NORTH CENTRAL ACCREDITATION REVIEW

Department of Physics
Kansas State University

C. E. Hathaway, Head

PREFACE

This report on the Department of Physics over the decade 1971-1981 presents both general statements concerning the policies and operations within the Department and statistics concerning the students and faculty. The statements on policy and operations reflect the evolution of both formal and informal procedures which have developed over a considerable period of time. In some cases, as will be noted in the text, the faculty as a whole have endorsed the policies and procedures by a formal vote. In other cases, the policies and procedures have simply evolved with no need for a formal endorsement. This report was prepared solely by the Department Head with the considerable aid of the departmental clerical staff and without involving or burdening the faculty. As such, this report reflects the view of the Department as perceived by the Department Head.

The statistics have been gleaned from both departmental and University records which are believed to be accurate. When estimates have been used, they are indicated in the text or tables by an asterisk (*).

TABLE OF CONTENTS

Page

I. EDUCATIONAL TASK OF THE DEPARTMENT

A. Role in the Community, State, Nation and World

The role or purpose of the Physics Department as an integral part of a University with an established tradition of education and research is quite broad. The faculty passed a resolution in 1971 indicating their support of the following statement concerning the role and purpose of the Department of Physics, a statement which applies equally well in 1981 and to the next decade.

> *The Department of Physics at Kansas State University has a broad commitment to generate and disseminate knowledge. These roles are interrelated and complement each other. The Department has the responsibility to maintain an active research program in order to contribute to the society through the generation of a better understanding of the physical world and man's relationship to that world. Such a research program assures to the Department a faculty that is intellectually alive and a curriculum that is current.*
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> *The Department has a professional responsibility to educate future generations of physicists. The Department should provide the undergraduate physics major with the skills he will need to contribute effectively in his chosen career. The Department has the responsibility in its graduate education program to produce a person confident of his ability to function as a professional physicist.*
>
> *The Department has the responsibility to provide education for students in scientific, engineering, and other disciplines that require an understanding of some applications of the principles of physics.*
>
> *An additional role of the Department is to awaken in the non-science student an interest in the nature of the physical world and to provide him with a familiarity with some of the current ideas and concepts. Such familiarity*

with physical concepts should enable him to be a more effective citizen in today's rapidly changing technological society.

The Department also has a responsibility to provide information for those in the geographical region of which the University is an integral part. The Department thus extends both research and educational programs beyond its laboratories and formal classrooms.

(Resolution: September 28, 1971.)

An important role of the Department in the immediate geographical area and in the State is to provide an education in physics and the physical sciences for non-science oriented students as a necessary and important component of an education for future citizens who will need some understanding of science in order to aid in the decision-making process in an ever increasing technologically dependent community. The students involved in the courses which address this need range from students in professional and preprofessional degree programs (architecture, pre-law), to students in arts and humanities curricula to students pursuing various curricula leading to certification in non-science teaching areas. An equally significant role involves providing an education in physics to those students in professional curricula, engineering curricula, and other science-oriented curricula who have direct interest in and need for a knowledge of physics. The third component of the educational role involves providing for the professional and liberal education at the undergraduate and graduate level of physicists with a variety of career goals who will use their education in teaching, research and community service on a state, national, and international basis. Although these students are small in number, and at times in the last decade appeared nearly ready to appear on the vanishing species list, they form an extremely important component of the department whose contributions far exceed their numbers.

In addition, the department provides less formal educational opportunities for persons in the general area. These opportunities are provided to the general public and the public school system through Planetarium showings, occasional public lectures of general interest, group tours of research facilities and open house activities. Specific examples will be addressed in sections of this report.

The Department plays an educational role of international significance in providing facilities and staff for the education of professional physicists who will be active in other countries. This is accomplished through the acceptance of some foreign graduate students and through visiting and guest faculty and research associates from other countries. The exchange of knowledge and ideas through the participation of departmental faculty and students in international meetings is another aspect of the role played by the department on an international level.

B. Projected Plans

The Department will be guided in its continued growth by the statement on role and purpose. The Department is strongly committed to the dual role of generating knowledge through scholarly activity and the sharing of knowledge through teaching. The Department in order to meet this commitment will continue in its effort to attract and retain well-qualified faculty, to create an environment which will nurture the fullest development of each individual faculty member, to retain in the educational program that which has been and remains effective and to modify those aspects which have been less effective, and to seek and attract the extramural funding necessary for scholarly activity in physics.

C. Evaluation of Effectiveness

The only true measure of the effectiveness of the Department will be the quality of the graduates (B.A., B.S., M.S., Ph.D.) as determined by their successes, the quality of the scholarly activities of the faculty, and hence the image of the Department as held by the community of professional physicists on a national and international level. A measure of the effectivenss of the Department should be evident within the pages of this report.

II. PROGRAM DESCRIPTION

A. Instructional

1. Service Level Courses

Greater than 90% of all the unweighted student credit hours produced by the Department is of a service nature, predominately at the freshman and sophomore level. For example, the total unweighted student credit hour production by the Department for the Spring of 1981 was 7669 semester credit hours of which 7211 credit hours (94%) were generated in the service courses, the other 458 credit hours (6%) were generated by courses for undergraduate physics majors and graduate students. The enrollment in these service courses are shown in Table I below:

TABLE I

SERVICE COURSE STUDENT CREDIT HOUR PRODUCTION[1]

1971-1972 through 1980-1981

YEAR	Lower Level Courses (≤399)	Upper Level Courses (>400)	Total
1971-1972	15,309	0	15,309
1972-1973	14,914	42	14,956
1973-1974	14,469	63	14,532
1974-1975	13,366	105	13,471
1975-1976	13,629	66	13,695
1976-1977	12,693	30	12,723
1977-1978	11,371	30	11,401
1978-1979	12,936	60	12,996
1979-1980	13,190	240	13,430
1980-1981	13,880	365	14,245

[1] These figures are based on students finishing the course as indicated by a grade reported at the end of the semester. The drop rate in these courses has ranged between 12 and 15% over this decade.

A full set of statistics on the credit hour production by course listing for the period 1971-1972 through 1980-1981 is given in Appendix A, Table A1. In addition, the statistics on grade distributions in all physics courses are presented in Appendix A, Table A2. All of the service courses which are taught are described in detail in Appendix B. Those service courses taught every year including a brief sketch are listed below in Table II:

TABLE II

Service Course Listing

COURSE NAME	PURPOSE AND/OR CLIENTELE
1. Man's Physical World I (3) (101)	Survey, non-mathematical introduction to Physics; general low-level liberal arts.
2. Man's Physical World II (3) (102)	Survey, non-mathematical introduction to range of physical sciences with Physics 101 as a prerequisite.
3. Man's Physical World I Laboratory (1) (103)	Independent laboratory associated with Physics 101.
4. Man's Physical World II Laboratory (1) (104)	Independent laboratory associated with Physics 102.
5. General Physics I (4) (113)	Introduction to physics requiring knowledge of algebra and trigonometry; preprofessional students, some science and engineering majors.
6. General Physics II (4) (114)	Continuation of Physics 113.
7. Descriptive Physics (4) (115)	One semester survey of physics requiring a knowledge of algebra; life science, agricultural, architecture, and medical technician majors.
8. Physics for Musicians (3) (125)	An introduction to the physics of music; music majors.
9. Descriptive Astronomy (3) (191)	A low-level introduction to astronomy with a highly varied clientele.
10. Descriptive Meteorology (3) (193)	A non-technical introduction to meteorology with a highly varied clientele.
11. Engineering Physics I (5) (213)	A calculus level introduction to physics; science and engineering majors.
12. Engineering Physics II (5) (214)	Continuation of Physics 213.
13. Modern Physics (3) (451)	A non-mathematical introduction to 20th Century physics for students who have earned a B or better in Physics 101.
14. Astronomy (3) (495)	Observational astronomy for students who have earned a B or better in Physics 191.

COURSE NAME	PURPOSE AND/OR CLIENTELE
15. Physics for Science Teachers (2-3) (515)	Topics of interest primarily to students preparing to teach at the secondary level; requires one year of college level physics.
16. Physics of Sound (3) (525)	Introduction to high-fidelity sound reproduction; requires General Physics II.
17. Introduction to the Physics of Lasers (3) (553)	An introduction to laser technology; requires Engineering Physics II.

These are the courses which account for more than 90% of the student credit hour production. During this last decade, and particularly starting during the period 1978-1979, the Department made a conscious decision to develop a set of junior-senior, service-level courses which had lower-level physics course prerequisites, because (1) it was obvious that there were non-science and non-engineering students as well as science and engineering who desired physics courses not aimed at physics majors, (2) it would provide the faculty an opportunity to enjoy the interaction with students enrolled in classes which they wanted to take and wanted to learn, and (3) it would broaden the student base of the department. The upper level service courses in this category are Modern Physics, Astronomy, Physics for Science Teachers, Physics of Sound, and the Introduction to the Physics Lasers. This experiment was an instant success as measured by both student and faculty reactions. However, the success of enrolling 130 students in five of these junior-senior level courses in 1980-1981 as compared to 20 students in two such courses in 1978-1979 coupled with a simultaneous growth in enrollment of 15% in the General Engineering Physics classes has produced an over-burden in the teaching load. The result of this over-burden resulted in the cancellation of the Astronomy class for the 1980-1981 year in spite of a high student demand and will lead to subsequent cancellation of most of these junior-senior service courses for several years unless some relief can be obtained. Unfortunately, the Department cannot cancel lower-level service courses in as much as such courses tend to be built tightly into the curricula of many majors. *The Department will, however, begin to limit enrollment in these classes starting with the Fall of 1981.*

2. Undergraduate Physics Major Program

The undergraduate physics degree program as of 1981 is described

UNDERGRADUATE CURRICULA IN PHYSICS

GENERAL

The courses required for a physics major are: Phys. 100,150,213,214,506,522, 523,532,551,636; Math. 220,221,222,240; Chem. 210,230; and nine hours of science option courses.

The general requirements of the College of Arts and Science must be met. For a Bachelor of Science degree in Physics the additional requirements are: 2 courses in English Composition, 1 course in Oral Communications, 1 course in Physical Education, 4 courses in Humanities (one in fine arts, one in philosophy, one in literature and one in the western heritage, or one in fine arts, one in philosophy and two course in a foreign language) 4 courses in Social Sciences and 1 course in Life Science with a laboratory. For a Bachelor of Arts degree in Physics the additional requirements are: 2 courses in English Composition, 1 course in Oral Communication, 1 course in Physical Education, 4 courses in Humanities (one in fine arts, one in philosophy, one in literature, and one in the western heritage), 4 courses in Social Science, 1 course in Life Science with a laboratory and 4 courses in a foreign language or equivalent competence. One of the courses taken to satisfy the general requirements must be a course with international or non-western cultural content.

The 9 hours of science option courses in the physics curriculum may be selected with the approval of the physics department undergraduate advisor from courses, 400 level or higher, in the departments of Chemistry, Computer Science, Geology, Mathematics, Physics, Statistics, the Division of Biology, the College of Engineering and other departments as appropriate to the student's program. The courses selected to satisfy the science option requirement should contribute to the student's educational goals and the advisors approval of the courses selected will be indicated to the dean of the college, the department and the student by letter during the first semester senior year. Early consultation between student and the undergraduate advisor will make the approval of the science option courses a routine matter.

FOUR YEAR COURSE SCHEDULE

The following schedule suggests the way in which a physics major may schedule his classes in order to satisfy all the requirements and complete the prerequisites for more advanced courses in physics.

First Year

FALL SEMESTER					SPRING SEMESTER				
Chem	221	210	Chemistry I	4	Chem	221	230	Chemistry II	4
Engl	229	100	English Comp I	3	Engl	229	120	English Comp II	3
Math	245	220	Anal Geom & Calc I	4	Math	245	221	Anal Geom & Calc II	4
HPER	261	101	Concepts PE	1	Phys	265	150	U.G. Seminar II	1
Phys	265	100	U.G. Seminar I	1	Phys	265	213	Engr Phys I	5
Spch	281	105	Oral Comm I	2					
				15					17

Second Year

FALL SEMESTER					SPRING SEMESTER				
Math	245	222	Anal Geom & Calc III	4	Math	245	240	Series & Diff Eq	4
Phys	265	214	Eng Phys II	5	Phys	265	551	Atomic Physics	3
			Hum or Soc Sci Elec	6	Phys	265	636	Physical Instr.	4
								Hum or Soc Sci Elec	3
				15					14

Third Year

Phys 265 522	Mechanics I	3	
Phys 265 523	Mechanics I Rec	2	
Phys 265 506	Phys Lab I	3	
Math 245 514	Recommended	3	
	Hum or Soc Sci Elec	3	
		14	

Phys 265 532	Elec & Mag I	3
	Science Option	3
	Hum or Soc Sci Elec	6
	Life Science Elective	3
		15

Fourth Year

Science Option	3
Hum or Soc. Sci Elec	3
Free Elec	9
	15

Science Option	3
Hum or Soc Sci Elec	3
Free Elec	9
	15

Some students may have completed sufficient high school work in certain subjects such as Chemistry I, Calculus I, or English Composition I to receive credit by examination. The procedures for such examinations are described in the paragraph, "Credit by Special Examination" on page 13 of the General Catalog.

Undergraduate physics majors and others interested in physics are invited to join the Society of Physics Students. The organization provides an important channel of communication between the Department and its undergraduate students. The SPS selects one student each year to serve on the Physics Department Curriculum committee.

TYPICAL PROGRAMS

As an example of the manner in which the science options* and the 31 hours of free electives may be selected to provide an integrated education program adopted to the student's interest and career goals, the following five programs are given. These programs are intended to be illustrative only and are not to be construed as requirements nor do they exhaust all program possibilities. Students interested in a minimal physics program are advised to consider taking a physics minor.

I. Physics Teaching

For preparation for a career in secondary teaching, the courses after the first three should be selected in order to qualify the student for the teacher certification in secondary teaching.

Math 245 791	Topics Math High Sch Teach (*)	3	
Phys 265 616	Adv. Phys Lab (*)	3	
Phys 265 535	Fund Holography (*)	3	
Phys 265 553	Intro Phys. Lasers (*)	3	
Psyc 273 110	Gen. Psychology	3	
Educ 405 215	Educ Psychology 1+	3	
Educ 405 315	Educ Psychology 2+	3	
Educ 415 451	Prin Second Educ +	3	professional semester
Educ 415 476	Meth of Teaching+	3	professional semester
Educ 415 586	Teach Participation+	8	professional semester
Educ 405 611	Educ Sociology+	3	professional semester
Educ 415 316	Instr Media+	1	

+Teaching certification requirement

II. Engineering Physics

The suggested courses below are intended to equip the student with the background for a career in industrial or laboratory work in physics. In addition to courses in the Physics Department, it is suggested that the student consider the following courses from Engineering, Mathematics and Computer Science. A five year dual-degree program in Physics and Mechanical Engineering is available and similar dual-degree programs can be arranged with electrical engineering or nuclear engineering.

CE	520 350	Engineering Materials, or	2
CE	520 352	Engineering Materials I	3
ME	560 571	Fluid Dynamics (*)	3
EE	530 511	Circuit Theory II (*)	4
EE	530 525	Electronics I (*)	3
Math	245 514	Vector Analysis (*)	3
Math	245 551	Applied Matrix Theory (*)	3
CS	286 300	Algorithmic Proc. (*)	3

III. Computational Physics

The growing use of computers in applied and fundamental physics provides an opportunity for physicists who are interested in scientific problem solving. The following courses may be selected as satisfying the 9 hour science option and free electives.

Math	243 514	Vector of Analysis (*)	3
Math	245 550	Intro. to Complex Analysis (*)	3
Math	245 551	Applied Matrix Theory (*)	3
Stat	285 510	Intro Prob and Statistics I (*)	3
Stat	285 511	Intro Prob and Statistics II (*)	3
CS	286 300	Algorithmic Proc (*)	3
CS	286 580	Numerical Computing (*)	3
CS	286 560	Data Structures (*)	3
CS	286 200	Fund. Comp Programming	2
CS	286 201	Fortran Lab	1

IV. Scientific Management

The following curriculum is suggested as means by which the student in physics can prepare for a career in the management or supervisory aspects of science and technology. As a more extensive preparation than suggested below, the student may earn two B.S. degrees by pursuing a dual degree program in physics and business administration. The details may be found in the university catalogue.

Econ	225 110	Economics I	3
Econ	225 120	Economics II	3
CS	286 300	Algorithmic Proc. (*)	3
Bus	310 260	Fund Account	4
Bus	310 370	Manag and Cost Controls	3
Bus	320 420	Manag and Concepts	3
Bus	320 390	Business Law I	3
Bus	320 531	Personnel Admin	3
IE	550 501	Industrial Manag I (*)	3
IE	550 571	Intro Oper Res I (*)	3

V. Graduate Preparation in Physics

Students completing a B.S. in physics with any of the previously given programs will be admitted to most graduate schools in physics. For students who wish to proceed with graduate study in physics with a minimum of delay, the following courses are recommended for the 9 hours of science options and free electives.

Math	245 514	Vector Analysis	3
Math	245 553	Ad. Calc. (or 245-550)	3
Math	245 554	Ad. Calc. (or 245-551)	3
Phys	265 621	Mechanics II (*)	3
Phys	265 611	Intro Quant Mech I (*)	3
Phys	265 612	Intro Quant Mech II (*)	3
Phys	265 671	Thermo Stat Phys (*)	3
Phys	265 631	Elec & Mag II (*)	3
		Language	15

in detail on the following pages. As is indicated, there is a common core with five options: (1) Graduate Preparation in Physics, (2) Scientific Management (Business), (3) Computational Physics, (4) Engineering Physics, and (5) Physics Teaching. In reality, almost all physics degree majors pursue some variation of the program aimed at preparation for graduate work in physics. As will be discussed in more detail in the section on performance, the number of physics majors graduating in the last decade has declined as compared to the previous decade, an unfortunate statistic in line with the national trend. However, in the last two years there has been a decided reversal in the number of physics majors at the freshman and sophomore levels.

It is the standing policy of the department that all undergraduates are encouraged to be employed in the department. This serves several functions. (1) The learning of physics is best accomplished by a combination of classroom and practical work. (2) Prospective employees prefer to hire students who have had practical experience in physics. (3) Students working together in the department form a cohesive unit which has a morale boosting effect for both the students and faculty, and which encourages other students to consider a career in physics. (4) *The department needs the undergraduate manpower to function in the present high enrollment climate.*

A special room on the first floor of the building across from the faculty conference room has been established this year to serve as offices and a gathering point for physics majors. The physics majors have made very good use of this room, a fact that is enjoyed by students and faculty alike. The proximity to the faculty conference room has brought about much more faculty-student camaraderie. This next fall semester an Apple II Computer system will be installed in the room for the sole use of undergraduate physics majors.

In summary, the undergraduate physics program survived a considerable decline in the decade of the seventies, but has emerged basically sound and looking toward growth in the eighties, a promise which appears a reality already.

3. The Graduate Program

The graduate program is described in detail in the brochure Graduate Study and Research in Physics found in Appendix C. The successes of this program, although small in size, are discussed in Section IV on

Performance. The research areas available in physics are as follows: (1) Atomic Physics, (2) Nuclear Physics, (3) Condensed Matter Physics, (4) Biophysics, (5) Applied Physics, (6) Infrared Spectroscopy, (7) Meteorology, and (8) Physics Education. In reality, because of small numbers of graduate students, only the programs in (1) Atomic Physics, (2) Nuclear Physics and (3) Condensed Matter Physics are actually involved in research with graduate students. Two areas of graduate concentration have been eliminated in the last decade. Because there is no great demand in astronomy and because the department never had more than one astronomer on the staff, the graduate level work in this area was eliminated upon resignation of the astronomy staff. Because of the low quality of students entering a combined Physics-College of Education joint program leading to a Ph.D. in Education and many other inherent problems, the Department has chosen not to continue any collaboration in this area. The current graduate student body, Summer 1981, is distributed among the research areas as is shown below:

AREA	NUMBER OF GRADUATE STUDENTS
Atomic	9
Condensed Matter Physics	5
Nuclear Physics	1

The total graduate student body now only numbers sixteen. The ability of the department to attract quality graduate students declined considerably in the last decade primarily because of the decline in the number of undergraduate physics majors throughout the midwest and because the department has had a long-standing policy of not self-capturing its own graduating seniors. In spite of the fact that the graduate stipends are relatively adequate ($625 per month) and the department had maintained an outstanding record of garnering extramural support and being truly scholarly productive, the rebuilding of the graduate program in numbers of students will be a slow and arduous task in the eighties. The department has undertaken a considerable advertising and recruiting effort but the results have been disappointing. There are numerous pressures which will cause problems in this area: (1) The number of graduate senior physics majors in the midwest remains low. (2) Students from west of the Rockies and East of the Mississippi River will generally not consider a midwestern school. (3) There are too many physics graduate programs in the midwest. (4) The salaries being offered to graduating seniors in physics, particularly by petroleum and computer-related industries has approached that of industrial offers to

Ph.D. graduates in physics and has exceeded the salaries of all of the assistant professors and many of the associate professors in the department.

Because of the low number of graduate students, it has become necessary to cycle the graduate courses so that graduate students may expect to make steady and satisfactory progress through the graduate program. The admission requirements, typical graduate course schedules, degrees in physics, examinations, normal time schedule, and graduate course listings are presented in the brochure in Appendix C.

The department has for a decade required all first year graduate students to teach the first semester in order to provide each student a period to become well acquainted with the programs and the faculty and the research areas prior to selecting a major professor and research problem. This has been a wise policy, good for the students and the faculty. *However, with the increase in enrollment and decrease in the graduate student body in the department, the policy has taken on a self-centered, absolutely essential requirement on the part of the department.*

As can be easily seen in Section IV on Performance, it would be a mistake to judge strictly the vitality of the graduate program on the numbers of students. Although the numbers have declined, and the problem is serious, the graduate program remains vital and ready to produce more students when the current situation begins to change. This reflects well on the faculty.

All students are required to take 9 semester credit hours until such time as the student has accumulated the number of hours required for the degree on which the student is working. After that point, the student may enroll in no fewer than 6 hours of credit each semester. All first-year graduate students are advised by the Graduate Student Advisor and all other graduate students are advised by the major professor and the supervisory committee. The progress of each graduate student is reviewed by a meeting of all the graduate faculty during the first week of November and April. A student receives a letter after the April meeting indicating whether he or she is making normal progress toward a given degree. This review process is conducted by the Graduate Student Advisor.

The graduate program will face a critical year next September since only 2 new graduate students have accepted positions in the program, one of whom is a foreign student. At this point the department has three other offers outstanding--all to foreign graduate students, two from mainland China.

4. Colloquia and Seminars

In addition to the normal course work at the undergraduate and graduate levels, the intellectual life of the department is stimulated by weekly colloquia and seminars. The Physics Colloquium consists of presentations predominately by visiting scholars and some resident faculty. Although incomplete, the listing of colloquia given in Appendix D indicates that during the period 1971-1972 through 1980-1981, there were 235 colloquia presented. Of these, 74% were presented by visiting scholars from other universities and laboratories, 21% were given by KSU physics faculty, and 5% were given by other KSU faculty.

More specialized talks are presented in various weekly seminars concerned directly with on-going research. These seminars are scheduled on a regular basis and have averaged two per week during the academic year. These seminars are dominated by local faculty and graduate students presenting specifically talks related to very current research in the department.

B. Research Areas

The research programs are parallel to the graduate program which has already been described. In capsule, the research areas are described by the overly brief paragraphs which follow. The specific interests of individual faculty and some current publications are described in the brochure in Appendix C.

1. Atomic Physics

The experimental atomic physics program utilizes the 12-MeV tandem Van de Graaff accelerator, the 3-MeV Van de Graaff accelerator, and a 150-keV accelerator. A large number of ion beams have been produced and used for experiments in these accelerators, including as many as 25 different elements at this time, with new beams being developed. The research interests include (1) electron exchange between moving and stationary atoms, (2) lifetimes of atomic states produced in atomic collisions, and (3) x-ray and electron emission in heavy atom collisions.

The theoretical atomic physics program is centered upon atomic structure, x-ray and electron emission, and atomic collision processes. Much of the work is related to the inner shell ionization processes studied in the experimental program in the laboratory.

2. Biophysics

The biophysics program, although small in terms of faculty, is a very aggressive and vital program. The work in the biophysical and genetic studies of yeast is well supported by N.I.H.

3. Applied Physics

Research programs in physics often arise in response to a practical need. Such research may cut across traditional boundaries and require application of knowledge and techniques from a number of different areas. Several faculty members are engaged in applied physics research on a wide-ranging variety of topics. Current applied physics projects include studies of the physics of aerosol scavenging in the atmosphere, interaction of ion beams with metal surfaces, fast-neutron damage in insulators and the physics of grain dust explosions. These studies involve such diverse fields as solid state physics, chemical physics, fluid dynamics, kinetic theory, electrodynamics, and atomic scattering. Applied physics work at KSU inclues both experimental and theoretical efforts.

4. Condensed Matter Physics

Research into the physics of condensed matter covers a wide range of topics including solid state physics and the physics of liquids. The properties of metals, semiconductors, and insulators are studied by x-ray diffraction, transport measurements, optical spectrum analysis, and charged particle scattering. Properties of liquids are studied by light scattering and the measurement of thermodynamic transport properties. The equipment available for these studies includes a wide variety of lasers including continuous and high power pulsed dye lasers with spectroscopic instrumentation, spanning the full range from 1 Hz to 10^{14}Hz, Dec 11/34 A online computer facility, two x-ray diffractometers, high vacuum evaporation systems, two electron microscopes, facilities for storing and handling liquid He, and one of the 150-keV accelerators. Current research projects include: (1) observation of crystal defects by x-ray diffraction, (2) laser-induced Raman Scattering to study spontaneous and multiphoton coherent processes in semiconductors and liquids, (3) theoretical studies of transport phenomena in terms of band theory and (4) light scattering from systems near the limit metastability with respect to solid-liquid phase transitions.

5. Physics Education

A program involving the investigation of the problem solving skills and styles of students and the development of learning experiences consistent with the students' intellectual growth is active in the department. There also is active on-going research in the development of new demonstration and laboratory equipment with a current emphasis on the development of an integrated computer-controlled interactive television disc system for auto-tutorial use.

6. Meteorology

A program involving computer analyses of weather data to describe the climatic resources of Kansas with particular emphasis on its effects in agricultural operations is carried on jointly with the Agricultural Experiment Station.

7. Nuclear Physics

The nuclear physics program is centered upon experiments carried out at the tandem Van de Graaff accelerator, which is the only accelerator of this type in central United States. The program emphasizes the use of heavy ions (projectiles heavier than helium) to induce nuclear reactions, and is unique in the concentration of studies of this type rather than the more standard light-ion nuclear reactions. Experiments currently in progress include (1) resonances in elastic and inelastic heavy-ion scattering, (2) determination of nuclear shapes by heavy-ion scattering, (3) correlations between particles and gamma rays, and (4) measurement of very short nuclear half-lives.

All of these programs have flourished in the seventies in spite of the decline in graduate students. This has been accomplished primarily through dedicated hard work on the part of the faculty and post-doctoral students. However, the lack of post-doctoral students will likely have an affect on the research program in the eighties.

C. The Agricultural Experiment Station

There exists a special relationship between the Department of Physics and the Agricultural Experiment Station (AES). Two physics faculty are supported by the AES: Professor Dean Bark (80%) and Professor Basil Curnutte (20%). Dr. Bark serves as the resident climatologist and meteorologist for the AES, the campus, and for many persons in the State. The research of Dr. Bark centers on computer analyses of weather data to describe the climatic resources of Kansas, with particular emphasis on its effects in agricultural operations. For example, in the last year Dr. Bark has overseen the installation of a network of automatic recording climatic stations which can send, by telephone, reports directly to the central logging station here at KSU for analysis on the computer.

Dr. Curnutte operates as a service for staff of the Agricultural Experiment Station a stand alone characteristic x-ray fluorescence system which was an outgrowth of an earlier heavy-ion induced characteristic x-ray fluorescence experiment aimed at determining the possible build-up of toxic heavy metal in wheat and other grains. The success of the project led to the current program of study which provides consultation on the use of x-ray fluorescence and related techniques (proton induced x-ray emission and particle backscattering) to problems of trace element determination in agriculturally related samples.

In addition to these well-defined projects, the Department of Physics engages in short-term investigations of the application of technological developments (e.g., holography, laser induced fluorescence, time-resolved detonation techniques) to agriculturally related problems. Results of such preliminary studies are evaluated and disseminated to staff members of the Agricultural Experiment Station when these results appear sufficiently promising to be used as viable techniques for research on agriculturally related problems. Occasionally collaborative projects are established.

A recent success which is now fully and well funded extramurally by the USDA and private industry involves the research of Dr. Ron Lee in the area of grain dust explosions. This research undertaken jointly with the USDA Grain Marketing Research Laboratory has led to the development of a data-gather laboratory second to none in the world. At the present, this project is gathering a fundamental and pragmatic data base which may be used immediately in undustry as well as on a long-range basis to better understand the processes involved in grain dust explosions.

The Department of Physics provides service and support on a broad basis for all investigators associated with the AES. In particular, funds are provided directly from the AES for one-half of a position in the Instrument Shop and the Electronics Shop. In return, investigators associated with the AES are provided services in the Instrument Shop, Electronics Shop, Glass Shop, and the receiving and storage facility. The only charges made are for the cost of materials. A study covering eighteen months showed that AES related work in these shops amounted to one man-year per year in each of the Instrument and Electronics Shops. This usage was distributed among agriculturally related departments as shown below:

DEPARTMENT	ELECTRONICS SHOP USAGE	INSTRUMENT SHOP USAGE
Grain Science & Industry	25%	21%
Animal Sciences & Industry	18%	9%
Pathology	10%	12%
Biochemistry	9%	--
Agronomy	8%	19%
Foods and Nutrition	6%	--
Clothing, Textiles & Interior Design	--	14%
Biology	--	14%
Other	24%	11%

This relationship between the department and the AES has proven to be mutually rewarding and hopefully will continue in the future.

D. Other Research Support

The departmental faculty occasionally receive support from the Bureau of General Research, particularly seed money for new faculty and seed money for more established faculty who are moving into new areas. While such funds are small compared to the extramural support, these seed monies have quite frequently been very important in garnering extramural support.

E. Service

1. Public Service

The service to the community by the faculty is primarily of a personal nature and commitment. Many of the faculty give lectures at various public schools and for various clubs and organizations, but while such activity is applauded it is not of a major consequence in the department.

Once each year there is a major departmental effort to provide an all day field trip for all students in physics classes in the Topeka School System. This involves some 200 high school students, takes two days and involves almost all the faculty. This adventure has been sufficiently successful such that it is built into the curriculum of the Topeka School System.

The department bootlegs a Planetarium which provides service to a broad cross-section of the region near Manhattan. The Planetarium is operated 2 to 3 afternoons a week depending each semester on what we can afford, and services some 3,500 clientele per year. However, the current *manpower shortage and our inability to afford repairs on the instrument will conspire to reduce the operation of the Planetarium starting in September.*

Over the last decade, the department has operated several NSF supported programs related to the improvement of science teaching in colleges and junior colleges, receiving approximately $200,000 for this effort. This summer the department will operate a NSF sponsored Summer Science Training Program involving "The Role of Modeling in the Physical Sciences." The program has attracted 28 highly talented high school juniors and sophomores.

The department has, through the initial efforts of Professor James Legg and more recently the efforts of Professor John Eck, operated over a telephone network a multidisciplinary telenetwork program for honors high school students. This program is most probably better described by the Division of Continuing Education. At present some 20 high schools cooperate in the program, and the typical enrollment ranges up to 150, last year's enrollment being approximately 85 students.

Capable students are instructed by eminent scientists, each participant presenting one formal lecture (90 minutes) followed by a second extensive question-answer-discussion session a week later. Each particular session is monitored by a KSU faculty member who is active in that research area and who preferably knows the invited lecturer moderately well. The scientists invited to lecture in the program are chosen because (1) they have achieved a considerable reputation in a given research field, and (2) they are known to have personalities and a delivery style which will project well over the telenetwork. The students are provided reading materials well in advance of each speaker, and each student must author a term paper.

Prior to the 1979 Honors Colloquium on the Sciences the lectures were not coordinated but were chosen to be representative of current research in biochemistry, biology, chemistry, geology, and physics. The lecture series in 1979 was centered around the topic "Life in the Universe" and each of the areas mentioned above was requested to select a speaker to represent that area and speak on some aspect of the central topic. This was a decided improvement on the program, and the 1980 series centered around the need and quest for alternative sources of energy.

The reception of this program by both high schools and students has been very good. Kansas is basically a rural state with only three major population centers, some 78% of the population spread over the state in small to very small communities. The majority of high schools in the state must struggle to offer a physics class and for them to offer a challenge to honors students is most often not possible. The program has filled a great need in the state -- the student from a small high school in Kansas is able to have dialogue and ask questions of leading figures in science about scientific research and questions of immediate concern today. And question they do; there has never been a question and answer session (2 hours) which ran dry or even came close.

2. Professional Service

The faculty are encouraged to, have and continue to be involved in professional service. Examples of the individual roles of faculty in terms of such professional service for the period 1977-1980 are given below:

Professor L. D. Bark: Liaison between the American Meteorological Society and the American Society of Agronomy; Chairman of the North Central Regional Technical Committee on "Climatic Resources of the North Central Region"; member of the Kansas Weather Modification Advisory Committee, the Kansas Water Resources Board, and the Kansas Solar Advisory Committee.

Professor C. L. Cocke: First atomic physicist named to the Program Advisory Committee to the Super Hilac operated by the Lawrence Berkeley Laboratory.

Professor R. D. Dragsdorf: Chairman, AUA-ANL Material Science Committee.

Professor Patrick Richard: Executive Committee of the Holifield Heavy Ion Facility; Organizing Committee of the Fourth Conference on the Application of Small Accelerators; International Advisory Committee to the 2nd Conference in Inner Shell Ionization Phenomena; Program Committee for the International Conference on the Physics of X-Ray Spectra; Member of the Program Committee of the Division of Electron and Atomic Physics Division of the American Physical Society.

Professor Dudley Williams: President-Elect, President, and Past President of the Optical Society of America; Associate Editor of the Journal of the Optical Society of America; Member of the Governing Board of the American Institute of Physics.

Associate Professor Dean Zollman: Film Editor for the American Association of Physics Teachers; Member of the Publication Committee and the Modules Advisory Committee of the AAPT; Member of the Editorial Board of <u>The Physics Teacher</u>; Member of the A.A.P.T. Publications Committee.

This list is not intended to be exhaustive, but is simply meant to convey the level of professional commitment that exists on the part of the faculty.

3. Institutional Service

The Department of Physics believes itself to be fully integrated into the College and the University. As has already been mentioned, the departmental instrument, electronics and glass shops provide technical services to the whole campus at cost (or sometimes below cost when necessary). In addition, there are several lessor known services: (1) The department has contracted with the United Parcel Service for a daily pick-up service and allows all departments and individuals to make use of this service with only the charge levied by UPS. No attempt is made to cover the minimal cost of the pick-up contract. (2) The department, when possible, screens surplus property and has brought to the campus several millions of dollars of equipment and furniture which has been distributed throughout the campus for only the cost of shipping.

III. RESOURCES

A. Personnel

1. Unclassified

The faculty at the rank of Assistant Professor and above now number 25 as compared to 27 in 1970-1971. In addition, in 1970-1971 the Department had one instructor and 16 half-time graduate teaching assistants all associated with the teaching function of the department while in 1980-1981 there are no instructors on the staff and 15 half-time graduate teaching assistants. There has been a gradual erosion of the number of teaching staff in spite of the fact that (1) the teaching load in 1980-1981 is equal to or greater than it was for the 1970-1971 peak if one takes into account the difference in the effort required to teach junior-senior level courses as compared to freshman-sophomore level courses, (2) the department operates in 1980-1981 an activities center which is open 38 hours a week servicing an average of 300 students per week and which did not exist in 1970-1971, and (3) the department operates now on a regular basis and staffed for some 12 hours a week a Planetarium for public service (approximately 3,500 persons per year) which was operated only sporadically at best in 1970-1971. In summary, the number of teaching staff has been allowed to decline to the point where both the teaching, research and service aspects of the department will decline unless measures are taken to protect the balanced posture the Department has tried to develop and maintain. Since the State will not likely provide the resources needed, and since the University will not be in a position to shift resources as and when needed, *the Department will be forced to take internally protective measures in the very early 1980's.*

There will be as of Fall 1981 seventeen Professors, five Associate Professors, and three Assistant Professors either in tenured or in tenure-track positions within the Department. Eighty-eight percent of the faculty are now tenured. A complete summary of the faculty who have been tenured or tenure-track members of the Department during the period 1970-1971 to 1980-1981 is presented in Table III . The individual faculty vitas in Appendix E, present more detailed information. Table III and Appendix E present ample evidence of the quality of the faculty of the Department. All of the faculty have earned the Ph.D. degree, none having received a terminal degree at K-State.

The preliminary teaching assignments are made to the Department Head by the Chairman of the Course and Curriculum Committee after receiving information from the faculty on their teaching preferences for a given

TABLE III. FACULTY AT OR ABOVE THE RANK OF ASSISTANT PROFESSOR

1970-1971 to 1980-1981[1]

	NAME	RANK	HIGHEST DEGREE	YEAR	INSTITUTION	SPECIALTY	PUBLICATIONS[2] 1971-1980
1.	Bark, L. Dean	Professor	Ph.D.	1954	Rutgers	Agricultural Climatology, Microclimatology	2
2.	Bhalla, Chander P.	Professor	Ph.D.	1960	Univ of Tennessee	Theoretical Atomic Physics	27
3.	Cardwell, A. B. [3]	Professor	Ph.D.	1930	Univ of Wisconsin	Applied Physics	--
4.	Cocke, Charles L.	Professor	Ph.D.	1967	California Inst. of Technology	Atomic Physics, Nuclear Physics	21
5.	Compaan, Alvin	Professor	Ph.D.	1971	Univ of Chicago	Solid State, Light Scattering	23
6.	Curnutte, Basil	Professor	Ph.D.	1953	Ohio State Univ	Molecular Structure & Atomic Physics	17
7.	Dale, E. Brock	Professor	Ph.D.	1953	Ohio State Univ	Semiconductors, Acoustics	4
8.	Dragsdorf, R. Dean	Professor	Ph.D.	1948	M.I.T.	X-Ray Physics	1
9.	Eck, John D.	Professor	Ph.D.	1967	Johns Hopkins Univ	Nuclear Physics	24
10.	Ellsworth, Louis D.	Professor	Ph.D.	1941	Ohio State Univ	Atomic Physics	10
11.	Gray, Tom J.	Professor	Ph.D.	1967	Florida State Univ	Atomic Physics	22
12.	Hathaway, C. E.[4]	Professor	Ph.D.	1965	Univ of Oklahoma	Solid State, Physics Education	7
13.	Leachman, Robert [5]	Professor	Ph.D.	1950	Iowa State Univ	Nuclear and Accelerator Physics	--
14.	Lee, Ron S.	Professor	Ph.D.	1966	Iowa State Univ	Detonation Physics	13
15.	Legg, James C.[6]	Professor	Ph.D.	1962	Princeton Univ	Nuclear Physics	3
16.	Macdonald, James R.[7]	Professor	Ph.D.	1966	McMaster Univ	Atomic Physics	27
17.	Manney, Thomas R.	Professor	Ph.D.	1964	Univ of California	Biophysics	12
18.	Seaman, Gregory[8]	Professor	Ph.D.	1965	Yale University	Nuclear Physics	6

	NAME	RANK	HIGHEST DEGREE	YEAR	INSTITUTION	SPECIALTY	PUBLICATIONS[2] 1971-1980
19.	Richard, Patrick	Professor	Ph.D.	1964	Florida State Univ	Atomic Physics	64
20.	Spangler, John D.	Professor	Ph.D.	1961	Duke University	Theoretical Applied Physics, Physics Education	4
21.	Williams, Dudley	Regents' Prof	Ph.D.	1936	North Carolina Univ	Molecular Spectroscopy. Optics	24
22.	Crawford, F. W. [9]	Associate Prof	Ph.D.	1934	Univ of Oklahoma	Chemical and Applied Physics	--
23.	Folland, Nathan O.	Associate Prof	Ph.D.	1965	Iowa State Univ	Theoretical Solid State	5
24.	Lin, C. D.	Associate Prof	Ph.D.	1974	Univ of Chicago	Theoretical Atomic Phys	27
25.	McGuire, James	Associate Prof	Ph.D.	1969	Northeastern Univ	Theoretical Atomic Phys	35
26.	Rosenkilde, C. E.[10]	Associate Prof	Ph.D.	1866	Univ of Chicago	Theoretical Classical Physics	1
27.	Weaver, O. L.	Associate Prof	Ph.D.	1970	Duke University	Theoretical Nuclear Phys	8
28.	Zollman, D. A.	Associate Prof	Ph.D.	1970	Univ of Maryland	Physics Education	23
29.	Hagmann, Siegbert	Assistant Prof	Ph.D.	1977	Univ of Koln	Atomic Physics	15
30.	Jack, Hulan E.	Assistant Prof	Ph.D.	1971	Univ of New York	Applied Physics	2
31.	Sorensen, Christopher	Assistant Prof	Ph.D.	1977	Univ of Colorado	Condensed Matter Physics	16

Total Publications in Refereed Journals[2] Associated with Faculty on the Staff in the Period 1971-1980: 443

Total Publications in Refereed Journals[2] Associated with Fauclty on the Staff currently in the Period 1971-1980: 409

1 Faculty Holding Tenure and Tenured Track Positions.

2 Publications in Refereed Journals as Corrected for Multiple Authorship with other K-State Faculty.

3 Retired in 1972.

4 Head, Department of Physics

5 Head, Department of Physics, Resigned in 1974.

6 Director, James R. Macdonald Accelerator Laboratory.

7 Deceased, December, 1979.

8 Resigned, 1975.

9 Retired 1975.

10 Resigned 1977.

semester. The final teaching assignments are made by the Department Head in consultation with the Chairman of the Course and Curriculum Committee. The normal teaching assignment is in the range of 6 to 7 course hours per semester with some attempt being made to minimize the number of faculty who are carrying two lecture classes.

As would be expected, the individual preferences tend to be parallel to the research interests of individuals, but almost all faculty share in the massive departmental commitment to the service courses. The specialized training, talent and research interest of a given faculty member are matched with a given teaching assignment in as much as that is possible. For example, Professor E.Brock Dale, a member of the KSU Chamber Orchestra, who is involved in acoustic research teaches the Physics for Muscians and the Physics of Sound courses. Assistant Professor Chris Sorensen, an amateur astronomer, teaches Descriptive Astronomy and Astronomy. Regents' Professor Dudley Williams, author of the sophomore text Elements of Physics, teaches the Engineering Physics course. Professor Tom Manney, a biophysicist,teaches the Descriptive Physics course which has a high enrollment of life science and agricultural degree majors. Professor R. Dean Dragsdorf whose research is in X-ray Physics teaches the graduate course in this area, while Professor Al Compaan who utilizes lasers extensively in his research teaches both the Introduction to the Physics of Lasers and the graduate Solid State class. These examples could be extended and it would be noted that in almost all cases, if not all, the faculty are well matched to and well qualified for the courses they teach.

After a faculty member has taught a given course for two years, another faculty may request to teach the class and expect to receive serious consideration of such a request. That is, the general policy of the Department is that no individual has sole control or ownership of a course. There are, of course, certain courses which have been created by individual faculty which naturally tend not to be rotated among the faculty as frequently. This policy is aimed at preventing a faculty member from becoming stale or bored with a course and allows him or her to further his or her knowledge by teaching courses other than those specifically associated with his or her research specialty.

As an extension of this policy, while faculty in smaller classes have considerable control over the selection of text books, the selection of text books for major service courses is done with full consultation of the faculty. This policy extends to the choice for textbooks in courses required of all physics majors.

2. Classified

There are some 17 support and classified employees which form the support staff for the faculty and students. The classified staff is listed in Table IV.

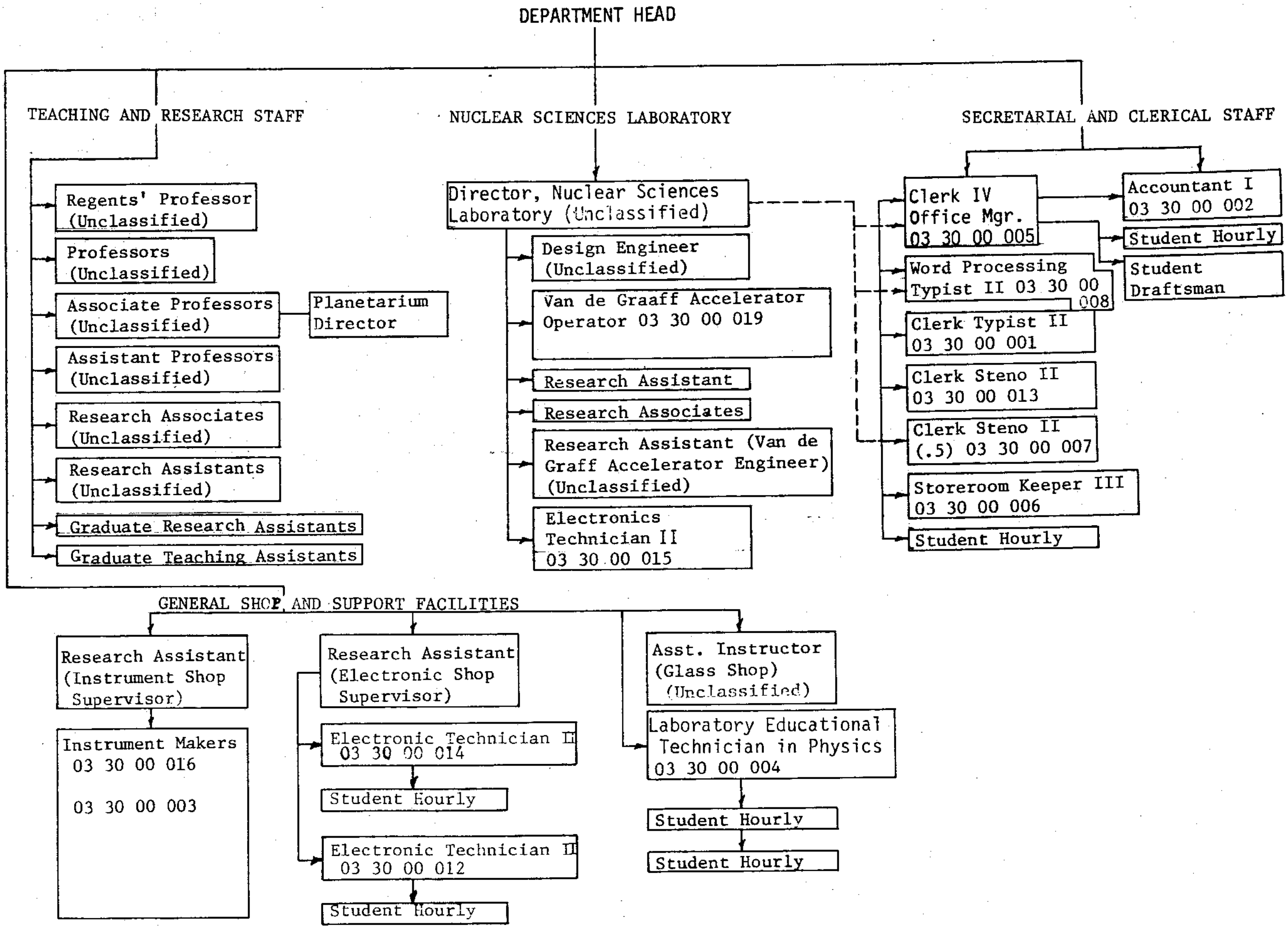
TABLE IV

Support Staff[1]

NAME	OFFICIAL TITLE	WORKING TITLE	FUNDING[2]
Office Staff			
Sheryl Spisak	Clerk IV	Office Manager	Univ. (1.0)
Vanessa Dunback	Clerk Steno II	Departmental Secretary	Soft (1.0)
Tammie LaRoche	Word Processor II	Research Typist	Univ. (1.0)
Dea Richard	Clerk Steno II	Research Secretary	Soft (.5)
Sandra Chandler	Clerk Typist II	Departmental Receptionist	Univ. (1.0)
Adolph Holub	Accountant I	Accountant	Univ. (1.0)
Teaching and General Department Support Staff			
Ted Geisert	Lab. Educational Tech	Demonstration Facility Manager	Univ. (1.0)
Lewis Hine	Storekeeper	Storeroom Keeper	Univ. (1.0)
General Research and Maintenance Support Staff			
David Hill	Instrument Maker	Research Service Coord.	Univ. (1.0)
James Tormey	Research Assistant	Supervisor of Instrument Shop	Univ. (1.0)
Robert D. Geering	Instrument Maker	Instrument Maker	Soft (1.0)
Mark Ross	Research Assistant	Supervisor of Electronics Shop	Univ. (1.0)
Richard Napper	Electronics Tech. II	Electronics Technician	Soft (1.0)
Vernon Prockish	Electronics Tech. II	Electronics Technician	Univ. (1.0)
Mitsugo Ohno	Assistant Instructor	Glass Blower	Univ. (1.0)
James R. Macdonald Accelerator Laboratory Support			
Robert Krause	Van de Graaff Accelerator Operator	Accelerator Staff Supervisor	Soft (1.0)
Mike Wells	Electronics Tech. II	Accelerator Technician	Soft (1.0)

[1] Three individuals in this listing hold quasi-academic ranks for historical reasons although they are members of the general support staff.

[2] The funding for these positions is either from the State through the University (Univ.) or from various grant and contract funds (Soft).



ORGANIZATION CHART - DEPARTMENT OF PHYSICS

1980

The organization chart on the next page shows how this staff fits within the Department as a whole.

The Department Support Staff is excellent, highly productive, and a critical part of the department. Because of the weighty bureaucracy and red tape associated with the State Civil Service, it has been difficult to properly reward and promote the members of this support staff. This holds true even when the source of funds is from grants and contracts.

The support staff in the Department of Physics has responsibilities well outside the department and the College of Arts and Sciences. In particular, the Instrument and Electronics Shops and the Glassblowing Shop design, fabricate and maintain scientific equipment for a wide cross-section of the campus ranging from the Agricultural Experiment Station to Home Economics.

The department has made an effort to invest in the support staff, funding additional training when possible. For example, on two occasions a member of the Electronics Shop has been sent to a computer school and this summer the department will bring in a welding expert for one week to up-date the welding techniques of the staff associated with the Instrument Shop. *The campus, in general, however, has become pitifully dated in terms of the technical support staff and those individuals trained in modern techniques in the Physics Department, particularly in the area of microprocessor and computer electronics, will be less available for use by others on the campus.*

B. Facilities

1. Space

The Department of Physics is housed in Cardwell Hall which was constructed in 1963 with a great deal of foresight. This facility is well described in the article in Appendix F.

The building is shared with the Department of Mathematics and the University Computing Center. The Department of Mathematics and the Department of Physics can and do accommodate one another's needs quite frequently, even during tight times. The relationship between the Computing Center and the Department of Physics has not been as pleasant. As the perceived need for expansion of the Computing Center has occurred, those approving such expansion have generally given no thought to the space required. The end result has been that on two occasions, the Department of Physics and the Computing Center were told to "work something out." That which has been worked out was usually a compromise not satisfactory to either party. *In the last case, space which the Director of the Computing Center stated was needed almost immediately was not utilized for over six months. The Department of Physics has yielded over 2,000 square feet to the Computing Center and any future expansion of the Computing Center should make provision for others "to give at the office."* In this day of modern technology, computer devices and operators need not be housed in the same buildings.

Cardwell Hall provides 116,800 square feet of which 30,800 are for research. The building houses a professional instrument shop, a glassblowing shop, and an electronics shop. These shops are adequate for present needs, but a continual investment must be made to keep them from becoming dated. There is also an accelerator laboratory, the James R. Macdonald Atomic and Nuclear Sciences Laboratory, housed in a sub-basement. The building is presently filled to overflowing with considerable activity in the basement hallways because of the cardpunch machines and tables installed by the Computing Center. *There is room for no more Computer Center equipment in the hallways and the thought of placing terminals in these hallways is unacceptable.*

The quality of the space has generally been adequate for both teaching and research. However, the recent dramatic increase in enrollment has strained the classroom space. The only other major inadequacy noted in the last decade was the lack of sufficient electrical power and water flow for the installation of lasers on the third floor of the building. This has been corrected to some extent, but providing additional power will be very expensive.

C. Equipment

Few universities can match the major facilities which exist in several areas of research at Kansas State University. The James R. Macdonald Laboratory houses a 6 MV tandem Van de Graaff Accelerator which is fully complemented by a Canberra Scorpio computer system and an older PDP-15 system. This facility while capable of accomplishing both atomic and nuclear physics research has been designed specifically for and is primarily dedicated to atomic physics research. It is in many small ways unique, and the Macdonald Laboratory has established a considerable national and international reputation in the area of heavy-ion atomic physics. In addition to this major facility, the department also has a 3 MV Van de Graaff and two home-constructed 150-KeV accelerators.

The laser laboratory on the third floor of the building is extremely well equipped. A list of the equipment includes: (1) Spectra Physics 50 mW He-Ne laser, (2) Jodon 20 mW, single-mode He-Ne laser, (3) Coherent Radiation 2-wall argon ion laser, (4) Control Laser 8W argon ion laser, (5) Coherent Radiation C.W. Dye Laser, (6) Molectron one megawatt N_2 laser, (7) Molectron pulsed dye laser, (8) home constructed double-frequency, pulsed dye laser, and (9) 11-Megawatt Quanta Ray Nd:YAG laser with frequency doubling system. These laser systems are fully complemented by a Spex double-grating monochrometer equipped with a PAR OMA-II multichannel detector, a Langley-Ford photon correlation system and other state-of-the-art optical system, all of which are interconnected with a PDP-11 computer system with graphics output and floppy-disk storage. These facilities are used for a wide range of experimental studies in solid state and condensed matter physics.

Adequate facilities, including x-ray diffraction equipment, electron and optical microscopes, metallurgical preparatory facilities, vacuum deposition apparatus, and magnets are available for solid state research. There also exist considerable spectroscopic equipment covering the spectral range from ultraviolet to the far infrared. The small accelerators have also been used extensively for solid state studies.

A detonation laboratory under the direction of Professor Ron S. Lee at the U. S. Grain Marketing Research Laboratory has been established for cooperative research between physics and this USDA laboratory. This is a rather unique laboratory and which will allow an important data base to be gathered on dust explosions.

A 500 liter nitrogen storage drawer is maintained to allow ease in performing experiments and educational demonstrations down to liquid nitrogen temperatures. However, liquid helium must be inconveniently shipped considerable distances. This makes extremely low temperature experimentation very difficult. A facility for the production of liquid helium would enhance the research effort, particularly in the area of solid state physics.

The presence of the University Computing Center in the Physical Sciences Building with the ITEL Advanced System 5 Model 3 makes it easily accessible to members of the physics faculty. For the most part, this system is entirely adequate for the needs of physics research, and no expansion of the system is needed to accommodate physics calculations. The cost for research-type calculations if one includes the 8 to 1 matching for real dollar commitments of $5,000 or more per year is now very reasonable. Any move away from such a matching system would be detrimental to the ability of faculty to undertake serious calculations in Theoretical Atomic and Solid State Physics.

The Department has considerable and adequate lecture demonstration and teaching laboratory equipment. A Planetarium and an observatory with an 18-inch Cassegrainian reflecting telescope are available for teaching purposes. The Planetarium serves not only the physics service courses but also the general public. Over 3,000 people from the geographical region attend the Planetarium each year. Unfortunately, the Planetarium is not a budgeted item and operates as a boot-strap on the GTA positions. *The current and projected teaching load will necessitate considering closing or seriously curtailing the operation of the Planetarium.* As an example of recent additions, the Department now has 10 Celestron 5-inch telescopes which are placed directly in the hands of students in the junior-senior level observational astronomy course *(when the teaching load allows this course to be offered).*

The Department operates an Activities Center where students may interact with a constantly changing display of physics equipment. Over a hundred single concept films, a Moog synthesizer, a rotating frame of reference are among the numerous items which students may touch, use and occasionally break. This facility is described in Appendix G. *Unfortunately, this operation will be curtailed starting in September 1981.*

D. Library

The departmental library (2,400 square feet) houses a strong collection to support on-going research in the Department. The collection is well balanced in relation to the graduate and undergraduate level. Most importantly, the library is well-managed by an efficient and very competent librarian. Her report on the status of this library is contained in Appendix H.

There are three major concerns connected with this library: (1) Any additional reductions in the serial budget such as the 15% budget in 1980 which caused a number of serials to be eliminated would hurt this library seriously. (2) Allocations for monographic materials are already so limited that faculty tend to hold back requests for needed resources if the price of the item is high. (3) There are not now and probably never will be enough shelving.

E. Operating Resources

The operating funds would be wholly inadequate for the department except for the 40% return to the department of overhead charges on grants and contracts. This would become a major problem if the ability of the department to garner extramural funding were to decline. *If the teaching load increases any further, the research posture of the department will be affected and the decline of grant and contract monies would precipitate a crisis in operating resources.*

IV. PERFORMANCE

A. Instruction

1. Quality of Instruction

By any measure the quality of performance with respect to instruction at the undergraduate and graduate levels has remained very high in the department. The department has a commitment to a balanced approach to teaching and scholarly productivity, believing strongly that these two activities are complementary. It is difficult to measure or evaluate the department's contribution to the teaching responsibility of the University. However, it may be noted that classes are never cancelled for any reason at all, illness or professional activities. If teaching can be measured by the statistics of student evaluations then perhaps the figures shown below have some meaning. Based on the Hoyt evaluations, required by vote in the Department of Physics, as submitted by 13 faculty involved in the primary service courses (Man's Physical World I and II, General Physics I and II, Engineering Physics I and II, and Descriptive Physics), the means on the student evaluations for Spring and Fall semesters of 1978 are given below:

TABLE V

Student Evaluations
Spring and Fall 1978

OUTCOMES	MEAN	S.D.
Overall Evaluations (or Progress on Relevant Objectives):	79	± 23
Would Like Instructor Again:	69	± 30
Improved Attitude Toward Field:	66	± 29

These figures, if they mean anything, are at least very respectable.

While grade escalation has been a general problem for higher education, it can still be stated (although just barely) that the modal grade in physics courses is still a "C". A study of the grade distribution for 1980-1981 service courses is shown below:

TABLE VI.

1980-1981 Service Course[1] Grade Distribution

Grade	Number of Students Receiving Grade	Percentage of all Grades
A	607	17.3
B	1,008	29.1
C	1,011	29.2
D	416	12.0
F	309	8.9
WD	98	2.8
INC	18	0.5
TOTALS	3,467	99.8

[1] This includes all service courses with course numbers below 299 which were taught both semesters (Man's Physical World I and II, General Physics I and II, Descriptive Physics, Descriptive Astronomy, Descriptive Meteorology, and Engineering Physics I and II).

The distribution of all grades in all physics courses is given in Appendix A.

2. Quality of Baccalaureate and Graduate Degrees

The undergraduate physics degree program was described in the section on Program Description earlier. As indicated, there is a common core with five options: (1) Graduate Preparation in Physics, (2) Scientific Management (Business), (3) Computational Physics, (4) Engineering Physics, and (5) Physics Teaching. In practice only the first option tends to be utilized by physics majors. During the period 1971-1981 some 63 undergraduate degrees were awarded with 4 degrees being Bachelor of Arts and 59 degrees being Bachelor of Science degrees. Of these degrees only 2 used the teaching option and neither went into the teaching profession. The statistics on these students is given in Table VII below. Appendix I presents more detailed information.

TABLE VII.

Physics Undergraduate Degrees
1971-1981

YEAR	TOTAL DEGREES[1]	BA/BS	ΣΠΣ[2]	CUM LAUDE	MAGNA CUM LAUDE	SUMNA CUM LAUDE	AVERAGE GRADE POINT RATIO
1971	16 (3)	2/14	--	1	6	0	3.29
1972	3 (0)	0/3	--	0	2	0	3.33
1973	11 (3)	1/10	--	2	2	0	3.11
1974	7 (2)	0/7	--	1	0	0	2.97
1975	6 (0)	0/6	--	1	2	0	3.22
1976	7 (0)	0/7	3	1	2	0	3.18
1977	5 (1)	1/5	4	2	1	0	3.38
1978	2 (0)	0/2	1	0	0	0	3.02
1979	2 (1)	0/1	0	0	0	0	3.58
1980	1 (0)	0/1	1	1	0	0	3.79
1981	3 (0)	0/3	2	0	0	0	3.48

Total Degrees 63 G.P.R. Average 3.30

[1] The number in parentheses represents the number of students earning dual degrees.

[2] A chapter of the Physics Honorary Society, ΣΠΣ, was started in 1976. This number represents the number of graduating seniors who were initiated in ΣΠΣ.

As will be obvious, there was a continuing decline in the number of undergraduate physics majors through the decade of the 70's. However, in the last two years the number of undergraduate physics majors has increased. The current class sizes (1980-1981) not including 5 dual majors in the College of Engineering, are as follows:

Freshmen	-	10
Sophomores	-	14
Juniors	-	8
Seniors	-	4

The Departmental graduate program is described in the Graduate

Study and Research brochure in the Appendix C. The grade distributions for graduate courses are given in Appendix A, during the period 1971-1981. Appendix J presents information on all M.S. and Ph.D. degrees granted in the period 1971-1981. During this time, the department granted ~~57~~ 35 Ph.D.'s and 57 ~~35~~ M.S. degrees as shown by the table below:

Graduate Degrees (1971-1981)

YEAR	M. S. DEGREES	PH.D. DEGREES
1971	3	4
1972	9	6
1973	7	4
1974	5	3
1975	6	8
1976	6	1
1977	6	4
1978	3	2
1979	2	1
1980	4	2
Total degrees granted	57	35

These students have done well and the department can be very pleased with the achievements of these students. This record speaks well for the students and the program.

3. Advising

All undergraduates are assigned a mentor or undergraduate advisor who is responsible for aiding the student in his or her development. It is a standing policy of the department that all undergraduates are given employment in the department if they so desire. In truth, students are encouraged to work in the department because of the general feeling that physics is best learned by doing physics.

4. Selection of Graduate Students

All graduate student applications are screened by a faculty selection committee. No students are allowed into the graduate program unless the student is of a caliber to be awarded an assistantship or has a full-time scholarship. The greatest single problem for the department has been the general lack of graduate students. This has adversly affected the teaching of undergraduate laboratories, the graduate instructional program, and the graduate research program.

B. Research

1. Grants and Contracts

The research posture of the department has been strong and healthy in spite of nagging problems such as the lack of a sufficient supply of graduate and post-doctoral students. During the period 1970-1980, over six and one-half million dollars ($6,502,837) was awarded in the department from a wide range of funding agencies. This amount does not include a number of grants and contracts which were shared with other departments such as the THEMIS grant which contributed about one-half million dollars to research support in the department over the period 1970-1975 or the grants presently shared with Chemistry or Nuclear Engineering. A review of this funding is shown in Table VIII on the next several pages.

These grants are well distributed in the department, essentially all major research areas receive some support. Some 84 percent of the faculty were receiving extramural support in 1978, but that has decreased to 71 percent at the present. While it would be better if all the faculty research were supported on extramural funds, any figure above 70 percent should be considered very respectable.

2. Publications

The evidence of scholarly attainment should not be reduced to the counting of publications and research grants. However, the publication rate is an expedient, if not altogether correct measure of the activity of a faculty. An examination of the individual vita presented in Appendix E or Table III indicates that the faculty associated with this department produced 443 refereed publications over the period 1971-1980 corrected for any multiple authorship with other K-State faculty members and 409 such publications counting

TABLE VIII.

Research from Extramural Support
1970-1980[1]

GRANT DESCRIPTIVE NAME	PRINCIPAL INVESTIGATOR	AGENCY	AMOUNT AWARDED[2]	YEARS ACTIVE TO DATE [3]
1. IR Studies of Planetary Atmospheres	Williams	NASA	$ 205,038	14 (1966)
2. IR Reflection Spectra of Water and Hydrated Materials	Williams	Navy	109,037	11 (1967)
3. Mössbauer Spectroscopy	Tumollilo	Research Corp	4,500	1 (1970)
4. Mössbauer Spectroscopy	Eck	Research Corp	5,200	1 (1970)
5. CAPE Educational Grant	Hathaway	NSF	83,866	3 (1969)
6. College Science Improvement Program for 2-Year Colleges	Spangler	NSF	50,300	3 (1970)
7. Political and Scientific Effectiveness in Nuclear Materials Control	Leachman	NSF	252,764	2 (1970)
8. Beam Foil Spectroscopy	Cocke	Research Corp	5,833	1 (1970)
9. Atomic and Nuclear Res.	Leachman	AEC	135,138	2 (1969)
10. Atomic and Nuclear Res.	Richard	ERDA	1,639,258	4 (1971)
11. Atomic Properties Related to Ion Stopping	Bhalla	Army	109,089	5 (1971)
12. Instructional Scientific	Zollman	NSF HEW HEW HEW	4,300 2,486 2,294 4,289	2 (1973) 1 (1974) 1 (1975) 1 (1976)
13. Biomedical Science Support	Manney	HEW	1,000	1 (1973)
14. Nuclear Defense Agency Internship Program	Leachman	Nuclear Defence Agency	69,000	2 (1973)
15. X-Rays from Ions	Curnutte	Navy	132,000	6 (1973)
16. Cloud Studies	Bark	KWRB	16,153	2 (1974)
17. Electrical Phenomena	Rosenkilde	Livermore	209,518	5 (1974)
18. Study of Effects of Altering the Precipitation Patterns on Economy of Kansas	Bark	KWRB	70,737	6 (1975)
19. Climate of Kansas	Bark	KWRB	2,500	1 (1975)

GRANT DESCRIPTIVE NAME	PRINCIPAL INVESTIGATOR	AGENCY	AMOUNT AWARDED[2]	YEARS ACTIVE TO DATE[3]
20. Spectroscopic Studies of Cuprous Oxide	Compaan	Research Corp	$ 10,800	2 (1975)
21. Detection of Heavy Metal Contaminants in Dense High Temperature Plasmas	Richard	DOE	2,171,000	6 (1975)[4]
22. Dechanneling of Charged Particles in Single Crystals	Jack	Research Corp	10,000	2 (1976)
23. Wiener-Lee Transformations in Molecular Physics	Weaver	Research Corp	1,470	1 (1976)
24. Mutations in Fungi Imperfecti	Manney	Gulf Oil	62,474	4 (1976)
25. Raman and Photoluminescence Studies of Pure and Implanted CuO	Compaan	NSF	48,000	4 (1976)
26. Biomedical Support	Manney	HEW	5,000	1 (1977)
27. TIPS Implementation	Folland	Exxon	6,208	2 (1977)
28. Effect of Differential Rotation on the Solar Neutrino Flux	Endal	NSF	10,700	2 (1977)
29. Application of Relativistic Phase Approximation to the Photoionization Cross Section of Atoms	Lin	Research Corp	2,500	2 (1977)
30. Modeling of Grain Dust Explosions	Lee	USDA	33,918	3 (1978)[4]
31. Studies of the Evolution of Rotating Stars	Endal	NSF	6,600	1 (1978)
32. Heavy-Ion Interactions	Eck	NSF	17,984	2 (1978)
33. Activity-Based Physics for Pre-Service Elementary School Teachers	Zollman	NSF	22,944	2 (1979)[4]
34. Laser Studies of Excitation and Free Carrier Relation in Pure and Implanted Semiconductors	Compaan	NSF	27,700	2 (1979)
35. Dynamical Light Scattering Studies of the Liquid-Solid Phase Transition	Sorensen	Research Corp	1,200	1 (1979)
36. Sloan Foundation	Lin	Sloan	20,000	3 (1979)[4]
37. Atomic Physics of Strongly Correlated Electrons	Lin	DOE	84,000	2 (1979)[4]
38. Laser Annealing in Semiconductors	Compaan	Navy	135,959	1 (1980)[4]

	GRANT DESCRIPTIVE NAME	PRINCIPAL INVESTIGATOR	AGENCY	AMOUNT AWARDED[2]	YEARS ACTIVE TO DATE[3]
39.	Light Scattering Studies of Supercooled Liquids and the Liquid-Solid Transition	Sorensen	NSF	$ 44,600	1 (1980)[4]
40.	Gene Functions Associated with the Sexual Cycle	Manney	HEW	640,479	9 (1970)[4]
41.	Modeling of Pressure Effects on Grain Dust Explosions	Lee	USDA	25,000	1 (1980)[4]
		TOTAL AWARDED:		$6,502,837	

1 This table is incomplete as it does not cover some

2 Funds awarded in the period 1970-1980.

3 This represents the total number of years the grant has been active. A number in parentheses represents the year the grant was first awarded.

4 Grant presently still active.

only the faculty currently on the staff at the present. The Table IX below indicates a summary of the rate of publications onver the last decade:

TABLE IX.

Faculty Publications

YEAR	NUMBER[1]
1971	39
1972	38
1973	60
1974	54
1975	53
1976	51
1977	41
1978	42
1979	33
1980	32

1 Corrected for multiple authorship among K-State faculty.

The peak in productivity coincides with a period in which the department had a rather permanent visiting position, a large number of visiting faculty, and a larger graduate student body. Although the rate of production of scholarly papers should increase again slightly, *it is not anticipated that a significant change will occur unless the availability of post-doctoral students and higher quality graduate students improves considerably.*

3. Post-Doctoral Activities

Although the records of the department are not as complete as they should be, there were at least 30 post-doctoral students who studies in the department from 1970 to 1980. Most of these students were associated with the atomic and nuclear sciences research program. The names of these individuals are given in Appendix K along with the research area and the name of the mentor.

4. Sabbatical Leaves

The Department of Physics has encouraged faculty to take sabbaticals in order to seek the re-creation which stimulates scholarly activity. In the period 1972-1973 through 1980-1981 nine faculty have had successful sabbaticals. The individuals and where the sabbatical leaves were taken are described in Table X below.

TABLE X.

SABBATICAL LEAVES 1971-1981

NAME	YEAR	RESEARCH AREA	LOCATION
Brock Dale	9/1/72 - 5/31/73	Scattering of light Ions from Crystalline Solids	University of Aarhus Aarhus, Denmark
Chandra Bhalla	9/1/73 - 5/31/74	Atomic Physics	FOM Institute Amsterdam, The Netherlands
James Macdonald	9/1/76 - 5/31/77	Atomic Physics	G.S.I., Darmstadt Germany
Thomas Manney	9/1/77 - 5/31/78	Chemistry of Yeast Peptide Pheromones	Ruhr University, Bochum, West Germany
Lewis Cocke	9/1/77 - 5/31/78	Atomic Collisions Physics	Physics Institute Univ of Aarhus, Denmark
John Eck	9/1/78 - 5/31/79	Nuclear Heavy Ion Interactions	Australian National University-Canberra
Larry Weaver	9/1/79 - 5/31/80	Group Theory and Collective Models of Nuclei	Physics Dept, Univ of Toronto; Nordita; Inst for Theoretical Physics, Tübingen; Math Dept, Univ of Minnesota
Nathan Folland	9/1/79 - 5/31/80	Theoretical Formulation and calculation of the Equation of State of Solids.	Lawrence Livermore Laboratories, California
Jim McGuire	9/1/80 - 5/31/81	Collision Mechanisms in Ion-Atom Collisions	Hahn Meitner Institute, Berlin, West Germany

5. Colloquia and Special Events

As was mentioned in Section II on Program Description, the Department operates an aggressive colloquia and seminar program. However, above and beyond these regularly scheduled programs the department has played an active role in producing special events of importance to the campus, the community, and some events which have national scope. In particular, two events were of particular importance: (1) The Heavy Ion Lecture Series (1972-1973) and (2) The Contractors Meeting on High Energy Atomic Physics.

In 1972 a permanent faculty position opened when the former departmental administrator elected to take a leave for a position in Washington. It was decided by the new director of the Atomic and Nuclear Sciences Laboratory, Dr. J. C. Legg in consultation with the faculty associated with the accelerator, that this position could be best used as a high level visiting position. In a rather bold move it was decided to announce the existence of the yet embryonic KSU Atomic and Nuclear Sciences with a lecture series on use of heavy ions in physics research. A wish list of 20 internationally recognized leaders in the field was composed with the hope of attracting 8 speakers, each speaker to spend approximately one week in the department and deliver a series of lectures. *The first eight lecturers invited and accepted are listed below in the order of appearance:*

Dr. Allan Bromley, Chairman of the Department of Physics, Yale University, Director of the A.W. Wright Nuclear Structure Laboratory, and Henry Ford II Professor of Physics.

Eugen Merzbacher, Chairman of the Department of Physics of the University of North Carolina and Kenan Professor of Theoretical Physics.

Donald Robson, Professor of Physics at Florida State University and 1971 Tom W. Bonner Awardee in Nuclear Physics.

Frans Saris, Professor of Physics at the F.V.M. Institute of Atomic and Molecular Physics in Amsterdam.

H. Terry Fortune, Professor of Physics at the University of Pennsylvania.

J. D. Garcia, Professor of Physics at the University of Arizona.

Walter Greiner, Director of the Institute for Theoretical Physics at the University of Frankfort.

Ivan A. Sellin, Professor of Physics at the University of Tennessee.

The lectures given by these individuals were tape recorded and transcribed by Drs. Greg Seaman and John Spangler into a two volume set of some 788 pages. These two volumes became essentially the definition of the cutting edge and a projection of heavy-ion physics for the seventies. Only two copies still exist in the department; these copies will be provided only if needed.

In 1979, the Department of Energy requested the Department of Physics to organize and host a Contractors Meeting on High Energy Atomic Physics. This by invitation only conference of some 72 individuals centered around 20 invited papers and 4 discussion panel sessions which attempted to define the state-of-the-art and project the future of high energy atomic collision physics. Brief summaries of the papers presented are included in the bound publication in Appendix L.

In addition to these events, the department has attempted, on a regular basis, to bring lecturers to the campus who could address important topics and speak to a broad audience. Some of these efforts are collaborations with other departments. Examples of these are listed below:

"Advances Toward Laser Fusion," Dr. Harlow Ahlstrom, Lawrence Livermore Laboratory.

"Scientists Working in Congress," Dr. Benjamin S. Cooper, Scientific Advisor, U. S. Senate Committee on Insular Affairs.

"Harvesting the Sunshine," Aden and Marjorie Meinel, University of Arizona.

"Quantitative Aspects of Social Phenomena," Dr. Elliot Montroll, University of Rochester.

"Destruction of Waste and the Undestroyable Atom---An Environmental Problem," Dr. Per Olav Löwdin, University of Uppsala and the University of Florida.

"Black Holes and the Theory of Relativity," by Dr. William Kaufmann, Griffith Observatory and Planetarium.

C. Departmental and Institutional Involvement

1. Organization of the Department of Physics

The Department of Physics in accordance with the University operates under a Department Headship. The Department and the Department Head are reviewed every four to five years by the Dean of Arts and Sciences. The last review was during the Fall Semester of 1980.

The faculty elect a Faculty Advisory Committee to the Department Head. The function and constitution of this committee was agreed upon by the faculty on May 5, 1971.

PHYSICS FACULTY ADVISORY COMMITTEE TO THE DEPARTMENT HEAD

FUNCTION: To represent the Faculty in aiding the Department Head in the planning and implementation of policies on matters of importance to the Physics Department. The Committee shares with the Department Head the responsibility to see that the Faculty is kept informed on matters of importance to the Physics Department and to insure that the Faculty has both formal and informal means of expressing their opinions and ideas. A Graduate Student representative will serve on the Committee and have parallel responsibilities with respect to the Graduate Students.

CONSTITUTION: The Committee will consist of one Graduate Student (to be chosen by the Physics Graduate Students in any manner they deem suitable), and four members of the Physics Faculty occupying a position in the rank of Instructor, Assistant Professor, Associate Professor, or Professor. The Faculty members of the Committee will be chosen by vote of the Physics Faculty of the ranks indicated above. Committee members serve a term of two years and are not eligible to succeed themselves.

The first election will be held in May 1971. Thereafter, elections will be held each April. Two of the four Faculty members of the Committee chosen in the first election, to be determined by lot, will serve until the April 1973 election. These two people may succeed themselves. The other two Faculty members chosen in the first election will serve until the April 1973 election.

The Department also utilizes certain standing committees to conduct its affairs. The 1980-1981 physics department committee assignments are enclosed with this report. Each committee is briefly described

PHYSICS DEPARTMENTAL COMMITTEES

The person whose name is underscored will serve as chairman.

Departmental and Building Operations

FACULTY ADVISORY COMMITTEE TO THE DEPARTMENT HEAD: Alvin Compaan, R. Dean Dragsdorf, Patrick Richard, Dean Zollman, and Edson Justiniano

CURRICULUM COMMITTEE: Basil Curnutte, John Spangler, Tom Gray, John Eck and Jim Hall

Proposes changes, deletions, and additions of class offerings; coordinates with University administration on changes; suggests teaching assignments; coordinates any possible courses or programs for interim semester; coordinates class and classroom scheduling; maintains statistics of teaching loads and room usage.

COLLOQUIUM COORDINATOR: D. Williams

Arranges for speakers for Physics Colloquia and coordinates visits of speakers.

GRADUATE STUDENT AFFAIRS COMMITTEE: C. P. Bhalla (Graduate Student Advisor), R. Dean Dragsdorf, Tom Gray*, graduate student.

Schedules and arranges qualifier examinations; recommends general systems of examinations and courses for graduate degrees; considers any initial appeals and requests from graduate students; (*) indicates person responsible for the "Blue Book".

GRADUATE ENTRANCE COMMITTEE: C. E. Hathaway, John Spangler, Tom Gray, C. D. Lin, Al Compaan, C. P. Bhalla (Graduate Student Advisor).

Selects incoming graduate students; recommends size of resident graduate student body; coordinates traineeship activities; coordinates introductory sessions of new graduate students.

UNDERGRADUATE AFFAIRS COMMITTEE: Tom Gray, Dean Zollman, C. E. Hathaway

Advises undergraduate physics students concerning undergraduate curriculum; stimulates and coordinates undergraduate activities including the freshman topics course; advises students on career possibilities; Chairman serves as Advisor to Society of Physics Students.

UNDERGRADUATE LABORATORIES AND DEMONSTRATIONS COMMITTEE: Dean Zollman, James Legg, Ted Geisert

Recommends changes and additions in the undergraduate laboratories; recommends purchases of laboratory and demonstration equipment.

COFFEE AND CREAM SEMINAR COORDINATOR: C. L. Cocke

Arranges in-house speakers for the Coffee and Cream Seminar.

SECRETARY FOR DEPARTMENTAL MEETINGS AND DEPARTMENTAL HISTORIAN: Louis Ellsworth

Records all deliberations and decisions of Departmental and Faculty Meetings; maintains departmental archives.

COMPUTER ALLOCATIONS: Hulan Jack

Allocates departmental computer allotment for research and educational purposes.

GRADUATE STUDENT ADVISOR: C. P. Bhalla (effective October 1, 1979)

Advises all graduate students on course scheduling and examination procedures.

GRADUATE PROGRAM COMMITTEE SELECTION: John D. Spangler

Assists the Department Head (with concurrence of the student's faculty advisor and committee) in the approval of committee members of individual graduate programs.

Relations Outside Department

NON-TRADITIONAL STUDIES PROGRAM: John Spangler

Develops departmental out-reach programs in the physical sciences.

TELENETWORK AND HIGH SCHOOL LIAISON: C. E. Hathaway and John S. Eck

LIBRARY LIAISON: Chris Sorensen

on this sheet. It should be noted that undergraduates are included on the Curriculum Committee and the Undergraduate Student Affairs Committee. Graduate students are represented on the Advisory Committee, Curriculum Committee, Colloquium Committee, Graduate Student Affairs Committee, and the Undergraduate Laboratory Committee. The students thus are given working inputs into departmental matters.

All academic matters concerning the undergraduate or graduate program are brought to the faculty for discussion and formal votes. The most important decisions made by a faculty member are those concerning promotion and tenure. The faculty, by resolution (September 24, 1971), endorsed the statement given below which remains the operating guideline on promotion and tenure.

GUIDELINES FOR TENURE AND PROMOTION
DEPARTMENT OF PHYSICS

The questions of tenure and promotion should encompass professional growth of the individual in the academic community as a whole as well as recognition by his professional colleagues and by his professional societies. The Department of Physics endorses the procedures and statements of the American Association of University Professors with respect to academic freedom and tenure.[1]

I. TENURE

A. The criterion for tenure is satisfactory progress toward promotion.

B. The procedural details of the tenure decision are the University regulations as indicated in the KSU Faculty Handbook. The regulations follow the procedures recommended by the American Association of University Professors. A meeting of the tenured members of the faculty will be convened when necessary to discuss questions of tenure prior to a formal closed ballot.

II. PROMOTION

A. Promotion is based on consideration of a faculty member's activities in the areas of (1) research, (2) teaching, and (3) service to the Professional and University community. A faculty member should be competent in both research and teaching in order to achieve full development in the University environment.

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[1] *AAUP Policy Documents and Reports, 1971 Edition.*

B. *Each member of the faculty will have his progress toward promotion, increased remuneration, and tenure reviewed each year (Fall Semester) by the Department Head. The Department Head will consult individually with the Faculty for purposes of this review. The Department Head will meet with each non-tenured faculty member to discuss this review and to provide constructive suggestions for future activities.*

All other faculty members will have a similar opportunity for an interview with the Department Head to discuss their professional progress if they so desire.

C. *The promotion from Assistant to Associate Professor generally is based more on promise than on demonstrated distinction.*

1. *He should have demonstrated to the faculty that he has the potential to acquire a national reputation in some area of physics in his further progress and development. The quality of his work in physics should be reflected by his publications and grant proposals, and requests to serve national professional organizations.*

2. *He should be a competent teacher. He should be interested in and capable of teaching at more than one of the three levels of courses*[2] *offered by the department.*

3. *He should have worked effectively as an individual, with other faculty members and with students, for the Department and for the University.*

4. *He should have worked constructively to bring outside support to the Department through his own research program, through proposals for improving the teaching program, through proposals for acquiring departmental research instruments or through other individual and collective efforts.*

D. *The promotion from Associate Professor to the rank of Professor is based on demonstrated distinction. The same considerations for promotion to the rank of Associate Professor apply to the promotion to the rank of Professor, with the substitution of the following*

---

[2] *The three levels are defined to be the lower undergraduate courses (100-399), upper undergraduate-graduate courses (400-599), and the graduate courses (600 and above).*

Item 1.

1. *He should have acquired a national reputation in some area of Physics.*

Faculty are evaluated on performance each year according to the guidelines and procedures outlined in Appendix M. Merit salary increases are determined by the department head on the basis of this review.

Possible candidates for promotion are reviewed by the Advisory Committee and those who are felt to be viable candidates are requested to prepare a promotion dossier for review by all faculty at ranks higher than the candidate. Promotion recommendations are determined after full consultation and secret ballot of those faculty holding a higher rank than the candidate.

Tenure-track faculty are reviewed on an annual basis for reappointment. In the appropriate year, a candidate for tenure prepares a dossier for consideration by all tenured faculty and the candidate presents at least one formal colloquium reviewing his or her research program. A meeting of all tenured faculty is held for open discussion of the tenure candidate. The next day a secret, written and signed ballot on tenure is taken. The ballots are counted by the Advisory Committee, the comments on the ballots are recorded without identifying the authors and this listing is notarized with the signatures of the Advisory Committee. The original ballots are destroyed. The department makes the final recommendation to the Dean conveying at the same time the vote of the faculty. By mutual agreement the department head is honor bound to inform the tenured faculty should his recommendation on tenure differ from that of the vote of the tenured faculty.

2. Faculty Involvement on an Institutional Level

Physics faculty have traditionally been very willing to serve on college and University committees. It would be difficult to list all of the faculty involvements over the last decade but perhaps the involvement of the faculty during the 1980-1981 period solely outside the department but on the campus will provide some feeling for the level of institutional commitment on the part of the faculty.

Professor Tom Manney: Chairman, University Biohazards Safety Committee.

Professor Dean Bark: Member of the Agricultural Experiment Station Program Committee.

Associate Professor Al Compaan: Arts and Sciences Course and Curriculum Committee, Advisory Committee to the Dean of Arts and Sciences.

Professor Basil Curnutte: University United Way Committee.

Professor R. Dean Dragsdorf: Physical Science Sub-Committee of the Graduate Council.

Professor John Eck: Content Coordinator for the Science Honors Telenetwork Program.

Professor Louis Ellsworth: Radiation Safety Committee and the Reactor Safeguards Committee.

Professor C. E. Hathaway: President of the Faculty Senate, Chairman of the Regents' Institution Coordinating Council, Chairman of the Rhodes Selection Committee, Landon Lecture Advisory Committee, Administrative Council, McCain Development Board.

Assistant Professor Hulan Jack: Chairman of the Committee on Minority Affirmative Action; Truman Scholarship Committee.

Professor J. C. Legg: Chairman of the University Library Committee; University Digital Computer Committee.

Professor John Spangler: Arts and Sciences Course and Curriculum Committee; Faculty Representative to the University of Mid-america; Board of Overseers for Non-traditional study.

V. PLANS FOR IMPROVEMENT AND DEVELOPMENT

A. Instruction

1. Existing Limitations

The increase in enrollments in those disciplines which require physics as component in the degree program (e.g. engineering) coupled with more disciplines requiring physics courses (e.g. architecture) have produced in the last two years a faculty teaching load which is having a detrimental effect on the balance approach to teaching and scholarly activity which has characterized the department. The lack of a pool of undergraduates from which we may attract graduate students, the current salaries being given to graduating senior physics majors, and the lack of any temporary technically trained staff in the region has caused the department *to have to increase the size of laboratory sections in the undergraduate service courses (45 students in an engineering physics laboratory with six students sharing one piece of scientific apparatus) and to depend increasingly upon undergraduate laboratory teaching assistants.* Whereas the department had no undergraduates teaching laboratories in the spring of 1980, the majority of laboratory instructors in the spring of 1981 were undergraduates, and in the fall of 1981 the laboratories will have to be staffed by undergraduates down to the sophomore level and will make up something greater than 75% of the laboratory staff. While there is no doubt but that undergraduates can do an adequate job in these positions[1], the pedagogical status of laboratory teaching can only at best remain static under such a situation and will most likely decline. For example, although some new technologically advanced equipment has been purchased over a two-year period which would have been introduced into the laboratories this next year, these plans must be postponed and the equipment will be shelved until such time as the pressure of the current enrollment declines.

In addition, the current equipment is suffering rapid deterioration because of several significant factors. (1) It is necessary to assign too many students to the same piece of equipment and the damage rate appears to climb exponentially with the number of hands on the equipment. (2) It is extremely difficult for a single laboratory assistant to properly oversee more than 18 to 24 students at a time. (3) The damage rate has now exceeded our ability to repair equipment and *no preventative maintenance has been accomplished for over a year.*

A grant has been submitted to NSF which would couple Apple II computers to disc television systems. While this interactive autotutorial

[1] All first year teaching assistants are required to take a week long training course described in Appendix N.

system would be a real boon to many needy students, it will be difficult to find the time and the manpower to initiate such a system.

In order to survive with some pedagogical credibility with respect to the lower level services classes, the department will be forced to take some of the steps indicated below:

a. Limit enrollments in Engineering Physics and General Physics classes. Limitation of the enrollment in Man's Physical World would not help the situation because manpower is available to cover these laboratory sections.

b. Decrease the hours the Activities Center is open by at least 50%.

c. Decrease or eliminate the public service aspect of the Planetarium.

d. Offer the Man's Physical World I section for education majors only once a year and offer Man's Physical World II laboratories only once a year.

The offerings of junior-senior level service courses have already been reduced in spite of a growing demand and it may be necessary to simply eliminate these classes for a period of several years.

The picture with respect to physics majors is positive and it may be expected that faculty will accept the almost overload situation caused by such an increase gleefully. These bright young people provide excitement in a period of great frustration. The department has developed a modest endowment fund which will provide needed scholarships in the eighties. Physics majors will also provide some needed manpower but the department will need to remain sensitive to the possibility of overloading or allowing a student to overload himself or herself.

The department will remain aggressive in recruiting graduate students, but the situation looks bleak.

B. Research

The department has flourished during the seventies when the grant posture of many other departments declined and the department has no plans to change its aggressive posture in spite of the current hardships associated with the teaching load and the low number of graduate students and post-doctoral students available. The greatest problem which will face the department, the college, and the University will be the replacement of faculty positions as faculty retire and resign in the eighties. One faculty member will retire in 1981-1982 and is very likely that one faculty member will resign in 1981-1982. Two more faculty members could retire (age sixty-five) by 1982-1983, and these faculty will have to retire by 1987. In addition, it may be conservatively estimated that at least one other additional faculty member will resign during that period. Hence, between 1981-1982 and 1986-1987 the department should have a turn-over of 5 faculty members. If the College and University mandate that these positions be filled strictly by non-tenure track positions then the research program will age rapidly and falter. This will affect the ability of the department to garner extramural funding and it should be recognized by all that the State of Kansas and this University simply cannot afford a physics research program without adequate extramural funding.

If and when the department is allowed to hire tenure-track replacements, those replacements would most likely be in the area of optical solid state and with the current status of the research funds in the department, little help would be needed to establish laboratories for these individuals. Because of the current and projected research thrust of this nation in this area, it would be impossible to attract visiting faculty of any respectable caliber.

The James R. Macdonald Laboratory has been encouraged by D.O.E. to make plans to upgrade the accelerator facility with the possible addition of several super conducting linear accelerator sections. The facility has already begun to become somewhat of a national user's facility and D.O.E. has expressed a desire to see the laboratory evolve further in this direction. Should the final decision be made to upgrade the accelerator, it will require a sharing of the cost between D.O.E., the department, the college, and the University. However, it should be recognized that such a step could well lead to a National Laboratory status for this facility and would essentially generate the viability of this facility into the next century.

Of more immediate concern is the fact that it will be necessary to replace the accelerator tubes next year at a projected cost of $50,000 and this will also require sharing of costs between D.O.E., the College, and the University. The department head has assured D.O.E. that K-State has a continuing interest in the James R. Macdonald Laboratory and that some matching arrangement can be expected.

C. Service

The department would like to continue to provide service to the University community and the greater public audience the University serves. However, the current enrollment increases coupled with the long-standing tradition of meager funding of higher education in Kansas will cause some immediate decreases in services the department has traditionally provided.

While it goes against the very principles which this department considers as very important, that of each department extending itself to the strength of the integrated whole of the University, this department will have no choice but to become more provincial and isolationist in its attitudes. In particular, as much as we would like to be a help in the current and projected problem with respect to the maintenance and repair of microprocessor-based instrumentation, we simply cannot absorb any more of the load.

APPENDIX I

Undergraduate Degrees in Physics

1971 - 1981

APPENDIX I

Statistics and Information on Students
Earning the B.A. or B.S. Degree in Physics
from 1970-71 through 1980-81.

NAME	GPA	ADDITIONAL INFORMATION
1971		
Charles D. Beckenhauer		Magna Cum Laude; U.S. Air Force
Willis L. Boughton		Magna Cum Laude
Paul Burgardt		Magna Cum Laude; Iowa State, Graduate School
Vartkais Y. Dermenjian		
John J. Devore		Kansas State University
Barney L. Doyle		Magna Cum Laude; Los Alamos National Laboratory
Samuel D. Doyle		Texas Instruments(3/73)
Stephen J. Elkins		
Robert D. Prochaska		U.S. Air Force(12/80)
Michael K. Read		U.S. Air Force(5/75)
Charles A. Ruberson		U.S. Air Force(11/78); Dual Degree in Math
David N. St. John		
William A. Toepfer		South Western Bell(1/79)
Donald M. Trotter		Magna Cum Laude; NCATE accredited program graduate
David W. Wood		Magna Cum Laude; Dual Degree in Math
Dennis L. Meyer		Cum Laude; Dual Degree in Business
1972		
Michael L. Handquist		Magna Cum Laude; Manager Custom Development Software SYSTEMS Engineering Laboratories(12/77)
Paul L. Harder		Magna Cum Laude; U.S. Air Force (12/78)
Robert K. Phillips		Self-employed

NAME	GPA	ADDITIONAL INFORMATION
1973		
John A. Brewer		Arkansas Tech.
Steven D. Deines		Magna Cum Laude
Steven A. Dyer		University of Kentucky
Richard D. Evans		U.S. Air Force(3/80)
Gary T. Fina		Cum Laude; Dual Degree in Math; Chemistry Department at KSU
Keith A. Jamison		Received M.S. in Physics(1975); Ph.D.(1978) KSU
Michael I. Riley		Dual Degree in Math; University of Kentucky, Lexington; M.S. Physics (1976); Ph.D. KU
Robert E. Ross		Certain-Teed
Ronald D. Warhurst		
David M. Zimmerman		Sigma Pi Sigma; M.S. in Physics (1976); Conoco Petroleum, Ponca City, Oklahoma
Fred J. Zutavern		Magna Cum Laude; Dual Degree in Math
1974		
David N. Hein		Cum Laude; Received M.S. in EE at KSU in 1976
Carl L. Jacobs		M.S. in ME in 1976
Sherwin E. Klemp		Dual Degree in Computer Science; Schlumberger Limited(6/75)
Ronald D. Knerr		Texas Instruments
Roger D. Lanksbury		Dual Degree in Nuclear Engineering
David G. McFerren		
Wayne L. McGill		Xerox Corporation
1975		
Floyd Harris		
James W. Oltjen		Magna Cum Laude; University of California(Davis); M.S. in Animal Science

NAME	GPA	ADDITIONAL INFORMATION
1975(cont'd)		
Gary L. Porubsky		Cum Laude
Randall S. Riepe		Magna Cum Laude; Superior Oil Company(5/77)
John W. Shellenberger		M.S. of Computer Science
William B. Smith		
1976		
Darrell E. Aermann		Physical Science
Roger L. Facklam		Sigma Pi Sigma; Cum Laude; U.S. Air Force(8/80)
James B. Heathman		
Jon J. Held		U.S. Grain Marketing Research Center; M.S. in ME at KSU in 1977
Gary L. Norton		Magna Cum Laude; Sigma Pi Sigma
Joseph G. Poole		Schlumberger Well Service
Kent N. Scarbrough		Magna Cum Laude; Sigma Pi Sigma; KSU Electrical Engineering Department
Merle E. Thowe		3M Company; M.S. in EE 1978
1977		
Stephen Batsel		Sigma Pi Sigma; Cum Laude; Dual Degree in Math; University of Illinois(8/77)
Loren Bareiss		Sigma Pi Sigma; Obtained M.S. in EE at KSU
Steven Coloney		Sigma Pi Sigma; Cum Laude; U.S. Air Force(12/79)
Thomas Fangrow		
John Trow		Sigma Pi Sigma; Magna Cum Laude; University of California(9/78)
1978		
Mark W. Clark		Sigma Pi Sigma
David Steiner		

NAME	GPA	ADDITIONAL INFORMATION
1979		
James Ketter		NCATE accredited program graduate
Scott R. Sheppard		B.S. in EE
1980		
Barton L. Willis		Cum Laude; Sigma Pi Sigma; Virginia Polytechnic Institute and State University(9/80)
1980		
William C. Hammill, Jr.		Sigma Pi Sigma; U.S. Navy(Submarines) (1981)
Kevin P. McCandless		
Margaret A. Young		Recipient of W. Randolph Lovelace Award; Sigma Pi Sigma; U.S. Air Force(1981)

APPENDIX J

Graduate Degrees in Physics

1971 - 1981

APPENDIX J

VI. THESIS AND DISSERTATIONS TITLES

A. Masters Degrees

Year	Student	Thesis Title	Present Position	Major Professor
1970	Jagdeeshchandra N. Bandekar	"The Intra Molecular Vibrations of the Water Molecule in the Liquid State"	Graduate Student Kansas State University	Curnutte
1970	John Henry Brand, II	"Photomultiplier Tube Parameters for Measurement of Low Light Levels	Graduate Student Kansas State University	Curnutte
1970	William A. Chenoweth	"Thermolunimescence"	Phillips University Enid, Oklahoma	Curnutte
1970	Leslie A. Dreiling	"The Influence of Magnetic Fields on the Analysis of Sunspot Structure"	Johns Hopkins Applied Physics Laboratory Baltimore, Maryland	Evans
1970	Dennis K. MacDonald	"Characteristics of a Velocity Selector Used with a Tandem Van de Graff Accelerator		Seaman
1970	Indira Radhakrishnan Nair	"Scattering of Electromagnetic Radiation by Defects in Crystals"	High School Teacher Huntingdon, Pennsylvania	Hathaway
1970	Charles S. Nichols	"The Effects of a Magnetic Field on Abundance Determinations in Stellar Atmosphere"		Evans
1970	J. David Schneider	"Boron and Phosphorus Implantation in Silicon"		MacDonald
1970	Thomas R. Wittick	"A Study of the Spin of the 5th and 6th Excited States of ^{39}K"	Texaco Houston, Texas	Seaman
1970	Warren Bruce Wylie	"Electron Tunneling between Microparticles in thins Discontinuous Gold Films"		Dale

VI. THESIS AND DISSERTATIONS TITLES

A. Masters Degrees

Year	Student	Thesis Title	Present Position	Major Professor
1971	Hobson, Dana	"Comparison of the Optical Properties of Sea Water"	Southwestern Bell Telephone	Williams
1971	West, Jon K.	"Analysis of Surface Composition and Contaminants in Biological Samples by Heavy-Ion Scattering"	General Electric Schnectady	Seaman
1971	Savoy, Steve	"Equilibrium Charge Distributions of Heavy Ions from 1 MeV to 48 MeV"	University of Southwestern Louisiana	Macdonald
1972	Brockman, Robert	"An Infrared Study of Water in Several Crystal and Organic Compounds"	Texaco, Houston	Williams
1972	Fox, Michael	"Beam Foil Lifetimes in Neutral Iron"	University of Colorado	Cocke
1972	Haeker, Howard	"A Report of Available Research on the Status of Science Teaching in the State of Kansas, 1936-71"	Teaching, Kansas City	Curnutte
1972	Ramsey, Larry	"The Effects on Non-Thermal Velocities on Solar Line Profiles"	University of Indiana Ph.D. Program	Evans
1972	Sethna, Prochy	"Design, Construction and Proposed Use of Apparatus for Measuring Resistivity of Thin Films"	K.S.U., Research Associate	Lee
1972	Spears, Jacqueline	"A Survey of Students Attitudes Toward Science and Society"	Teaching at Marymount College, Salina	Hathaway
1972	Volkman, Monty	"Analysis of Surface Contaminants in Biological Samples by Characteristic X-ray Analysis"	Kwajalein Island Safeguard System	Seaman
1972	Winters, Loren	"X-ray Production in Collisions of Protons with Argon and Krypton"	East North Carolina State University	Macdonald

VI. THESIS AND DISSERTATION TITLES

A. Masters Degrees (Con't.)

Year	Student	Thesis Title	Present Position	Major Professor
1972	Woods, Clifford	"Fragment Energies in the Fission of ^{231}Pa"	Los Alamos National Labs	Leachman
1973	Dryer, Erich	"Gamma Rays from Various (C^{12},X) Reactions"	Germany	Legg
1973	Gocke, Elmar	"Analysis of Radiation Induced Mutation in Yeast"	Germany	Manney
1973	Hein, Michael	"K-Shell Auger and X-Ray Rates...."	K.S.U., Ph.D. Program	Bhalla
1973	Martin, Richard	"Bromine and Zinc Concentrations in Wheat Flour"	Johns Hopkins Applied Physics Laboratory	Seaman
1973	Randall, Russell	"On the Shape and Stability of a Conducting Fluid Drop Rotating in an Electric Field"	Dressler-Atlas, Houston	Rosenkilde
1973	Schiller, Steven	"Study of One-and Two-Neutron Transfer Reactions on ^{27}Al Using ^{18}O and ^{13}C Beams"	Ballistic Research Lab, Aberdeen	Eck
1973	Shane, Kendahl	"The Stopping Power of Neon Ions in Aluminum"		Seaman
1974	Garwood, Gary	"A Study of the LTE Curve of Growth Method as Used in the Determination of the Solar Chromium Abundance"	New Mexico State University	Evans
1974	Guffey, James	"A Comparison Between Experimental Electron Capture Data and a Modified Brinkman-Kramers Calculation"		Macdonald
1974	Johnson, James	"Study of the Elastic Scattering of ^{14}N on ^{12}C"	Continental Oil, Ponca City, OK	Eck
1974	Pettus, Edward	"Projectile X-Ray Cross Sections for Fully Stripped Fluorine Ions on Argon"	Batavia National Accelerator	Macdonald
1974	Workman, Ricky	"An X-Ray Double Crystal Spectrometer Study of Singly-Ionized Sodium Implanted MgO"	Shell Oil, Houston	Dragsdorf

VI. THESIS AND DISSERTATION TITLES

A. Masters Degrees (Con't.)

Year	Student	Thesis Title	Present Position	Major Professor
1975	Page, Steven	"Fluorescence Lifetimes of Free and Intracellular Level in *Saccharomyces cerevisiae*"		Hathaway
1975	Baughman, James Jr.	"Inexpensive Science Materials for the Instruction of the Visually Handicapped"		Zollman
1975	Habiger, Robert	"Photoluminescence Studies of the Yellow Series Free Exciton in Cuprous Oxide Using Pulsed and Continuous Wave Tunable Dye Lasers"	Kansas State University	Compaan
1975	Jamison, Keith A.	"Study of K X-Rays from Al, Sc, and Ti Following Bromine-Ion Bombardment"	Kansas State University	Richard
1975	Phillips Robert L.	"Scattering of C^{13} From O^{16}"	Kansas State University	Legg
1975	Thorn, Charles T.	"Temperature and Environmental Effects on the Phosphorescence of Pyrazine, Benzotrifluoride, and Benzotrichloride"	U. S. Army	Spangler
1976	Riley, Michael I.	"Genetic Analysis of Trisomic Tetraploids and the Expression of Cryptopleurine Resistance in Aneuploid *Saccharomyces cerevisiae*"	Kansas University	Manney
1976	Dellai, Cheryl K.	"Trace Element Analysis of Powdered Beverages and Other Materials by X-ray Fluorescence"	Dresser Atlas, Houston	Seaman
1976	Marrs, Charles D.	"A Study of the Optical Absorption and Photoconductivity of Gamma-Irradiated LiF"	Kansas State University	Lee
1976	Simony, Paul R.	"Comparisons Between the Born Approximation and a Distorted Wave Born Approximation for 1S-2S Excitation by Electron Impact in Hydrogenic Targets"	Kansas State University	McGuire

VI. THESIS AND DISSERTATION TITLES

A. Masters Degrees (Con't.)

Year	Student	Thesis Title	Present Position	Major Professor
1976	Sneeringer, Basil L.	"An X-Ray Double Crystal Spectrometer Study of Ar and Rb Implanted MgO Crystals	Bendix Corporation Kansas City, Missouri	Dragsdorf
1976	Zimmerman, David M.	"A Weiner-Lee Transform Scheme for Calculating Quantities That Obey Dispersion Relations"	Kansas State University	Weaver
1977	Bratton, Tom R.	The differential cross section for electron capture from helium by 293 keV protons,	Schlumberger, Inc. Grand Junction, CO	C.L. Cocke
1977	Wickberg, James N	Study of Radiation Damage in Stainless Steel by Coulomb-excited Mossbauer Spectroscopy		Eck
1977	Annett, Clarence H.	Impact Parameter Dependence of K-vacancy Production in Copper-Nickel Collisions at 50 and 65.6 MeV	K.U. Medical Center	C.L.Cocke
1977	Hall, James M.	Internal Resonance Raman Scattering of Characteristic Target K X Rays in Thick Silicon Targets		Richard
1977	Hesse, Joseph F.	Resonance Raman Scattering and Optional Reflectivity Studies of Ion Implantation Produced Damage in Cuprous Oxide	Heath-Schlumberger Wichita Falls	Compaan
1977	Rogers, Steven R.	Differential Cross Sections for Charge Transfer Using Screened Coulomb Potentials in the Eikonal Approximation		McGuire
1978	Bruckman, Robert R.	Study of the Elastic and Inelastic Scattering of ^{16}O by ^{28}Si	Dept. of Electrical Engineering, K-State	Eck
1978	Gealy, Glen S.	Aluminum K X-ray production and electron transfer cross sections for oxygen, nitrogen and fluorine ions from 0.6 to MeV/amu.	Johns Hopkins Applied Physics Laboratory	Gray

VI. THESIS AND DISSERTATION TITLES

A. Masters Degrees (Con't.)

Year	Student	Thesis Title	Present Position	Major Professor
1978	Gunn, Sheila K.	The Influence of Gene Dosage on the Inhibition of Protein Synthesis by Cryptoleurine in the yeast Saccharomyces Cerevisiae.		Manney
1978	Meade, John E.	Charge Distributions for Radioactive Aerosols in a Bipolar Atmosphere Permeated by an Electric Field.	Lawrence Livermore Lab.	Rosenkilde
1979	Lo, Ho Wai	Raman measurements of temperature during continuous eave laser-induced heating of silicone.	Graduate Student Kansas State University	Compaan
1979	Tunnell, Laura Norman	Electron transfer in ion-atom collisions.	Graduate Student Kansas State University	C.D. Lin
1980	Can, Cuneyt	Theoretical transitions energies lifetimes and fluorescence yields for multiply-ionized fluorine and silicon.	Graduate Student Kansas State University	C.P. Bhalla
1980	Theisen, Terry Cagney	Multiple electron capture at high velocities using the bates potential in the independent electron approximation.	Manitowish Waters, Wisconsin	McGuire
1980	Thomas Randall Dillingham	Single Electron Transfer Cross Sections for Carbon, Nitrogen, Oxygen and Fluorine Ions incident on Helium	Graduate Student Kansas State University	Richard
1980	Philip L. Pepmiller	Charge State Study of Fluorine K X-rays Following a Fluorine-Neon Collision.	Graduate Student Kansas State University	Richard

Masters Degrees

Year	Student	Thesis Title	Present Position	Major Professor
1981	Deines, Steven	Semiclassical Coulomb Approximation with Application to Single and Double K-Shell Ionization in Ion-Atom Collisions		McGuire
1981	Gangwere, George H.	Measurements of Thermally Activated Relaxation Times in Amorphous Poly(methyl Methacrylate) Using Photon Correletion Spectroscopy		Sorensen
1981	Halfpap, Bradford Lee	An Investigation of Some Properties of Supercooled Fluids Using Photon Correlation Spectroscopy		Sorensen
1981	Osman, Junaidah	The Concept of the Pseudospinodal in Critical Phenomena		Sorensen
1982	Lee, Ming-Chih			Compaan

APPENDIX J

VI. THESIS AND DISSERTATIONS TITLES

B. Doctoral Degrees

Year	Student	Thesis Title	Present Position	Major Professor
1970	Burton, Donald E.	"Internal Conversion Processes for Electric Quadrupole Transitions in the Deformed Nuclear Region"	Lawrence Radiation Lab Livermore, California	Bhalla
1970	Nelson G. Kilmer	"Temperature Effects on the Phosphorescence of Benzene, Toluene, and Pyrazine"	Hesston College Hesston, Kansas	Spangler
1970	Jesudas Muanje	"X-ray Diffraction by a Thermally Excited Quartz Crystal"	Teaching Nigeria	Dragsdorf
1970	Glen P. Reese	"A Model for Electronic Stopping Power of Heavy Ions"	Private Industry North Carolina	Bhalla
1970	Herbert R. Rosner	"Relativistic Calculations of Atomic X-ray and Auger Transition Rates"		Bhalla
1970	Ralph M. Tapphorn	"Lifetime Measurements of Excited States in ^{39}K by the Doppler Shift Attenuation Method"	Ball Aerospace Boulder, Colorado	Seaman

VI. THESIS AND DISSERTATIONS TITLES

B. Doctoral Degrees

Year	Student	Dissertation Title	Present Position	Major Professor
1971	Griffith, Gary	"Fission Modes of the ^{242}Am Fission Isomer"	University of Florida	Leachman
1971	Rhine, Paul	"The Infrared Reflectance Spectra of Aqueous Solutions of Some Strong Electrolytes"	Union Pacific Railroad	Williams
1971	Temple, Paul	"Multiphonon Raman Spectrum of Silicon"	NRC Research Fellow Naval Ordnance Test Station	Hathaway
1971	Walters, Donald	"Auger and X-Ray Transition Probabilities for the Nonrelativistic Hartree-Fock-Slater Model"	White Sands Missle Range New Mexico	Bhalla
1972	Brand, John	"A Low Energy Beam-Foil Investigation of Neutral Nickel"	U.S. Army, Aberdeen Proving Ground	Curnutte
1972	Crawford, James	"Optical and Electrical Conductivity Studies of Ion Implanted Insulators"	North Texas State University	Dragsdorf
1972	Gale, Douglas	"Nulcear Deformation of ^{28}Si From ^{16}0 + ^{28}Si and ^{18}0 + ^{28}Si Elastic and Inelastic Scattering"	East Texas State University	Eck
1972	Tomak, Mehmet	"Theory of Extrinsic Electronic States in High Dielectric Semiconductors"	Turkey (teaching)	Folland
1972	Tubbs, Lloyd	"Strengths and Widths of Nitrous Oxide Infrared Absorption Bands"	Johns Hopkins Applied Physics Laboratory	Williams
1972	Bandekar, Jagdeesch	"A Monte Carlo Normal Coordinate Analysis Treatment of Intermolecular Vibrations in Liquid Water"	India	Curnutte
1973	Hartwig, Wolfram	"Survey of (^{12}C,α) Reactions on Several Targets and Investigations into Possible Direct Reactions in ^{11}B(^{12}C,α)^{19}F"	Rutgers University	Legg

VI. THESIS AND DISSERTATIONS TITLES

B. Doctoral Degrees (Con't.)

Year	Student	Dissertation Titles	Present Position	Major Professor
1973	Rahn, Larry	"The Raman Spectra of Some Imperfect Crystals of Silicon"	Sandia Laboratory	Hathaway
1973	Simonis, George	"The Raman Spectrum and Phase Transition in Sodium Axide"	Harry Diamond Army Research Laboratory	Hathaway
1973	Wenstrand, David	"The Effects of Departures from Local Thermodynamic Equilibrium on the Line Spectrum of A_p-Stars"	Johns Hopkins Applied Physics Laboratory	Evans
1974	Chiao, Tang	"Experimental Measurement of Electron Transfer Cross Sections for C, N, and F in Ar, Kr, Xe Gases at High Energies"	Texas A. and M. University	Macdonald
1974	Farmer, John	"X-Ray Induced Currents and Space Charge Buildup in MOS Capacitors"	Argonne National Laboratory	Lee
1974	Winters, Loren	"K X-Ray Production in Collisions of Chlorine and Sulfur Ions"	East Carolina State University	Macdonald
1975	Goldberg, Harvey	"Elastic Scattering Cross-Section of 40 100keV H and He Ions from Metallic Atoms"	Delaware University	Dale
1975	Golden, Jack	"Calculations of Ionization Using the Glauber Approximation"	Shell Oil Company, Houston	McGuire
1975	Kauffman, Robert	"High Resolution X-Ray Spectra of Ne"	Bell Telephone Laboratories	Richard
1975	Randall, Russel	"Impact Parameter Dependence of Inner-Shell Vacancy Production in Fast Ion-Atom Collisions	Dresser Atlas, Houston	Cocke
1975	Sethna, Prochy	"A Study of Ionic Conduction in Solvent Flims Absorbed on Insulating Substrates with Application to a Humidity Sensing Device"	K.S.U., Research Associate	Lee

VI. THESIS AND DISSERTATIONS TITLES

B. Doctoral Degrees (Con't.)

Year	Student	Dissertation Titles	Present Position	Major Professor
1975	Shane, Kendahl	"Energy Loss of Low-Energy Calcium Ions in Carbon"	Union Pacific Railroad	Seaman
~~1975~~	~~Winters, Loren~~	~~"K Vacancy Formation In Single~~ Collisions . . ."	~~East North Carolina~~ State University	~~Macdonald~~
1975	Woods, Clifford	"Auger Electron Production in Ion-Atom Collisions"	Los Alamos National Laboratories	Richard
1976	Guffy, James A.	"X-Ray Production Cross Sections for Bare and One-Electron Fluorine, Oxygen, Nitrogen, and Boron Projectiles Following Electron Capture in Helium in the Energy Range from 0.25 to 2.3 MeV/amu.		Macdonald
1977	Dreyer, Erich W.	Nuclear Spectroscopy of Low Lying Levels in ^{22}Ne by the ^{13}C(^{13}C,ay)^{22}Ne Reaction	West Germany	Legg
1977	Fox, Michael H.	Purification and Comparison of Alpha-Factor Isolated from Wild-Type and Mutant Strains of *Saccharomyces cerevisiae* (Yeast)	Post Doc Colorado State Univ.	Manney
1977	Phillips, Robert L.	Broad Resonance Structure in the Scattering of ^{15}N by ^{12}C	Yale University	Legg
1977	Shaw, Michael D.	Four Beam Anomalous X-ray Transmissions of CuKa X-rays in Elastically Bent Asymmetric Silicon Crystals	Pittsburg State Univ. Pittsburg, Kansas	Dragsdorf
1978	Jamison, Keith A.	Radiative Election Rearrangement and Polarization in Target KX-Ray Spectra.	Army Ballistics Res. Lab. Aberdeen, Md.	Richard
1978	Robert M. Habiger	A Study of Exciton Lifetimes in Cuprous Oxide Using Tunable Dye Lasers	Phillips Research Lab. Oklahoma	Compaan

B. Doctoral Degrees (Con't.)

YEAR	STUDENT	DISSERTATION TITLES	PRESENT POSITION	MAJOR PROFESSOR
1979	Hohly, Richard Walter	Development of basic problem solving skills in calculus based introductory physics	Kansas City, MO	Robert James Education Curnnute-Physics
1980	Charles Denton Marrs	Photoconductivity of Unirradiated Gamma-Irradiated, and Fast-Neutron-Irradiated Al_2O_3 & SiO_2	Naval Weapons Center China Lake, California	Lee
1980	Thomas W. Tunnell	Deexcitation of Multiply-Ionized Atoms	Kansas State University	Bhalla
1981	Hall, James M.	Systematics of Single and Double K-Shell Vacancy Production in Titanium Bombarded by Heavy Ions		Richard
1981	Simony, Paul R.	A Second Order Born Calculation for Charge Transfer		McGuire
1982	Justiniano, Edson L.	A Systematic Study of Charge Transfer in Collisions of Highly-Charged Low-Velocity Rare-Gas Ions with Rare Gases		Cocke

APPENDIX K

Post-Doctoral Students

1971 - 1981

APPENDIX K. POST-DOCTORAL STUDENTS

	NAME	RESEARCH AREA[1]	MENTOR	YEAR(S)
1.	Mohammed Ahmed	Atomic Physics (T)	Bhalla	1975-76
2.	Joseph Bednar	Atomic Physics (E)	Cocke	1973-74
3.	Richard Bird	Biophysics (E)	Manney	1971-74
4.	Douglas Crozier	Nuclear Physics (E)	Legg	1973-75
5.	Stephen Czuchlewski	Atomic Physics (E)	Macdonald	1973-75
6.	Harry Downing	Infrared Spectro-scopy (E)	Williams	1973-75
7.	Barney Doyle	Atomic Physics (E)	Richard	1976-77
8.	Stephen Ferguson	Atomic Physics (E)	Macdonald	1969-71
9.	Raymond Gardner	Atomic Physics (E)	Cocke	1976-78
10.	Forest Hopkins	Atomic Physics (E)	Richard	1972-73
11.	Helmut Laumer	Nuclear Physics (E)	Seaman	1971-73
12.	James Meade	Biophysics (E)	Manney	1978-79
13.	Kent Palmer	Infrared Spectroscopy (E)	Williams	1972-74
14.	Erik Pedersen	Atomic Physics (E)	Macdonald	1974
15.	Larry Pinkley	Infrared Spectroscopy	Williams	1974-77
16.	Charles Robertson	Infrared Spectroscopy(E)	Williams	1970-73
17.	Prochy Sethna	Infrared Spectroscopy(E)	Williams	1975-79
18.	Carl Schmiedekamp	Atomic Physics (E)	Richard	1976-78
19.	Tillman Saylor	Atomic Physics (E)	Curnutte	1977
20.	Ulrich Schiebel	Atomic Physics (E)	Macdonald	1976-77
21.	Siu Chung Soong	Atomic Physics (E)	Bhalla	1976-77
22.	Atilla Aydinli	Solid State (E)	Compaan	1980-
23.	Wolfgant Fritsch	Atomic Physics (T)	Lin	1979-80
24.	Siegbert Hagmann	Atomic Physics (E)	Macdonald	1978-80
25.	Tom W. Tunnell	Atomic Physics (T)	Lin	1980-
26.	Sankoorikal Varghese	Atomic Physics (E)	Cocke	1974-76
27.	Gary L. Webster	Atomic Physics (T)	Lin	1981-
28.	Horst Schmidt-Bocking	Atomic Physics (E)	Macdonald Richard	1979-80
29.	Michitaka Terasawa	Atomic Physics (E)	Richard	1978-79
30.	Kiyoshi Kawatsura	Atomic Physics (E)	Richard	1979-80

[1] A (T) implies Theoretical and an (E) implies Experimental.

APPENDIX M

Faculty Evaluation Guidelines

APPENDIX M

GUIDELINES FOR THE EVALUATION OF FACULTY DUTIES FOR MERIT PAY INCREASES

This document concerning guidelines for merit pay increases serves as a supplement to the "Guidelines for Tenure and Promotion, Department of Physics, 1971". Though the previously adopted guidelines do not address yearly evaluations for merit pay raises and thus make necessary this supplement, the present document is not intended to supplant or replace any of the previously adopted guidelines.

The duties of faculty members are generally divided into three major areas: (1) research, (2) teaching, and (3) service to the profession, the university, and the community. The ideal faculty member is expected to extend knowledge through his research, pass on knowledge to students through his teaching, and perform various services such as counseling students in their program of study and various administrative duties in the university and in his profession. However, very few human beings are ideal and most university professors do not perform all possible duties equally well. Therefore, in any evaluation of faculty performance a value judgment must be made about the relative merit of the various duties that the faculty have performed. These duties fall under the three traditional categories and their unique characteristics can be discussed separately as such.

I. RESEARCH

The discovery of new knowledge and the publication of this knowledge is a traditional role of any strong university. We believe that this function is vital to the Physics Department and, therefore, consider it a vital duty of the faculty of the Physics Department. As physics professors we shall always reserve to ourselves the right to judge the merit of various lines and methods of research. We are on record that health of the Physics Department. Also of importance are other services which are less often associated with the idea of service. Helping someone to solve a hard research problem, helping someone to get a difficult computer program running, and helping someone to a new and exciting way of presenting material to students are services that are gratefully accepted but often forgotten in the evaluation of duties.

A characteristic of service as a faculty duty is that it produces some benefits for the department and the university. Thus, before someone embarks on a program of service, it is imperative that the department head and the advisory committee should agree that this program of service is important to the department.

Outside monetary support is necessary to the maintenance of our departmental programs. Thus, faculty members are expected to work constructively to bring outside support to the department as an integral part of their research, teaching, and service duties.

In any consideration of these duties, it must be remembered that they are just that: duties of the university professor. The adequate performance of one of these duties alone over the course of years is no justification for expecting a substantial merit raise.

The department head in constant consultation with the advisory committee and periodic consultation with the department should decide the duties which are important to the department and make certain that every faculty member is aware of all of these duties being performed in the department. Further, the department head shall equitably apply these guidelines and those for tenure and promotion to any evaluation of faculty performance.

FACULTY EVALUATION PROCEDURE

Department of Physics

For the period December, 1974 to December, 1976

I. The Collection of Performance Information

Each faculty member is to be evaluated on the basis of information supplied by the faculty member, the faculty member's peers, and students. Peers in this document are considered to be persons holding tenure-earning appointments in the Department of Physics. The formal assembly of this information is to be done during the month of December by the department head. Each faculty member shall supply:

(1) Written evidence of accomplishments in research during the preceding year. This evidence must include an up-to-date vita and may include published papers, proposals, progress reports, or any other evidence indicative of research accomplishments during the past year.

(2) Written evidence of professional services within or outside of the department. To be pertinent to this evaluation procedure such services should in some way benefit the department or university.

(3) Summaries of the results of student evaluation of courses taught. Such evaluation reports are to be obtained using the Hoyt long or short evaluation form which should be administered no earlier than the 8th week and no later than the 15th week of the semester in which the course is being taught. The individual faculty member may append a personal interpretation of results of student evaluations. This evaluation is to be confidential so that student evaluation shall not unduly influence the peer evaluation of teaching performance.

(4) Information in support of teaching performance during the preceding year. This information is to be made available to the faculty of the Physics Department. This must include a collection of all examinations given in courses in which the faculty member had the responsibility of testing and assigning an overall grade

(over)

The department head or a faculty member may request a conference during which the report of the individual's evaluation is reviewed and discussed. The department head may not refuse such a request. In the event of serious disagreement between a faculty member and department head concerning a rating, the department head's advisory committee shall act as a review panel at the request of the faculty member.

The head of the department shall make a report to the faculty as a whole on the overall results of the evaluation process. The minimum information that is to be supplied in this report is the number of faculty members assigned to each category. The department head may choose to report special situations that will occur during the course of the next year.

III. Agreement of Personal Responsibility

Each faculty member shall supply the department head a written statement of personal responsibility for the subsequent calendar year. This statement should specify the effort that the individual desires to devote to teaching, research, and service during the next year. The department head shall, upon request by a faculty member, discuss and assist in the preparation of this statement. Upon review and acceptance by the department head, this statement becomes an agreement on the basis of which evaluation of an individual is to be made for the next calendar year. In the normal course of events, such agreements may be amended during the year with the mutual acceptance of the individual and the department head to take into account special circumstances.

IV. Confidentiality of Performance Evaluation Information

The performance evaluation information contains information which is confidential and other information which is to be available to the department faculty as a whole. It is important that it be clearly known in advance which

(over)

GUIDELINES FOR THE EVALUATION OF FACULTY DUTIES

FOR MERIT PAY INCREASES

This document concerning guidelines for merit pay increases serves as a supplement to the "Guidelines for Tenure and Promotion, Department of Physics, 1971". Though the previously adopted guidelines do not address yearly evaluations for merit pay raises and thus make necessary this supplement, the present document is not intended to supplant or replace any of the previously adopted guidelines.

The duties of faculty members are generally divided into three major areas: (1) research, (2) teaching, and (3) service to the profession, the university, and the community. The ideal faculty member is expected to extend knowledge through his research, pass on knowledge to students through his teaching, and perform various services such as counseling students in their program of study and various administrative duties in the university and in his profession. However, very few human beings are ideal and most university professors do not perform all possible duties equally well. Therefore, in any evaluation of faculty performance a value judgment must be made about the relative merit of the various duties that the faculty have performed. These duties fall under the three traditional categories and their unique characteristics can be discussed separately as such.

I. RESEARCH

The discovery of new knowledge and the publication of this knowledge is a traditional role of any strong university. We believe that this function is vital to the Physics Department and, therefore, consider it a vital duty of the faculty of the Physics Department. As physics professors we shall always reserve to ourselves the right to judge the merit of various lines and methods of research. We are on record that health of the Physics Department. Also of importance are other services which are less often associated with the idea of service. Helping someone to solve a hard research problem, helping someone to get a difficult computer program running, and helping someone to a new and exciting way of presenting material to students are services that are gratefully accepted but often forgotten in the evaluation of duties.

A characteristic of service as a faculty duty is that it produces some benefits for the department and the university. Thus, before someone embarks on a program of service, it is imperative that the department head and the advisory committee should agree that this program of service is important to the department.

Outside monetary support is necessary to the maintenance of our departmental programs. Thus, faculty members are expected to work constructively to bring outside support to the department as an integral part of their research, teaching, and service duties.

In any consideration of these duties, it must be remembered that they are just that: duties of the university professor. The adequate performance of one of these duties alone over the course of years is no justification for expecting a substantial merit raise.

The department head in constant consultation with the advisory committee and periodic consultation with the department should decide the duties which are important to the department and make certain that every faculty member is aware of all of these duties being performed in the department. Further, the department head shall equitably apply these guidelines and those for tenure and promotion to any evaluation of faculty performance.

APPENDIX M

RE-ENDORSED BY FACULTY VOTE: 1977 - Present

FACULTY EVALUATION PROCEDURE

Department of Physics

For the period December, 1974 to December, 1976

I. The Collection of Performance Information

Each faculty member is to be evaluated on the basis of information supplied by the faculty member, the faculty member's peers, and students. Peers in this document are considered to be persons holding tenure-earning appointments in the Department of Physics. The formal assembly of this information is to be done during the month of December by the department head. Each faculty member shall supply:

(1) Written evidence of accomplishments in research during the preceding year. This evidence must include an up-to-date vita and may include published papers, proposals, progress reports, or any other evidence indicative of research accomplishments during the past year.

(2) Written evidence of professional services within or outside of the department. To be pertinent to this evaluation procedure such services should in some way benefit the department or university.

(3) Summaries of the results of student evaluation of courses taught. Such evaluation reports are to be obtained using the Hoyt long or short evaluation form which should be administered no earlier than the 8th week and no later than the 15th week of the semester in which the course is being taught. The individual faculty member may append a personal interpretation of results of student evaluations. This evaluation is to be confidential so that student evaluation shall not unduly influence the peer evaluation of teaching performance.

(4) Information in support of teaching performance during the preceding year. This information is to be made available to the faculty of the Physics Department. This must include a collection of all examinations given in courses in which the faculty member had the responsibility of testing and assigning an overall grade

(over)

The department head or a faculty member may request a conference during which the report of the individual's evaluation is reviewed and discussed. The department head may not refuse such a request. In the event of serious disagreement between a faculty member and department head concerning a rating, the department head's advisory committee shall act as a review panel at the request of the faculty member.

The head of the department shall make a report to the faculty as a whole on the overall results of the evaluation process. The minimum information that is to be supplied in this report is the number of faculty members assigned to each category. The department head may choose to report special situations that will occur during the course of the next year.

III. Agreement of Personal Responsibility

Each faculty member shall supply the department head a written statement of personal responsibility for the subsequent calendar year. This statement should specify the effort that the individual desires to devote to teaching, research, and service during the next year. The department head shall, upon request by a faculty member, discuss and assist in the preparation of this statement. Upon review and acceptance by the department head, this statement becomes an agreement on the basis of which evaluation of an individual is to be made for the next calendar year. In the normal course of events, such agreements may be amended during the year with the mutual acceptance of the individual and the department head to take into account special circumstances.

IV. Confidentiality of Performance Evaluation Information

The performance evaluation information contains information which is confidential and other information which is to be available to the department faculty as a whole. It is important that it be clearly known in advance which

(over)

The written tenure policy of the faculty speaks to the type of faculty and program which has been and will be developed in the Department. The faculty passed a resolution on September 24, 1971, endorsing the most recent written statement on tenure.

GUIDELINES FOR TENURE AND PROMOTION

DEPARTMENT OF PHYSICS

The questions of tenure and promotion should encompass professional growth of the individual in the academic community as a whole as well as recognition by his professional colleagues and by his professional societies. The Department of Physics endorses the procedures and statements of the American Association of University Professors with respect to academic freedom and tenure.[1]

I. TENURE

A. The criterion for tenure is satisfactory progress toward promotion.

B. The procedural details of the tenure decision are the University regulations as indicated in the K.S.U. Faculty Handbook. The regulations follow the procedures recommended by the American Association of University Professors. A meeting of the tenured members of the faculty will be convened when necessary to discuss questions of tenure prior to a formal closed ballot.

II. PROMOTION

A. Promotion is based on consideration of a faculty member's activities in the areas of (1) research, (2) teaching and (3) service to the professional and university community. A faculty member should be competent in both research and teaching in order to achieve full development

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1. AAUP Policy Documents and Reports, 1971 Edition.

in the university environment.

B. *Each member of the faculty will have his progress toward promotion, increased remuneration, and tenure reviewed each year (Fall Semester) by the Department Head. The Department Head will consult individually with the Faculty for purposes of this review. The Department Head will meet with each non-tenured faculty member to discuss this review and to provide constructive suggestions for future activities.*

All other faculty members will have a similar opportunity for an interview with the Department Head to discuss their professional progress if they so desire.

C. *The promotion from Assistant to Associate Professor generally is based more on promise than on demonstrated distinction.*

1. *He should have demonstrated to the faculty that he has the potential to acquire a national reputation in some area of physics in his further progress and development. The quality of his work in physics should be reflected by his publications and grant proposals, and requests to serve national professional organizations.*
2. *He should be a competent teacher. He should be interested in and capable of teaching at more than one of the three levels of courses*[2] *offered by the department.*
3. *He should have worked effectively as an individual, with other faculty members and with students, for the Department and for the University.*

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2. The three levels are defined to be the lower undergraduate courses (100--399), upper undergraduate-graduate courses (400--599), and the graduate courses (600 and above).

4. *He should have worked constructively to bring outside support to the Department through his own research program, through proposals for improving the teaching program, through proposals for acquiring departmental research instruments or through other individual and collective efforts.*

D. *The promotion from Associate Professor to the rank of Professor is based on demonstrated distinction. The same considerations for promotion to the rank of Associate Professor apply to the promotion to the rank of Professor, with the substitution of the following Item 1.*

1. *He should have acquired a national reputation in some area of Physics.*

There is no formal program of orienting new faculty. However, the Department has initiated a G.T.A. Training Program. Ten new G.T.A.'s attended the first G.T.A. training course during the week of August 23, 1971. Incoming G.T.A.'s met for approximately four hours per day to familiarize themselves with experimental apparatus used in laboratory classes and to discuss aspects of effective teaching. Discussions centered around education objectives for laboratory teaching, quiz construction and evaluation techniques, grading, departmental procedures, and the social role of the instructor. Such discussions were conducted in an effort to familiarize the G.T.A. with the basic responsibilities assumed in laboratory teaching and to provide him with an initial foundation from which he could develop his individual style of teaching. At present the G.T.A.'s meet twice each month to continue discussions centered upon problems encountered in laboratory teaching. Projected plans include the development of computer assisted grading, the development of laboratory teaching evaluation forms, and the introduction of the Flanders system of interaction analysis.

APPENDIX N

Laboratory Teaching Assistant Training Course

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Orientation for the new teaching assistant— A laboratory based program

Jacqueline Spears*
Dean Zollman
Department of Physics
Kansas State University
Manhattan, Kansas 66506
(Received 15 January 1974; revised 30 April 1974)

A traditional part of the "education" of a physics graduate student is facing his first class as a teaching assistant. Unfortunately, the most the new teaching assistant learns from this encounter is how little he knows about teaching. The laboratory instructors orientation program at Kansas State University offers the instructors an opportunity to see some of the problems he will face and some methods for handling them before *he begins teaching. The program, which includes introductions to Transactional Analysis and Piaget's theory of intellectual development, is based on laboratory experiences undertaken by the new instructor before classes begin.*

INTRODUCTION

The new graduate teaching assistant (GTA) is placed in a rather strange position. In most cases, he or she has neither taught a class nor been exposed to the methods of teaching. His or her purpose in teaching may vary from providing financial support for graduate studies to gaining experience for an eventual career in college teaching. Regardless of the GTA's background or motivation he is charged with the responsibility of providing an educational experience for undergraduate students.

Commonly the new GTA becomes a laboratory instructor. As such, he plays a very significant role in the educational experience of the student. In particular, because of his close contact with students, the laboratory instructor can help shape many of the attitudes which students form not only toward physics but also toward science in general. In short, the GTA carries an important burden in undergraduate teaching. Traditionally, the GTA has been placed in this position with no training in the field of education.

When the new GTA encounters his first class, he remembers advice all of us have heard: "To be a good teacher, imitate good teachers you have had." So off he goes—trying to imitate his quantum mechanics teacher while teaching physics to French majors. This approach frequently fails. It can also result in the laboratory instructor defensively complaining about "dumb students" and students complaining about "instructors who cannot communicate."

The field of education has evolved learning theories and teaching strategies which place emphasis upon the *uniqueness* of students. Each student, because of past intellectual or emotional experiences, requires different types of classroom interaction. The gifted teacher realizes this and evolves many educational strategies as a result of being very sensitive to the interactions with his students. Most of us, however, profit from a formal exposure to a variety of teaching strategies and an understanding of individual differences in intellectual development. The teaching assistant has, in his undergraduate days, seen *one* particular approach to *one* particular student —himself. If he believes the folklore, he will assume that this approach is good for everyone. His success in the teaching experience will be greatly enhanced by the destruction of this myth.

The Teaching Assistant Orientation Program we have developed at Kansas State University attempts to challenge the well-known myths and, at the same time, prepare the new GTA for his first teaching assignment. The program is based on four basic concepts:

The teacher must meet the students where they are, intellectually and personally.

To teach one must understand how students learn.

Tools and concepts developed by educators can aid in the development of a personal teaching style.

"I didn't learn anything because the teacher always answered my questions."[1]

THE PROGRAM

New teaching assistants in the Department of Physics arrive in Manhattan, Kansas, one week before the beginning of classes. Thus, the main problem with any GTA orientation program is the lack of time. Too much information exists to be assimilated in only one week. Additionally the GTA has had little past experience with which to interpret the information presented. Since the program occurs when classes are not in session, the GTA is unable to see in action what he will be doing the following week. The Orientation Program was thus evolved with these real limitations in mind. The program is meant to provide a foundation from which the GTA can build a personal and flexible teaching style. The GTA is also given a manual which provides a vast number of resources to supplement the first week's experiences. (The Appendix presents more information on the manual.)

Table I contains the Orientation Program schedule used during the Fall semester, 1973. During the week the GTAs spend an average of three hours per day in the Orientation Program. The new teaching assistant meets his first class one week after orientation begins. Thus, we have maintained a small program which concentrates on the problems of teaching physics in the laboratory setting, rather than one of a more general nature designed for university-wide usage.[2]

The first session deals with the interaction of people. During the summer each new teaching assistant is sent a copy of *I'm OK, You're OK* by Thomas A. Harris[3] and asked to read this book before coming to campus. Teaching is dominantly an interaction between instructor and learner; transactional analysis provides a useful and simple model for understanding these interactions.[4] Some of the questions discussed include:

> Who assumes the parent role in a teaching situation?
> What makes a student feel NOT OK when he enters a physics class? As he works through the laboratory experiences?
> How can we use Transactional Analysis to improve communication with our students?

The inclusion of transactional analysis serves to encourage the teaching assistant to try to meet the students where they, the students, are.

At this point the teaching assistant usually begins to realize that, as an undergraduate, intellectually he may have been somewhat different from the average student he will meet. This concept is emphasized during the afternoon session as the current work in intellectual development is discussed. Most new graduate students are unfamiliar with the model of intellectual development of Piaget.[5] Once this model has been presented, the particular application to physics teaching is introduced in a discussion of Renner's findings.[6] These discussions underscore the importance of laboratories in the learning of physics. Of all the sessions during the week this one usually presents the new teaching assistant with the largest amount of new information. (Since we cannot expect anyone to assimulate this much information we include relevant material in the GTA orientation manual.) The discussion of both Piaget's model and Renner's experimental findings concerning college students emphasizes the necessity, in teaching, of understanding how students learn and of being flexible in interacting with individual students.

Table I. The orientation program for the fall semester, 1973.

Day	Time	Topic
Monday	10:30–12:00	Transactional Analysis
	1:30–3:30	Intellectual Development
Tuesday	9:30–10:30	Models of Instruction
	10:30–12:00	Experiment I
	Homework: Write up experiment and prepare quiz	
Wednesday	9:30–10:30	Discussion of Exp. I
	10:30–12:00	Experiment II
	Homework: Same as Tuesday	
Thursday	9:30–10:30	Discussion of Exp. II
	10:30–12:00	Experiment III
	Homework: Same as Tuesday	
Friday	9:30–10:30	Discussion of Exp. III Evaluation of Teaching Rules, regulations, mechanics of teaching

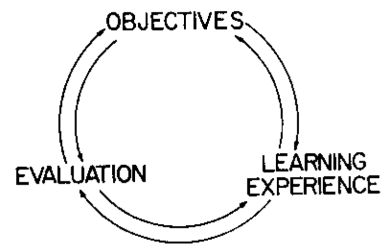

Fig. 1. A model of instruction showing the relation between the three aspects of education.

With the background material on personal interaction and intellectual development, we are ready to focus on the particulars of instruction.

The third session deals with the presentation and discussion of a model for instruction as shown in Fig. 1. This model presents a convenient structure for analyzing classroom difficulties. The meanings and interrelationships of objectives, learning experiences and evaluations are presented in the first session. The remaining three days' activities are centered around the application of this structure in the laboratory experiments.

The teaching assistants perform three laboratory experiments utilizing these different instructional strategies. The first experiment consists of a write-up containing thirty numbered steps to be completed by the student. It thus represents the strategy popularly known as "cook book" experiments. The second experiment is taken from an inquiry-based laboratory and presents the student few, if any, concrete instructions. The third experiment utilizes a strategy between the extremes of inquiry and cook-book experimentation, and is most similar to the particular strategy provided in most undergraduate laboratories at Kansas State University. This approach attempts to offer the student some freedom in designing his own experiment, but not so much freedom that he becomes frustrated by lack of direction. Thus, the laboratory write-ups focus on questions to be answered and means to answer them with the equipment available rather than detailed instructions of exactly what to do and when to do it. The emphasis of the experiments and amount of instruction depends on the level of the course and the background of the students.[7]

For each of the three experiments the teaching assistants are asked to prepare a report written in the same way as they will require their students to write it and to construct a quiz to evaluate the students' understanding of the experiment. The various strategies are discussed within the context of the model of instruction in order to clarify the three aspects of instruction (objectives, learning experiences, and evaluation) as well as to contrast the three strategies of instruction. Some of the questions discussed include:

> How do you *feel* when you are provided explicit instructions? No instructions?
> What can you expect students to learn from the experiments?

Table II. GTAs were asked: "How did the Orientation Program help you accomplish each of the following?" [Scale: 1 (extremely detrimental) to 5 (extremely helpful].

Function	Mean value of responses
Present introductions to experiments	3.4
Answer questions during the performance of experiment.	3.8
Prepare quizzes.	3.5
Grade laboratory experiments.	4.1
Grade quizzes.	3.2
Evaluate laboratory experiments as to their clarity, effectiveness and usefulness to the student.	3.7
Evaluate the students' total performance at the conclusion of the semester.	3.5
Assist in formation of overall objectives of the laboratory session.	4.1
Evaluate my own teaching.	4.1
Establish methods I used in teaching the laboratory.	4.0
Understand the Physics Department's teaching methods.	4.3
Establish a personal philosophy of teaching.	3.7
Understand the Physics Department's philosophy of teaching.	4.3
Understand the attitudes of students enrolled in the laboratories.	3.9
Understand the background of students enrolled in the laboratories.	3.9
Interact with the students.	3.6
Understand my attitude toward students	3.7

Do your expectations change if the strategy is different?

How did you write your laboratory report? Why did you write it in that manner? Were there differences among the teaching assistants?

Does your quiz test the objectives of the experiment?

Does your quiz require knowledge obtained from sources outside the laboratory? Are the quizzes different for the different strategies?

The discussion of these and other questions focuses attention upon the degree of interrelationship between the learning experience (strategy), objectives, and testing (evaluation).

Discussions following the experiments help the teaching assistants see what they are expecting from students and why. We discuss how the nature of the learning experience is changed by the strategy employed as well as by the personal response of the instructor to student questions. These sessions address themselves to the last two concepts presented in the introduction.

The program concludes with a discussion of the techniques of self-evaluation in teaching and the fundamental administrative mechanics of teaching at a university. All teaching assistants are required to use an instructor evaluation form developed for laboratory teaching as a method of obtaining student feedback.[8] The contributions and limitations of student feedback are discussed within a structure of encouraging continual self-evaluation in teaching. A copy of the evaluation form is provided to each teaching assistant.

During the semester follow-ups have been handled primarily on a one-to-one basis. We discuss individual problems with laboratory instructors frequently. However, group meetings have been limited to one or two per semester. Since the GTAs become involved with different types of students, sessions for each of the four introductory courses seem best. Unfortunately, such meetings are difficult to schedule, but we hope to begin them on a regular basis next year.

EVALUATION OF THE PROGRAM

Over the last three years the program has evolved into the one described above. While changes are still being made, the format has become relatively stable. Initial evaluation of the program has been limited to feedback from the teaching assistants themselves. A questionnaire was administered to sixteen teaching assistants who participated in the orientation program during the Fall semester 1973. The questionnaire was administered twice—at the end of the orientation program (before classes had begun) and again at the end of the Fall semester. Since these two evaluations gave very similar results, only the latter is presented.

The first section of the evaluation asks the teaching assistant to independently rate the contribution made by the orientation program to the various objectives. Reproduced in Table II are the mean values of the ratings the GTAs gave each of seventeen aspects. Significantly, all of the aspects received average values of greater than three. These results indicate that the program seems to have been somewhat helpful to all aspects of laboratory teaching.

The second part of the questionnaire asked the teaching assistants to comparatively rank the contribution of the orientation program to each of the various objectives. The results are summarized in Table III. The variances on these rankings are reasonably large, thus small differences in means are not significant. However, an overall pattern does seem to be present. The rankings seem to be highest on aspects related to the broad understanding of students, the GTA himself, and methods of teaching. The mechanics of day-to-day teaching were ranked at the other end of the spectrum. Since laboratory teaching is primarily a one-to-one interaction between instructor and student, these rankings indicate that our program is heading in the right direction.

Finally, in the third section we asked the GTAs to tell us if we spent too little or too much time on any one aspect of the program. The results of this section are pre-

Table III. GTAs were asked to rank the following from 1 (gain most from) to 10 (gained least from the orientation program).

Portion of orientation program	Mean value
Understand students	4.1
Establish methods and/or philosophy	4.2
Understand my attitudes	4.7
Evaluate experiments	4.8
Evaluate teaching	5.4
Evaluate students	5.6
Present introductions	5.8
Grade quizzes and experiments	6.2
Answer questions	6.3
Prepare quizzes	7.9

Table IV. GTAs were asked to rank the amount of time spent in the orientation program on each of the following items as: 1 (too little); 2 (just right); 3 (too much).

Portion of Orientation Program	Mean Value
Performing Experiments	2.3
Discussing teaching methods	1.6
Discussing procedures	1.9
Discussing goals and objectives	1.8
Discussing evaluation	1.3
Discussion interaction of people	2.3
Discussing intellectual development of students	1.9
Preparing and evaluating lab reports	1.4
Preparing and evaluating quizzes	2.2

sented in Table IV. The mean responses are around 2.0 with the exception of the area of evaluation. Here we seem to have hit the middle ground rather well.

CONCLUSIONS

The GTA Orientation Program was undertaken for the purpose of providing the new teaching assistant information and direction *before he begins* his teaching experience.[9] Because of the limitations of a graduate program in an academic discipline and the variety of motivations for becoming a teaching assistant, our program was not designed to fulfill the specific objectives of a teacher training program.[10] Evaluation has thus been initially limited to measuring the degree to which the orientation program makes contributions useful to the new teaching assistant. The results indicate that our program is making positive contributions and appears useful to the teaching assistant, especially in the area of personal interaction.

The program described here can be considered a model for use by other graduate departments. Major emphasis is placed upon teaching as a personal interaction among individuals, and thus attempts to sensitize teaching assistants to their experiences with students. By placing the emphasis upon human interaction rather than subject matter competency, the program in effect broadens the new teaching assistant's view of teaching. This approach is particularly useful for teaching assistants involved in a laboratory setting, as teacher-student interaction is frequently on a one-to-one basis.

Piaget's model of intellectual development and the model of instruction (Fig. 1) can also be utilized in any academic discipline. Both are exceptionally good structures from which to present the various components of teaching relevant to the actual classroom experience. Experience during the past three years has indicated, however, that these structures are most successfully introduced within the subject matter familiar to the teaching assistant. The vast majority of teaching assistants are unfamiliar with educational theory and, as Piaget would suggest, require concrete experiences with the concepts presented. In our particular case the laboratory experiments served as the vehicle by which the model of instruction could be concretely presented. Other types of activities could undoubtedly serve a similar purpose.

The ultimate evaluation of the orientation program, of course, is in its effect upon the quality of instruction provided to the students. Because of the pragmatic approach taken in evolving the present program the impact of its existence on the student has not been ascertained. Such evaluation will probably be undertaken as the program is expanded to incorporate video taping, course credit for the orientation, and in-service meetings. While we cannot ascertain the impact of the present program on the undergraduate students, we do know that during the past three years the increase of enrollment in introductory physics laboratories has far exceeded the increase of enrollment at the University. This observation combined with the response by teaching assistants who have participated in the program have encouraged us to continue in our efforts to provide a teaching assistant orientation program.

ACKNOWLEDGMENTS

The program would not have evolved without the support and comments from the teaching assistants involved. Support from the Department of Physics faculty, particularly C. E. Hathaway, has been extremely valuable.

APPENDIX

The GTA Orientation Manual contains a number of papers on various aspects of physics teaching as well as some material which pertains to the local facilities.

In the annotated table of contents below the material in Secs. 1–6 present reference materials for the discussions held during the orientation program. The Appendices offer other useful information to the laboratory instructor. For completeness, material related to local facilities has been retained.

Sec. 1. Introduction
The role of a teaching assistant at Kansas State is described.

Sec. 2. Communication and Interaction
An introduction to Transactional Analysis as it applies to physics teaching is presented. Much of this material is taken from Fuller and Sims.[4] The section concludes with "How to Lose Friends and Alienate Students" based on material in McKeachie.[11]

Sec. 3. Intellectual Development of Students
The model of Piaget is presented. Emphasis is placed on its application to college physics teaching and the studies of Renner and his co-workers.[6]

Sec. 4. A Model for Instruction
Examples of various components of the model of instruction are given. Their application to physics teaching is discussed.

Sec. 5. What Is The Science Laboratory?
Several definitions of the science laboratory are presented. McKeachie,[11] Nedelsky,[12] Rogers[13] and the National Education Association Department of Science Education (1905) are quoted.

Sec. 6. Experiments
Instructions for each of the three experiments are reproduced exactly as they would be presented to the students. No other material about the experiments is given in the manual.

Appendix 1: The First Day
A check list of activities a teacher needs to do on the first day of class is presented.

Appendix 2: "It's Your Laboratory" by Eric M. Rogers.[13]
Rogers discusses some ideas about laboratory teaching.

Appendix 3: "The Physics Activities Center"[14]
The Kansas State Physics Activities Center is described.

Appendix 4: Film Loop List
The Super-8mm film loops available at Kansas State are cataloged.

Appendix 5: PHSLABGD
This computer program offers a method of keeping grade records for each lab student.[15]

Appendix 6: Laboratory Evaluation
The instructor evaluation used at the end of each semester is reproduced.[8]

*Present address: Department of Physics, Southwest Missouri State University, Springfield, MO.

[1] This comment was made by a student in our introductory physical science course.

[2] A recent review of university-wide programs appears in Stockdale and Wachok, Sci. Ed. **57,** 353 (1973).

[3] Thomas A. Harris, *I'm OK, You're OK,* Harper and Row, New York, 1967). Available in paperback from Avon Books, New York.

[4] See for example: R. G. Fuller and W. L. Sims, Phys. Teach. **12,** 217 (1974), and C. Johnson and James Cramer, "The OK Classroom," Instructor (May 1973).

[5] See for example: Jean Piaget, J. Res. Sci. Teach. **2,** 176 (1964) and Refs. 6.

[6] J. Renner and A. Lawson, Phys. Teach. **11,** 65, 273 (1973); J. Renner and J. McKinnon, Am. J. Phys. **39,** 1047 (1971).

[7] Courses for non-science students, pre-professional students and science and engineering students are offered. Further details about any of these labs can be provided by the authors.

[8] J.D. Spears, D. A. Zollman, and C. E. Hathaway, AAPT Announcer **3,** 23 (1973).

[9] A program which is conducted during the first semester of teaching is described in L. D. Muhlstein, B. DeFacio and Am. J. Phys., **42,** 384 (1974).

[10] Abstracts of different approaches appear in J. Coll. Sci. Teach. **3,** 100 (1973). A description of a program to prepare graduate students for careers as college physics teachers is presented in F. B. Stumpf, Am. J. Phys. **39,** 1223 (1971).

[11] Wilbert J. McKeachie, *Teaching Tips: A Guidebook for the Beginning College Teacher* (D. C. Heath, Lexington, MA. 1969)

[12] Leo Nedelshy, *Science Teaching and Testing,* (Harcourt, Brace and World, New York, 1965).

[13] Eric M. Rogers "It's Your Laboratory" in *Proceedings of the Northwestern University Conference on the Training of College Physics Laboratory Assistants,* edited by C. J. Overbeck (Northwestern University, Evanston, IL, 1954).

[14] Dean Zollman, Phys. Teach. **12,** 213 (1974).

[15] Written by Fred Zutavern.