

**Program Review**  
Marshall University  
May 2006

Date: \_\_\_\_\_ 10/30/2006 \_\_\_\_\_

Program: \_\_\_\_\_ B. S. in Physics \_\_\_\_\_  
Degree and Title

Date of Last Review: \_\_ 11/02 \_\_\_\_\_

**Recommendation**

Marshall University is obligated to recommend continuance or discontinuance of a program and to provide a brief rationale for the recommendation.

Recommendation

Code(#):

1. Continuation of the program at the current level of activity; or
2. Continuation of the program with **corrective action**: Corrective action will apply to programs that have deficiencies that the program itself can address and correct. **Progress report due by November 1 next academic year**; or
3. Identification of the program for **resource development**: Resource development will apply to already viable programs that require additional resources from the Administration to help achieve their full potential. This designation is considered an investment in a viable program as opposed to addressing issues of a weak program. **Progress report due by November 1 next academic year**; or
4. Continuation of the program at the current level of activity, with the designation as a program of excellence (See Series 11 Statement from the Policy Commission); or
5. Discontinuation of the program (Procedures outlined in HEPC Administrative Bulletin 23).

**Rationale for Recommendation:** (Deans, please submit the rationale as a separate document. Beyond the College level, any office that disagrees with the previous recommendation must submit a separate rationale and append it to this document with appropriate signature.)

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Recommendation: Signature of person preparing the report: \_\_\_\_\_ Date: \_\_\_\_\_

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Recommendation: Signature of Program Chair: \_\_\_\_\_ Date: \_\_\_\_\_

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Recommendation: Signature of Academic Dean: \_\_\_\_\_ Date: \_\_\_\_\_

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Recommendation: Signature of Chair, Academic Planning Committee: (Baccalaureate pgms only) \_\_\_\_\_ Date: \_\_\_\_\_

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Recommendation: Signature of President, Faculty Senate/ Chair, Graduate Council: \_\_\_\_\_ Date: \_\_\_\_\_

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Recommendation: Signature of the Provost and Senior Vice President for Academic Affairs: \_\_\_\_\_ Date: \_\_\_\_\_

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Recommendation: Signature of the President: \_\_\_\_\_ Date: \_\_\_\_\_

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Recommendation: Signature of Chair, Board of Governors: \_\_\_\_\_ Date: \_\_\_\_\_

# College/School Dean's Recommendation

Deans, please indicate your recommendation and submit the rationale.

**Recommendation:** Code(#):

1. Continuation of the program at the current level of activity

## **Rationale:**

(If you recommend a program for further development identify all areas for specific development; if you recommend a program as a *program of excellence* address all criteria listed in HEPC Series 11)

Physics Departments across the country tend produce a number of graduates that is comparatively small as compared to other disciplines. The reason may be the very demanding mathematics background required and the rigor of the coursework. A smaller segment of the incoming freshmen are drawn to this very demanding field. Nationally, Physics departments who offer the BS but no graduate program graduate approximately four students per year with about 50% of the departments producing approximately 3 per year, the same number produced by Marshall University during the reporting period. The MU graduates do very well in obtaining suitable jobs or admission to prestigious graduate schools, a tribute to the quality of education experienced.

Although the PHY department has a relatively small number of majors, approximately 30, as compared to other science departments it serves a large, exceedingly important, and varied role in providing service course work for BSC majors, CHM majors, other departments in COS, pre-professional health care students, students seeking teaching degrees, and students in Communication Disorders. In addition PHY provides course work including ISC classes that support the general education program for non-science majors. Approximately 60% of the enrollment in PHY is not PHY majors. They represent students whose major or professional school admission pre-requisites require a substantial PHY background. Thus, Physics is a cornerstone in the foundation of many curricula and programs that could not exist without foundation PHY courses.

The Physics Department suffers from one problem that is shared among all COS departments. Because HERF funding was decreased precipitously three years ago the funding has not returned to the 2003 levels. Although lab fees, the other major source of funding, still exists and stress has been placed on this source of funding to help compensate for inadequate HERF funding. As a result, aging equipment has been difficult to replace. For example, a multi year programs has been implemented to replace WW II vintage, 1948 model, oscilloscopes. There are many other examples of aging equipment that needs replacing but for which funding is limiting. The decrease in HERF funding particularly impacts the growing research effort by the Physics Department. It would be improper to cover faculty travel with lab fee dollars, thus the department is powerless to allow adequate travel to scientific meetings where research productivity can be shared. Thus, MU Physics professors are working at a competitive disadvantage when compared to professors at other institutions who are able to share their research with the scientific community and who vie for the same source of grant money. Inevitably, lowered funding will take a toll on the productivity of the Physics Department if the decreased funding in an environment of continued inflation exists progress will be

slowed. The same quality of learning experience cannot be sustained without additional funding to compensate for recent budget cuts.

Signature of the Dean:

\_\_\_\_\_ Date: \_\_\_\_\_

### III. Program Statement for the Physics B.S. Marshall University

The specific goal of the Physics B.S. program is to prepare the graduate to enter graduate school in physics or engineering, medical school or other health profession programs, or to obtain direct employment in government or industrial laboratories or other technically related fields. Physics is the most basic, rigorous and quantitative of the natural sciences. Its concepts underlie all the other physical sciences, including chemistry and all engineering disciplines. This program provides students with a firm grounding in the mathematical and logical reasoning needed in all the physical sciences. The analytical and abstract reasoning skills developed by the students can be used in many different fields other than physics (medicine, law, computer science, engineering, technical sales, etc.) The student must take advanced laboratory courses and must also demonstrate computer skills at a level sufficient to employ programming to numerically solve differential equations as well as an ability to interface scientific instruments for data acquisition and analysis.

This program is one of only five baccalaureate physics programs in the entire state, and according to the most recently available data<sup>1</sup>, has more undergraduate physics majors than any other West Virginia public institution of higher education (including West Virginia University, but our number of physics graduates is less than WVU) during the academic year 2005-2006. Unique characteristics of our program include the ability for students to engage in faculty-mentored research projects in our faculty's federally funded research facilities. We also teach a sampling of courses that emphasize some medical applications of physics.

#### A. Adequacy:

##### 1. Curriculum (see Appendix I)

Our BS program is the traditional program designed for students with high mathematics skills and an interest in research who will likely continue their studies at a graduate school earning an M.S. and probably a Ph.D. in physics or a related area of science. As the mission of the Department of Physics and Physical Science is to provide to our majors grounding in the core subfields of our discipline, and to prepare them for graduate study, our curriculum consists of background core and the advanced physics courses. The background courses of classical mechanics, quantum mechanics, electricity and magnetism, is still viewed as an essential foundation to the understanding of specialized topics within physics. The core courses of physics require a firm foundation in calculus and differential equations. New areas of research are addressed as special applications of material taught in intermediate and advanced courses and are sometimes the focus of advanced seminar-style courses. We also develop new advanced laboratory exercises to explore recent developments in physics.

The curriculum in physics provides a natural structure for the B.S. physics major: a broad exposure to many topics in PHYS 211/213 in the first year, concentration on mechanics and the phenomenology of general modern physics (PHY 320 and PHY421) in the second year, and core courses in electricity and magnetism (PHY 300-302), advanced classical mechanics (PHY 330), and quantum mechanics (PHY 442) in the junior and senior years. For upper-level electives we offer courses in mathematical physics (PHY 445), statistical and thermal physics (PHY308), optics (PHY 304), electronics (PHY 314), biomedical physics (PHY 350), nuclear physics (PHY 462) and other special topic courses.

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<sup>1</sup> AIP Pub. Number R-151.41, August 2006. [online] URL: <http://www.aip.org/statistics/trends/reports/physrostd.pdf>

The physics major must complete all College of Science general requirements. The students must complete the calculus sequence in mathematics and must also take Ordinary Differential Equations (MTH 335) as well as 35 semester hours of required course work in the major and at least ten additional semester hours of 300-400 level physics courses including two advanced laboratory courses. The requirements for the B.S. in Physics are consistent with those of many colleges or university in the United States. We are making changes to enhance it so that it could be more consistent with the curriculum of major colleges. Our faculty are considering the benefits of having physics majors begin freshman year (instead of sophomore year) with PHY211-PHY213 and, provided sufficient faculty are available, to offer each required course on a yearly (instead of the current once-every-two-years) basis.

For introductory courses it is very important to enhance the conceptual understanding of the subject, so at Marshall we have been part of a national trend to utilize interactive engagement (IE) methods into the large, predominantly lecture-format introductory courses. For instance, our faculty utilize both *Workshop Physics* and *Peer Instruction* - both well-known IE methods in the physics community. .

### *Workshop Physics*

Major revisions to the General Physics (PHY 201 through 204) curriculum began with the help of an internal Instructional Technology grant awarded in 1996 and a follow up grant in 1997. First, the General Physics Lab (PHY202) in S100 was converted from a traditional lab to a microcomputer-based lab (MBL) in the Fall of 1997. The lab has eight lab stations, each equipped with a computer, interface box with sensors and the apparatus needed for experiments in all areas of introductory physics. The discovery-based laboratory curriculum first used was adapted from “Real Time Physics” and “Tools for Scientific Thinking” but has since been revised a number of times in Spring 2002. Results of a nationwide standard *Force Concept Inventory* (FCI)<sup>2</sup> evaluation test, given to one hundred and fifty students in eight lab sections before and after MBL instruction, demonstrated a dramatic improvement of conceptual understanding. Accordingly, after the laboratory was upgraded for computer-based data acquisition, one section of the PHY201 lecture (normally held in S277) was converted into a *Workshop Physics* laboratory environment.

*Workshop Physics* is a laboratory-centered approach that replaces the traditional instructional format of three hours of lecture, PHY 201/203, and two hours of lab, PHY 202/204, in favor of an activity based, computer-enhanced workshop that meets in the S100 laboratory three times a week. *Workshop Physics* was described in the December 1991 “Physics Today”, the July/August 1991 “Change: The Magazine of Higher Learning” and in a Sheila Tobias’s 1992 book “Revitalizing Undergraduate Education”. *Workshop Physics* was first offered at Marshall in the Fall of 1997. As expected, the course has been proven to be effective in teaching important concepts and gives all students extensive experience in using computers for collecting and analyzing data. *Workshop Physics* provides the Physics Department with an important alternative to the traditional passive-student lecture method of instruction. Work with this course is ongoing as activities and course materials are continuously revised and improved.

### Peer Instruction/Personal Response System and Mastering Physics

We also make use of another well-known IE method at Marshall, the so-called *Peer Instruction* (PI)<sup>3</sup>, in conjunction with the *Personal Response System* (PRS). PI is a variation of the

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<sup>2</sup> D. Hestenes, M. Wells, and G. Swackhamer, “Force Concept Inventory”, *Physics Teacher* **30**, 141 (1992).

<sup>3</sup> Eric Mazur (1997). *Peer Instruction: A User’s Manual 1/e*. Upper Saddle River, NJ 07458: Prentice Hall.

Socratic Method that has been adapted by Mazur to the modern classroom. Since first implementing *PI* at Harvard in 1991, Mazur *et al.* have reported<sup>4</sup> progressively higher normalized student gains in conceptual understanding (as measured by the FCI), as well as the highest value (0.74) ever reported (in 1997) for the normalized student gain. Instructors have tried the method in a variety of academic settings: high schools, community colleges, and large and small state schools. All have reported improvements in student performance and understanding. *P/PRSI* was first implemented at Marshall for the calculus-based introductory physics course, PHY211-213, during the 2000-2001 academic year. This required installing a PC-controlled overhead projection system in S277 with an internal grant from the COS Dean's office and distributing to the students handheld infrared communication devices – the *Personal Response System* (“clickers”). With *PI/PRS*, students are encouraged to critically think through the arguments being developed, to discuss their ideas and insights with their neighbors and to report their responses to a lectern-mounted receiver that collects *PRS* student responses and displays them in a bar-chart. The *PRS* software records each student response for grading/attendance purposes as well. The *PI/PRS* thereby provides the instructor with a continuous assessment of the student’s basic understanding. The ease with which *PI/PRS* is implemented and adapted to a variety of settings is responsible for the widespread adoption of *PI* by physics instructors around the country. Students in PHY211 now enjoy the *PI/PRS* technique and frequently request using it if the instructor overlooks it for that particular lecture. In conjunction with *PI/PRS*, we also make extensive use in PHY211-213 of *MasteringPhysics*, originally software developed at MIT under NSF-funding called *CyberTutor*, that provides an excellent online homework system including with guided tutorials and feedback. Wilson has made a number of presentations on this technique to the Marshall community.

In spring 2006, we began offering a new course of Solid State Physics for our senior students to prepare them for advanced study and research after they graduate. The trial was a success and the students enjoyed many benefits from the course. In spring 2005, we also have offered a new special topics course, "Introduction to *LabView*", hoping to attract more majors to the program and to provide important skills in acquiring and analyzing data from instrumentation commonly found in industry and the research laboratory.

We are also planning in making some substantial curriculum change in a near future to give our students better background in all subfields of physics.

## 2. Faculty (See Appendix II)

All seven full-time faculty have earned doctoral degrees with specific training and expertise appropriate to their teaching areas. The diversity of training among the faculty is a strength and was planned. The experience of the faculty amounts to a shared total of 140 years of college teaching experience. There are six tenured professors and one tenure-track assistant professor. We have also used 3 temporary instructors and one full time temporary professor in the period of this report

With regard to professional activities, our faculty have been active in research and publish regularly in professional journals and provide information through interviews to local news stations. We also regularly attend workshops, short courses, regional and international meetings. In the last five years, our faculty have published more than 30 papers in professional journals and

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<sup>4</sup> Catherine H. Crouch and Eric Mazur, “Peer Instruction: Eight Years of Experience and Results”, submitted to the American Journal of Physics, [Online] URL: <http://mazor-www.harvard.edu/education/pi.html>; R.R. Hake, “Interactive-engagement methods in introductory mechanics courses”, [Online] URL: <http://www.physics.indiana.edu/~sdi/> and submitted on 6/19/98 to the “Physics Education Research Supplement to AJP” (PERS).

conference proceedings, presented works in 20+ conferences and meetings. Our faculty have also been authors of book chapters, book coauthors and editors and have provided consultation for various Law firms. Our faculty are also very active in pursuing federal funding for research. Since AY2001-2002 our faculty have received more than \$784,076 in federally funded research grants as a result of submitting eighteen external grant applications as noted in Appendix VIII (generating \$119,283 in indirect cost recovery funds for the university). Just recently, Professor Thomas Wilson has received a National Science Foundation Electrical and Communications Systems award of \$239,896 for his proposal on “Coherent Acoustic Phonon Generation and Development of Terahertz Cryogenic Acoustic Microscope”. A part of these research grants has been used to support undergraduate research and graduate student research during the years inclusive to this report.

During the past years, we have made considerable effort at providing professional opportunities for our students and our faculty. Some examples:

(1) In Fall 2003 two Dr. Wilson’s students have presented their works at the 2003 Fall Meeting of the Ohio Section of the APS (CWRU, Cleveland, OH).

(2) Summer of 2005, Dr. Wilson supervised a student on a research project in his laboratory through the Marshall REU program.

(3) In 2005 Dr. Vaseashta presented his research at the International Symposium on Nanotechnology in Environmental Protection and Pollution in Bangkok, Thailand; First International Workshop on Semiconductor Nanocrystals in Budapest, Hungary; Functional Properties of Nanostructured Materials Conference, Bulgaria; and the 2005 NSTI Nanotechnology Conference and Trade Show; APS March 2005, CA.

(4) Drs. Orsini and Wilson organized and chaperoned a 2-day field trip for approximately a dozen of our majors to the Wright-Patterson Air Force Base to visit the research laboratories of two former MU physics graduates who are employed as senior scientists there. Everyone also attended the spring meeting of the Ohio Section of the American Physical Society held in Dayton, OH. Dr. Wilson presented a paper on his research results. The students expenses were covered by departmental and college of science funds.

(5) Summer 2006, Dr. Huong Nguyen supervised a student to work on a research project on hybrid exciton in quantum dot through the Marshall SURE research program

(6) Fall 2005, the entire department, both faculty and students, organized and participated in a very successful "2005 Year of Physics Marshall University Open House" (a world-wide centennial event honoring the contributions of Albert Einstein during the 'miracle year' of 1905). Dr. Orsini presented a paper on “General Theory of Relativity and the Geometry of Spacetime”. The department hosted over one hundred middle and secondary school students that in addition to tours of the research facilities included hands-on activities in our teaching laboratories. Dr. Wilson received a grant from the American Physical Society to bring in Dr. Stroud, a distinguished laser physicist for two days of activities for the festival that included a lecture to the COS faculty and students, an evening public lecture at the JC Edwards Playhouse (that included a well-received optical “teleportation” illusion which was arranged by Drs. Orsini and Wilson), a round-table discussion about graduate school with our majors, as well as a brief talk on the importance of laser optics at the Open House kickoff.

Dr. Stroud is Professor of Optics and Professor of Physics, and the Director of the Center for Quantum Information at the University of Rochester (NY), Fellow of both the Optical Society of America and the American Physical Society. Dr. Stroud has lectured in more than 75 different universities, held several lectureships, and from 1998-2005, has been a Distinguished Traveling Lecturer for the Division of Laser Science of the APS. His wide-ranging research interests include the creation of exotic, high-angular momentum, electronic orbitals in atoms, quantum entanglement and the teleportation of quantum information, and optical approaches to developing quantum computers and quantum cryptography.

(7) Spring 2006, Dr. Oberly chaperoned a group of physics majors to the Physics Department at the Ohio State University.

(8) Spring 2004, Drs. Orsini and Oberly organized a trip for the Society of Physics Students (SPS) at Marshall University to go to Green Bank, WV. The students used a 40 foot radio telescope to collect data to study the rotation of our galaxy. The students expenses were covered by departmental funds.

(9) In the summer of 2006, Dr. Huong Nguyen presented her research works in for Europe community at *III Joint European Magnetic Symposia, JEMS' 06*, San Sebastien, Spain and in *International Symposium on Structure-Property Relationships in Solid State Materials*, Bordeaux, France. She also presented her work at the APS March Meeting, Baltimore 2006.

On average, our staff (full-time and temporary) collectively teaches 180 credit hours per academic year, more than 60% of which is associated with low-level service courses. We have also made extensive use of part-time and temporary instructors during the past five years - an average of 18% over the last three years (See Appendix VII).

A comparison of course evaluations over the past five years for full-time and part-time faculty in the Department of Physics and Physical Science, shows that part-time faculty (including sabbatical replacements) accrue an average score of only 50%, versus a score of 66% for full-time faculty, regarding the excellence of the instructor. There have been some exceptions in which a temporary faculty has received excellent scores comparable to full time faculty.

In the last five year we have had a change in our faculty. One of our senior professors retired and we hired a new tenure-track faculty, professor Huong Nguyen, who is a theorist working on quantum dot and low dimensional systems. We believe Dr. Huong Nguyen will add much needed strength to our upper-level physics offerings as well as the research component for our students. She is actively doing research in hot topics of nanophysics and of condensed matter theory in general and has an impressive publication record.

In the future, we expect more changes among our faculty. One of our most senior professors, Dr. Bellis, has announced that he will retire at the end of this academic year 2006-2007. We recently placed an advertisement to hire a new faculty. Dr. Bellis has been teaching a full load of twelve credit hours per semester. We expect our new faculty teaching only half load to have another half of their time for doing research. So in order to replace Dr. Bellis actually we need two new faculty instead of one. Additionally, Dr. Seiji Takemae, who has been our full-time temporary faculty for the last four years, is planning on leaving us. Dr. Takemae had also been teaching a full load of twelve credit hours per semester. To replace Dr. Takemae, we would need two new faculty for the same reason. Totally, we would need four new tenure-track faculty. So far, we have only



permission to hire one faculty but we still need three more. We ask that administrative to give us permission to hire three additional tenure-track faculty, this would bring the number of tenure and tenure-track faculty to ten. Alternatively, we could hire a full-time lecturer to replace Dr. Takemae. The lecturer would teach full time, thus we would need one additional tenure track faculty and one lecturer.

The increase in the tenure-track faculty would benefit not only our students but also our Department. About 60% of our duty consists in teaching service courses. In order for faculty to be productive and successful in research and assist student in Capstone projects, release time must be granted. It is very difficult for us to find qualified part-time instructors to teach physics. This makes instruction more problematic.

### **3. Students:**

#### a. Entrance standards:

Physics majors traditionally have been gifted with an outstanding academic ability that is concomitant with the requirements for the successful completion of a rigorous program with a highly mathematical base. The introductory physics course for majors requires the student to be taking at least the second semester calculus course concurrently and the junior level physics courses require completion of the calculus sequence and at least concurrent enrollment in differential equations. Physics majors must also have at least an average grade of “C” in calculus.

#### b. Entrance abilities:

The physics majors’ ACT scores for this period ranged from 19.0 to 27 with an average of 24.3. The average for all MU majors during the same period is 20.2. The average of the secondary school GPA for physics majors during the same period was 3.70; the GPA average for all MU majors was 3.2.

#### c. Exit abilities:

We have been implementing exit exams for our graduates. However it has been difficult for us to get all of our graduates to take the exam, and those who do, do not take it seriously. Are taking steps to encourage and push students to consider the exam as a serious matter. See Section 5 below.

### **4. Resources:**

#### a. Financial:

Our budget consists of HERF and Lab fee money. From academic year 1997/98 through academic year 2001/02 the average yearly budget was \$45,244. The past five years the average was only \$42,490. Thus over the past five years we received a decrease of \$2,754 per academic year. This department has a very large service course function and devotes more than 90% of its financial resources to the lower division service courses. It is essential that our budget be increased. When we consider inflation, our equipment buying power has gone down significantly. The reduction is causing our labs to become below standard. Broken equipment cannot be replaced, thus affecting our ability to provide an adequate service for the College of Science students as a whole.

The departmental budget is shown in Appendix IX.

b. Facilities:

The department moved back into the renovated Science Building in 1990. The renovated facilities are, in general, excellent. We are looking to improve S277 to provide an access to the storage area for the demonstration apparatus for the introductory physics courses held in S277. S277 itself is now already computerized and designed for *Peer Instruction* and is convenient for lectures. The upper division laboratories are equipped with good storage facilities and are well lit. Rooms S100 and S103 now are used for Physics undergrad lab classes.

Teaching laboratory equipment is not adequate at the upper division level. The astronomy and nuclear physics courses need additional equipment and storage area.

In the year 2001, the Chemistry Department required lab space to house their newly acquired NMR (Nuclear Magnetic Resonance). In a verbal agreement between the chairmen of the Chemistry and Physics and Physical Science Departments and the previous dean of the College of Science, Joe Bragin, the NMR was housed in lab space assigned to the Physics Department. In return for the lost space, the radiation storage area located in the basement of the COS was to be returned to the Physics Department. The agreement was never upheld. The reason given by Dr. Bragin was the extensive cost needed to decommission the radiation storage area for human occupancy.

The department needs more lab space in order to expand its research capability. We therefore are requesting that the radiation storage area be decommissioned and be returned to our department. The radiation storage area can be relocated in the new Biotechnical Science Building.

**5. Assessment Information:**

a. Criteria for assessment of student performance and program quality:

We began implementing an assessment examination for our majors during the 2002-2003 academic year. We use the Major Field Test in Physics (MFTP), which is available at cost from the Educational Testing Service. The Major Field Test program is an innovative battery of undergraduate outcomes tests that is used by schools and departments at more than 600 colleges and universities globally to measure student academic achievement and growth, and assesses the level of comprehension and problem-solving skills in all of the core subfields in physics. The content of the Major Field Tests reflects the basic knowledge and understanding gained in the core undergraduate curriculum. The tests are two-hour, multiple-choice examinations designed to assess mastery of concepts and principles as well as knowledge expected of students at the conclusion of a major in specific subject areas. They go beyond measurement of factual knowledge, however, because they also evaluate students' ability to analyze and solve problems, understand relationships, and interpret material.

b. Assessment Data to Improve Program Quality

This is the fourth year we have been implementing an exit exam required for graduating seniors. The national benchmark we have selected to use is the Educational Testing Service "Major Field Test in Physics II". It now is available online offering the advantages of immediate scoring

and reports. The results are presented in the Tables 1 and 2 below. MFTP percentile scores (both individual and group) are relative to nationwide averages. We have had some notable successes, but the results for 2006 were disappointing. We believe the main reason for poor results in 2006 was that our students did not review for the test or take it seriously. Changes are being made to help motivate our students to study for the tests.

**Table 1: Results for ETS Major Field Test in Physics**

Student #	Year MFT Physics Taken	Percentile of Students Nationwide Scoring <b>Lower</b> for this “ <u>Total Physics Score</u> ” Category	Percentile for “ <u>Introductory Physics Topics</u> ” Category	Percentile for “ <u>Advanced Physics Topics</u> ” Category
1	2003	5%	30%	1%
2	2003	90%	95%	85%
3	2004	55%	40%	60%
4	2004	5%	42%	5%
5	2004	55%	42%	95%
6	2005	55%	60%	40%
7	2006	1%	1%	25%
8	2006	10%	25%	5%
9	2006	25%	1%	70%
10	2006	5%	1%	60%
11	2006	10%	1%	25%
Total Averages:	2003-2006	Mean: 29% SD: 30%	Mean: 31% SD:30%	Mean:43% SD:33%

**Table 2: 2006 ETS Major Field Test in Physics Assessment Indicator (only available when more than 4 students sit for the exam during a given year)**

2006 MFT Physics Assessment Indicator Number (Report only available when more than 5 students to take the test)	Assessment Indicator Title	Percentile of Students Nationwide Scoring <b>Lower</b>
1	Classical Mechanics and Relativity	5%
2	Electromagnetism	1%
3	Optics/Waves and Thermodynamics	1%
4	Quantum Mechanics and Atomic Physics	25%
5	Special Topics	20%

The department has tried to develop a full post-assessment procedure with graduates of the program; from some that have responded to our form letters we can conclude that our graduate has been very successful in employment and in graduate schools.

c. Graduate and Employer Satisfaction:

Although we have no formal database, we informally are collectively aware that our graduates have achieved acceptance into graduate programs at major universities including University of California at Berkeley, California Technology Institute, Carnegie Mellon University, MIT, Michigan University, University of North Carolina, Ohio State University, John Hopkins University, University of Kentucky, Dayton, University of California at Irvine, WVU, Virginia, Virginia Technical University, South Carolina University, University of Cincinnati, Kansas State University, and Colorado University.

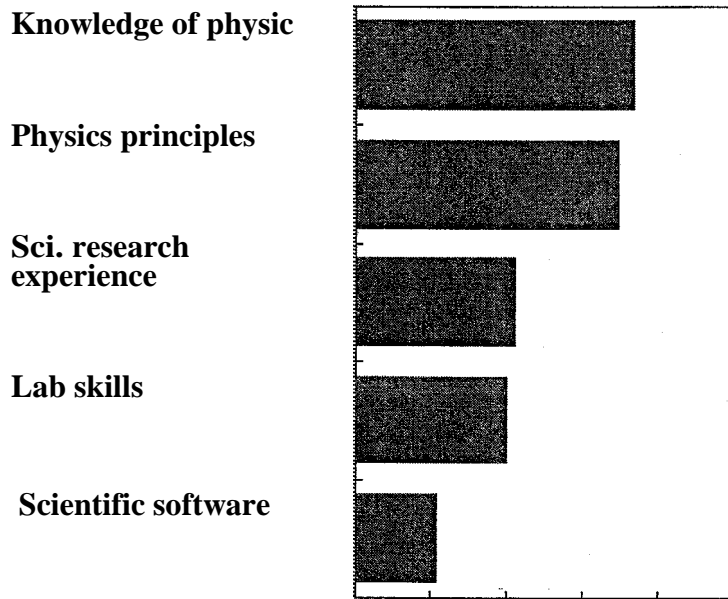
An AIP chart<sup>5</sup> below illustrates the self-reporting of United States BS-physics graduate's degree of satisfaction with their education

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<sup>5</sup> [Online] <http://www.aip.org/statistics/trends/highlite/bachplus5/figure5.htm>

**Figure 5. Ratings of physics bachelors' education by those who are employed in Engineering, Math, or Science.**



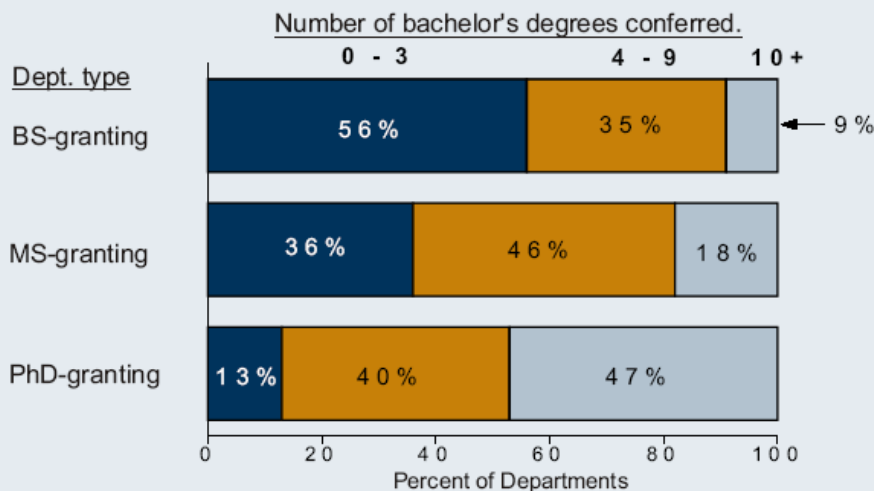
### **6. Previous Reviews:**

From the last review, the Committee is concerned over the low number of graduates in recent years. In addition to the viability issue, the Committee expressed concern over the low level of professional development activities of some faculty.

The numbers of physics graduates in this period is still low, but it is a nationwide problem. Our five-year average is 3.8 graduates per year; larger than the last period (3.6). National average (as described below) for BS-only granting institutions is 4.1.

We have also made substantial progress in the professional development activities of our faculty: over this period our faculty have more than 30 papers published in professional journal and conference proceeding and more than 20 presentations at professional meetings. Our faculty are authors and co-authors of books and book chapters, have invited talks and key-note lectures in national and international meetings. Our faculty has also been successful at garnering external research grants and has successfully included students in research.

Figure 3. Number of physics bachelor's by highest physics degree offered, class of 2004.  
7%



AIP Statistical Research Center, Enrollments and Degrees Report.

Table 4. Size of physics bachelor's class by type of department, class of 2004.

Department Type	Degrees per Department	
	Average	Median
Bachelor's-granting	4.1	3
Master's-granting	5.6	5
PhD-granting	14.0	9

AIP Statistical Research Center, Enrollments and Degrees Report.

Departments with graduate programs, specifically those that offer the PhD as their highest physics degree, still remain home to the largest undergraduate programs in the country (see Figure 3). These departments produced on average about 14 physics bachelor's degrees in the class of 2004. Only about 13% of these departments conferred 3 or fewer degrees. This contrasts greatly with degree production at departments where the bachelor's is the highest physics degree offered. These averaged only 4 degrees per department, with more than half of the departments conferring 3 or fewer degrees (see Table 2). Still, taken together, undergraduate-only departments made a large contribution to the number of overall physics bachelor's produced, 43% in the class of 2004.

## 7.Strengths/Weaknesses:

### A. Strength.

The faculty are well-trained, all with earned doctorates and very experienced. The small size of the faculty and the program has allowed the students to interact regularly with the faculty, which the students view as a very positive feature. The friendliness nature of the department and close relationship between faculty and students make students feel comfortable and motivated to study.

As noted above, with regards to the two expressed concerns of the previous Review Committee, we can say with confidence that our faculty have made impressive strides to become more research active (Appendices II and VIII), and that we are producing BS graduates at a rate higher than the previous period, and exceeding the rate of physics graduate by more than 50% of the only BS-granting institutions.

The faculty are also strongly committed to physics education<sup>6</sup>. We can also award up to \$4000 per year in scholarships to worthy physics students through donations provided by the Callahan and the Manakill families.

Finally, the newly renovated classrooms and teaching laboratories are a definite strength.

### B. Weaknesses

Our budget needs to be increased. When we comparing the program review filed five years ago with this one, we find a decrease in the yearly budget of about \$2800. Over the same period we show an average increase in the number of students of about 20 per year. When we take into account an inflation rate of about 24%, we need an increase in the budget by about 25% to just keep pace. We are currently improving the research component of our faculty. We also have been hiring new faculty who are experts in new and updated specialties. However, we still lack expertise in some other areas of physics. As we move to the future we will be looking to hire new faculty with diverse specialties.

Our current staffing level is less than adequate to meet the increased demands of supervising student research and Capstone projects. Also, with the existing number of faculty the teaching load is too excessive, thus reducing the productivity of our faculty in research.

Laboratory space needs to be increased. If a new hire is an experimentalist he/she will require lab space which we do not have. I have requested space now occupied by the radiation lab in the basement of the COS. That space was to be returned to the physics department in 2001, but money was never found to decommission it in order to be suitable for human occupancy.

### C. Viability:

#### 1. Off-campus classes (See Appendix III)

The department occasionally has taught off-campus classes primarily to serve the need to certify in-service high school teachers in physics –although none have been taught during the past five years.

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<sup>6</sup> With regards to the primary school science teacher preparation, in a memo dated August 20, 2002, from Professor Tony Williams, Interim Dean of CEHS to Dr. Orsini, said, “Allow me to commend your department on the high quality of the faculty who teach PS 109 and 110 and on the level of instruction that our students receive. We appreciate that your Ph.D. professors teach the physical science classes that go into our teacher preparation program...”

It is difficult to offer laboratory-based survey courses off-campus.

2. Service Courses: (See Appendix IV with attached graphs)

The department has an exceedingly large service course function, devoting more than 90% of its funds and 60% of its time, to the low-level service courses, including those taught outside the department. Only about 40% of the Student Credit Hour production at the undergraduate level is for upper division courses.

3. Articulation Agreements:

There are no program specific articulation agreements with other institutions for delivery of this program.

4. Upper Division Courses: (See Appendix)

Occasionally one-half of the total enrollments in upper-division classes will be non-majors. This has been especially true in PHY 350, which is taken mostly by pre-medicine majors to prepare for the MCAT exam. Upper division courses are also taken by in-service teachers to improve their physics content understanding.

5. Enrollments: (See Appendix VI)

The number of majors at Marshall has been small but stable for more than a decade. Over the past five years, Marshall has averaged 3.8 BS degrees per year (Appendix VI).

6. Enrollment Projections:

The same AIP Report on **Enrollment and Degrees** reports a 36% increase in undergraduate physics majors nationwide for the year 2004 compared to the year 1999.

*D. Necessity:*

1. Graduates

Although we are only aware of the employment/career situation of our graduates informally, we tabulate some information as follows:

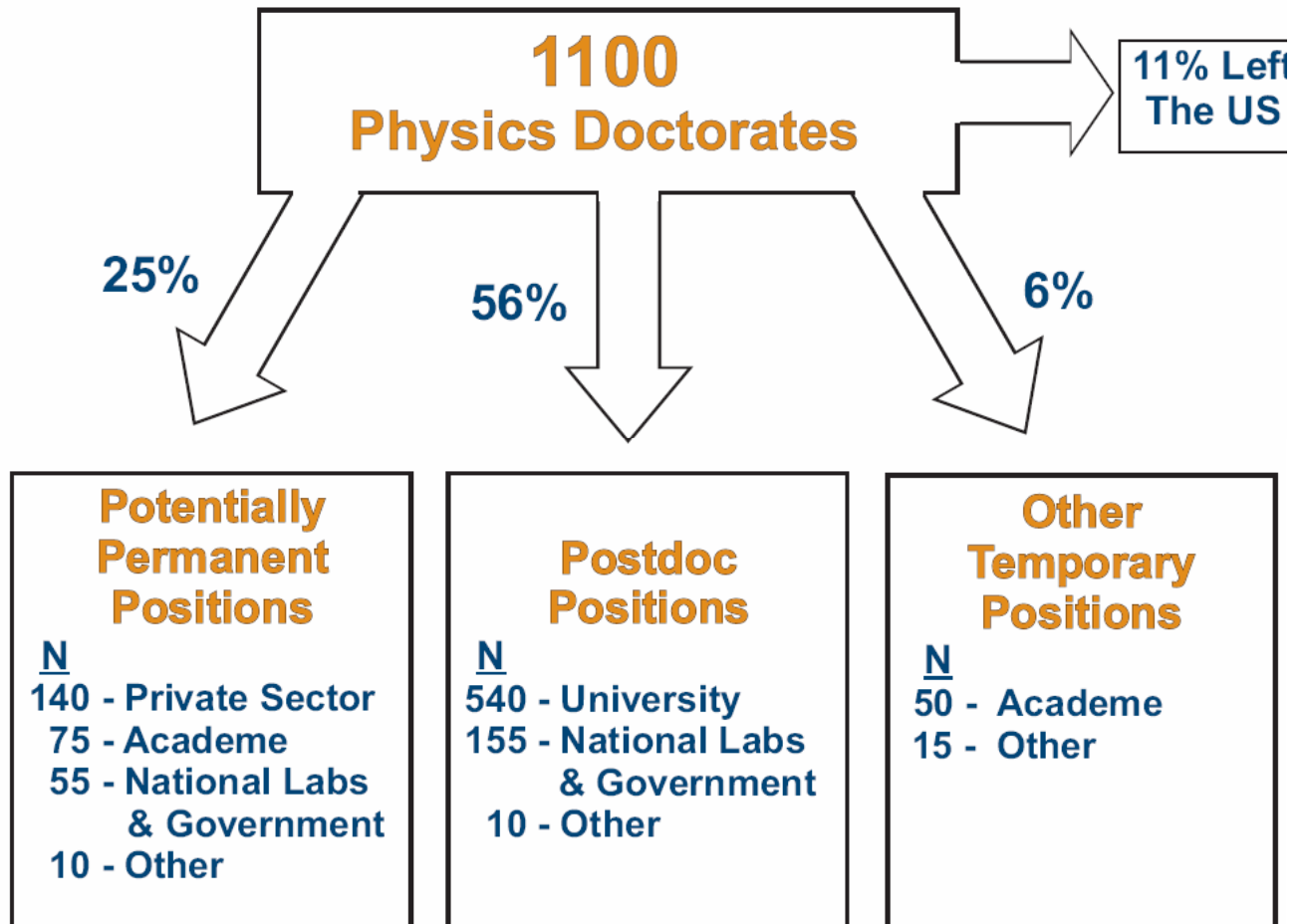
Graduating Year	Employment Situation
2002 (5)	Student #1- Graduate School of Cal Tech Student #2- Graduate School of U. Dayton Student #3- Lab Technician, MU Student #4- Researcher, Paterson AFB
2003 (3)	Student #1-Environmentalist, OVEC Student #2-Graduate School, U. Kentucky Student #3- Graduate School-MU
2004 (2)	Student #1- Graduate School, U. Kentucky
2005 (1)	Student #1-English teacher in Korea
2006 (5)	Student #1- Medical School MU Student #2- Graduate School, MU Student #3- Palmer Chiropractic



## 2. Job Placement:

Historically, BS physics graduates pursue the Ph.D. According to AIP data, five to eight years after graduating, only about one-third of people who earned bachelor's degrees in physics do not have any additional degrees. An AIP report indicates a steady improvement in job prospects for recent Ph.D.s since the early 1990s (data in the table and following bulleted paragraph comes from the AIP website- [www.aip.org/statistics/trends/highlite/emp00/emphigh.htm](http://www.aip.org/statistics/trends/highlite/emp00/emphigh.htm)) :

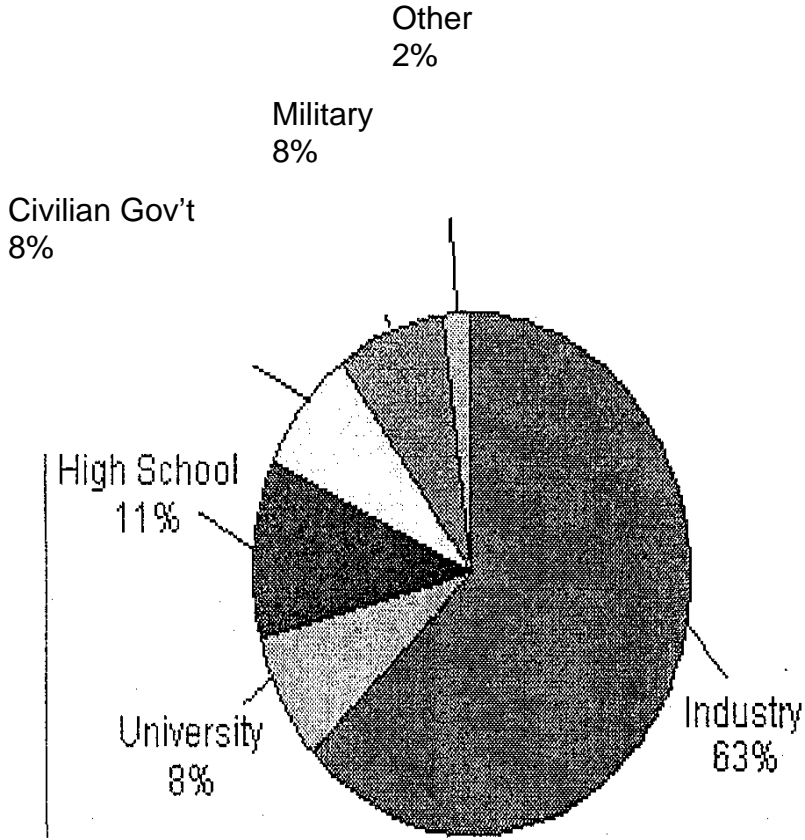
# Physics PhDs 1 Year Later



2% of the PhDs were unemployed the winter after they received their degree.  
Academe includes universities, 4-year and 2-year colleges.

Source: AIP Initial Employment Survey - Classes of 2002 and 2003.

**Employer distribution for full-time US  
Employed physics bachelors, class of 2000.**



a. Similar Programs:

There are no similar programs within a 50-mile radius of the campus. The program at Marshall University is one of only five B.S. physics degree programs in West Virginia. Our program serves primarily students from southern West Virginia. The B.S. physics program, the Physics 9-12 Teaching Specialization, and the M.S. in Physical Science degree are three parallel programs that use the same space, equipment, and faculty. Elimination of anyone of the three would negatively affect the other programs. Two of the three provide teacher training in an area of critical shortage for the state of West Virginia as well as the nearby areas in Kentucky and Ohio.

3. Consistency with Mission:

The undergraduate program and courses in physics and physical science has two major goals:

- To train scientists in research and applied areas,
- To train technical support personnel for industries,

The Physics B.S. program is consistent with the mission statement of Marshall University. Physics is the most conceptually- and mathematically- challenging of all of the natural sciences; physics is also the natural science in which the laws of nature are given a firm and fundamental foundation. It is consistent with the goals of the institution to maintain and enhance basic academic programs. The program is intimately connected with the other science programs and is central to the institution's mission, as well as that of the College of Science. A thriving physics program will be also conducive to the health of the recently proposed accredited baccalaureate engineering degree - engineering students are required to pass a calculus-based survey course.

Undergraduate education is Marshall University's first priority, but more recently a new emphasis on scholarly research is occurring as well. The existence of a quality physics program is a necessary foundation for the other natural and applied sciences as well as the increasing number of technical programs found at Marshall.

:

Thomas E Wilson  
 1218 9<sup>th</sup> Street, Huntington, WV 25701  
 (304) 696-2752 (O) (304) 697-5804 (H)  
 wilson@marshall.edu

EDUCATION

- Indiana University, Bloomington, IN*  
**Ph.D. in Physics** **1984**  
 Dissertation: "Dynamics of Nonequilibrium Broadband Phonon Distributions", Thesis Advisor: Professor  
 Walter E. Bron
  
- University of Hawaii, Honolulu, HI*  
**M.S. in Physics** **1976**
  
- University of Evansville, Evansville, IN*  
**B.A. in Physics and Mathematics - summa cum laude** **1974**

AWARDS

- National Science Foundation/ENG/ECS/GOALI award \$239,896: "Coherent acoustic phonon generation and development of terahertz cryogenic acoustic microscope" **2006-2009**

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- Charles E Hedrick Outstanding Faculty Award, Marshall University **2002-2003**
- Research Fellow, Max-Planck Institute au CNRS, Grenoble, France **2001-2002**
- Army Research Office research award DAAD19-01-1-0466, "Resonant Acoustic Phonon Generation in Doping Superlattices by Pulsed FIR Laser", Cost of performance \$462,437. (Sole Principal Investigator). **2001-2005**
- Marshall University Research Corporation 'Sponsored Teaching, Research and Service' Award. **1998**
- Army Research Office research award DAAHO4-96- 1-0401, "Coherent high-frequency acoustic phonon generation in silicon doping superlattices by pulsed millimeter-wave laser radiation", Cost of performance \$366,185. (Sole Principal Investigator). **1996-1999**
- Department of Energy, Strategic Defense Initiative's New and Innovative Concepts Program research award DE-AC-03-875F17, "A compact high-power FIR wave with three-mirror pump CO2 cavity and semiconductor-switched cavity-dumping", Award amount: \$145,317. (Sole Principal Investigator). **1987-1990**
- National Science Foundation "Small Grant for Exploratory Research" from the Quantum Electronics, Waves and Beams Program. Project Title: "A Novel Design for a Cavity-Dumped Millimeter-Wave Laser". Grant Award ECS-9013408. Award Amount \$18,305. (Sole Principal Investigator) **1990-1991**
- NASA West Virginia Space Grant Consortium Special Project Award, "Development of Introductory Physics Java Applets for Distance-Learning". Award amount: \$3,000. (Sole Principal Investigator). **1998-1999**
- West Virginia Technology Advantage Program, "Interactive Distance-Learning Classroom", Award amount \$79,961. (Co-PI along with Profs. Al-Haddad, Norton, McCarthy, and Tesser (project director)) **1996**
- NSF Research Opportunity Award. Work performed at the Free Electron Laser Facility/Quantum Institute at UC-Santa Barbara by invitation of Dr. Vincent Jaccarino. Investigated threshold energy density for optically switching far-infrared radiation. \$3,000. **1987**
- NSF Research Opportunity Award. Work performed at the laboratory of Professor Walter E. Bron at UC-Irvine. Preliminary experiments for the design and construction of cavity-dumped, optically pumped FIR laser. \$3,000. **1986**
- Outstanding Graduate Student Teaching Award, Indiana University **1980-1981**

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## TEACHING EXPERIENCE

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*Marshall University, Huntington, WV*

**Associate and Full Professor** – “Principles of Physics (Calculus-based introductory course)”, “General Physics (algebra-based introductory course)”, “Physics for Poets (survey course for the non-science major)”, “Introductory Laboratory (for above introductory courses)”, “Classical Mechanics”, “Mathematical Methods of Physics”, “Quantum Mechanics”, and “Thermodynamics” **1994-2005**  
Developed syllabi and overall course structure, and administered all grades. Implemented *Peer Instruction with the Personal Response System* (audience-paced electronic feedback system) from 2003 to present – presented numerous invited seminars on the topic both at Marshall and at WV Technology conferences. Developed large database of online problem sets for *WebCT* from Ohanian’s *Physics*

*Connecticut College, New London, CT*

**Assistant Professor** – “Principles of Physics”, “Introduction to the Laboratory”, “Solid State Physics”, and “Electronics” **1986-1992**  
Developed syllabi and overall course structure, and administered all grades.

*Indiana University, Bloomington, IN*

**Teaching Assistant** – to Professor Richard Hake in “Introduction to the Laboratory” **1977-1980**  
Collaborated on curriculum and laboratory development, met with students during office hours and upon request, graded all laboratory reports.

*University of Hawaii, Honolulu, HI*

**Teaching Assistant** – to Professor Burton Henke in “Introduction to the Laboratory” **1974-1976**  
Collaborated on curriculum and laboratory development, met with students during office hours and upon request, graded all laboratory reports.

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## RELATED EXPERIENCE

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*Submillimeter Technology Laboratory, University of Massachusetts at Lowell Research Foundation, Lowell, MA*

**Senior Laser Scientist** **1992 - 1994**  
Developed pulse millimeter-wave laser source for scale-model radar imaging.

*Intel Corporation, Aloha, OR*

**Senior Process Engineer** **1984 - 1985**  
Developed spin-on anti-reflection coating process for aluminum metallization layer for 256K dynamic memory in FAB5 semiconductor fabrication facility

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## PUBLICATIONS AND CONFERENCE PAPERS

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- TE Wilson, “Fabrication and characterization of granular aluminum / palladium bilayer microbolometer”, submitted to *Meas. Sci. Tech.* 9.27.06
  - Thomas E Wilson, “Considerations for developing a terahertz cryogenic acoustic reflection microscope with sub-nanometer resolution”, withdrawn for future submission, *Journal Acoustical Society of America*
  - Mark Uslan, Darren Burton, Thomas Wilson, “Accessibility of Home Blood Pressure Monitors for Blind and Visually Impaired People”, submitted (August 2006) to *Diabetes and Technology and Therapeutics*.
  - Thomas E Wilson, “Progress towards terahertz acoustic phonon generation in silicon doping superlattices”, SPIE *OpticsEast* International Conference, Boston, MA October 2005.
  - Invited paper, Thomas E Wilson, “Considerations for developing a terahertz cryogenic acoustic reflection microscope with sub-nanometer resolution”, Army Research Office Special Workshop “Terahertz Deep Subwavelength Spectroscopic Imaging”, Atlanta, GA, June 2005.
  - Mark Uslan, T.E. Wilson et al., “Improving Small Screen Visual Displays”, *Vision2005 Conference*,
-

Royal National Institute for the Blind, London, England, April 4-7, 2005.

- Thomas E Wilson, "Modeling the high-speed switching of far-infrared radiation by photoionization in a semiconductor", *Physical Review B* **59** (20), 12996 (1999).
- Thomas E Wilson and Theron Trout, physics simulations written as Java applets (3.7 and 9.10) to an electronic (CD-ROM) supplement to *Contemporary College Physics 3/e* by Jones and Childers (McGraw-Hill 1999)
- E.J. Mueller, T.E. Wilson, J.Waldman, J.T. Kennedy and R.A. Hart, "Generation of High Repetition Rate Far-Infrared Laser Pulses", *Applied Physics Letters* **64** (25), 3383 (1994).
- T.E. Wilson, "A High-Power NH<sub>3</sub> Laser Pumped in a Three-Mirror CO<sub>2</sub> Laser Cavity with Optically-Switched Cavity-Dumping", *International Journal of Infrared and Millimeter Waves* **14** (2), 303 (1993).
- Invited paper, T.E. Wilson, "A High-Power Far-Infrared NH<sub>3</sub> Laser Pumped in a Three-Mirror CO<sub>2</sub> Laser Cavity with Optically-Switched Cavity-Dumping", in Proceedings of the 14th International Conference on Lasers '91, (San Diego, CA 9-13 Dec 1991) edited by F.J. Duarte, D.G. Harris, (STS Press, McLean, VA, 1992) pp. 762-768.
- T.E. Wilson, "A compact high power FIR laser with three-mirror pump CO<sub>2</sub> cavity and semiconductor-switched cavity-dumper", U.S. Department of Energy Strategic Defense Initiative's *New and Innovative Concepts Program* conference held July 1989 San Francisco, CA. Summary Report edited by Robert LeChevalier (TPI Inc., Falls Church, VA October 1989).
- T.E. Wilson, "A High-Power Millimeter Wave 13CH<sub>3</sub>F Laser Pumped in a Three-Mirror CO<sub>2</sub> Laser Cavity with Optically-Switched Cavity-Dumping", in Proceedings of the Thirteenth International Conference on Infrared and Millimeter Waves (Honolulu, HI 5-9 Dec 1988), edited by Richard J. Temkin (SPIE, Volume 1039, Bellingham, WA)
- T.E. Wilson, "A Proposal for the Direct Electromagnetic Generation of Coherent Terahertz Acoustic Phonons in Semiconductor Superlattices at the UCSB Far-Infrared FEL Facility", *Journal of the Optical Society of America* **B6**, 1058 (1989).
- T.E. Wilson, F.M. Lurie, W.E. Bron, "Quasidiffusive Transport of a Broadband Phonon Distribution", *Physical Review B* **30**, 6103 (1984).
- T.E. Wilson, W.L. Schaich, "A Calculation of Non-Local Phonon Heat Transfer", *Solid State Communications* **50**, 3 (1984).
- T.E. Wilson, W.E. Bron, F.M. Lurie, and W.L. Schaich "Heater Film Dynamics, Phonon Diffusion and Phonon Decay", Proceedings of the Fourth International Conference of Phonon Scattering in Condensed Matter (August 22-26, 1983 in Stuttgart, Germany) Springer Series in Solid-State Sciences 51, p. 34. Editors: W. Eisenmenger, K. Lassmann, and S. Dottinger (Springer-Verlag, New York, 1984).

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#### PAPERS (STUDENT CO-AUTHORS) PRESENTED AT REGIONAL APS CONFERENCES

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- Thomas E. Wilson, "Fabrication of Granular Aluminum Transition-Edge Microbolometer – Solving the Contact Resistance Problem", presented at the 2005 Spring Meeting of the Ohio Section of the APS (April 7-8, University of Dayton, OH). Abstract found at <http://meetings.aps.org/Meeting/OSS05/Event/31828>.
  - Thomas E. Wilson, "LabView Program for Deconvolution of Nanosecond Heat Pulses" (student author Quan Yuan), and "ABCD Matrix Methods in Physical Optics" (student author Adicus Garton) papers C4.007 and C5.10 respectively, presented at the 2003 Fall Meeting of the Ohio Section of the APS (CWRU, Cleveland, OH). Abstracts linked from: <http://www.aps.org/meet/OSF03/baps/aiiW.html>
  - Thomas E. Wilson, "Creating Advanced-Mathematics WebCT Quiz Questions", *WVNet2000* Conference, November 13, 2000 (Morgantown, WV)
  - Thomas E. Wilson, "Ultrashort-pulsed millimeter-wave laser", paper D.02 presented at the 2000 Fall Meeting of the Ohio Section of the APS (U.Toledo, OH). Abstract at: <http://www.aps.org/meet/OSF00/baps/abs/S500001.html>
  - Thomas E. Wilson, "Using WebCT for the online delivery and grading of undergraduate physics quizzes", 8<sup>th</sup> National Conference of the *Council for Undergraduate Research*, June 19-21, 2000,
-

College of Wooster, OH

- Thomas E. Wilson. Theodore Hodapp, "Using TestPoint and LabView for Computer-controlled Data Acquisition", 8<sup>th</sup> National Conference of the *Council for Undergraduate Research*, June 19-21, 2000, College of Wooster, OH
- Thomas E. Wilson, "Creating Advanced-Mathematics WebCT Quiz Questions", *Almost Heaven WebCT* Conference, April 14, 2000, Charleston, WV
- T.E. Wilson, "Modeling the high-speed switching of far-infrared radiation by photoionization in a semiconductor", paper EB.05 presented at the 1998 Fall Meeting of Ohio Section of the American Physical Society (U.Akron, OH). Abstract at: <http://www.aps.org/BAPSOF98/abs/S600005.html>
- T.E. Wilson and Laurence Malley (student author), "Hybrid TEA CO<sub>2</sub> laser with longitudinally-excited, wide-bore, low-pressure section", paper EB.09 presented at the 1997 Fall Meeting of Ohio Section of the American Physical Society (U.Miami, OH). Abstract at: <http://flux.aps.org/meetings/YR97/BAPSOF97/abs/S200009.html>
- Thomas E. Wilson and Kathy J. Jude (student author), "Ripple tank demonstration of gaussian beam propagation", paper EB.08 presented at the 1997 Fall Meeting of Ohio Section of the American Physical Society (U.Miami, OH). Abstract at: <http://flux.aps.org/meetings/YR97/BAPSOF97/abs/S200008.html>
- Thomas E. Wilson and Theron T. Trout (student author), "Introductory Mechanics Simulations in Java", paper EB.07 presented at the 1997 Fall Meeting of Ohio Section of the American Physical Society (U.Miami, OH). Abstract at: <http://flux.aps.org/meetings/YR97/BAPSOF97/abs/S200007.html>
- T.E. Wilson, "Single-mode operation of an unstable resonator hybrid TEA CO<sub>2</sub> laser", presented at the 1995 Fall Meeting of Ohio Section of the American Physical Society (U.Dayton, OH)
- T.E. Wilson, "A high-power NH<sub>3</sub> laser pumped in a three-mirror CO<sub>2</sub> laser cavity with optically-switched cavity-dumping", presented at the 1991 Fall Meeting of New England Section of the American Physical Society (Bates College, Lewiston, ME).
- T.E. Wilson, "Preliminary results from a far-infrared laser cavity dumper", presented at the 1986 Fall Meeting of New England Section of the American Physical Society (U.New Hampshire, Durham, NH).

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#### LANGUAGES

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- English – native language
  - French – speak, read, and write with moderate fluency and proficiency
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#### MEMBERSHIPS

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- American Physical Society
- American Association of Physics Teachers
- Council for Undergraduate Research (National Physics Councilor 1998-2002)
- Society of Professional Optical Engineers
- American Association of University Professors (WV Chapter Treasurer 1998-2001)
- Engineers Club of Huntington (member board of directors 1995-2000)



## Prof. Ashok K. Vaseashta

### Office Address

Marshall University  
Department of Physics and Graduate Program in Physical Sciences  
One John Marshall Drive  
Huntington, WV 25755-2570  
E-mail: [prof.vaseashta@marshall.edu](mailto:prof.vaseashta@marshall.edu)  
Tel/FAX: (304) 696-2755

### Present Positions

#### **Professor of Physics and Physical Sciences**

Marshall University, Huntington, WV  
Graduate Program in Physical Sciences and Department of Physics

### University Education

- **Ph.D.:** Materials Science and Engineering, 1990.  
Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, VA
- **M.Tech. (DST Scholar):** Condensed Matter Physics. Indian Institute of Technology, Delhi, Center of Advanced Research in Electronics (CARE)
- **M.Sc (Physics Honors) and B.Sc, (Physics Honors)**, University of Delhi, Delhi.
- **Certificate of Proficiency:** French and Japanese (Durham Technical Academy).

### Employment

**June 1999-Present, Assistant/Associate/Full Professor,** Department of Physics and Physical Sciences, Marshall University, Huntington, WV.

### Professional Memberships

- Senior Member: Institution of Electrical and Electronics Engineers, Chapter: Electron Devices.
- Member: ASTM, Committee E56 on Nanotechnology.
- Member and Delegate: NIST/ANSI, Nanotechnology Technical Advisory Group (TAG) to TC-229 Committee.
- Member: Materials Research Society
- Member: American Institute of Physics & American Physical Society
- Member: Institute of Biological Engineering
- Member and Communications Director: AAPT
- Member: American Association for the Advancement of Science (AAAS)
- Member: Smithsonian Institute
- Life Member: Semiconductor Society of India
- Communication Director and Member: AAPT.

### Books and Book Chapters

- “Nanostructured and Advanced Materials” Springer, 2005, NATO Science Series II: Mathematics, Physics and Chemistry, **204**, Eds. **Vaseashta, A.**; Dimova-Malinovska, D.; Marshall, J.M., 424 p., ISBN: 1-4020-3561-6
- Book in progress: Proposed title: **Physics and Technology of Nanomaterials.**(expected publication date: 2007)
- 4 Book chapters in progress.

### Selected Publications:

#### *Summary*

- *Over 100 publications in peer reviewed scientific journals and conference proceedings.*
- *Chaired over 45 technical sessions and presented over 35 invited seminars, lectures, and keynote presentations.*

## **Brief VITA – Ralph E. Oberly**

Education: B.S., Physics, The Ohio State University, 1963

Ph.D., Physics, The Ohio State University, 1970

Dissertation Title: High Resolution Infrared Spectra of Some  
Carbon Dioxide

Isotopic Species of

Areas of Interest: Optics, Holography, Image Processing, Molecular Physics,  
Computer Modeling

### **PROFESSIONAL EXPERIENCE:**

Professor of Physics and Physical Science, Marshall University, Huntington, WV, 1983 to present. Associate Professor 1977-1983. Tenure granted 1975. Assistant Professor 1987-1983. Graduate Faculty since 1970.

Yeager Professor, Marshall University, 1987 to present.

US Air Force Summer Faculty Research Program, Wright-Patterson AFB: Summer 1985, Free radical spectra of phosphorus monoxide; Summer 1982, Spectroscopic study of the B-X band system of diatomic sulfur; Summer 1981, Spectroscopic study of silane plasma; Summer 1977, Laser Stark effect.

Fulbright Exchange Teacher, Cambridgeshire College of Arts and Technology, Cambridge, England, 1975-76.

NASA/ASEE Summer Faculty Fellow, Marshall Space Flight Center: Summers 1974, 1975, Holographic particle sizing.

Chairman, Department of Physics and Physical Science, Marshall University, 1974-85.  
Acting Co-Chairman, 1973-74.

### **PROFESSIONAL SOCIETY MEMBERSHIPS:**

American Association of Physics Teachers

Optical Society of America

SPIE - The International Society of Optical Engineering

### **RECENT PUBLICATIONS, TECHNICAL REPORTS, AND PAPERS PRESENTED:**

(Note: recent papers from 40+ total.)

Michael Wyllie, Ralph Oberly, and James O. Brumfield, "A Comparative Quantitative Approach to Digital Image Compression". Abstract submitted to the HISE conference of the Optical Society of America to be presented in Santa Fe, NM, February 11-15, 2007.

Chandra Inglis-Smith, Brandie Yalniz, and Ralph Oberly, "Bare Necessities: Transportation and Demographic Analysis Using Survey and GIS of the Exotic Dance Industry of Huntington and Barboursville, West Virginia". Presented to the 12<sup>th</sup> Bicennial Conference on Appalachian Geography, Pipestem Resort, Pipestem, WV, March 17, 18, 2006.

Brumfield, J.O., Ferguson, J.R.II, & Oberly, R.E., "A comparative analysis of U.S. Forest Service/U.S. Army Corps of Engineers GPS field collection procedures with an image base map for Geobiophysical Modeling and cartographic representation in the Appalachian Mountains". Publication of the ICA HMRSC VII International Symposium, University of Graz, Austria, pp 83-88, 2004.

Fet, G.N., Litteral, T.L., Brumfield, J.O., & Oberly, R.E., "Demonstration of the Image Map Web Server Technology to Assess Environmental Concerns in Appalachians". Publications of the ICA HMRSC VII International Symposium, University of Graz, Austria, pp 60-62, 2004.

Litteral, T.M., Fet, G.N., Brumfield, J.O., & Oberly, R.E., "Using 3D Satellite Image Analysis for Mining Reclamation in West Virginia", Appalachian Remote Sensing Conference sponsored by WVview/NASA, West Virginia University, Morgantown, WV, 2003.

Litteral, T.M., Fet, G.N., Brumfield, J.O., & Oberly, R.E., Using Remote Sensing & GIS with Image Map Web Server for a transportation corridor & economic development in Mingo County, West Virginia". Presented at ICA HMRSC VII International Symposium with Global Mountain Summit, Bishkek, National Academy of Sciences, Kyrgyz Republic, 2003

Ferguson, J.R.II, Brumfield, J.O., Sanderson, D.D., & Oberly, R.E., "Abandoned mine inventory with haul roads of the Monongahela National Forest of the Appalachian Mountains: A comparative analysis with GIS of U.S. Forest Service/U.S. Army Corps of Engineers GPS field collection procedures and image basemap selection for Geobiophysical Modeling and cartographic representations". Proceedings of the ICA HMRSC VII International Symposium with Global Mountain Summit, Bishkek, National Academy of Sciences, Kyrgyz, Republic, 2004.

Litteral, S.K., Sanderson, D.D., Brumfield, J.O., Oberly, R.E., and Jones, R.L., "Feature extraction of mining activity impacting the mountainous terrain of Dewey Lake's ecotourism". Proceedings of the 6<sup>th</sup> International Symposium on High Mountain Remote Sensing, University of Graz, The Austrian Academy of Science and Institut fur Geographie und Raumforschung Cartography, volume 37, 2002.

Invited to give Directed Study Workshop on "Holography" each year for the past 20 years at the National Youth Science Camp, Bartow, WV. Participated in the years: 1986, 1988, 1989, 1990, 1991, 1992, 1994, 1995, 1996, 1997, 1998, 1999, 2002, 2004, 2005, 2006.

#### **THESIS DIRECTION:**

Advisor or reader for 16 thesis (14 MS, 2 Ph.D.) projects over the past 15 years. Currently advisor for one project and reader on two others.

#### **ONGOING RESEARCH:**

Student oriented research in areas of holographic non-destructive testing (HNDR), digital and optical image processing, and spectroscopy.

#### **CURRENT COMMITTEE WORK AND OTHER ACTIVITIES:**

College of Science Grants Committee

Initiated science student exchange program between Marshall University and Anglia Ruskin University, Cambridge, England, first students fall 1992.

MU/NASA Space Grants Committee

Program Coordinator, MS in Physical Science, 2005 to present.

Advisor: Society of Physics Students, 1985 to present.

*VITA*  
*Dr. NICOLA ORSINI*  
*Department of Physics & Physical Science*

**PERSONAL:** Born November 25, 1943, Capurso (Bari), Italy  
Naturalized U.S. Citizen, January 20, 1978  
Married, two children

**EDUCATION:** Ph.D., The University of Michigan, Department of Atmospheric and Oceanic Science, September 1977  
M.S. (A&OS), The University of Michigan, 1973 B.S.  
(Physics), Western Michigan University 1972  
Student, Western Michigan University, 1969  
Electronic and English courses, Muskegon Community College, 1967

**EMPLOYMENT:** Fulbright Exchange Teacher, Cambridgeshire College of Arts and Technology, Cambridge, England, 1984-95  
NASA/ASEE Summer Faculty Fellow, Goddard Space Flight Center, Greenbelt, Maryland, Summers 1981, 1982  
Marshall University, Chairman of Physics and Physical Science, 1991 to present  
Marshall University, Professor of Physics and Physical Science, 1991 to present  
Marshall University, Associate Professor of Physics and Physical Science, 1985 to 1991  
Marshall University, Assistant Professor of Physics and Physical Science, 1980 to 1985  
Cotley College, Nevada, Missouri, Assistant Professor of Physics, 1978-1980  
Norlin Communications, Inc., Space Physics Laboratory, College Park, Maryland, Physicist, 1977-1978  
The University of Michigan, Space Physics Research Laboratory, Research Assistant, 1972-1977  
Western Michigan University, Physics Department, Instructor-Astronomy Laboratory, Spring term, 1972  
Western Michigan University, Physics Department, Electronic Technician, 1969-1972  
Consumers Power Company, West Olive, Michigan, Laboratory Technician, 1968

**AWARDS AND HONORS:** Two-month appointment as a Visiting Research Scientist at The University of Michigan Space Physics Research Laboratory in Ann Arbor, MI. Summer 1990.  
Marshall University - Summer Research Award, topic, "Data Acquisition for Ionospheric Modeling", 1989.  
Selected as a Yeager Professor to teach a highly selected group of students based on their high academic standing which have been awarded a Yeager Scholarship at Marshall University. 1987-1991  
Fulbright Exchange Teacher, US-UK Teacher Exchange Program, 1984-85.  
Marshall University Foundation Research Grant, topic, "Nitric Oxide in the Upper Stratosphere", 1983.  
NASA/ASEE Summer Faculty Fellowship, 1981, 1982  
Block Grant Award, (1-75/4-75 & 9-73/4-74), The University of Michigan  
Mildred Weed Goodrich Fellowship, (1-73), The University of Michigan.  
First Graduate Scholarship Predoctoral Fellowship, The University of Michigan  
Professor of the Year Award from Phi Eta Sigma National Honor Society, Fall 2000.  
Fabulous Faculty Member 2000-2001 Award from Phi Eta Sigma National Honor Society.  
Nominated as an "Outstanding Faculty Member" from The Gamma Beta Society, April 11, 2001.

**SCIENTIFIC** American Geophysical Union

- SOCIETIES: Sigma Xi, The Scientific Research Society  
Appalachian Section American Association of Physics Teachers (AAPT)  
Fulbright Teacher Exchange Program (Mutual Educational Exchange Program)
- TEACHING ACTIVITIES
- a. Curriculum Development
    - Developed new course Astronomy Laboratory 400L/500L and
    - Developed prototypes for some laboratory apparatus, 1982. This course is now required for many teaching specializations.
    - Taught Special Topics course (PHY 480/580) on atmospheric physics during 1 st summer term 1983.
    - Contributed to major revision of Physics 202 and Physics 204 Laboratory manuals along with other department faculty.
    - Developed new course Physics 412/512, Atmospheric Physics with Computer Simulation, 1989. The course is now part of the M.S. Program in Physical Science.
  - b. Field Trips
    - Accompanied students in PHY 412/512 "Atmospheric Physics" to The University of Michigan, Ann Arbor on April 10-12 1990. These students used The University of Michigan's computer facilities and their data.
    - Take Astronomy 400/500 students to, "Astronomy Weekend", Jenny Wiley State Resort Park, Prestonsburg, KY., every Fall.
    - Field trip with SPS to National Radio Astronomy Observatory (NRAO), April 9 and 10, 2004.
    - Field trip with PS 110 students to the Haverhill Chemical Plant in Haverhill, OH, April 22, 2004.
    - Accompanied physics majors to the Wright Patterson AFB lab, April 2005.
  - c. Team teach yearly sessions of Curriculum and Instruction Course 562/205 at Logan and Wayne County, West Virginia.
  - d. Team teach Physics 431/631 – 432/632, Seminar.
- RESEARCH & SCHOLARLY:
- a. Publications in Professional Journals
    - "Determination of the rate coefficient for the  $N_2^+ + O$  reaction in the ionosphere", with co-authors, J. Geophys. Res., 82, 1631, 1977.
    - "Quenching of metastable  $^2D$  oxygen ions in the thermosphere by atomic oxygen", with co-authors, J. Geophys. Res., 82, 4829, 1977.
    - "The charge exchange reaction of metastable  $O^+(^2D)$  ions with molecular oxygen as a source of  $O_2^+$  in the thermosphere", with co-authors, Geophys. Res. Letts., 1978.
    - "Charge exchange of metastable  $^2D$  oxygen ions with  $N_2$  in the thermosphere", with co-authors, Planet. Space Sci., 25, 1171, 1977. "Determination of the  $N_2 +$  recombination rate coefficient in the ionosphere", with co-authors, Geophys. Res. Letts., 4, 431, 1977.
    - "The Effect of  $N_2$  Recombination on the Aeronomic Determination of the charge exchange rate coefficient of  $O^+(^2D)$ , with  $N_2$ ", with co-authors, Geophys. Res. Letts., 5, 657, 1978.
    - "Study of  $O^+$  Biteouts: The molecular ion chemistry in the 'Biteout' region of the nighttime equatorial ionosphere", Technical Report, Norlin Communications, Inc., Space Physics Laboratory, Item 54/NAS 5-23011, 1978.
    - "The distribution and variability of mesospheric odd nitrogen: a theoretical investigation", J. of Atmos. and Terr. Phys. 44, 479-488, 1982.
    - "Solar disturbances and mesospheric odd nitrogen", J. of Atmos. and Terr. Phys. 44, 489, 1982.

- “Geophysical interpretation of Mid Latitude Nitric Oxide Measurements”, Transaction, American Geophysical Union, Vol. 64, No. 18, May 1983.
- “Nitric Oxide in the Upper Stratosphere: Measurements and Geophysical Interpretation”, with co-authors, J. of Geophys. Res., 88, C15, 10, 809 Dec. 1983
- “Geomagnetic Activity Effects on the Equatorial Neutral Thermosphere”, with co-authors, Transaction, American Geophysical Union, Vol. 71, No. 43, October 1990.
- b. Publications for Laboratory Use  
 Contributed to major revision of Physics 202 and Physics 204 Laboratory Manuals now being published by Tichenor Publishing Co., Work done in 1983, 1984.  
 Wrote some experiment instructions for Astronomy 400L/500L laboratory course.
- c. Short Courses, Workshops  
 Chautauqua Short Course on Remote Sensing, 1980-81.  
 Chautauqua Short Course on Astronomy Bizarre 1982-83.  
 Chautauqua Short Course on Teaching Introductory Astronomy, May 1994.  
 Chautauqua Short Course on introducing Observational Equipment and Activities into the Introductory Astronomy Course, June 1995.  
 Web CT Workshop, November 13, 1988  
 Seminar on “Conflict Management and Confrontation Skills: Jan. 11, 1999, Charleston, WV.  
 Chautauqua Short Course on A Radio View of the Universe and the New Green Bank Telescope, June 1999.
- d. Papers Presented In Professional Meetings  
 “A study of the diurnal and seasonal behavior of  $N_2^+$  in the thermosphere using the AE-C satellite”, American Geophysical Union Meeting, Spring 1976.  
 “A study of vibrationally excited  $N_2^+$  ions in the thermosphere using the Atmosphere Explorer-C satellite”, American Geophysical Union Meetings, December, 1976.  
 “The  $N_2^+$  recombination rate coefficient as a function of the electron to atomic oxygen density ratio using the AE-C satellite measurements”, American Geophysical Union Meeting, Spring 1978.  
 “Molecular Ion Chemistry in the  $O^+$  'Biteout' Region of the Nighttime Equatorial Ionosphere”, Atmosphere Explorer Team Meeting, Goddard Space Flight Center, Greenbelt, Maryland, June, 1978.  
 “Stratospheric odd nitrogen: a comparison between calculations and Measurements”, Atmospheric Sciences group, Goddard Space Flight Center, July 1982.  
 “Geophysical Interpretation of Mid Latitude Nitric Oxide Measurements”, American Geophysical Union Meeting, June 1, 1983, Philadelphia, PA.  
 Other Meetings Attended  
 American Geophysical Union Spring Meeting, Baltimore, MD, May 25-29, 1981.  
 American Geophysical Union Spring Meeting, Philadelphia, PA, May 31 – June 4, 1982.  
 Blue Grass Chapter of Health Physics Society, Lexington, KY, May 21, 1998.  
 Appalachian Section of American Association of Physics Teachers (AAPT), Huntington, WV, November 4, 5, 1983, Morgantown, WV, November 1984. Athens, OH, November 1985.  
 Appalachian Section and Southern Ohio Section of AAPT, Chillicothe, OH, April 1986.  
 AAPT, West Virginia Wesleyan College, November 1987.

AAPT, Davis and Elkins College, November 1988. "Radar Echo of the Venusian Surface: July 17, 1990. The University of Michigan.  
 "Thermal Ion Upwelling in the High-Latitude Ionosphere" July 27, 1990, The University of Michigan.  
 Weekly Seminars for the Space Physics Laboratory Researchers, Summer 1990, The University of Michigan.  
 Appalachian Section of AAPT, West Virginia Institute of Technology, Montgomery, WV, October 26-27, 1990.  
 Appalachian Section of AAPT, Marshall University, Fall 1982

**Papers presented to "Local" Audiences**

"The nighttime equatorial "Biteout" in the earth's Ionosphere", Marshall University Physics and Physical Science Department, May 1980.  
 "The Chemistry of the Ionosphere", Marshall University Chemistry Seminar, November 1980.  
 "Black Holes" Marshall Science Fiction Society, December 1981.  
 "What is a Black Hole", Marshall University Chi Beta Phi, November 1982.

SERVICE TO THE  
 DEPARTMENT &  
 THE UNIVERSITY

- a. Committee Assignments
  - 1982-present, College of Science Academic Appeals Committee 1982-present, Marshall Council for International Education
  - 1983 Research Board
  - 1983 University Honors Council
  - 1985-1998 Member of the Advisory Board for the Autism Training Center at Marshall University
  - 1985-87 Commission to Study Undergraduate Teacher Education (Empanelled by the College of Education - Marshall University)
  - 1987-95 Member of the Education Personnel Preparation Advisory Committee. Officially recognized by the West Virginia Department of Education as the advisory group required under Policy 5100. The policy responsible for increased standards in the preparation of teachers.
  - 1986-87 Vice President, Marshall Council for International Education 1988-90 Member Aviation Technology Advisory, (Community College) 1988-96, Member of Core Curriculum Committee
  - 1988-97 Nature and Science (Huntington Museum of Art)
  - 1989-92 Member of the Academic Planning Committee
  - 1989-90 Search Committee for Executive Director of Autism Training Center
  - 1989-95 Member Assessment Task Force Subcommittee Faculty Research and Development
  - 1993-94 Orientation, Academic Forum Session during our new student orientation program
  - 1993 Provided support during Safety Accreditation Visit for the Safety Technology Department
  - 1994 Thesis Committee (Oral examination of Gary W. Ingram) Nov. 19 1995-summer, Represented Marshall University in Italy to learn about preparing high school students with the industrial perspective in mind.
  - 1995-present, Member Health Fitness Center Advisory Committee
  - 1995-99 Member College of Science Academic Program Plan Advise Physics and Physical Science Majors/Students Summer Orientation
  - 1999-2000 Member of the Core Curriculum Committee
  - 1999-2000 Member Assessment Task Force Subcommittee Faculty Research and Development
  - 1999-2000 Member Health Fitness Center Advisory Committee
  - 1999-2000 Member College of Science Academic Program Plan

1999-2000 Nature and Science Search Committee (Huntington Museum of Art)  
 2003-2004 Member of Education Personnel Preparation Advisory Committee.  
 2003-2004 Member of the West Virginia IMPACT organization.  
 2004 Capstone Judge for four College of Education students, April 15, 2004 and November 18, 2004,  
 2003-2004 Chair of the Physics Faculty Selection Committee, Fall '03/Spring '04 and fall '04.  
 2003-2004 Faculty member of the Marshall University Chapter of the Society of Physics Students.  
 Summer 2004 Chaired the Physics and Physical Science Department without monetary compensation.  
 2005 Organized the Open House for Physics Department to honor Albert Einstein's five major scientific papers in 1905.  
 2005 Made modifications and upgrades to Physics 101L, and the Astronomy 400/500 reports.  
 2000-present Liaison faculty member of the College of Science for the COEHS.  
 2005 Assisted the Department of Communication's Speech and Hearing Center fall accreditation effort.

COMMUNITY SERVICE:

Supplies information and interviews to local news media regarding atmospheric and astronomical phenomena.  
 "Astronomy", talk presented to middle school students of Our Lady of Fatima Catholic Church, Huntington, WV, November 1982  
 "Life and Death of Stars", talk presented to Middle School students of Our Lady of Fatima, Huntington, WY., December 1982.  
 "Evolution of a Black Hole", talk presented to Beverly Hills Middle School students, Huntington, WY., November 1983.  
 Talk on Haley's comet and on other topics dealing with astronomical Phenomena, Milton Senior Citizen Luncheon Meeting at Milton Presbyterian Church, November 13, 1985  
 Talk on "The Evolution of Stars", Huntington Museum of Art, Studio 5, May 6, 1989  
 Talk on "Stars Like Us", Jenny Wiley State Resort Park, Prestonsburg, KY, Astronomy Weekend 1989, November 11, 1989  
 Talk on "Planets", Beverly Hills Middle School (7<sup>th</sup> graders), May 27, 1992  
 Talk to Peyton Elementary (5<sup>th</sup> graders), February 24 and March 3, 1994  
 Talk on "Eclipses", Marshall University and Huntington Community, May 10, 1994  
 Talk on "Tour of the Universe", Our Lady of Fatima School (5<sup>th</sup> graders), November 7, 1994  
 Talk on "Stars & Planets", Guyandotte Elementary (5<sup>th</sup> graders), November 29, 1994  
 Talk on "Planets", Cammack Middle School (6<sup>th</sup> graders), April 25, 1995.  
 Advised Ms. Dinkins and helped her with Astronomy activities for her 9<sup>th</sup> grade Earth Science class, April 2, 1998.  
 Science Fair Judge, South Point High School, December 8, 1999.  
 Science Fair Judge, Huntington High School, January 6, 2000.  
 Grand Prize Judge, West Virginia State Science & Engineering Fair, Marshall University, April 2, 2000.  
 Presented a summary of part of the IMPACT Symposium, Marshall University College of Education, October 22, 2000.  
 Served as a judge for the "State Science & Engineering Fair", Marshall University, March 31, 2001.  
 Science Fair Judge, St. Joseph Catholic High School, March 9, 2004.  
 Presentation and workshop, Guyandotte Elementary School (3<sup>rd</sup> graders), May 26, 2004.  
 Served as a judge for the "State Science & Engineering Fair", Marshall University,



Spring 2004.  
 Consultant for “The Underwood Law Offices” of Huntington, WV for the case of Rhetta Skaggs vs. Days Inn of Huntington, Spring 2005.  
 Talk on “Planets”, Guyandotte Elementary School, Spring 2005.  
 Talk on “How to Incorporate more Physics in Teaching”, Cabell County high school teachers, Spring 2005.  
 Led workshop for the Center for Academic Excellence on the “Cassim Huygen’s Mission to Titan”, Booth Experimental Theatre, April 4, 2005.  
 Talk “Curved Space Time, Black Holes & Gravity’s Final Victory), October 14, 2005.  
 Served as judge for West Virginia State Science & Engineering Fair, Spring 2005.  
 Judge for the Astronomy Grand Prize given by the Ohio Valley Astronomical Society, April 2, 2005.

Interviews by Local Media

Supplies information and interviews to local news media regarding atmospheric and astronomical phenomena.

09-11-92	“Harvest Moon” Christy Gibson (Herald-Dispatch)
02-04-93	Yeager Students
09-07-93	“Asteroids” (Marshall University Parthenon)
11-30-93	“Cultural Diversity” Nathan Wyrick (student)
02-18-94	Yeager Students
03-03-94	Yeager Students
05-05-94	Annual Eclipse (Herald-Dispatch)
06-23-94	“Comet Shoemaker-Levey 9” (Marshall University Parthenon)
06-27-94	“Comet Shoemaker-Levey 9 Collision with Jupiter” Beckey Bookwalter (Herald-Dispatch)
11-16-94	“Phases of Moon” Becky Bookwalter (Herald-Dispatch)
02-15-96	“Story on Venus” Shannon Marts (Herald-Dispatch)
02-29-96	“Story on Calendar” (Leap Year) David Bentley Channel 3 TV
04-08-96	“Questions on Daylight Savings Time” David Bentley Channel 3 TV
09-27-96	“Lunar Eclipse, Public’s Reaction” Melissa Rakes (Herald-Dispatch)
11-14-96	“Mars & Space Probe” Eric Fossell (Herald-Dispatch For Your Info Page)
	“Hale-Bopp” Jerry Mathinson (Channel 13 TV)
02-03-97	“Hale-Bopp” Eric Fossell (Herald-Dispatch)
02-13-97	“Comets & Asteroids” Rob Serey (Channel 3) plus 3 follow-up disc
05-18-98	“The Cause of Meteor Showers” (Herald-Dispatch)
11-17-98	“Meteor Showers” Lisa Osborn (Herald-Dispatch)
11-26-98	“Blue Moons” Debra Cramer (WSAZ-TV)
03-01-99	“Global Warming” (WSAZ-TV staff)
07-12-99	“Roller Coasters” Bob Withers (Herald-Dispatch, For Your Info Page)
07-30-99	“Meteor Showers” Tony Cavalier
08-11-99	“Leonid Meteor Shower” Carrie Cline (Channel 3 TV)
11-17-99	“Millennium” (Herald-Dispatch, For Your Info Page)
01-03-00	“Autumnal Equinox” (Anglia University students)
09-23-03	“Aurora Borealis and Solar Flares” Tony Cavalier (WSAZ Channel 3)
10-29-03	“Aurora Borealis and Solar Flares” (WOWK Channel 13)
10-29-03	“NRAO Trip” Sarah Hereford (Marshall University Parthenon)
04-13-04	
11-10-04	“Communication disruption due to Increase in Solar Particles Arriving on Earth” classroom presentation Tony Cavalier (WSAZ Channel 3)

# CURRICULUM VITAE

**Que Huong NGUYEN**

902 11<sup>th</sup> Avenue Huntington WV 25701

304-606-2758 (O) 304-697-0558 (H), [nguyenh@marshall.edu](mailto:nguyenh@marshall.edu)

## **EDUCATION**

- City University of New York. : **Ph. D. in Physics** **2001**  
Dissertation: “ *Electronic Structure and Optical Properties of Quantum Dot*”  
Adviser: Joseph L. Birman
- Institute of Physics, Hanoi, Vietnam. **Lower Doctorate Degree, Physics** **1989**  
Dissertation: ” *Problems on Electronic Structures of Exciton in Cubic Semiconductor with Degenerate Valence Band and related Physics Properties*”  
Adviser: Nguyen Van Hieu
- Kishinev State University, Moldavia (former USSR). **M.S. and B. S. in Physics** **1981**  
Dissertation: “ *Account of Spin-Orbit Interaction in the Theory of Electric Absorption*”.

## **TEACHING EXPERIENCE**

- Assistant Professor, Marshall University,** **from 2005**  
Introductory Laboratory, Solid State Physics, Electromagnetism,  
Thermodynamics and Statistical Physics.
- Adjunct Assistant Professor, Yeshiva University** **2002-2005**  
Introductory Physics.
- Adjunct Assistant Professor, William Paterson University** **2002 -2003**  
Introductory Physics (Calculus-based Physics courses)
- Visiting Assistant Professor ,William Paterson University** **2001**  
Introductory Physics and General Physics (Algebra-based)
- Graduate Teaching Assistant, City College, CUNY, New York** **1994 -2000**  
Introductory Laboratory, Introductory Physics

## **EMPLOYMENT**

- Center for Ultrafast Photonic and Laser, City College, CUNY,** **2001-2005**  
**Research Associate,**
- Develop theory of luminescence for the Mn-doped semiconductor quantum dot with an extra electron inside the dot.
  - Study different aspect of quantum nanocrystals: optical and luminescence properties of Quantum Dot configurations, especially Wannier Frenkel hybrid exciton in new semiconductor-organic systems; the Dicke model of Super-radiance and phase transition for the array of quantum dot; effects of electric and magnetic fields ...
  - Study polarization-induced internal electric field and carrier dynamic in GaN/AlGaIn MQW Structures. Write a computer simulation programs to obtain the band structures and different characterises of the structures.
- Physics Department, City College, City University of New York,** **1994-2001**  
**Graduate Student,**  
Study electronic structure and optical properties of semiconductor quantum dots and quantum dot systems; optical response of Bose-Einstein Condensate of Atomic Species; theory of phonoritons in highly excited semiconductors

**Institute of Physics, Hanoi, Vietnam,  
Researcher**

**1992 – 1994**

- Studied properties of phonoritons in highly excited semiconductors.
- Studied theory of excitons in quantum wells and superlattices.

**Institute of Applied Physics, Academy of Sciences, Moldova (former USSR)  
Researcher ,**

**1990-1992**

- Studied Hubbard models , strongly correlated electron systems and high Tc superconductivity.

**Institute of Physics, Hanoi, Vietnam,  
Researcher**

**1981-1990,**

- Studied electronic structure and optical properties of excitons in direct band gap cubic semiconductors.

### **SCIENTIFIC PUBLICATION:**

1. Nguyen Que Huong and Nguyen Hoa Hong, *Ferromagnetism Due to Oxygen Vacancies in Oxide Thin Films*, submitted to Physical Review Letter, 2006
2. Nguyen Que Huong, *Theory of Luminescent Emission in a Nanocrystal Doped by Magnetic Impurities with an Extra Electron*, submitted to Journal of Physics: Condensed Matter, 2006
3. Nguyen Que Huong and Joseph L. Birman, *Nonlinear Optical Response of Hybrid Exciton State in Quantum Dot- Dendrite System*, submitted to Applied Physics Letter, 2006
4. J. L. Birman and Nguyen Que Huong, **J. Luminescence** 2006 (accepted), *Wannier-Frenkel Hybrid Exciton in Organic-Semiconductor Quantum Dot Heterostructures*
5. Y. Gao, N. Q. Huong, J.L. Birman and M. J. Potasek, **Proc. SPIE Int. Soc. Opt. Eng.** **5592**, 272 (2005) *Highly effective thin film optical filter constructed of semiconductor quantum dot 3D arrays in an organic host*
6. Nguyen Que Huong and Joseph L. Birman, **Phys.Rev.B** **69**,085321 (2004) *Theory of Luminescent Emission in Nanocrystal Zn:Mn with an Extra Electron*
7. Y. Gao, N. Q. Huong, J. L. Birman , M. J. Potasek, **J. Appl. Phys.** **96**, 4839 (2004) *Large Nonlinear Optical Properties of Semiconductor Quantum Dot Arrays Embedded in an Organic Medium*
8. Nguyen Que Huong and Joseph L. Birman, **Phys.Rev.B** **67**,075313 (2003) *Hybrid Exciton State in a Quantum Dot Dendrite System: Green Function”*,
9. Nguyen Que Huong and Joseph L. Birman, **Phys. Rev. B** **61**(2000), 13131 *Quantum Dot Lattice Embedded in an Organic Medium: Hybrid Exciton State And Optical Response.*
10. Nguyen Que Huong, Joseph L. Birman, **Journal of Luminescence** **87-89** (2000), 333 *Electronic State and Optical Response of a Semiconductor Quantum Dot Lattice Embedded in an Organic Host.*
11. Nguyen Que Huong and Joseph L. Birman, **J. Chem. Phys.** **108** (1998), 1769. *Origin of Polarization in Polar Nanocrystals.*
12. Nguyen Hong Quang, Nguyen Minh Khue and Nguyen Que Huong, **ICTP-IC** **95** (1995),265 *Density-Density Dependent Phonoriton States in Highly Excited Semiconductors.*
13. Nguyen Minh Khue, Nguyen Que Huong and Nguyen Hong Quang, **J. Phys: Condens. Matter** **6** (1994), 3221 *The Effect of the Quantum Nature of Excitons on the Phonoriton State in Semiconductors.*

14. Le Qui Thong, Nguyen Que Huong and Nguyen Toan Thang, **Viet. Comm.** 5, 21 (1994)  
*The effect of K-linear term on phonoriton in CdS.*
15. Nguyen Que Huong, Le Qui Thong and Nguyen Ai Viet, ICTP IC 92 (1992), 318.  
*The Additional Contribution Caused by Coulomb Interaction to the Exciton Dispersion in Multiple Quantum Wells and Superlattices for Direct Band Gap Cubic Semiconductors.*
16. Nguyen Que Huong, Le Qui Thong and Nguyen Ai Viet, ICTP IC 92 (1992), 320.  
*On the Theory of Phonoriton in Cubic Semiconductor with a Degenerate Valence Band.*
17. V. A. Moskalenko, C.P. Kojokaru, Nguyen Thi Que , **Jour. Low. Temp. Phys (USSR)**, 17 (1991), 645  
*On the Superconductivity in the Two-Band Hubbard Model.*
18. A.I. Bobrusheva and Nguyen Que Huong, 3<sup>rd</sup> National Conf. on Physics, Hanoi 1993  
*The Stark Effect for Excitons in Step Quantum Wells.*
19. Nguyen Toan Thang, Nguyen Ai Viet, Nguyen Que Huong, **Proc NCSR Vietnam**, 3 (1991), 31.  
*Fine Structure and Energy Spectrum of Exciton In Direct Ban Gap Cubic Semiconductors with Degenerate Valence Band.*
20. Nguyen Que Huong and Nguyen Ai Viet, **Czech. J. Phys.** B 41, 277 (1991)  
*Resonant Electronic Raman Scattering on Donor Levels in Cubic Semiconductors.*
21. Nguyen Que Huong, Nguyen Toan Thang and Nguyen Ai Viet, **Phys. Stat. Sol.(b)** 161 (1990), 637.  
*Hole-hole Exchange Interaction of Exciton in Direct Ban Gap Cubic Semiconductors with Degenerate Valence Band.*
22. Nguyen Que Huong, **JINR Rapid Comm.** No.5, Vol.31 (1988),26  
*Elastic Raman Scattering on Donor Levels in Direct Band Gap Cubic Semiconductors with a Degenerate Valence Band.*
23. Nguyen Que Huong, Nguyen Toan Thang, Nguyen Ai Viet, **JINR Rapid Comm.**, No.5, Vol. 31 (1988), 31.  
*Exchange Energy and Wave Function of Exciton in Direct Band Gap Cubic Semiconductors.*

### **BOOK CHAPTERS**

1. Nguyen Que Huong, Yu. Perlin, L. S. Khartrenko, in "**Semiconductors and Optical Processes**", Kishinev, Shtiinsa 1983.
2. Nguyen Que Huong, Magnetism Due to Oxygen Vacancy in Undoped Oxide Thin Film, in "**Magnetism in Oxyde Thin Films**", 2006

### **CONFERENCES**

1. Nguyen Que Huong, *Theory of Luminescent Emission in a Nanocrystal Doped by Magnetic Impurities with an Extra Electron*, III Joint European Magnetic Symposia, JEMS' 06, San Sebastien, Spain June 2006.
2. Nguyen Que Huong, *Electric Field Effect on Hybrid Exciton in a Quantum Dot Coated by an Organic Shell*, International Symposium on Structure-Property Relationships in Solid State Materials, Bordeaux, France, June 28 - July 1, 2006

3. Nguyen Que Huong, Electric Field Effect on Wannier-Frenkel hybrid exciton, APS March Meeting Baltimore, March 2006
4. Nguyen Que Huong, Joseph L. Birman, and Al. L. Efros, APS March Meeting, Seattle 3/2001. *Mn Doped ZnS Nanocrystal: Effect of an extra electron Injected in to the Nanocrystal.*
5. Nguyen Que Huong and Joseph L. Birman, Inter. Conf. on Luminescence, Osaka, 1999. *LCAO Theory for Mn-doping ZnSe Quantum Dot.*
6. Nguyen Que Huong and Joseph L Birman, Inter. Conf. on Luminescence, Osaka 1999. *Hybrid Exciton State for A Semiconductor Quantum Dot Array in Organic Medium*
7. Nguyen Que Huong and Joseph L. Birman, Workshop on Quantum Dot, Washington DC 1997. *Piezoelectric Effect in Coated Quantum Dot.*
8. V. A. Moskalenko, C.P. Kojokaru, Nguyen Thi Que, 3<sup>rd</sup> State Conf. on Superconductivity, Kharcop (USSR) 1991. *A New Diagram Technique for Fermion System in Hubbard Model.*
9. A.I. Bobrusheva and Nguyen Que Huong, 3<sup>rd</sup> National Conf. on Physics, Hanoi 1993. *The Stark Effect for Excitons in Step Quantum Wells.*
10. Nguyen Que Huong, Nguyen Toan Thang and Nguyen Ai Viet, 11<sup>th</sup> Nat. Conf. Theor. Phys. Samson, Vietnam 1987. *Exchang Energy of Excitons in Cubic Semiconductors.*
11. Nguyen Que Huong, Nguyen Toan Thang and Nguyen Ai Viet, 11<sup>th</sup> Nat. Conf. Theor. Phys. Samson, Vietnam 1986. *Fine Structure of Excitons in Cubic Semiconductors.*

**ACTIVITIES/ TRAINING:**

- APS March Meetings
- 99<sup>th</sup> International Conference on Luminescence, Osaka, Japan, 8/1999.
- Workshop on Quantum Dot, Washington DC, 1997.
- Summer Course on Low-Dimensional Quantum Field Theories for Condensed Matter Physics, ICTP, Trieste, Italy 1992.
- International Symposium on Nature and Properties of High Tc Superconductivity, Hanoi, Vietnam 1990.
- Spring Course on Atomic and Molecular Physics, Trieste, Italy, 1989.
- Annual National Conference on Theoretical Physics (6<sup>th</sup> to 15<sup>th</sup>), Hanoi, Vietnam.

**LANGUAGE:** English, Russian, French, and Vietnamese.

## SEIJI TAKEMAE

Department of Physics and Physical Science, Office: (304) 696-6466 Marshall University, Cell: (814) 571-0677 One John Marshall Drive, E-mail: [takemae@marshall.edu](mailto:takemae@marshall.edu) Huntington, WV 25755 U.S.A.

### Education

Pennsylvania State University, University Park, PA 16802 Ph.D. in theoretical physics, 2002. Advisor: Murat G. Unaydin.  
University of California at Irvine

B.S. in Physics (Minor in Mathematics), 1995.

### Awards

Physics Department Teaching Award at the Pennsylvania State University (2001).  
Minority Scholars Fellowship Award at the Pennsylvania State University (1995).

### Research Experience

Graduate assistant at Pennsylvania State University working with Murat G. Unaydin.

I constructed the unitary supermultiplets of the supersymmetry algebra associated with the seven dimensional antide Sitter space time background. The particles in this supersymmetric background appear in the supermultiplets of the space time supersymmetry algebra.

### Technical Experience

Programming experience in C++ and Mathematica.  
Experience with Macintosh, Unix and Windows operating systems.  
Experience with L<sup>A</sup>T<sub>E</sub>X.  
Experience with Microsoft PowerPoint. During the summer of 2001, I posted my lectures for Physics 212 at the Pennsylvania State University on powerpoint slides on a website maintained by Aileen Duncan.

### Teaching Experience

Visiting Assistant Professor (2003-2006) (*in progress*) in the Physics Department at Marshall University. I have served as an instructor for two sections of introductory first-year physics courses (Newtonian Mechanics, Electricity and Magnetism, Geometrical and Wave Optics, Thermodynamics, Fluids) at the non-calculus based level. In the fall of 2004 and spring of 2005, I taught a one-year long course in electricity and magnetism for physics majors. My responsibilities as a lecturer have included the writing and grading of homework and exams. In addition, I regularly provide supplemental contact time during office hours and review sessions. I have also served as an instructor for physics labs covering mechanics, sound waves and thermodynamics, electrostatics, DC/AC circuit and optics. As a lab instructor, I have assisted students in doing the lab exercises and I also have graded their lab

reports.

During the fall semester of 2003 I did an independent study with an honor student.

Lecturer (Summer 2003) in the Physics Department at Bucknell University. I served as an instructor for one section of first semester freshman physics. Besides giving lectures, I wrote and graded the homework, quizzes and exams.

Lecturer (2002-2003) in the Physics Department at Bucknell University. In the first semester, I taught two laboratory sections and one problemsolving section for the freshman physics course (Newtonian Mechanics, Mechanical Waves, Thermodynamics, Special Relativity) at the calculus based level. I also assisted in the writing and grading of the hour-tests and final exam. In the second semester, I taught one laboratory section and two problemsolving sections for the next part of the same freshman physics course (Electricity and Magnetism, Geometrical and Wave Optics, Elementary Quantum Mechanics, some advanced topics including superconductivity and particle physics). I also assisted in writing and grading the hour-tests and final exam.

Teaching Assistant (1996-2002) in the Physics Department at the Pennsylvania State University. Taught laboratory and recitation sections for introductory freshman and sophomore level physics courses (Newtonian Mechanics, Mechanical Waves, Electricity and Magnetism, Geometrical and Wave Optics, Thermodynamics, Introductory Quantum Mechanics) at the non-calculus based level as well as at the calculus based level with computer assisted labs.

Received Physics Department Teaching Award (2000-2001).

Was the main lecturer and course administrator of physics 212 (calculus based and computer assisted electricity and magnetism course) during the summer of 2001 at Penn State.

## Publications

M. Günaydin and S. Takemae, "Unitary supermultiplets of  $OSp(8^*4)$  and the AdS(7)/CFT(6) duality," Nucl. Phys. B578, 405 (2000) [arXiv:hep-th/9910110].

S. Fernando, M. Günaydin and S. Takemae, "Supercoherent states of  $OSp(8^*2N)$ , conformal superfields and the AdS(7)/CFT(6) duality," Nucl. Phys. B628, 79 (2002) [arXiv:hep-th/0106161].

## Languages

English (native speaker)  
Spanish (conversational)

## References

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# RICHARD JOHN BADY

Dept. of Physics and Physical Sciences  
Marshall University Huntington WV 25755

## **EDUCATION**

### DOCTOR OF EDUCATION

1978, Rutgers University, New Brunswick, New Jersey

### MASTER OF EDUCATION

1973, Rutgers University, New Brunswick, New Jersey

### BACHELOR OF ARTS (Cum Laude)

1971, Shippensburg State University (PA). Major: Chemistry, Minor: Mathematics

## **TEACHING EXPERIENCE**

Marshall University (1986-present)

General Physical Science Courses and labs

Environmental Science—Physical Aspects and lab

Integrated Science and lab

Mount Senario College, Ladysmith, WI (1978-1986)

Chemistry: General, Organic, Analytical

General Physics, Intro to Algebra

Philosophy of Science

Delbarton High School, Morristown, NJ (1973-1975)

Chemistry, Physics

## **GRANTS RECEIVED**

Metropolitan Life Foundation. \$500 To study retention at Mount Senario College, Ladysmith WI, 1982

Dwight Eisenhower Math and Science Education Act. \$50,000 for summer workshops on science teaching with activities for elementary school teachers, In conjunction with MU COE and RESA. 1993.

Dwight Eisenhower Math and Science Education Act. \$50,000 for summer workshops on science teaching with activities for elementary school teachers, In conjunction with MU COE and RESA. 1994.



Dwight Eisenhower Math and Science Education Act. \$48,000 for summer workshops on science teaching with activities for elementary school teachers, In conjunction with MU COE and RESA. 1995.

Dwight Eisenhower Math and Science Education Act. \$25,000 for summer workshops on science teaching with activities for elementary school teachers, In conjunction with MU COE and RESA. 1996.

Dwight Eisenhower Math and Science Education Act. \$35,000 for summer workshops on science teaching with activities for elementary school teachers, In conjunction with MU COE and RESA. 1997.

Dwight Eisenhower Math and Science Education Act. \$30,000 for summer workshops on science teaching with activities for elementary school teachers, In conjunction with MU COE and RESA. 1998.

Dwight Eisenhower Math and Science Education Act. \$20,000 for summer workshops on science teaching with activities for elementary school teachers, In conjunction with MU COE and RESA. 1999.

Dwight Eisenhower Math and Science Education Act. \$43,000 for summer workshops on science teaching with activities for elementary school teachers, In conjunction with MU COEHS and RESA. 2000.

Dwight Eisenhower Math and Science Education Act. \$48,000 for summer workshops on reading and science teaching, In conjunction with MU COEHS and RESA. 2001.

Dwight Eisenhower Math and Science Education Act. \$24,000 for summer workshops on reading and science teaching, In conjunction with MU COEHS and RESA. 2002.

## **PUBLICATIONS and PRESENTATIONS**

Bady, R.J. The development of hypothesis testing and correlational reasoning. Presented at annual conference of National Association for Research in Science Teaching, Cincinnati, OH, March 1977.

Bady, R.J. Commentary on "An empirical derivation of hierarchies of propositions related to ten of Piaget's sixteen binary operations". *Journal of Research in Science Teaching*, 1977, 14(6), 571-573.

Bady, R.J. and Enyeart, M.A. Try and prove it: An exercise in the logic of science. *The Science Teacher*, 1978, 45(9), 36-37.

Bady, R.J. Methodological issues in formal operations research: What does it mean to be formal? *Science Education*, 1978, 62(2), 233-239.

Bady, R.J. Comments on current use of Piaget's concept of stage. *Journal of Research in Science Teaching*. 1978, 15(6), 573-576.

Bady, R.J. An analysis of combinatorial reasoning tasks. *The Formal Operator*, Douglass College, spring, 1978.

Bady, R.J. Effect of taking science on formal logical reasoning ability. Presented at National Association for Research in Science Teaching, Toronto, March 1978.

Bady, R.J. Students' understanding of the logic of hypothesis testing. *Journal of Research in Science Teaching*, 1979, 16(1), 61-65.

Bady, R.J. Several research reviews in *Investigations in Science Education*, ERIC, 1978-1980.

Bady, R.J. A study of retention at Mount Senario College, 1982. Funded by Metropolitan Life Foundation.

Bady, R.J. Teaching science with creationism and geocentrism. Presented at National Science teachers Association, Pittsburgh, Nov. 1987.

Bady, R.J. Using the learning cycle in elementary science teaching. West Virginia Science Teachers Association, Parkersburg, 1988.

Bady, R.J. et al. Lab manual for Physical Science 109L at Marshall University, Kendall-Hunt, 1989, revised, 1993, 1999.

Bady, R.J. et al. Lab manual for Physical Science 110L at Marshall University, Kendall-Hunt, 1989, revised, 1993, 1999.

Bady, R.J. Air pollution and health: Two case studies in West Virginia. Environmental Issues Conference Proceedings, WQV State College, Institute, 1992.

Bady, D, and Bady, R.J. A history of WV environmental issues. (Chapter in: Choices for a new Decade) WV Humanities Council, 1993.

Bady, R.J. Activities and demonstrations for teaching energy concepts. WV Science Teachers Association, Charleston, 1994

Bady, R.J. Two games for teaching environmental concepts. National Science Teachers Association, Philadelphia, March 1995

#### **UNIVERSITY SERVICE (LAST 10 YEARS)**

Marshall Community and Technical College, Transition Advisory Committee  
Marshall Affirmative Action Advisory Panel  
University Recycling Committee  
COS Liason to COEHS—Physical Science Certification  
Advisor to COEHS General Science students  
COS Freshman Advisor  
COS Promotion and Tenure Committee  
University grade appeal hearing board  
Advisory board--Appalachian Rural Science Initiative (project funded by NSF)  
Advisory board--Science on Wheels Project (funded by Toyota)

#### **COMMUNITY SERVICE (LAST 10 YEARS)**

Southwestern Consortium for Excellence in Science and Math Education  
Tri-State Geographic Initiative (US EPA)  
WV Dept. of Education—review development of state science standards  
WV Dept of Education—grant reader  
Science Fair Judge—various area high schools  
Huntington Parks District summer nature camp

## VITA

Robert Elwyn Bellis  
Department of Physics and Physical Science

### EDUCATION:

Ph.D: University of Nottingham, England, United Kingdom 1963-64  
University of Wales, United Kingdom, 1962-63.  
Research area: EPR study of radiation damage.  
MSC: University of Wales, United Kingdom, 1961-62  
Area of concentration: Molecular Physics. Course work in X-ray, NMR, EPR and UV spectroscopy.  
Dissertation: EPR of Free Radicals.  
BSC: University of Wales, United Kingdom, 1958-1961  
Major: Physics Minor: Mathematics

### CURRENT POSITION:

Professor, Physics Department, Marshall University,  
Responsibilities: Teaching undergraduate Physics, Physical Science and Integrated Science. Teaching graduate courses for Physics and Physical Science teachers in the Physical Science M.S. program.  
Maintaining and developing the Modern Physics Laboratory.

### PAST POSITIONS :

Assistant Professor, Physics Department, Marshall University,  
Huntington, West Virginia, 1982-1985.  
Visiting Assistant Professor, Department of Physics & Astronomy,  
Western Kentucky University, 1975-1982.  
Visiting Assistant Professor, Department of Physics, Roanoke College,  
Salem, Virginia, 1974-1975.  
Science Teacher, Blackwell School, London, England, 1972-1974.  
Staff Physicist, Radiation Section, Research Division, Goodyear Tire  
and Rubber C., Akron, Ohio, 1966-71.  
Post Doctoral Fellowship, Department of Physics, Kent State University,  
Kent, Ohio, 1964-65.

**CURRENT  
RESPONSIBILITIES:**

I teach a full teaching load every semester. My major interest is in teaching. I read books and journals on teaching when I find the time and look for ways to apply new ideas in the classroom. I teach Workshop Physics, a laboratory-centered approach that replaces the traditional instructional format of three hours of lecture, PHY 201/203, and two hours of lab, PHY 202/204, in favor of an activity based, computer-enhanced workshop that meets in the lab three times a week. I constantly write and rewrite the lab manuals for both courses.

I am responsible for the first semester General Physics lab, the largest lab in the department with about 300 students enrolled every year. This lab uses a discovery-based laboratory curriculum adapted from "Real Time Physics" and "Tools for Scientific Thinking" but has since been revised a number of times, most recently in Summer '05 for publication by Kendall Hunt Publishing Co. The manual was used in the Fall'05 Lab and royalties donated to the Soc. Physics Students.

I am also responsible for the operating and maintaining the Modern Physics Lab, and for revising and rewriting the experimental procedures for the lab activities.

# Michael G. Fahrman

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*U.S. citizen*

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## EDUCATION

- 1989                      **Ph.D. in materials science**  
Academy of Sciences, Berlin, Germany  
Thesis title : “ Deformation and Fracture Behavior  
of Ti(C,N)-base Cermets at Elevated Temperatures”
- 1980                      **M.S. in physics**  
University of Technology, Dresden, Germany  
Thesis title : “ Theoretical Modeling of the  
Sensitivity of Solid State Particle Detectors”

## PROFESSIONAL EXPERIENCE

- 1997 – present                      **Special Metals Corporation, Huntington, WV**  
Metallurgist – Advanced, Technology Department
- Modeling-assisted alloy and process development for a large variety of products, encompassing laboratory trials to final implementation in full-scale production. Involved in marketing activities such as technical presentations at customers.
  - Supervision of Physics Laboratory (1997 – 2001). Completed successfully team leader training for Continuous Improvement, the company-equivalent to Six-Sigma.
  - Collaboration with academic institutions and national laboratories on selected R&D projects. Participation in consortiums to oversee technical progress in modeling activities.
- 1996 – 1997                      **Westinghouse Electric Company, Orlando, FL**  
Materials Engineer, Combustion Turbine Materials
- Evaluation of failure modes and life prediction of thermal barrier coatings on hot path components.
- 1992 – 1996                      **Carnegie Mellon University, Pittsburgh, PA**  
Research Associate, Department of Materials  
Science and Engineering
- Experimental and theoretical investigation of the rafting dynamics of the  $\gamma'$ -phase in model single-crystal Ni-base superalloys of varying  $\gamma'$ -volume fractions under creep conditions.

- Design of a series of two-phase (  $\gamma$  -  $\delta$  ) Ni-Al-Mo model alloys exhibiting a systematic variation in the  $\gamma$  /  $\delta$  lattice mismatch. Extensive study of the effect of this lattice misfit on the various aspects of coarsening in these ternary alloys such as coarsening rates and precipitate shape evolution.
- Advised several senior student research projects and co-advised a Ph.D. thesis when collaborating with the Institute of Solid State Physics at the University of Vienna, Austria.

1980 – 1991

**Institute of Solid State Physics and Materials  
Research**, Dresden, Germany,  
Materials Scientist, Powder Metallurgy Division

- Supervisor of Powder Metallurgical (P/M) Laboratory of hard materials, chiefly cemented carbides and cermets. Accountable for laboratory-scale processing of inserts for cutting applications, starting from powder synthesis to eventual prototype fabrication and testing in collaboration with the P/M industry.
- Actively involved in the development of new cutting grades. Research on the effect of alloying additions and the role of metallurgical reactions occurring during sintering on the final microstructure, assisted by extensive mechanical testing at ambient and elevated temperatures and concurrent evaluation of the resulting microstructures. Established correlations between selected microstructural features, mechanical properties, and the metal cutting performance of these tool materials.

#### *EXPERTISE*

- Experimental : metallography, light microscopy,  
(hands-on) electron microscopy (scanning and transmission microscopy)  
diffraction techniques (x-ray, electron diffraction)  
small-angle x-ray scattering  
testing of mechanical and thermo-physical properties
- Modeling : thermo-chemical modeling of multi-component systems  
(Thermo-Calc, JMatPro)  
fluid dynamics (FLOW-3D), some deformation (DEFORM)

#### *PROFESSIONAL ACTIVITIES*

2005 – present	Member of the Seven Springs Committee for Superalloys'2008
2001 – 2006	Key Reader for Mat. Met. Trans. A
2001 – present	Member of the High Temperature Alloys Committee of TMS
1999 – 2001	Chair of the West Virginia Chapter of ASM International
1996 – present	Member of TMS
1995 – present	Member of the Humboldt Association of America
1995 – present	Member of ASM International

Peer reviewer at international conferences and of professional journals with international circulation (Scripta Materiala, Acta Materiala, and Metallurgical and Materials Transactions).

#### *HONORS*

1992 – 1994	Feodor-Lynen-Fellowship, Alexander v. Humboldt Foundation, Germany
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## PUBLICATIONS

2 patents granted, 1 patent pending, 35 publications in journals and conference proceedings with international circulation (list attached). Delivered over 30 oral presentations at conferences and special seminars.

## REFERENCES

Prof. T. M Pollock      Department of Materials Science and Engineering,  
University of Michigan, Ann Arbor, MI  
phone : 734-615-5150      fax : 734-763-4788  
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Dr. G. Gille            General Manager R&D  
Hermann C. Starck & Co., Goslar, Germany  
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## PATENTS

G. Gille, B. Schultrich, M. FAHRMANN, M. v. Ruthendorf-Przewoski,  
*“ Carbonitrides of IVa, Va, and VI a transition metals, methods of making them,  
and their application in hardmetals”*  
European Patent, EP 0 464 396 A1, 1991.

M. FAHRMANN and G. D. Smith,  
*“ Low-cost, corrosion and heat resistant alloy for diesel engine valves”*  
United States Patent, US 6,372,181, 2002.

G. D. Smith, B. A. Baker, M. FAHRMANN, and M.A. Harper,  
*“ Composite tube for ethylene pyrolysis furnaces”*  
Submitted 2003, U.S. patent pending.

## PUBLICATIONS

1. D. G. Evans and M. FAHRMANN,  
*“ A study of the effect of electro-slag re-melting parameters on the structural integrity of large diameter alloy 718 ingot”*  
Proceedings of the Tenth International Symposium on Superalloys, Seven Springs, PA, 2004, eds. T. M. Pollock et al.  
(TMS/Warrendale), 2004, p. 507.
2. W. Hermann, M. FAHRMANN, and H.-G. Sockel,

*“ Determination of the  $\gamma$ -solvus temperature of two commercial wrought Ni-base superalloys by thermal expansion measurements”*

Proceedings of the Tenth International Symposium on Superalloys, Seven Springs, PA, 2004, eds. T. M. Pollock et al. (TMS/Warrendale), 2004, p. 517.

3. M. FAHRMANN and G. D. Smith,

**“ Capitalizing on computational tools in industrial alloy development”**

Journal of Metals 54 (2002) 42.

4. M. FAHRMANN, T. Banik, B. Lindsley, and G. D. Smith,

**“ A powder metallurgy approach to the fabrication of superplastic INCONEL 718”**

Proceedings of THERMEC 2000, the International Conference on Processing & Manufacturing of Advanced Materials, Las Vegas, NV, 2000, CD-ROM, Elsevier Science / TMS, 2000.

5. M. FAHRMANN and J. R. Crum,

**“ Formation of a Pt<sub>2</sub>Mo type phase in long-term aged INCONEL alloy 686 “**

Proceedings of the Ninth International Symposium on Superalloys, Seven Springs, PA, 2000, eds. T. M. Pollock et al. (TMS/Warrendale), 2000, p. 813.

6. N. Saunders, M. FAHRMANN, and C. J. Small,

*“ The application of CALPHAD calculations to Ni-based superalloys “*

Proceedings of the Ninth International Symposium on Superalloys, Seven Springs, PA, 2000, eds. T. M. Pollock et al. (TMS/Warrendale), 2000, p. 803.

7. M. FAHRMANN and G. D. Smith,

**“ Evaluation of Clad Tubing after 18 Years Service in a Coal-Fired Utility Boiler “**

Proceedings of the Symposium on Materials Performance in Fossil Fuel Combustion and Conversion Systems , NACE'2000, Orlando, FL, 2000, paper no. 00232.

8. M. FAHRMANN and G. D. Smith,

**“ Capitalizing on Computational Tools in Alloy and Process Development “**

Proceedings of Symposium on Advanced Technologies for Superalloy Affordability, TMS Spring Meeting, Nashville, TN, eds. K.-M. Chang et al. (TMS/Warrendale), 2000, p. 73.

9. M. FAHRMANN, A. A. Wereszczak, and T. P. Kirkland,

**“ Stress relaxation behavior and dimensional stability of INCONEL alloy 783”**

Mat. Sci. Eng. A 271 (1999) 122.

10. M. FAHRMANN, W. Hermann, E. Fahrman, A. Boegli, T. M. Pollock, and H. G. Sockel,

*“ Determination of matrix and precipitate elastic constants in (  $\gamma$  -  $\gamma'$  ) Ni-base model alloys, and their relevance to rafting “*

Mat. Sci. Eng. A 260 (1999) 212.

11. M. FAHRMANN, E. Fahrman, T. M. Pollock, and W. C. Johnson,

**“ Element partitioning during coarsening of (  $\gamma$  -  $\gamma'$  ) Ni-Al-Mo alloys “**

Met. Mat. Trans. 28A (1997) 1943.

12. O. Paris, M. FAHRMANN, E. Fahrman, T. M. Pollock, and P. Fratzl,



*“ The early stages of precipitate rafting in a single-crystal Ni-Al-Mo alloy investigated by small-angle x-ray scattering and TEM “*  
Acta Materiala 45 (1997) 1085.

13. M. FAHRMANN, E. Fahrman, O. Paris, P. Fratzl, and T. M. Pollock,

**“ The role of plasticity in rafting of a single-crystal nickel base superalloy “**

Proceedings of the Eight International Symposium on Superalloys, Seven Springs, PA, 1996, eds. R. D. Kissinger et al. (TMS/Warrendale), 1996, p. 191.

14. M. FAHRMANN, J. G. Wolf, and T. M. Pollock,

*“ The influence of microstructure on the measurement of high-temperature lattice mismatch in single-crystal Ni-base superalloys “*  
Mat. Sci. Eng. A 210 (1996) 8.

15. O. Paris, M. FAHRMANN, and P. Fratzl,

*“ Breaking of rotational symmetry during decomposition of elastically anisotropic alloys “*  
Phys. Rev. Lettrs. 75 (1995) 3458.

16. M. FAHRMANN, P. Fratzl, O. Paris, E. Fahrman, and W. C. Johnson,

*“ Influence of misfit strain on microstructural evolution in Ni-base model alloys “*  
Acta metall. Mater. 43 (1995) 1007.

17. M. FAHRMANN, P. Fratzl, O. Paris, E. Fahrman, and W. C. Johnson,

*“ Effect of misfit strain on microstructural evolution in model Ni-Al-Mo alloys “*  
Proc. Int. Conf. on Solid-Solid Phase Transformations in Inorganic Materials, Pittsburgh, PA, 1994, eds. W. C. Johnson et al., (TMS/Warrendale), 1994, p.593.

18. M. FAHRMANN, P. Fratzl, O. Paris, E. Fahrman, and W. C. Johnson,

*“ Misfit strain-induced shape transitions of the  $\gamma'$ -phase in model Ni-base alloys “*  
Proc. Symposium on Alloy Phase Stability and Design. ASM/TMS Fall Meeting, Pittsburgh, PA, 1993, eds. G. S. Stocks and P. E. A. Purchi, (TMS/Warrendale), 1994, p. 157.

19. M. FAHRMANN, W. Gruner, A. John, and V. Richter,

*“ Denitrogenation of titanium carbonitride powders during a vacuum heat treatment and its relevance to sintering of cermets “*  
Proc. Int. Conf. on Materials by Powder Technology, Dresden, Germany, 1993, ed. F. Aldinger, (DGM/Oberursel), 1993, Vol. I, p. 833.

20. V. Richter, A. Beger, and M. FAHRMANN.

*“ Cermets – a promising tool material “*  
Proc. Int. Conf. on Tool Materials, Interlaken, Switzerland, 1992.

21. M. FAHRMANN,

*“ Influence of carbon and nitrogen contents on microstructural evolution and properties of WC-(Ti,Ta,W)(C,N)-Co hardmetals “*  
Proc. II. Mat. Research Symposium of the German Ministry of Technology, Dresden, Germany, 1991, eds. B. Vierkorn-Rudolph et al., (TUV Rheinland/Cologne), 1991, Vol. I, p. 2360.

22. G. Gille, M. FAHRMANN, J. Henke, and G. Leitner,

*“ Microstructural evolution during sintering and properties of Ti(C,N) cermets “*  
ibid, p.2231.

23. M. FAHRMANN, H. J. Klaus, and W. Poessnecker,

*“ The influence of carbon content on the properties of a WC-3TiC-6TaC-9Co hardmetal “*  
Powd. Met. Int. 23 (1991) 211.

24. G. Gille, M. FAHRMANN, H. Kotsch, G. Putzky, V. Richter, and A. Beger,

*“ The influence of binder phase composition and microstructure on the properties of*

- Ti(C,N) cermets* “  
 Proc. 12<sup>th</sup> Int. Plansee Seminar, Reutte, Austria, 1989, eds. H. Bildstein and  
 H. M. Ortner, (Tyrolia/Innsbruck), 1989, Vol. II, p.363.
25. G. Gille, K. Komac, S. Novak. And M. FAHRMANN,  
 “ *Sintering behavior and properties of V-and Nb-containing Ti(C,N) cermets* “  
 Proc. IX. Int. Conf. on Powder Metallurgy, Dresden, Germany, 1989, ed. K. Mueller, (AdW/Berlin), 1989, Vol. III, p. 250.
  26. M. FAHRMANN,  
 “ *High-temperature creep of Ti(C,N)-base hardmetals* “  
 Int. J. Refract. & Hard Materials 8 (1989) 219.
  27. M. FAHRMANN, G. Gille, H. Kotsch, V. Richter, and A. Beger,  
 “ *The influence of binder phase composition and grain size distribution on the  
 properties of Ti(C,N) cermets*”  
 Proc. IX. Int. Conf. on Powder Metallurgy, Dresden, Germany, 1989, ed. K. Mueller, (AdW/Berlin), 1989, Vol. III, p. 179.
  28. W. Foerster, G. Gille, and M. FAHRMANN,  
 “ *Mechanical and physical properties of TiC- and Ti(C,N)-base hardmetals, and their  
 potential for cutting applications* “  
 Neue Huette 32 (1987) 343.
  29. M. FAHRMANN, G. Gille, G. Putzky, V. Richter, and H. Kotsch,  
 “ *High-temperature behavior and cutting performance of Ti(C,N)-base cermets* “  
 Proc. VII. Int. Conf. on Powder Metallurgy, Pardubice, Czech Republic, 1987,  
 ed. V. Slesar et al., Vol. II, p.111.
  30. G. Gille, B. Schultrich, G. Putzky, M. FAHRMANN, W. Foerster, and H. Kotsch,  
 “ *Comparison of TiC- and WC-base hardmetals in terms of mechanical and physical  
 properties* “  
 Proc. Int. Powd. Metall. Conf., Duesseldorf, Germany, 1986, eds. W. A. Kaysser and W. J. Huppmann, (Schmid/Freiburg),  
 1986, Vol. I, p. 279.
  31. M. FAHRMANN,  
 “ *High-temperature strength of TiC-Mo<sub>2</sub>C-Ni hardmetals* “  
 Int. J. Refract. & Hard Materials 5 (186) 96.
  32. B. Schultrich, H. J. Klauss, M. FAHRMANN, G. Gille, H. Kubsch, and V. Richter,  
 “ *Comparison of the deformation and fracture behavior of WC-base and TiC-base  
 hardmetals* “  
 Proc. VIII. Int. Conf. on Powder Metallurgy, Dresden, Germany, 1985,  
 ed. K. Mueller, (AdW/Berlin), 1985, Vol. III, p. 29.
  33. M. FAHRMANN and H. Kubsch,  
 “ *Crack formation around Vickers hardness indentations on TiC-base hardmetals* “  
 Proc. VII. Int. Symposium on Deformation and Fracture, Magdeburg, Germany, 1985, Vol. II, p. 131.
  34. B. Schultrich and M. FAHRMANN,  
 “ *Relation between defect position in bending tests and strength variance* “  
 J. Mater. Sci. Lettrs. 3 (1984) 597.
  35. A. Beger, M. FAHRMANN, G. Gille, H. Kotsch, and K. Mueller,  
 “ *Comparison of TiC-Mo<sub>2</sub>C-Ni and WC-Co hardmetals with respect to wear  
 behavior and mechanical properties* “  
 Proc. VII. Int. Conf. on Powder Metallurgy, Dresden, Germany, 1981,  
 ed. K. Mueller, (AdW/Berlin), 1981, Vol. III, p. 33.