement scenario
Currently, the replacement scenario employed to transition from 57 faculty to the steady state reduction by 1 to 56 is the following:

position		evolved into:
Foiles (deceased, open)	....	current NPE search
Carlson (retired, open)	....	open
Austin (retirement announced)	....	not replaced
Cowen	....	to be replaced
Other CMPE	....	to be replaced
Borysowicz	....	HEP/floating
Hetherington	....	HEP/floating
Any other	....	replaced into group

In order to meet startup requirements, the following presumptions will be made:

Item	Value/cost
Salary Assumptions	
Senior salary-retire	\$80k
Junior salary-hire	\$60k
Senior salary-hire	\$100k
Startup Assumptions	
all theory	\$150k
CMPE-junior	\$500k
CMPE-senior	\$1M
HEPE-junior	\$250k
HEPE-senior	\$500k
ASTE-junior	\$250k

Currently, open salaries are being put aside against the anticipated recruitment efforts. In three years, the first possible startup of the senior CMP hire, roughly \$300k will be accumulated.

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3.Department organization - it all comes together

The broadening desire and the vacancy opportunities will allow us to be opportunistic over the next half-decade. Many areas are becoming viable which are unexplored by our current faculty. We've outlined them above. This comes at an opportune time, given our current expectations of an applied physics major and a cross disciplinary Ph.D. program. The two academic programs and the research program plans all fit together as an attempt to simultaneously retain the necessary identity within our groups and to advantage ourselves of exciting opportunities for research faculty and students.

We are in the process of laying a superstructure of specialty over the existing AA, CMP, HEP, NP structure which will remain the basic administrative, cultural, and fiscal Groups within PA. They function well and are so firmly a part of our departmental life that they have been memorialized in our bylaws, recently reaffirmed after an extensive review of this decades-old document.

We are considering the creation of overlaying **Physics and Astronomy Research Sections**, some of which cover only research and academic areas within the department, others of which extend beyond the PA logical borders to other departments on campus. Table 4 shows the **Research Sections**under consideration. These **Research Sections**will be subscribed to by faculty interested in pursuit of issues and opportunities. They will have an identity which is less formal than our Groups, but faculty will nonetheless maintain a **Section**membership, nominal budget, and curricular role within the department. The budgets will be largely used to foster seminar and visitor opportunities and will be administered by **Section**Convenors who will serve as nominal contacts and shepherds.

Table 4 Proposed Sections and anticipated membership from within existing departmental personnel. The UGP column indicates Sections which will directly couple to the undergraduate applied physics option under current consideration and the GP column indicates anticipated areas of joint-Ph.D. (and possible MS) degree programs. The MSU column indicates Sections which would have a natural coupling to units outside of PA.

Section	UGP	GP	MSU	AAT	AAE	CMPT	CMPE	HEPT	HEPE	NPT	NPE
Nuclear/particle astrophysics		✔		✔	✔			✔	✔	✔	✔
Materials science*	✔	✔	✔		✔	✔	✔		✔		
Accelerator physics*		✔	✔						✔	✔	✔
Computational physics*	✔	✔	✔	✔		✔		✔	✔	✔	
Quantitative biology*	✔	✔	✔			✔				✔	
Instructional technology*			✔		✔				✔	✔	✔
Mathematical physics*		✔	✔	✔		✔		✔		✔	

It is reasonable to imagine that at MSU, like at other institutions, there may someday be aDepartment of Quantitative Biology with no building and no actual unit, rather theevolutionary result of the above Research Section as it matures and takes on an identityof its own.

These ideas are not fully formed, but we have been informally moving in these directionsfor years and this effort to tie together the research efforts and the curricular and degreeprogram expansion seems a natural next step.

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D .Plans for Increasing Development, Improving Diversity and Quality of Faculty/ Staff and Students, Enhanced Industrial Relations and Outreach/ Service

We are always on the lookout for scientific minority candidates. We have successfullyhired minority staff and endeavor to give scientific minority post docs the opportunity toteach when possible. We have successfully hired 2 women in astronomy and physics inthe last 5 years and we will continue to be serious in our efforts to hire among thosegroups who fit our plan and from whom the department and our students will benefit. It is a particularly difficult situation in physics.

Our development efforts are totally devoted to the SOAR project and the new building.

The Physics and Astronomy Department engages in a variety of industrial interactionsand outreach activities. The REU program; CBI, CAPA, Virtual university and Beamphysics initiatives; the planetarium and MSU observatory; and Science Theatre areexamples of significant activities in this area. In addition our research programs engagein their ownoutreach efforts, including strong outreach programs associated with: TheNSCL; MRSEC and SOAR. Our industrial connections are primarily through theresearch programs, in particular the MRSEC and CFMR have successfully seeded
collaborations and funding with industry, including Michigan companies (e.g. Ford andGM). The planned applied physics and professional masters programs will involve regular industry input to our curriculum offerings, and hence a more active role for a PA department industrial advisory committee. We also intend to invite some of our alumni and friends from the industrial world to review our undergraduate major plans. Now that this departmental plan is in place, we will also include it in a review. From this, we hope to develop a cadre of friends on whom we can call for future advise.

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VI.HowWillWeKnowWeHave AttainedOurTargets?

In 2005, if we are in the new building with:

*A successful applied physics degree program;
*A successful, unique joint Ph.D. program;
*a successful search for a group in CMP which meets our objectives stated above; *engaged in a first-class nuclear physics program with an active Nuclear/Particle
Astrophysics Section
*promoting an active academic accelerator physics program;
*engaged in a new HEP initiative; and
*making use of the SOAR telescope with the MSU IR imager...then,

we will have reached our goals.

Footnotes:

1Also, Eva Rzepniewski, an MSU REU student went to Notre Dame and also received a Rhodes that same year. back

2This was before the approval of the MRSEC, the SOAR telescope, the inclusion of MSU in the first round beamline approvals at the Advanced Light Source, the NSCL upgrade, or the discovery of the top quark and approval of LHC funding. It was before the hiring of some of our most promising young faculty. back

3This unfortunate term is now universal and tends to stand for any of polymer, biomaterials, mesoscopic biosystems, protein structure, etc.. Any of these listed areas are of possible interest to PA and would match the building and the existing group well. back

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