Marshall University
Program Review
November 2006/February 2007

Program: Master of Science in Physical Science
College: College of Science
Date of Last Review: 2001

I. Program Description

The Masters of Science in Physical Science (MS/PS) program has areas of emphasis, or options, in Chemistry, Geology, Mathematics, Physics and Geobiophysical Modeling. The program provides the opportunity for graduates from a variety of disciplines to improve the depth and breadth of their scientific, computer, and mathematical knowledge and skills through instruction, peer learning, and research. The approach is by nature integrated across scientific disciplines and combines instruction and peer learning with practical experience in solving real world problems. The MS/PS already has a long history of providing access to graduate education for those wishing to study the sciences in greater depth as well as in providing additional training and certification to high school science teachers. The program has drawn students from an international arena as well as regional and national.

The MS/PS program originated as a means for public school science teachers to increase their knowledge of science, and in many cases to add a certification, such as Physics 9-Adult Comprehensive (formerly, Physics 7-12), to their teaching credentials. As an interdisciplinary approach to science education, the program uses faculty and research facilities from all departments within the College of Science. The program has from the beginning featured a very flexible approach to student scheduling that has allowed each student’s Plan of Study to be unique to his/her needs. The graduates from the program have the technological skills to fulfill the University’s mission of workforce and economic development with an interdisciplinary outlook relevant for today’s society. With time the degree program has expanded its scope allowing students to build degree programs with broader areas of interest. In 1986 a graduate’s thesis involved the use of computer software to process large data sets using parallel and concurrent processing. Courses in remote sensing and image processing (now cross-listed as PS/BSC 410/510 and PS/BSC 411/511) entered the curriculum in the early 1980’s. These courses along with additional work involving practical applications of digital imagery (e.g., PS 470/570 Practicum) gradually evolved into a new track within the program. The new track is called the Geobiophysical Modeling option. This option now constitutes a major component of the MS/PS degree program. This expansion is consistent with the University’s emphasis on integrated science.

The Geobiophysical Modeling graduate option extends the Environmental Assessment and Policy (EAP) option of the Integrated Science and Technology (ISAT) baccalaureate in the College of Science. The EAP program was developed in response to requests from the WV Departments of Natural Resources and Environmental Protection as well as the US Fish and Wildlife Service, Army Corps of Engineers, Geological Survey and Forest Service and private sector environmentally related businesses such as Environmental Engineering and Columbia Energy. The ISAT program provides an integrated, interdisciplinary undergraduate degree in environmental science that combines traditional education in the natural sciences with practical
skills in conducting field work, data management, regulatory affairs and public policy. The Geobiophysical Modeling option of the MS/PS combines advanced coursework in natural science with image analysis, geographic information systems (GIS) and computer-based mathematical modeling. These skills are applied to environmental assessment, transportation systems, and urban growth monitoring. The Geobiophysical Modeling option emphasizes a team approach to the solution of real world problems which is consistent with the pedagogical approach of the ISAT/EAP undergraduate program in applying the traditional approaches of the natural sciences to the study of the environment. The demand for the Geobiophysical option is evident in the growth of enrollment in the MS/PS program since the remote sensing and image processing components have been added.

The MS/PS program is Marshall's only interdisciplinary graduate degree program with direct access to the University's investment of tens of millions of dollars in scientific instructional and research facilities and equipment, dozens of natural science and mathematics faculty with outstanding reputations as scholars and mentors and the multimillions of external dollars awarded to the campus annually for support of scientific research and education. Software grants worth millions of dollars over the past several years from ERMapper (San Diego, CA), IDRISI (Clark University in MA), and ESRI (Redlands, CA) have provided the basis of a computerized environment for the digital image processing portion of the Geobiophysical Modeling curriculum. The physical facilities and the analog optics portion of the graduate curriculum have been a cooperative extension of the Department of Physics and Physical Science academic offerings. The digital component is funded by the software grants and limited digital instrument parts for upgrades through a Rahall Transportation Institute grant. As such the MS/PS is ideally suited to capitalize on Marshall's sizeable investment in these disciplines in achieving the University's mission in workforce and economic development by providing access to a graduate education in the natural sciences or mathematics that is interdisciplinary and relevant for the 21st century.

Since the beginning of the calendar year 2002 there have been twenty-eight graduates from the MS/PS program. There are sixteen students currently in the program making progress in the various tracks toward their degree. Of the recent graduates all but one have full-time employment. The one has a visual disability that limits her options for employment. Virtually all of the employed graduates are working in fields that are related to their degree work.

MS/PS graduates as Rahall Transportation Institute (RTI) Research Associates lead projects and are working toward Ph.D. degrees in engineering. The project work occurs in the Science Building rooms 259 and 307. These projects are valued at half-million dollar plus per year. These funds are used to support project development as well as for tuition and salary of typically twelve graduate students. RTI project topics lead to thesis research and satellite/aerial digital-image processed mapping and modeling. These projects have an applied science, and transportation engineering emphasis. The background of many of the students is very often engineering.

MS/PS graduates who are Research Associates at RTI are also instructors at the Marshall Technical and Community College in the Geospatial Science and Technology Program. This program leads to the Associate in Applied Science Degree. This degree is being built as an interface with the Integrated Science and Technology and a Baccalaureate in Applied Science.

II. Accreditation Information
This is a program unique to Marshall University. No external accreditation program exists.

III. Program Statement

A. Adequacy

1. Curriculum:

The Physical Science degree program (cf. Appendix I) has several areas of emphasis all of which require a minimum of 32-36 student credit hours of coursework, with 12-18 hours in the area of emphasis, 6 hours in a minor area and 12-18 hours of electives. With a thesis a minimum of 32 hours is required. Without a thesis, a minimum of 36 credit hours is required. A thesis is required in the Geology area of emphasis and encouraged in all other areas. In the traditional areas the 12-18 hours required in the major are not specified, but must be approved by the student's advisor.

The MS/PS accommodates students with a range of backgrounds and career goals so there is no common core of courses that would be useful to all students. Students are assigned an adviser in their area of emphasis and in consultation with that faculty member develop a program that is consistent with the MS/PS and University degree requirements yet tailored to individual student needs.

Specific courses are required of in-service teachers who chose the physics area of emphasis to strengthen their background in the basic sciences or to obtain a Physics 9-Adult Comprehensive endorsement to their teaching certificate. These students generally use the non-thesis option requiring 36 credit hours to complete the degree requirements.

Teachers not working for certification choose courses in Physics, Physical Science, Chemistry, Geology, Mathematics, and Biological Sciences as appropriate to give them broader and deeper backgrounds in the natural sciences and mathematics.

- Teachers working toward Physics 9-12 certification must complete:
  - Astronomy and Astronomy Lab (PS 500 and 500L, 4 credit hours);
  - General Physics and General Physics Lab (PHY 201, 202, 203 and 204, 8 credit hours);
  - Modern Physics and Modern Physics Lab (PHY 320 and 521, 5 credit hours);
  - Mechanics for Teachers (PHY 547, 4 credit hours):
  - An additional 13 credit hours of Physics electives generally including Optics and Optics Lab (PHY 304 and 505, 5 credit hours), Electronics and Electronics Lab (PHY 314 and 515, 5 credit hours) and 3 additional credit hours in physics.

As graduate students, teachers would enroll in independent study or special topics courses at the 500 level to obtain credit for courses which do not carry graduate credit. Teachers lacking the introductory coursework in physics must enroll in the lower division classes to establish grounding in basic physics concepts.

Geobiophysical Modeling integrates computer enhanced image analysis, geographic information systems, development of computer based mathematical models and the study of environmental law and regulation with content in more traditional disciplinary courses. The program emphasizes a “hands-on” approach to problem solving. There are three areas of concentration:

- Aquatic Systems and Models
- Terrestrial Systems and Models
- Biophysical Systems and Models

Geobiophysical Modeling students come from a variety of undergraduate majors including Biology, Physics, Chemistry, Geology, Engineering, Geography, Mathematics and ISAT. Many of
these students do a thesis and complete 32 credit hours of coursework built around a core of spatial
analysis, image processing and remote sensing courses:

- Remote Sensing (PS/BSC 510, 4 credit hours)
- Image Processing (PS/BSC 511, 4 credit hours)
- Practicum (PS 570, 4 credit hours)

Students using the MS/PS program to enhance their technical backgrounds for graduate
school or employment typically select courses from Mathematics and any of the physical
sciences to meet their individual needs. These students typically take the non-thesis option. This
is a small group of students but not insignificant.

2. Faculty (d. Appendix II)

The MS/PS program shares faculty with other disciplines as students in the program are
eligible to take virtually any College of Science graduate course for which they have the
prerequisites. Curriculum vitae for the faculty actively providing instruction specifically for
the students in this program are provided in Appendix II. These faculty are active scholars
typically producing an average of two peer-reviewed journal articles, presentations and/or book
chapters each year. Collectively, the College of Science faculty were granted $1.85 million
dollars in externally sponsored research and education projects during the past fiscal year. To
date $578 thousand have been awarded this fiscal year. Sponsors include the Army Research
Office, NASA, the Corps of Engineers, WV Department of Natural Resources, National
Science Foundation, and the Ohio River Sanitation Commission.

3. Students

a. Entrance standards: Students must be admitted to the Graduate School before
registering for classes in this program. For admission to Graduate School a student must have a
baccalaureate degree from an accredited college or university and an undergraduate quality point
average of at least 2.5 or equivalent. Students who have a sufficiently high GPA, but do not have
an adequate background in the physical sciences, or the area of emphasis they enter, are expected
to take appropriate undergraduate classes before starting graduate work.

b. Entrance Abilities: The abilities and background of entering students vary
considerably. Some examples of the background of students entering the MS/PS program are:

- Students with an undergraduate degree in a specific area of physical science and
  wish to continue their study in that area so as to improve their prospects of employment or
  promotion, or to be accepted into a Ph.D. or other specialized program. This is almost always true of
  Geology students planning on becoming professional geologists or already working in the field. It is
  also often true of Physics students who frequently seek to improve their background before entering a
  Ph.D. program.
- Biology and Geology baccalaureates often want to improve their job prospects by
  broadening their training in remote sensing, image processing, and GIS technology. Integrated
  Science students with a career interest in environmental assessment and public policy belong in this
  group as well.
- Secondary school teachers required to add an endorsement in physics or another
  physical science to keep a teaching position. Each year, more new endorsements in physics are
  earned by full-time teachers than by new graduates. The Marshall MS/PS program is of vital
  importance to physics education in WV schools as it is the most productive program of its kind in the
  state.
c. Exit abilities: Before being admitted to candidacy students must have a quality point average of at least 3.0 or more in no less than 12 hours in their major. The nature of the MS/PS program (e.g. the geobiophysical option and use for teacher recertification) makes it impossible to define national standards, e.g. GRE score, against which to measure the entire MS/PS student population.

During the review period the average graduate GPA of MS/PS students was 3.68 which is indicative that MS/PS students are making good progress toward their degrees (i.e. maintaining a B or better average).

There is an ongoing assessment of competencies of students in the program. After completing the requirements for the degree the students should have the abilities described below.

- Have a sound grasp of the fundamental principles of the discipline. All degree candidates take a written and an oral examination to graduate. The written exam is comprehensive in their major. In the case where a student chooses the thesis option, the student defends the thesis before a faculty committee. If the student chooses the non-thesis option the oral is more broadly based in the discipline and course work the student has completed. In-service teachers who add an endorsement to their teaching certificate through the MS/PS program are required to pass a content specialization test administered by the state. Those scores are closely monitored and no MS/PS students to date have been required to repeat this exam.

- Know how to plan and carry out an investigation or research project. Many of the MS/PS courses (Appendix V) include lab work and a required open ended project. Students are trained in the application of a variety of scientific and technical equipment (e.g. global positioning systems (GPS), gas chromatography (GC), mass spectrometry (MS), nuclear magnetic resonance (NMR), liquid chromatography (LC), geographic information systems (GIS), laser instrumentation, etc.) to real environmental problems. Many MS/PS students elect the thesis option which provides extensive training in research investigation.

- The MS/PS program provides extensive training in computer technology (e.g. GIS, image processing, and remote sensing) and seeks to integrate computer-based information processing (e.g. in spatial analysis) into all aspects of the curriculum. Teachers in the program use software to analyze data taken in the laboratory courses and on research projects.

- Know how to write and speak. MS/PS students are required to submit written reports in many of the courses in which they enroll and many take the thesis option which requires an extensive written thesis and an oral defense. The core courses for the Geobiophysical option all are project oriented with oral (using power point software) and written presentation of the work done.

- Have critical thinking and problem solving abilities; know how to apply those skills to the solution of real problems of interest to government and industry. These skills are acquired in coursework but are developed in project assignments and especially in connection with thesis research.

4. Resources

a. Financial: The MS/PS program uses faculty and facilities (e.g. physics, chemistry, geology, ISAT, and computer labs) of participating departments so program expenses are rather broadly distributed over participating units of the College. In addition lab fees are charged in courses with special expenses such as the spatial analysis courses which have annual software license fees and must contribute to the maintenance, upkeep and repair of computer hardware and networking. The College of Science funds a College Information Technology staff which provides maintenance
and repair service as well as consulting on acquisition and implementation of information technology hardware and software.

The MS/PS program uses existing courses which are core requirements or electives in traditional disciplinary degree programs and would be taught on the same schedule were the MS/PS degree to be eliminated. Even the MS/PS spatial analysis courses would be unaffected by elimination of the MS/PS degree as they are presently used as electives by students enrolled in traditional disciplinary degrees.

Like the other degree programs in the College, the MS/PS program depends heavily on lab fees to cover operating expense. Heretofore there has not been systematic accounting of the expenditures of those fees for the MS/PS program because the registrar has provided only the gross fee revenue for each course and the departments do not have the staff time to parse that information according to course enrollments by MS/PS students. This situation is by no means unique to the MS/PS program as the policy has generally been that fee revenue goes to the offering department and is not divided between the home departments of the enrolled students. This policy adversely affects the MS/PS program and the policy will be discussed by the reconstituted MS/PS Program Steering Committee.

As mentioned earlier, MS/PS graduates as Rahall Transportation Institute (RTI) Research Associates lead projects. The project work occurs in the Science Building rooms 259 and 307. These projects are valued at half-million dollar plus per year. These funds are used to support project development as well as for tuition and salary of typically twelve graduate students. RTI project topics lead to thesis research and satellite/aerial digital-image processed mapping and modeling. These projects have an applied science, and transportation engineering emphasis. The background of many of the students is very often engineering. RTI has also provided funds for hardware and software upgrades in Science 259.

The facilities, faculty and staff used in this program exist for each of the respective departments within the College of Science. Elimination of the program would only hurt students seeking a productive career path and would not save funds in faculty, staff and facilities categories. The program has no line-item budget of its own!

b. **Facilities:** The facilities, laboratories and classrooms used in the MS/PS program are those of the participating departments. The program has no facilities of its own. Two laboratories assigned to the Physics department are used cooperatively for pre-service and in-service teacher preparation in physical science and astronomy. Part of the Physics optics lab is used for image analysis, remote sensing and GIS instruction as well as project and thesis work.

**Equipment:** In this respect the program is inadequately funded, as are the programs throughout the College of Science. Equipment funds have not increased significantly during the review. No budget exists specifically for the MS/PS program.

Departments have attempted to mitigate these problems by applying for external grants but these have been mainly in support of faculty research since such money is more widely available from external sources. In the past there have been successful efforts to obtain Course, Curriculum and Laboratory Improvement funding from the National Science Foundation's Division of Undergraduate Education but such funds are targeted to undergraduate programs and their use in the Physical Science graduate program is at best an afterthought. Participating departments need to develop strategies for upgrading the equipment available to the PS program and that will also be a major agenda item for the PS Program Steering Committee.

The program has been quite successful in obtaining vendor grants for its spatial analysis software (ERMapper, Microsoft Office Pro, IDRISI32, Surfer, Designer, ArcView, ArcInfo, Spatial Analyst, etc.) with a value well into six figures. The computers in the spatial analysis lab need to be updated but they are custom built and networked which limits the upgrade possibilities.
Improvements in this area will be very much tied to evolution of the spatial analysis curriculum in the next few years. Sharing Science 259 with the Physics Department's optics lab allows PS students enrolled in spatial analysis courses access to optical image processing equipment to supplement the digital information processing that takes place with the spatial analysis software.

5. Assessment information
   a. Elements of Assessment Plan: Student academic progress is closely monitored as are GPA, performance on classroom exams, written project reports and theses. Other assessment elements are performance on Comprehensive Exams and Content Specialization Tests (for teachers), student advisement sessions and anecdotal information about post-graduation employment and doctoral study.

   The MS/PS Steering Committee met approximately eight times during the 2005-2006 academic year. The topics of discussion included publicizing the program (An information sheet has been generated for distribution to interested student (See Appendix I), the role of the core courses (PS/BSC 510/511) in the Geobiophysical option, and the necessity of flexibility of selecting courses for the Plan of Study to suit individual student needs.

   Program Quality Improvements: The major improvement in the curriculum for the program in this assessment period is the encouragement and completion of students doing thesis work. Within the core curriculum courses (PS/BSC 510/511) students are encouraged to consider the thesis option on the basis that jobs are project oriented. The completion of a thesis is ideal preparation for a project oriented job where computer processing of data is necessary.

   In addition, students are encouraged to include as much computer oriented coursework in their Plan of Study as possible. Project completion often means knowledge of computer software.

   b. See separate file for the Chart I Assessment Summary.

   Note that the chart has remained unchanged since the last program review. Student outcomes are difficult to specify because of the flexible nature of the program. Flexibility is in fact one of the major strengths for the program, but that means that student outcomes are basically unique for each student. Student outcomes could be generally summarized for all students as:

   • Students must have a sound grasp of the physical principles of their discipline.
   • Students must be able to recognize a problem and formulate a plan of attack for solving the problem.
   • Students must have mathematical skills to handle mathematical solutions, including statistical concepts, to quantitative problems whether it be analysis of data from a Physics laboratory or from spatial data for land use and change.
   • Students must have a sound working knowledge of computer hardware and software systems as they apply to application in their discipline.
   • Students must have verbal skills to define a problem, specify a plan of attack for the solution of the problem, and justify the results gained from the process.
   • Students must have written skills to define a problem, specify a plan of attack for the solution of the problem, and justify the results gained from the process.
   • Assessment of these outcomes comes in the coursework whether it be a straight science course or a spatial analysis course. Science courses typically have problem assignments in the lecture component and experiment reports in the laboratory component. Both are used to assess student outcomes. Spatial analysis courses, at least the core courses, have project
proposals and/or reports required where the students must verbally and in writing show progress on a project.

- All students completing the MS/PS degree must show competency in program areas by competing a written comprehensive exam followed by an oral exam. The oral exam is tuned to the written exam when no thesis is involved. If a thesis is involved, the oral exam is a power point defense of the thesis work followed by a question session.

c. Assessment data are being collected from program graduates at this time. A questionnaire has been emailed to twenty-eight recent graduates. At this time twelve graduates have responded. The summary of the responses is given in Appendix VII. The data collected to this point is overwhelmingly supportive of the program. Written comments are constructive and favorable. Responses to a set of eleven statements (strongly agree, agree, disagree, strongly disagree) are all agree or better. For example, the last such statement is, “The knowledge and skills acquired through the program are important in advancing my career opportunities”. This statement has two responses for Agree and eight responses for Strongly Agree. The rest of the statements have similar responses. Data will be collected on a continuing basis and updated in the appendix format. The data collected to date will be brought to the attention of the MS/PS Steering Committee at a meeting during the current semester. The Steering Committee can interact with faculty teaching in the program concerning needed changes.

An information sheet has been generated for dissemination to students interested in joining the program. See Appendix VII for the information sheet. This information sheet is already in use and has been taken on recruiting trips by the COS staff.

Faculty for the core courses are in frequent contact with several of the graduates working in this region. They have been very frank in giving verbal comments about the effectiveness of the program and the changes that could be made. Their comments have been received and responded to where resources were available. For example, a Special Topics course entitled “Terrorism, Transportation and Rural Crime Scene Mapping” was offered two years ago at the request of existing students in the program. Other topics of current interest are frequently addressed in a similar manner.

d. The questionnaire discussed in the previous section is being used to collect data on graduate satisfaction. This aspect of the review is on-going. The results will be tabulated and updated annually. See Appendix VII for the survey document.

e. Summary Reports:

See Appendix VIII for the previous summary reports provided by the Office of Assessment.

6. Previous Reviews:

A full program review was submitted in November 2002. The normal date for the review would have been 2001.

Previous reviews found the program curriculum, faculty and student outcomes adequate including degree production which averaged 2.3 annually (7 degrees in three years) and recommended continuation at its present level of activity. The 1996 review took note of the equipment repair and maintenance needs.

HEPC included the MS/PS program in its special review of low degree production programs and requires the program to produce 7 master’s degrees during the period 2003 - 2005 or be subject to special justification by the institutional governing board. The program generated seventeen
graduates in that interval well exceeding the minimum required.

Major actions during this review period include further development of the Geobiophysical option which has proved very popular and the full development of the ISAT program as a feeder of the MS/PS degree.

Copies of the previous five years of summary reports are in Appendix VIII as provided by the Office of Assessment.

7. Strengths/Weaknesses:

**Strengths:** Because of the interdisciplinary nature of the program there is a wide range of faculty expertise that provides students with a great breadth of knowledge both in coursework and in thesis research. This facilitates study and research of issues that are inherently complex and multidisciplinary such as those dealing with the environment. Projects for graduates in the work area are often inherently interdisciplinary.

The broad multidisciplinary nature of the MS/PS program also provides students and faculty access to a wide range of scientific equipment and facilities for use in classroom instruction, the research laboratory and field work projects. This avoids duplicating the expense of purchase and maintenance of such resources already in traditional disciplinary departments.

A number of Physical Science faculty have worked extensively with K-12 teachers and school systems and are leaders in the College if not the campus in fulfilling the all-University responsibility for teacher preparation and pre-college curriculum development in science and mathematics. These faculty and their students contribute to strengthening Marshall's pre-service and in-service teacher preparation and pre-college curriculum development efforts. They also expose graduate science and math students to West Virginia's K-12 education community thereby increasing their understanding of and support for improvement in that sector of the state's program of public education.

All faculty teaching in the program have doctorates and a great deal of teaching and research experience. With the growth and development of ISAT as a feeder program increased numbers of PS faculty and students are actively engaged in research. External sponsorship of professional activities is increasing and presentations at professional meetings by students and faculty will continue to grow as a direct result. The close coordination between the undergraduate ISAT and MS/PS program will strengthen both programs.

The flexibility of planning a coursework program for each student to meet the background of the student and the needs of that student allow the program to function with students from a wide range of backgrounds. For example, students with undergraduate mathematics and geography degrees can both benefit from different aspects of the program even though their skills in mathematics vary greatly. Faculty in the core courses openly encourage students to interact on instructional elements and on research projects.

The flexibility allowed in each student’s Plan of Study allows teachers working toward certification in Physics 9-Adult Comprehensive to follow a structured series of courses (typically Modern Physics, Mechanics for Teachers, Optics, Electronics, and appropriate accompanying laboratories). Simultaneously, graduates from programs in Biological Sciences, Chemistry, Geology, Geography, and ISAT are encouraged to take the Geobiophysical Modeling core courses (PS/BSC 510/511) and then select from a broad range of graduate courses to suite their own needs.

The reconstitution of the PS Steering Committee has been directed to include faculty who are actively teaching in the program with vested interest in the program. Four of the members are also Department Chairs. The Program Coordinator has been teaching in the Physical Science program over the past 36+ years and was heavily involved with the creation of the core courses in image processing dating back to about 1980. In fact, both faculty who started the remote sensing and image
processing components of the program are on the Steering Committee.

**Weakness:** The major weakness of the interdisciplinary MS/PS program is at once also its major strength and that is its use of faculty, facilities and equipment from the traditional disciplinary departments. Although this provides broad access to such resources, it also means that the MS/PS program has **no resources of its own** and must share them with other departments. Furthermore, there is no line item budget on which the program exists. This alone is a great limitation on the computer facilities used for the core courses. This weakness is greatly mitigated by having the program share curriculum for the core courses with Physics and Physical Science and the Biological Sciences departments. Then, both programs have a common interest in increasing course enrollment, so that scheduling conflicts have not arisen.

**Suggestions:**
- A line item budget needs to be created for the program to overcome the weaknesses expressed above. A line item budget would allow for hardware and software replacement and updating in the laboratory in which the core courses are taught. It would also provide funds for project and thesis work done by students.
- In order to keep the Physics teacher certification component of the program alive it is necessary to schedule at least one suitable graduate course, possibly with a laboratory, during the C or D summer terms. These courses have not been offered recently because of University emphasis on summer school courses being offered with high enrollment. Without the summer school courses working teachers do not have the appropriate opportunity to make progress through the program. Their teaching duties during the academic year simply restrict many teachers from scheduling courses. The certification component is a vital component of the program due to the low numbers of certified science and mathematics teachers in West Virginia, and indeed, in neighboring states.
- The University needs to look into replacement existing faculty in the core courses. Both faculty members were part of the original creation of remote sensing and image processing courses on campus. They have developed a team teaching approach that encourages project completion, student-student interaction, flexibility in Plan of Study documents suited to the individual student. They are both at retirement age. A phased withdrawal from the program would allow new faculty to learn the current approach to teaching the core courses. This in turn would maintain much of the program strengths cited above.
- With the current heavy teaching loads the College of Science should allow release time for faculty in charge of the five-year program reviews.

**B. Viability:**

1. **Articulation Agreements:** An agreement between faculty of the core courses and faculty of the Community and Technical College (CTC) encourage students graduating from CTC and a bachelor’s degree (e.g., BOR) to enroll in the MS/PS program to expand their technical skills and broaden their chances for employment.

   There are presently no program specific articulation agreements with other institutions for delivery of this program because it is unique in West Virginia. The PS Steering Committee will consider such arrangements with the state's undergraduate institutions, possibly in the form of 4 + 1 (or + 2) cooperative degree programs with graduates earning an MS/PS from Marshall.
2. **Off-Campus Classes:** During the review period no off-campus classes were offered. This is partly due to the need for specialized facilities (e.g. optics laboratory, computer systems, etc.) many such courses require. In the past physics certification courses have been offered with off-campus lecture components and on-campus laboratory components. These have been offered with the cooperation of county school board officials. Another cycle of these courses should be negotiated in the near future.

3. **Service Courses:** See Appendix IV. The Geobiophysical Modeling students typically take the core courses (PS/BSC 510/511) as an introduction to spatial modeling procedures. A few students in the Geography Department take these courses as electives. The Geobiophysical modeling emphasis in the MS/PS program is increasing in part because of the growth of the ISAT program. The graduates in the Geobiophysical Modeling option have had excellent opportunities in the employment market because of their ability to process and analyze data for such projects as urban growth monitoring and environmental assessment.

With the exception of the ISAT program the departments participating in the PS program are primarily service departments. Most of the courses offered by these departments are courses taken by their majors or by other science majors in addition to MS/PS graduate students. A number of PS/PHY courses in physical and general science are required in the teacher education program (e.g. Astronomy). Consequently, the justification of the PS coursework does not rest exclusively on the MS/PS degree program but on its broad service function across the College of Science.

4. **Program Course Enrollment:** See Appendix V. Data in Appendix V show the breadth and frequency of the curricular offerings in the PS program, which are quite extensive as they should be for an interdisciplinary program. The course enrollments are one indication of the viability of the PS/MS program. The cross-listed core courses are also double numbered so that PS 410/510 and BSC 410/510 represent the full offering for the remote sensing course offered each fall term. PS 411/511 and BSC 411/511 represent the offering for the image processing course offered each spring term. Each term these courses typically carry 12-15 students.

In Appendix V all of the Geology courses have been listed as they are required for students using the Geology option of the MS/PS program. Their courses also serve as electives for students in the other options. The Physics and Physical Science courses (excepting PS/BSC 510/511) are often required for physics certification students and they also serve as electives for the other options. There have been only rare students use the Mathematics and Chemistry options in the program as both of those departments have separate MS programs. However, some courses from Mathematics and Chemistry have been entered into Appendix V as they would likely be electives for the other options.

5. **Program Enrollment:** See Appendix VI. The MS/PS already has a long history of filling major voids in the campus's academic programs from providing access to graduate education for those wishing to study physics and the geosciences in greater depth to providing additional training to high school science teachers. Several dozen students have matriculated in the program during the last five years alone with twenty-eight degrees awarded (2002 through summer 2006) and 30-35 students continuing to progress toward the MS/PS degree (cf. Appendix VI).

The Geobiophysical option is the most popular reflecting an increased dependence on physical methods such as spatial analysis and mathematical modeling in the biosciences, especially
in environmental science. Employment opportunities certainly are an attraction for students embarking on a career.

The Physics 9-Adult Comprehensive certification in the physical sciences would remain a steady contributor to the program if courses can be made available to in-service teachers. There is no similar program in the state and WVU is the only other West Virginia institution that offers a full range of degree programs in the physical sciences including access to the faculty, equipment and other resources necessary for an up-to-date curriculum in those disciplines.

6. **Enrollment Projections:** There is every reason to anticipate increased MS/PS enrollments, particularly in the Geobiophysical Modeling option. Historically and continuing for the foreseeable future West Virginia's natural resources will be its major source of wealth. Husbanding those resources so that they are sustainable and continue to be a major source of income for the state will require a workforce well trained in environmental assessment and public policy. Marshall's MS/PS and ISAT programs are designed to work cooperatively to produce just such a workforce. With ISAT *Environmental Assessment and Public Policy* baccalaureate degree production increasing, enrollments in the Geobiophysical option of the MS/PS programs will grow substantially in the next several years.

Also contributing to MS/PS enrollment growth will be interest in graduate education by those holding baccalaureates in closely related disciplines such as Geology. Employer surveys indicate that although Marshall baccalaureates are highly employable, advancement is dependent upon development of the additional skills and training that is associated with a graduate degree. The Geobiophysical modeling option provides such students the opportunity to broaden their knowledge of mathematical modeling as well as increase their field skills and deepen their knowledge of the geosciences in the area of career specialization.

West Virginia is placing greater emphasis on the continuing education of physical science teachers. The state provides teachers earning an in-field M.S., M.S. +15 or M.S. +30 SCH in designated shortage areas a salary increment starting at $1,000. Physical Science is one of seven designated shortage areas. Although West Virginia has a surplus of teachers due to the declining school age population this is not the case in science and mathematics. The shortfall of teachers in those subjects will continue to contribute to enrollment in the teacher certification option of the MS/PS program due to teachers wishing to add certification in the physical sciences to their credentials.

C. **Necessity**

1. **Advisory Committee:** The MS/PS program does not have an external advisory committee at the present time. The faculty advisory committee consists of seven faculty members from Biological Sciences, Geology, Integrated Science and Technology, and Physics and Physical Science. Four of the members are department chairs. As stated above the committee met eight times during the 2005-2006 academic year to discuss issues relevant to the program.

2. **Graduates:** There is no comprehensive data on graduates because until the recent implementation of the Geobiophysical Modeling option relatively few students received MS/PS degrees and those that did viewed themselves as more closely associated with one of the participating traditional disciplines than with the MS/PS program itself. Before implementation of the Geobiophysical modeling program most of the graduates were employed in the geosciences and physics either in commercial firms or as teachers in two-year institutions. A number of teachers successfully completed recertification under the program but did not complete their degrees.

With the advent of the Geobiophysical Modeling option the majority of the students have
career interests related to environmental assessment and public policy as demonstrated by their choice of graduate internships with organizations such as the Army Corps of Engineers and Environmental Sciences Research Institute.

In cases where the information has been obtained salaries appear to be competitive for entry level positions $40,000 to $60,000, significantly above those typical of entry level employees with only a baccalaureate degree. A May 2007 graduate has accepted a job based on the content of her graduate program in excess of $60,000.

3. **Job Placement:** There is no comprehensive data on employment of PS graduates. Demand appears to be increasing for graduates with environmental training. Several are employed as GIS staff members for the Rahall Transportation Institute and the Center for Environmental, Geotechnical and Applied Sciences at Marshall. The growth of the ISAT baccalaureate program as a feeder for the PS program will accelerate this trend.

Students become aware of employment opportunities through faculty with close ties to commercial firms and government agencies and through contacts made during internships. Anecdotally, graduates appear to have no trouble finding degree related employment or in being accepted to respected doctoral programs. The PS Steering Committee will institute regular surveys of graduates and employers to obtain more comprehensive data and to broaden post-graduate employment opportunities for our students.

D. **Consistency with Mission**

The MS/PS program is an excellent example of Marshall's fulfilling its mission in education and workforce and economic development in that it provides graduate training for the labor pool in West Virginia's key natural resource sector of the economy. Surveys of both commercial and governmental employers conducted by Marshall's Center for Business and Economic Research have documented that the state needs more employees with the advanced skills provided by this program.

The PS program is closely coordinated with the University's undergraduate programs in environmental assessment and public policy, geology and related disciplines. It uses the faculty, equipment and facilities of traditional disciplinary programs to deliver instruction at little or no additional cost. Simultaneously it provides baccalaureate graduates from these programs the opportunity to obtain a greater depth of knowledge and experience in subjects of great interest to this region of the country (e.g. protecting the environment while using natural resources to create wealth and jobs).

In addition the program provides content education in the physical sciences for both in- and preservice teachers, a critical shortage area in West Virginia. In this regard the program works in collaboration with the College of Education.

**IV Program of Excellence**

Designation does not currently apply to the MS/PS program.
Appendix I

MS in Physical Science Program Review

Required Courses

Information Sheet
MS/PS Program

Physics Teacher Certification Track

This track is used by working science teachers who obtain certification in Physics 9-Adult Comprehensive and/or who get an in-field MS which increases their salary. A few local students get this degree to simply increase their background in science.

Required Science Courses:

General Physics, PHY 201, 202, 203, 204 (or substitute PHY 211, 213 for PHY 201, 203)  
(Not available as graduate hours)  
Modern Physics for Teachers, PS 648  
Modern Physics Laboratory, PHY 521  
Mechanics for Teachers, PHY 547  
Astronomy and Astronomy Laboratory, PS 500, 500L

Recommended Electives:

Electronics for Teachers, PS 649  
Thermal Physics, graduate special topics or independent study numbers  
Optics, graduate special topics or independent study numbers  
Optics Laboratory, PHY 505

Accepted Electives:

Virtually any course in Chemistry (CHM), Geology (GLY), Mathematics (MTH), Physics (PHY), Physical Science (PS), or other science areas with approval by an academic advisor.
**Geobiophysical Modeling Track**

**Required Courses:**

Remote Sensing, PS/BSC 510  
Image Processing, PS/BSC 511  
Thesis Research, PS 681 (Up to 6 hours for thesis students)

**Recommended Elective:**

Practicum, PS 570

**Aquatic Systems and Models Concentration:**

**Required:** Two of the following three courses:

Analytical Chemistry, CHM 628  
Environmental Analysis Chemistry, CHM 523  
Geochemistry, GLY 525

**Electives:**

Ichthyology, BSC 501  
Herpetology, BSC 506  
Ornithology, BSC 508  
Mammalogy, BSC 509  
Entomology, BSC 514  
Myecology, BSC 518  
Limnology, BSC 531  
Conservation, BSC 560  
Wetlands, BSC 5XX  
Hydrology, GLY 555  
Spectroscopic Analysis, CHM 522

(14 credits with thesis option, 21 credits without thesis)

**Terrestrial Systems and Models Concentration:**

**Required:** Three of the four following courses

Geochemistry, GLY 525  
Computer Methods, GLY 530
Hydrology, GLY 555  
Environmental Geology, GLY 456  

Electives:  

Atmospheric Physics, PHY 512  
Applied Electronics, PHY 530  
Environmental Analytical Chemistry, CHM 523  
Regional Planning, GEO 514  
Planning and Development, GEO 515  
Climatology, GEO 525  
GIS in Cartography, GEO 530  
Geophysics, GLY 526  
Plant Ecology, BSC 530  
Conservation, BSC 560  
(14 credits with thesis option, 21 credits without thesis)  

Biophysical Systems and Models Concentration:  

Required:  

Plant Physiology, BSC 520 or Plant Ecology, BSC 530  
Geochemistry, GLY 525 or Hydrology, GLY 555  
Electronics or Optics  

Electives:  

Radiation Physics, PHY 550  
Climatology, GEO 525  
GIS in Cartography, GEO 530  
Hydrology, GLY 555  
Environmental Geology, GLY 556  
Plant Physiology, BSC 520  
Conservation, BSC 560  
(14 credits with thesis option, 21 credits without thesis)
M.S. in Physical Science

Department of Physics and Physical Science
Marshall University

The M.S. in Physical Science program was originally conceived to be a means for secondary science teachers to broaden and strengthen their science backgrounds. The program still serves this role. Students use this program to increase their knowledge and understanding in chemistry, geology, mathematics, and physics. Technology and computer science courses are acceptable options in the program. The program gives science teachers a Masters degree in their field of study.

The program has been extended to include a track on Geobiophysical Modeling. This track allows students to acquire computer skills in the areas of Remote Sensing, Image Processing, and Geographic Information Systems (GIS). It has been useful for students involved in biological, geological, and environmental studies. Technology students also find the track useful to extend their software experiences. Students completing this field have found a very positive job market.

It should be emphasized that both tracks above allow the student and faculty adviser to construct an academic program that is suited to the individual student. Flexibility in each student’s Plan of Study has been viewed as a key to the success and usefulness of the program. Both thesis and non-thesis options exist. The non-thesis options require the student to complete 36 approved credit hours of course work. The thesis option requires the student to complete 32 approved credit hours of course work, six of which can be for the thesis.

Questions about the program should be addressed to:
Dr. Ralph Oberly, Coordinator
Department of Physics and Physical Science
Marshall University
Huntington, WV 25755

Telephone: 304-696-2757
E-mail oberly@marshall.edu
Appendix II

MS in Physical Science Program Review

Faculty Data Sheets
Appendix II

Faculty Vitae

Vitae for principle faculty contributing to the MS/PS graduate program. The faculty are listed in alphabetical order as:

- R. Elwyn Bellis - Physics and Physical Science
- James O. Brumfield - Biological Sciences
- Aley El-Shazly - Geology
- Thomas Jones - Integrated Science and Technology
- Michael Little - Integrated Science and Technology
- Ronald Martino - Geology
- William Niemann - Geology
- Huong Nguyen - Physics and Physical Science
- Ralph Oberly - Physics and Physical Science
- Nicola Orsini - Physics and Physical Science
- Dewey Sanderson - Geology
- Ashok Vaseashta - Physics and Physical Science
- Thomas Wilson - Physics and Physical Science
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.
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.

curriculum vitae
James O. Brumfield, Ph.D.
Professor, Graduate Programs in Physical Sciences and Biological Sciences,
Marshall University

Fields of specialization:
- Geobiophysical Modeling, Remote Sensing, Geographic Information Systems, Image Processing,
Global Positioning Systems, Transportation Mapping;
- Systems Engineering, High Performance Computing and Engineering;
- Physics and Physical Sciences, Nuclear Safety, Radiation Physics, Health Physics;
- Earth Sciences: Geology (Geomorphology), Biological Sciences (Plant Physiology), Geography
  (Mapping, Global Positioning System), Environmental Science and Natural Resources planning,
  Urban Pollution, Land Use Planning for Rural Development.

Education:
Ph.D. in Geobiophysical Modeling, Union Institute, Cincinnati, OH;
Educational Fellowship recipient, Faculty Fellow & Researcher in geomorphology and mining,
ABD in Environmental Plant Physiology, West Virginia University;
M.S. in Biological Sciences, Marshall University, WV;
B.S. in Physics, Marshall University, WV.

Teaching graduate courses:
PHY & BSC 410/510, PHYSICAL PRINCIPLES OF REMOTE SENSING;
PHY & BSC 411/511, DIGITAL IMAGE PROCESSING AND GIS MODELING;
PHY, 582, 101, INSTRUMENTATION FOR MAPPING IN TRANSPORTATION SYSTEMS AND
  ENVIRONMENT;
PHY, 582, 102, TERRORISM, TRANSPORTATION AND RURAL CRIME SCENE MAPPING;
GEO 429/529, TEAM-TAUGHT: ARCVIEW GIS IN CARTOGRAPHY;
GEO 430/530, 3D ANALYST, SPATIAL ANALYST.

Teaching and directing graduate students:
- 15 Masters Degree thesis completed in cross-disciplinary geobiophysical modeling topics,
  students successfully accomplished program requirements in 1997-2003;
- 41 students were taking number of classes in Geobiophysical Modeling Graduate Program and
  specialized in Physical Sciences, Remote Sensing Applications with emphasis in terrestrial and
  aquatic systems.

International Development Projects:
- Established consulting relationships for the National Academy of developing country - Kyrgyz
  Republic. Consulted leading scientists and administrators of the National Academy of Sciences: Institute
  of Geology, Institute of Biotechnology, Institute of Biology and Soils; Kyrgyz Technical University
  (Transportation Department), Slavic University, Ministry of Ecology and Emergencies of Kyrgyz
  Republic, International Science and Technology Center (ISTC).

- Initiated International cooperation with the Dresden University of Technology, Institute
  for Cartography, Faculty for Forestry Geo-and Hydrosciences, Dresden, Germany;
  Institute Fur Cartographie and Raumforschung, University of Graz, Austria; Kyrgyz
  National Academy of Sciences, Central Asia.

Recent grant awards:
Principal Investigator: Educational Grant by ER Mapper, Inc., 2003;
Principal Investigator: ESRI, Arc View Spatial and 3-D Analysis Software, 2003;
Principal Investigator: Grant by ER Mapper, Inc. 1991-2002;
Co-Investigator: grant funded by NASA/WV EPSCoR Space Science Grant Consortium, 1997;
Principal Investigator: Software Award, ESRI, Inc., 1989-present;
Total awards value for the period of 1999-2003: $500,000.

**Professional Licenses and Certificates of Training since 1997:**
Material Licenses for Research: Education and Human Use of Radioactive Materials as Radiation Protection Officer and Marshall University Health Physicist.

**Professional societies memberships:**
IEEE Geoscience and Remote Sensing Society, Institute of Electrical and Electronics Engineering Inc.;
IEEE Computer Society; Institute of Electrical and Electronics Engineering Inc.;
International Remote Sensing Society, UK;
International Society of Manufacturing Engineers; USA.

**Recent presentations and publications:**


Appendix II

Faculty Data Sheet
(for the period of this review)

Name: Dr. Aley El-Shazly
Rank: Assoc. Prof.

Status (Check one): Full-time X Part-time Adjunct Current MU Faculty: X yes no

Highest Degree Earned: Ph.D. Date Degree Received: April 1991

Conferred by: Stanford University

Area of Specialization: Metamorphic Petrology/Geochemistry

Professional Registration/Licensure No Agency:

Years non-teaching experience
Years of employment other than Marshall 11
Years of employment at Marshall 2
Years of employment in higher education 11
Years in service at Marshall during this period of review 2

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught, course number, course title and enrollment. (Expand the table as necessary)

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<th>Title</th>
<th>Enrollment</th>
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<td>GLY 421/521</td>
<td>Petrology</td>
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<tr>
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<tr>
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<td>Mineralogy</td>
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<td>GLY 200</td>
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<td>200602</td>
<td>GLY 421</td>
<td>Petrology</td>
<td>5</td>
</tr>
</tbody>
</table>

NOTE: Part-time adjunct faculty does not need to fill in the remainder of this document.
1 If your degree is not in your area of current assignment, please explain.

**For each of the following sections, list only events during the period of this review and begin with the most recent activities.**

2 Activities that have enhanced your teaching and or research.

3 Discipline-related books/papers published (provide a full citation).
   - H$_2$O-CO$_2$-CH$_4$ bearing inclusions in quartz: Insights into the origin and evolution of two hydrothermal Au deposits. Eastern Desert, Egypt. (submitted to Economic Geology)

4 Papers presented at state, regional, national, or international conferences.
   - Geological Society of America Meeting, poster presentation, Salt Lake City, UT October 15-19, 2005

5 Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated.

6 Externally funded research grants and contracts you received.

7 Awards/honors (including invitations to speak in your area of expertise) or special recognition.

8 Community service as defined in the *Greenbook*.  

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Date Created: March 6, 2002  
msps appendix file  
Office of Program Review and Assessment, Academic Affairs, Marshall University, Huntington, WV 25755
CURRICULUM VITA

Dr. Thomas G. Jones

Work Address
Marshall University
Integrated Science and Technology
25560
1 John Marshal Drive
Huntington, WV 25573
(304) 696-7243
E-mail: JonesT@Marshall.edu

Home Address
110 Heather Court
Scott Depot, WV
(304) 757-8575

EDUCATION

University of Louisville, Ph.D. Dec 1997
Marshall University, B.S., M.S. 1986-1992

EMPLOYMENT HISTORY

Visiting Professor
Integrated Science & Technology
Marshall University
Huntington, WV
July, 01 to present

Professor of Research
West Virginia University
Morgantown, WV
2000 to 2001

Assistant Professor of Biology
Alderson-Broaddus College
Philippi ,WV
1997 to 2000

PROFESSIONAL ACTIVITY

Publications
Mammoth Cave National Park’s Fifth Science Conference. Mammoth Cave National Park, Mammoth Cave City, KY.


Presentations at Professional Meetings

- Relocation of Mussels from the Muskingum River Near Dresden, OH. Jones, Thomas, Ralph Taylor, James Spence, Brian Richards, and Katherine Channel. 4th Biennial Symposium of the Freshwater Mollusk Conservation Society, May 15-18, 2005
- Implementation of a spatial-temporal focus to predict habitat locations and distribution of Cambarus veteranus. Katherine Channell and Thomas G. Jones. ASB April, 2005.
- Crayfishes of the New River Gorge National River. Swecker, Casey and Dr. Thomas G. Jones. ASB April, 2005.
- West Virginia crayfish database; a tool to monitor threatened species and plan successful reintroduction of threatened and extirpated species. Jeong, Jooha, Katherine Channell, Beau Gerlach, Jordon Nash, Andrew Rieser, Casey Swecker, Amy Wolfe, Tom Jones, Barry Landers, Elizabeth E. Murray. Expanding the Ark: The Emerging Science and Practice of Invertebrate Conservation presented 3/12/04 New York City NY
- Characterization of Native and Invasive Crayfish Habitat and Genetics in West Virginia.

Extramural Grants and Contracts received and/or worked on

- Aquatic insects of the Kanawha and Ohio River, emphasis on adult dragonfly’s and EPT. WVDNR non-game Grant. Joshua Westbrook & Tom Jones. 2005
- Mussels of the Kanawha River. WVDNR non-game Grant. Brian Richards & Tom Jones. 2005
- Impact and distribution invasive crayfishes have on native populations in West Virginia. WVDNR non-game Grant Casey Swecker & Tom Jones 2005. $5,000.
- Chironimidae identification. Tom Jones and Josh Westbrooke. GAI Consultants/REI
Consultants 2004. $20,000

- Road culverts as barriers. WVDOT/RTI. Mike Little, Tom Jones, Ralph Taylor, and 2003. $50,000.
- GIS mapping and database linking for OSANCOs’ benthic insect data. Tom Jones. ORSANCO and RTI. 2002. $44,000
- Seasonality of the WVSCI scores. Tom Jones. 2002. WV DEP. $19,000.
- Pre-construction Assessment of Wetlands to be built along the Tolsia Highway. Tom Jones, Michael Robinson, Dan Evans, Frank Gilliam, Chuck Sommerville, and Dewey Sanderson. WVDOT/RTI. 2001. $104,000.
- The Corridor H Stream Monitoring Program. Ronald Fortney, Roger Viadero and Thomas Jones. West Virginia Department of Transportation. 2000. $300,000


**Boards/Committees**
Board of Trustees for Ohio River Basin Consortium for Research and Education
Scientific Advisory Committee Member, Mount Storm Power Plant 316a Demonstration Project
Member of the survey team working on the Hines Emerald Dragonfly Recovery Plan
Advisor to Marshall Environmental Science Student Association (MESA)
Advisor to Marshall University Scuba Club

**Professional Societies**
National Science Teachers Association
Professional Association of Diving Instructors (PADI), Open Water Instructor # 191450
American Fisheries Society
North American Benthological Society
Association of Southeastern Biologist
National Speleological Society, Biology Section
**Michael L. Little, Ph.D.**

**Professional Preparation:**

*Marshall University*  
Major in Zoology, BA  
5/67.

*Marshall University*  
Major in Biology, MS,  
5/74

*University of Louisville*  
Major in Biology,  
PhD, 5/83

**Appointments:**

Wayne Junior High School, Wayne, WV, General Sciences Teacher, 1967-1968  
Ceredo-Kenova High School, Kenova, WV, Biology Teacher, 1969-1972  
Marshall University, Huntington, WV, Instructor, Biology, 1973-1976  
University of Louisville, Lousiville, KY, Assistantship, Museum of Entomology, 1977-1978  
Marshall University, Huntington, WV, Assistant Professor, Biology, 1979-1983  
Marshall University, Huntington, WV, Associate Professor, Biology, 1984-1988  
Marshall University, Huntington, WV, Professor, Biology, 1989-1993  
Marshall University, Huntington, WV, Coordinator, Environmental Assessment and Policy Program, 1995-2003  
Marshall University, Huntington, WV, Departmental Chair, Integrated Science and Technology Program, 2003 to present

**Relevant Publications:**


**Synergistic Activities:**
**Director of Education Projects.** Developed an online virtual learning activity in which students integrate science and mathematical operations in a series of simulations. Presently, under revision and available at in development and accessible at [www.marshall.edu/highlandpark](http://www.marshall.edu/highlandpark).

**COLLABORATORS AND OTHER AFFILIATIONS:**

**Collaborators and Co-Editors**

- Dr. Akhtar Lodger, Associate Professor, Computer Science, Marshall University (at time of collaboration)
- Dr. Hisham Al-Haddad, Associate Professor, Computer Science, Marshall University (at time of collaboration)
- Mr. Douglas Chambers, USGS, Charleston, WV, District, Aquatic Biologist
- Dr. Robert Verb, Associate Professor, Biology, Ohio Northern University
- Dr. Peter Vila, Associate Professor, Environmental Science, Shepherd University
- Dr. Tom Jones, Visiting Assistant Professor, Integrated Sciences, Marshall University USFS, Parsons, WV
- Ms. Frederica Woods, Research Scientist, USFS, Parsons, WV
- Dr. William Niemann, Professor of Geology, Marshall University
- Dr. Ralph Taylor, Professor of Integrated Sciences, Marshall University

**Thesis Advisor and/or Graduate Committee Member**

- Mr. James Spence, Graduate Student, Physical Science, Thesis Stream Modeling
- Mr. Justin Elkins, Graduate Student, Physical Science, Non thesis student
- Mr. Noah Kennedy, Graduate Student, Physical Science, Non thesis student
- Mr. Tifton Hilton, Graduate Student, Physical Science, Thesis Benthic Diversity/Stream Structure
- Ms. Katherine Channel, Graduate Student, Physical Science, Thesis GIS and Stream Quality

**RECENTLY FUNDED RESEARCH/PROJECTS:**

- PI….No Child Left Behind Education Grant, 2001-2002, $29000

**PERSONAL NARRATIVE:**

Dr. Michael Little is presently chairperson of the Department of Integrated Science and Technology and a Professor teaching courses in the Integrated Science and Environmental Science degree programs. He was the 2002 Drinko Fellow at Marshall.

He received Baccalaureate and Master of Science degrees from Marshall University and a Ph.D. in Biology from the University of Louisville in 1983. His initial
research, in collaboration with Dr. John Wiley of the East Carolina University School of Medicine, tracked the movement of mobile genetic elements through the genomes of a diploid-tetraploid species complex of treefrogs. His environmental work in collaboration with Dr. Tom Pauley of Marshall University used terrestrial and aquatic salamanders as bioindicators of impacts from environmental acidification and insecticide use. He served for two years as a Research Associate with the West Virginia District of the US Geological Survey, Water Resources Division. He has recently worked with a group of undergraduate and graduate students who have sequenced a portion of the mitochondrial genome in a rare Appalachian fish, the Cheat Minnow. Current research involves the use of GIS and digital technology to map the relationship between stream structure and distribution of Appalachian fishes.

He has taught Genetics, GIS and Data Systems, Introductory Biology, History and Development of Scientific Thought, Applied Ecology of Terrestrial and Aquatic Systems, Introduction to Forensic Science, and Nature of Ecosystems, as well as seminars for the Marshall University Honors and Yeager Scholar programs. Working with the Integrated Science and Technology faculty and students, he has directed the development of a virtual Appalachian community that integrates science and math instruction in a web delivered series of activities. The status of this work can be monitored by checking the website at www.marshal.edu/highlandpark.
Appendix II

Faculty Data Sheet
(for the period of this review)

Name: Dr. Ronald L. Martino
Rank: Professor

Status (Check one): Full-time __X__ Part-time _____ Adjunct _____ Current MU Faculty: __X__ yes ___no

Highest Degree Earned: ___Ph.D._________________ Date Degree Received: ___1981_____

Conferred by: ___Rutgers University

Area of Specialization: ___Stratigraphy & Sedimentation

Professional Registration/Licensure ___________ Agency: ________________________________

Years non-teaching experience _______
Years of employment other than Marshall _______
Years of employment at Marshall ______ 28
Years of employment in higher education ______ 28
Years in service at Marshall during this period of review ______ 28

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught, course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
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<th>Title</th>
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<td>GLY210L</td>
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<td>Stratigraphy &amp; Sedimentation</td>
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<td>200502</td>
<td>GLY 201</td>
<td>Historical Geology</td>
<td>18</td>
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<td>200502</td>
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<td>Independent Study</td>
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<td>Capstone</td>
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<td>Thesis</td>
<td>1</td>
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<td>200503</td>
<td>GLY 110</td>
<td>General Geology</td>
<td>20</td>
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<td>200503</td>
<td>GLY 210L</td>
<td>Earth Materials Lab</td>
<td>16</td>
</tr>
<tr>
<td>200602</td>
<td>GLY 201</td>
<td>Historical Geology</td>
<td>26</td>
</tr>
<tr>
<td>200602</td>
<td>GLY 210L</td>
<td>Earth Materials Lab</td>
<td>14</td>
</tr>
<tr>
<td>200602</td>
<td>GLY 210L</td>
<td>Earth Materials Lab</td>
<td>27</td>
</tr>
<tr>
<td>200602</td>
<td>GLY 211L</td>
<td>Historical Geology Lab</td>
<td>14</td>
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<tr>
<td>200603</td>
<td>GLY 110</td>
<td>General Geology</td>
<td>17</td>
</tr>
<tr>
<td>200603</td>
<td>GLY 210L</td>
<td>Earth Materials Lab</td>
<td>23</td>
</tr>
</tbody>
</table>

*Split 50/50 with Niemann

NOTE: Part-time adjunct faculty does not need to fill in the remainder of this document.
1 If your degree is not in your area of current assignment, please explain.

**For each of the following sections, list only events during the period of this review and begin with the most recent activities.**

2 Activities that have enhanced your teaching and or research.

   “Exploration and Evaluation of Fractured Reservoirs” sponsored by Petroleum Technology Transfer Council, AAPP, 10/06/04. (short course)
   
   Attended monthly meetings of Appalachian Geological Society in Charleston, WV, 4/14/04; 9/21/04; and 11/18/04.
   
   Attended Eastern Regional AAPG in Columbus, OH 10/4-10/6/04
   
   American Association of Petroleum Geologists, Annual Meeting, Calgary, Alberta, June 19-24, 2005
   
   American Association of Petroleum Geologists, Eastern Sec. Meeting, Morgantown, WV Sept. 18-22, 2005
   
   AAPG – sponsored field trip 9/20-9/22, 2005 – Devonian Stratigraphy and Hydrocarbon Reservoirs

3 Discipline-related books/papers published (provide a full citation).


4 Papers presented at state, regional, national, or international conferences.

   Martino, R. L., and Wehrle, D. 2005, Outcrop Analogs and Sequence Stratigraphic Context of the First Cow Run Sandstone, (Late Pennsylvanian, Missourian), St. Mary’s and Newell Run Oilfields, West Virginia and Ohio; AAPP Eastern Section Meeting. Abstracts with Program.
   
   
   
   Martino, R. L., Elizabeth Gierlowski-Kordesch, M. Bascombe Blake, Cortland, F. Eble, 2006, Stratigraphy and Depositional Framework of the Twomile Limestone (Late Pennsylvanian) of Southern West Virginia, Geol. Soc. Am. Abstracts with program NC Meeting, Akron, OH
   
   (co-author of 2 papers presented:
   Belt, Edward S., Martino, Ronald L., Lentz, Leonard J. Heckel, P. E., 2006, Proximal Facies of the Upper Freeport and Associated Cyclothems in the vicinity of the Allegheny Front, Northern Appalachian Basin... In the Vicinity of the Allegheny Front, Northern Appalachian Basin Belt, GSA Abstract with Programs, NC Meeting.
   
   

5 Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.

   West Virginia State Map Review Board
   Geological Society of America; American Assoc. Petroleum Geologists; Society for Sedimentary Geology; Appalachian Geological Society; Co-Chaired Technical Session (Carboniferous Sedimentology and Stratigraphy) at NC. GSA meeting, 2006.

6 Externally funded research grants and contracts you received.

   American Chemical Society Petroleum Research Fund, $50,000, July 1, 2004 through August 31, 2007 Sedimentology, Petrology & Sequence Stratigraphy of the Greasy Ridge Oilfield, Southeastern, Ohio.

7 Awards/honors (including invitations to speak in your area of expertise) or special recognition.

8 Community service as defined in the Greenbook.

   Provided on request information on rocks, minerals, fossils, oil, gas, and coal to general public
   
   Identified fossils of horn corals, bryozoans, and other marine invertebrates found Kentucky for local resident
Provided consulting services to individuals and companies.

9 Research activities conducted this reporting period

Fall 2005 semester worked on the following research projects:

1. Stratigraphy and sedimentary facies of the Greasy Ridge Oilfield, Ohio
3. Spirobis – indicator of marine influence in Pennsylvanian cyclothems
4. Walking trails of the giant terrestrial arthropod *Arthropleura* from the Upper Carboniferous of Kentucky
5. Proximal facies of the Upper Freeport and associated cyclothems in the vicinity of the Allegheny Front, northern Appalachian Basin.
Appendix II

Faculty Data Sheet
(for the period of this review)

Name: Dr. William L. Niemann
Rank: Assoc. Prof.

Status (Check one):  Full-time X  Part-time_____ Adjunct_____ Current MU Faculty:  X  yes  ___ no

Highest Degree Earned: Ph.D. Date Degree Received: May 15, 1999

Conferred by: Univ. of Missouri - Rolla

Area of Specialization: Geological Engineering

Professional Registration/Licensure: Licensed Professional Geologist
Agency: State of Illinois

Years non-teaching experience: 8
Years of employment other than Marshall: 5
Years of employment at Marshall: 2
Years of employment in higher education: 7
Years in service at Marshall during this period of review: 2

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught, course number, title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
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</tr>
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</table>

*split 50/50 with Martino
**split 50/50 with Sanderson

NOTE: Part-time adjunct faculty does not need to fill in the remainder of this document.
If your degree is not in your area of current assignment, please explain.

(For each of the following sections, list only events during the period of this review and begin with the most recent activities.

2 Activities that have enhanced your teaching and or research.

3 Discipline-related books/papers published (provide a full citation).

4 Papers presented at state, regional, national, or international conferences.

5 Professional development activities, including professional organizations to which you belong and state, regional, national, and international conferences attended. List any panels on which you chaired or participated. List any offices you hold in professional organizations.

6 Externally funded research grants and contracts you received.
   West Greenbrier Co-Generation LLC (WGC) $21,869 and the WV Dept. of Environmental Protection (WVDEP)
   $20,000, $37,000 for drilling well. Total estimated value of the project is $97,000.

7 Awards/honors (including invitations to speak in your area of expertise) or special recognition.

8 Community service as defined in the Greenbook.
CURRICULUM VITAE

Que Huong NGUYEN
902 11th Avenue Huntington WV 25701
304-606-2758 (O) 304-697-0558 (H)
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
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

Date Created: March 6, 2002
msps appendix file
Office of Program Review and Assessment, Academic Affairs, Marshall University, Huntington, WV 25755
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 on the semiconductor-organic hybrid exciton in different systems…
- Study polarization-induced internal electric field and carrier dynamic in GaN/AlGaN 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. Investigate optical response of Bose-Einstein Condensate of Atomic Species. Study theory of phonoritons in highly excited semiconductors

Institute of Physics, Hanoi, Vietnam,
1992 – 1994
Researcher
- 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,
1981-1990
Researcher
- 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


4. J. L. Birman and Nguyen Que Huong, *J. Luminescence* 2006 (accepted), Wannier-Frenkel Hybrid Exciton in Organic- Semiconductor Quantum Dot Heterostructures


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.

   The Effect of the Quantum Nature of Excitons on the Phonoriton State in Semiconductors.

   The effect of K-linear term on phonoriton in CdS.

   The Additional Contribution Caused by Coulomb Interaction to the Exciton Dispersion in Multiple Quantum Wells and Superlattices for Direct Band Gap Cubic Semiconductors.

   On the Theory of Phonoriton in Cubic Semiconductor with a Degenerate Valence Band.

   On the Superconductivity in the Two-Band Hubbard Model.

18. A.I. Bobrusheva and Nguyen Que Huong, 3rd National Conf. on Physics, Hanoi 1993
   The Stark Effect for Excitons in Step Quantum Wells.

   Fine Structure and Energy Spectrum of Exciton In Direct Ban Gap Cubic Semiconductors with Degenerate Valence Band.

   Resonant Electronic Raman Scattering on Donor Levels in Cubic Semiconductors.

   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.*

   *Exchange Energy and Wave Function of Exciton in Direct Band Gap Cubic Semiconductors.*

**BOOK CHAPTERS**

2. Nguyen Que Huong, Magnetism Due to Oxygen Vacancy in Undoped Oxide Thin Film, in “**Magnetism in Oxyde Thin Films**”, 2006

**CONFERENCES**

3. Nguyen Que Huong, Electric Field Effect on Wannier-Frenkel hybrid exciton, APS March Meeting Baltimore, March 2006


**ACTIVITIES/TRAINING:**

- APS March Meetings
- Summer Course on Low-Dimensional Quantum Field Theories for Condensed Matter Physics, ICTP, Trieste, Italy 1992.
- Spring Course on Atomic and Molecular Physics, Trieste, Italy, 1989.
- Annual National Conference on Theoretical Physics (6th to 15th), Hanoi, Vietnam.

**LANGUAGE:** English, Russian, French, and Vietnamese.
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 Isotopic Species of Carbon Dioxide
Areas of Interest: Optics, Holography, Image Processing, Molecular Physics, Computer Modeling

PROFESSIONAL EXPERIENCE:
Yeager Professor, Marshall University, 1987 to present.
Fulbright Exchange Teacher, Cambridgeshire College of Arts and Technology, Cambridge, England, 1975-76.
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.)


**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 (HNDT),
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
MU/NASA Space Grants Committee
Program Coordinator, MS in Physical Science, 2005 to present.
Advisor: Society of Physics Students, 2005 to present.

Courses Taught Relevant to MS/PS Program
- PS/BSC 510 Remote Sensing Fall 2001, 02, 03, 04, 05
- PS/BSC 511 Image Processing Spring 2002, 03, 04, 05, 06
- PS 570 Practicum Spring 2006
- PHY 304 Optics (graduate independent study number Sping 2001, 03, 05
- PHY 505 Optics Laboratory Spring 2001, 03, 05
Independent Study and Thesis Topics virtually every semester

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
Cottey 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.
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
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 SOCIETIES:

American Geophysical Union
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 1st 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.


RESEARCH & SCHOLARLY:

a. Publications in Professional Journals
"Determination of the rate coefficient for the N2 + 0 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.
“Geophysical interpretation of Mid Latitude Nitric Oxide Measurements”, Transaction, American Geophysical Union, Vol. 64, No. 18, May 1983.

b. Publications for Laboratory Use
Contributed to major revision of Physics 202 and Physics 204
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

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 0$^+$ 'Biteout' Region of the Nighttime Equatorial Ionosphere”, Atmosphere Explorer Team Meeting, Goddard Space Flight Center, Greenbelt, Maryland, June, 1978.
“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, 981.
Appalachian Section and Southern Ohio Section of AAPT, Chillicothe, OH, April 1986.
AAPT, West Virginia Wesleyan College, November 1987.

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
“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
1995-2000 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 (7th graders), May 27, 1992
Talk to Peyton Elementary (5th 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 (5th graders), November 7, 1994
Talk on “Stars & Planets”, Guyandotte Elementary (5th graders), November 29, 1994
Talk on “Planets”, Cammack Middle School (6th graders), April 25, 1995.
Advised Ms. Dinkins and helped her with Astronomy activities for her 9th 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.
Talk on “How to Incorporate more Physics in Teaching”, Cabell County high school teachers, Spring 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-Levy 9” (Marshall University Parthenon)
06-27-94  “Comet Shoemaker-Levy 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)
02-03-97  “Hale-Bopp” Jerry Mathinson (Channel 13 TV)
02-13-97  “Hale-Bopp” Eric Fossell (Herald-Dispatch)
05-18-98  “Comets & Asteroids” Rob Serey (Channel 3) plus 3 follow-up disc
11-17-98  “The Cause of Meteor Showers” (Herald-Dispatch)
11-26-98  “Meteor Showers” Lisa Osborn (Herald-Dispatch)
03-01-99  “Blue Moons” Debra Cramer (WSAZ-TV)
07-12-99  “Global Warming” (WSAZ-TV staff)
07-30-99  “Roller Coasters” Bob Withers (Herald-Dispatch, For Your Info Page)
08-11-99  “Meteor Showers” Tony Cavalier
11-17-99  “Leonid Meteor Showers” Carrie Cline (Channel 3 TV)
01-03-00  “Millennium” (Herald-Dispatch, For Your Info Page)
09-23-03  “Autumnal Equinox” (Anglia University students)
10-29-03  “Aurora Borealis and Solar Flares” Tony Cavalier (WSAZ Channel 3)
10-29-03  “Aurora Borealis and Solar Flares” (WOWK Channel 13)
04-13-04  “NRAO Trip” Sarah Hereford (Marshall University Parthenon)
11-10-04  “Communication disruption due to Increase in Solar Particles Arriving on Earth” classroom presentation Tony Cavalier (WSAZ Channel 3)
Appendix II

Faculty Data Sheet
(for the period of this review)

Name: Dr. Dewey D. Sanderson
Rank: Professor

Status (Check one): Full-time X Part-time Adjunct
Current MU Faculty: X yes no

Highest Degree Earned: Ph.D. Date Degree Received: 1972
Conferred by: Michigan State University

Area of Specialization: Geology

Professional Registration/Licensure: No
Agency:

Years non-teaching experience

Years of employment other than Marshall

Years of employment at Marshall

Years of employment in higher education

Years in service at Marshall during this period of review

List courses you taught during the final two years of this review. If you participated in a team-taught course, indicate each of them and what percentage of the course you taught. For each course include the year and semester taught, course number, title and enrollment. (Expand the table as necessary)

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<thead>
<tr>
<th>Year/Semester</th>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
</thead>
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<td>GLY 150</td>
<td>Introductory Oceanography</td>
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<tr>
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<td>GLY 212</td>
<td>Geological Field Mapping</td>
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</tr>
<tr>
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<td>GLY 313</td>
<td>Structural Geology</td>
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<td>Earth Materials Lab</td>
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</tr>
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<td>Global Warming</td>
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<td>Global Warming</td>
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</table>

*split 50/50 with Niemann

NOTE: Part-time adjunct faculty does not need to fill in the remainder of this document.
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
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
  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.

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-
- 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.
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

- Charles E Hedrick Outstanding Faculty Award, Marshall University  2002-2003

- Research Fellow, Max-Planck Institute au CNRS, Grenoble, France  2001-2002


- Marshall University Research Corporation 'Sponsored Teaching, Research and Service' Award.  1998


- 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
TEACHING EXPERIENCE

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”

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*

1994-2005

Connecticut College, New London, CT

**Assistant Professor** – “Principles of Physics”, “Introduction to the Laboratory”, “Solid State Physics”, and “Electronics”

Developed syllabi and overall course structure, and administered all grades.

1986-1992

Indiana University, Bloomington, IN

**Teaching Assistant** – to Professor Richard Hake in “Introduction to the Laboratory”

Collaborated on curriculum and laboratory development, met with students during office hours and upon request, graded all laboratory reports.

1977-1980

University of Hawaii, Honolulu, HI

**Teaching Assistant** – to Professor Burton Henke in “Introduction to the Laboratory”

Collaborated on curriculum and laboratory development, met with students during office hours and upon request, graded all laboratory reports.

1974-1976

RELATED EXPERIENCE

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

**Senior Laser Scientist**

Developed pulse millimeter-wave laser source for scale-model radar imaging.

1992 - 1994

Intel Corporation, Aloha, OR

**Senior Process Engineer**

Developed spin-on anti-reflection coating process for aluminum metallization layer for 256K dynamic memory in FAB5 semiconductor fabrication facility.

1984 - 1985

PUBLICATIONS AND CONFERENCE PAPERS

- 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*
- Invited paper, Thomas E Wilson, “Considerations for developing a terahertz cryogenic acoustic reflection microscope with sub-nanometer resolution”, Army Research Office Special Workshop


- 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)


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

- 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/auiW.html


- 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”, 8th National Conference of the Council for Undergraduate Research, June 19-21, 2000, College of Wooster, OH

LANGUAGES

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

MEMBERSHIPS

- American Physical Society
- American Association of Physics Teachers
- 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)
Appendix III

MS in Physical Science Program Review

Not applicable
Appendix IV

MS in Physical Science Program Review

Service Course Enrollment
## Appendix IV

### Service Course Enrollment

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</table>

Note: Undergraduate double numbered enrollments are shown to indicate the full course enrollment.
Appendix V

MS in Physical Science Program Review

Program Course Enrollment Headcount
Appendix VI

MS in Physical Science Program Review

Program Enrollment

Please see separate file for Appendix V.
Appendix VI

Program Enrollment

There are 16 students currently enrolled in the MS/PS program. There are roughly 14 students who are part-time students in the program and are not taking courses this semester. Virtually all active students are in the Geobiophysical Modeling track for the program.

Of the 16 students currently in the program their average undergraduate GPA was 2.92. The average GPA for these students in their current program is 3.53.

The current enrollment in the program represents undergraduate degrees from the following colleges/universities:

- Drexel University
- Marshall University (5)
- Rio Grande University
- University of North Carolina
- West Virginia Institute of Technology (2)
- West Virginia University
- International institutions (3)

The data below show the numbers of graduates from the MS in Physical Science program per calendar year. The data starts with the year 1999 because it shows the level of graduates before and after the introduction of the Geobiophysical Modeling track as a major contributor to the program.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Graduates</th>
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<tbody>
<tr>
<td>1999</td>
<td>2</td>
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<tr>
<td>2000</td>
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<td>6</td>
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<td>2005</td>
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Appendix VII

MS in Physical Science Program Review

Graduate Assessment Document and Results
Evaluation Questionaire and Results

As of this date 12 graduates have responded to the questionnaire. The questionnaire was emailed to 28 graduates for whom email addresses were available. Additional contacts will be attempted between now and the next annual review report with the results included in that report. The tabulation below summarizes existing returns.

GRADUATE EVALUATION OF THE MS IN PHYSICAL SCIENCE

Please help us evaluate the program by responding to the following questions (all information will be held strictly confidential and used only for the purposes of this evaluation) and returning the completed form to:

Ralph Oberly, Ph.D.
Professor of Physics and Physical Science and Program Coordinator
Marshall University – COS
Department of Physics and Physical Science
One John Marshall Drive
Huntington, WV 25755

Telephone:  304-696-2757
Email:  oberly@marshall.edu

Name:

Highest Degree Obtained and Institution:

Ten responded that the MS in Physical Science is the highest degree earned.
One responded that MS in Geography is the highest degree earned.
One responded that she has an MS in Physical Science, an MS in Environmental Science from Univ. of Kentucky, and she is working on a Ph.D. in Agricultural Economics fro the Univ. of Kentucky

Current Address:

Employer: Kanawha County Schools
Automation and Robotics Institute/The University of Texas at Arlington
Rahall Transportation Institute
Environmental Simulations Ltd
West Virginia Department of Transportation
Ohio University Southern/Ohio Valley Environmental Council
Marshall University Department of Physics and Physical Science
U.S. Army Corps of Engineers, Huntington District
Track within MS/PS Program which you completed: (Type an X after the appropriate line.)

A. Physics/Physical Science Teacher Certification 2
B. Geobiophysical Modeling 7
C. Geology 0
D. Chemistry 1
E. Mathematics 0
F. Other 2

Responses to questions 1 through 4 are listed below as received.

1. Do you perceive any course or other component of the program to be in need of improvement? Specify.

One improvement that I believe would benefit would participants in the MS/PS Program would be a couple of mandatory meetings to give students important information such as when their plans of study should be completed and what other courses are beneficial. This could be student lead with professor support or vice versa. Getting all MS/PS students in a room with Dr. Oberly and Brumfield would provide a good opportunity for students to talk amongst themselves with the program directors.

More graduate specific work in undergrad/grad classes.

Not at all, all of the courses and coursework which I took part in enriched my life endlessly, and has given so many opportunities to further myself and my career.

The one aspect that would enhance the course would be 1 semester of software programming with a relational database component.

The courses are good but there is always room for improvement.

Yes, the program needs more in-depth upper level courses. For example, courses that are specialized in the various scanning systems with hands-on experience in equipment operations and in-flight training in cooperation with Goddard, NASA, NOAA, Canaan Valley Institute, military, or government agencies to name a few.

No.

No.

Not at all.

I do not feel that any component of the program to be in need of improvement. The instructors are knowledgeable, experienced, and practice sound teaching techniques. The courses were challenging and they helped prepare me to pass the national certification test for teachers. The program of study was developed in a systematic way that helps students use and apply previously learned concepts.

2. Has the completion of this program helped your career in any way? Specify.

Although I do not directly use GIS and remote sensing in my everyday job, there are components to my job that are enhanced by my knowledge of the subjects. At this time, my office, the Regulatory Branch of the U.S. Army Corps of Engineers, has a light-weight GIS interface and is getting ready to upgrade with the installation of ArcMap 9.1 just around the corner. Additionally, a large portion of the documents sent by environmental consultants to our office contain GIS and a variety of imagery.

Yes.
Yes, it most certainly has. I have gained valuable knowledge and obtained credible contacts in the professional world.

The Geobiophysical Modeling program launched by (my) career in GIS at Columbia Gas Transmission. My ability to integrate data management systems, GIS and geology was key to my success and progression to becoming a project manager.

Yes, without my degree I would not have my current position. This program allowed me to sculpt my classes and final degree to fit what I wanted to do with the rest of my career. As a professional who left a job to come back to school that was very important to me. I now have so many options available to me for high paying jobs located anywhere in the country because of the knowledge I obtained from the Geobiophysical Modeling program.

This program has paved the way for my career, being cross disciplined in Geospatial Technologies has helped me out more time than I can count, because in this day and age you need to have an understanding of how these complex systems work together from server to client and from remote sensing to Geographic Information Systems. This program helped me get this unique training and insight that my peers that attended other higher learning institutes did not.

No. Employers are looking for individuals with experience coming out of school, especially, paid training. This hinders those individuals that did not have those opportunities at their disposal while going through the program.

Analytical thinking about problems.

Yes, having a background specifically dealing with the geobiophysical modeling course has helped in understanding everyday job tasks.

Yes. This program helps me for my current study.

Yes. Dr. Oberly did teach me how to become a successful researcher and graduate student. This did help me in my ongoing Ph.D. studies.

This program has allowed me to become certified to teach high school Physics which has opened many opportunities for me.

3. Did graduating from this program increase your earnings? Please give either the increase in salary or your salary following graduation. Specify as 20,000-29,999, 30,000-39,999, etc.

With my MS, my salary increased $7,839 from $35,116 to $42,955.

Yes, I earned extra pay when tutoring math.

Graduating from this program increased my earnings from $0 to $45k. quite reasonable, I’d say.

From graduation $40,000 - $45,000

I increased my salary by $23,000.

Graduating from this program did increase my salary substantially. My salary upon graduation was $43,500.

N/A

Yes, allowed to get a job I couldn’t have without the degree.
The MS (which required the geobiophysical modeling program course for completion) gave me an additional $5000 (this is approximate) for starting salary of $50,000 in 2004 (this is salary after 1 year probation period required for all new employees).

Have not worked yet. I am still a graduate student (Ph.D.)

Graduating from this program increased my earnings by $2500 - $3000 annually.

4 Please make any additional comments that you think might help us improve this program.

As far as the curriculum is concerned, I don’t believe that there is a more well-rounded science-based MA/MS program at Marshall University than the MS/PS. Its interdisciplinary flexibility is its greatest quality. In order for students to make the most of their MS/PS experience, I would encourage that the MS/PS continue to allow them the freedom to choose classes from different disciplines. By taking a variety of classes, students will be better prepared for real-world jobs that aren’t typically centered around just one discipline.

I think it is important that potential students are aware of the program and it’s ability to help each and everyone’s professional career. I think it is important to acknowledge the success stories of the students whom have participated in the various programs, especially through the program of Geobiophysical Modeling. This program has attracted students globally, whom have graduated into wonderful professions all over the world, and who have become extremely successful. This is all thanks to the professionals associated with Marshall University’s College of Science.

The only issue that I have is that the school needs to fund the program better so that certain computer software’s can be updated more regularly. Marshall needs to be prouder of the International, successful students this program is turning out, and support it accordingly.

This program if it is going to survive needed to be expanded and modernized to keep its cutting edge status. And the university needs to provide substantially more support of this program. My thanks go out to the Professors of this program who have implemented and supported this program by going over and above there expected duties. Thank you Dr. Brumfield, Dr. Oberly, Dr. Ghosh, and Dr. Sanderson.

In addition to the development of more specialized coursework, a better computer laboratory with more advanced equipment is needed. Other courses in computer science may also be beneficial for the student as many employers are looking at computer science majors to fill these positions, even though, they do not have the ability to analyze anything that they create digitally.

The numbers in the table below indicate the number of responses for each column.

Please fill out the table below. Tab over to the appropriate column and type an X.

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<thead>
<tr>
<th>The program provided a sound understanding of the fundamental principles of the discipline.</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
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<th>Agree</th>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>The program required planning and carrying out independent investigations or research.</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>5</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statement</td>
<td>Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The program helped develop lab skills that are important in my profession.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computers were used extensively in the program to collect, graph and analyze data.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The program employs current practices, methods and technologies.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The program helped develop computer skills that are important in my profession.</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A number of courses in the program required written reports.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A number of courses in the program required oral reports or presentations.</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The program helped develop skills in communicating both verbally and in writing.</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The program helped develop critical skills and problem solving abilities.</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The knowledge and skills acquired through the program are important in advancing my career opportunities.</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix VIII

MS in Physical Science Program Review

Previous Review Comments from the Office of Assessment

Please see separate file for Appendix VIII
## Appendix V. Program Course Enrollment: Headcount

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>2</th>
<th>5</th>
<th>4</th>
<th>8</th>
<th>3</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS 585-586</td>
<td>GS 56</td>
<td>2</td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>PS 648</td>
<td>GS 56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS 649</td>
<td>GS 56</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PS 681</td>
<td>GS 56</td>
<td></td>
<td>1</td>
<td>5</td>
<td></td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Total Students</td>
<td></td>
<td>34</td>
<td>77</td>
<td>98</td>
<td>34</td>
<td>57</td>
<td>85</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>93</td>
<td>90</td>
<td>2</td>
<td>77</td>
<td>99</td>
<td>1</td>
<td>78</td>
</tr>
</tbody>
</table>
Dr. Oberly,


There was no summary for AY 2002-2003; however I did find a memo, which I have included in this packet, indicating that an assessment report for that year was not received.

If you have any questions, please contact me at x62206.
To: Dr. Ralph Oberly, Physical Science Steering Committee  
From: Bob Edmunds, Coordinator for Program Review and Assessment  
Date: June 15, 2006

Yearly Assessment Report for: MS Physical Science

Thank you for submitting the Yearly Assessment Report for the program. Please use the information in this report to guide your assessment activities during AY 2006-2007.

The Yearly Assessment Report for documenting AY 2005-2006 assessment activities is due by October 3, 2006. If the program is scheduled for a program review during the 2006-7 academic year, the Program Review will suffice as the documentation of assessment activities and no separate report will be due.

Reviewer summary of yearly assessment report:  
What follows is a brief critique of the report you submitted for the academic year 2004-2005. In most cases the report has been reviewed by members of the University Assessment Committee.

<table>
<thead>
<tr>
<th>I. a. Program goals:</th>
<th>Yearly Assessment Report Critique</th>
</tr>
</thead>
<tbody>
<tr>
<td>b. Learning outcomes and data collection:</td>
<td>The core learning outcomes were listed. The outcomes need to be individualized to the program. At present the outcomes are vague, i.e., computer skills, communication skills, critical thinking skills. These should be more tuned to the academic achievement more specifically related to Physical Science. No data are reported.</td>
</tr>
<tr>
<td>c. Results:</td>
<td>No specific data were reported with this report. The program should begin to collect data and report the results.</td>
</tr>
<tr>
<td>II. BOT Initiative #3:</td>
<td>Not applicable to graduate programs.</td>
</tr>
<tr>
<td>III. Plan for current year:</td>
<td>Continue structural work on the program. Implement the assessment program.</td>
</tr>
<tr>
<td>IV. Assistance needed:</td>
<td>Assistance from various university units. If the UAC can be of assistance, please let us know what we need to provide.</td>
</tr>
<tr>
<td>V. Lessons learned:</td>
<td>As the steering committee develops its operating procedures a more complete report will result.</td>
</tr>
</tbody>
</table>

Review of the Assessment Summary Chart “Marshall University: Assessment of Student Outcomes.”

This chart will help the program and the University Assessment Committee monitor a program’s patterns of evidence. Please remember that a program does not have to assess every outcome every year; however, within a 3-4 year period of time all program objectives must be evaluated, results analyzed, and actions taken (feedback loop) documented.

The program provided an assessment summary chart. It is suggested that the learning outcomes be revisited and tuned to more specific academic achievement for a graduate with an MS in Physical Science. Currently the outcomes are fairly vague and non-specific. Also there are currently a wide variety of assessment measures in place.
and the program needs to begin to collect data. As the program collects data, that data should be used, along with other direct and indirect measures, to determine what specific changes need to be made in the program.

Efficacy of Assessment:

Programs are evaluated in terms of the development of measurable learning outcomes, the use of viable assessment measures, and the implementation of an effective feedback loop. The current report has been evaluated based on these categories. This year the report shows program scores from 2000-2001 to the present.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Learning Outcomes</td>
<td>2</td>
</tr>
<tr>
<td>II. Assessment Measures</td>
<td>1</td>
</tr>
<tr>
<td>III. Feedback Loop</td>
<td>1</td>
</tr>
<tr>
<td>Total Overall Score:</td>
<td>4</td>
</tr>
<tr>
<td>Level of Implementation (efficacy of assessment)</td>
<td>2</td>
</tr>
</tbody>
</table>

Score Ranges

A score of 0 indicates minimum activity in the category.
A score of 1 indicates that a program is in the beginning stages of assessment.
A score of 2 indicates that a program is making progress toward implementing a viable assessment program.
A score of 3 indicates that a program is in the maturing stages of its assessment program.

Levels of Implementation

<table>
<thead>
<tr>
<th>Levels of Implementation</th>
<th>Efficacy of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A total overall score</td>
<td>Level 1: the program is in the beginning stages of its assessment of student academic achievement</td>
</tr>
<tr>
<td>between 0 and 3 indicates</td>
<td></td>
</tr>
<tr>
<td>A total overall score</td>
<td>Level 2: the program is making progress toward implementing a viable assessment program</td>
</tr>
<tr>
<td>between 4 and 6 indicates</td>
<td></td>
</tr>
<tr>
<td>A total overall score</td>
<td>Level 3: the program is in the maturing stages of continuous improvement of student academic achievement</td>
</tr>
<tr>
<td>between 7 and 9 indicates</td>
<td></td>
</tr>
</tbody>
</table>

Interpretation:

The program has had a spotty record in terms of presenting assessment information. However, the program appears to be a strong program and one that serves a useful purpose to its constituents. The program objectives need to be revisited because they appear vague and not particularly related to the physical sciences. The feedback loop has just begun to be put in place. Program changes should result as a function of the assessment efforts.

Recommendations:

The program should revisit the learning outcomes and revise them to fall in line with the competencies required of graduates from the program. Also, as the program draws courses from a number of different fields, assessment data will need to be collected by the various faculty and submitted to the steering committee for review and
interpretation. Because this program draws resources from a number of disciplines, careful coordination between the steering committee and the disciplines needs to be maintained.

General Comments:

The program has undergone a significant reorganization during the past year. It is hoped that with this new organizational structure that the program will continue to implement its assessment efforts.

Thanks so much for continuing to aid Marshall in its ongoing assessment efforts.

Enclosures
Two checks in any level indicate performance in that level, with the exception of level 0.

### 1. Learning Objectives

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0</td>
<td>No objectives were provided.</td>
</tr>
<tr>
<td>Level 1</td>
<td>Learning objectives were identified. They describe student behaviors.</td>
</tr>
<tr>
<td>Level 2</td>
<td>All in Level 1 plus: They are program, not class or course, objectives. They are clear. They are appropriate in number.</td>
</tr>
<tr>
<td>Level 3</td>
<td>All in Level 1 and Level 2 plus: They are comprehensive. They are measurable. They support Marshall's educational goals. They span multiple learning domains.</td>
</tr>
</tbody>
</table>

### 2. Assessment Measures

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0</td>
<td>No measures were identified.</td>
</tr>
<tr>
<td>Level 1</td>
<td>Measures were identified. They relate to the learning objectives.</td>
</tr>
<tr>
<td>Level 2</td>
<td>All in Level 1 plus: They include direct and indirect measures of student learning. They are multiple. They are integrated in the curriculum.</td>
</tr>
<tr>
<td>Level 3</td>
<td>All in Level 1 and Level 2 plus: They emphasize direct measures of student learning. They focus on real-world tasks. They stress higher order learning. They allow performance to be gauged over time.</td>
</tr>
</tbody>
</table>

### 3. Feedback Loop

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0</td>
<td>The feedback loop was not described. Assessment is largely the responsibility of the department chair.</td>
</tr>
<tr>
<td>Level 1</td>
<td>Data are being collected but not interpreted or not used. Few or no performance expectations/standards have been established. There is minimal evidence that the assessment program is stable and will be sustainable.</td>
</tr>
<tr>
<td>Level 2</td>
<td>Data are being collected, but the program does not sufficiently show that it is using this information to improve the quality of student learning. Minimal performance expectations/standards have been established. Data are occasionally considered in departmental planning and budgeting processes. Assessment findings about the state of student learning are beginning to be incorporated into reviews of the academic program and into the program's self-study.</td>
</tr>
<tr>
<td>Level 3</td>
<td>Data are routinely collected, interpreted, and used by faculty to improve the quality of student learning. Clear performance expectations/standards are in effect for all measures and are being used to assess the quality of student performance. Data are an integral part of departmental planning and budgeting process. Data are routinely shared with other appropriate constituents in program reviews and the like. The improvement of student learning is central to the department. Assessment is a part of the culture of the department.</td>
</tr>
</tbody>
</table>
MEMORANDUM

TO: Dr. James O. Brumfield, Program Director, Physical Science
FROM: Bob Edmunds, Coordinator for Program Review and Assessment
DATE: August 15, 2002


1. This memorandum is the review of the Yearly Assessment Report for the Academic Year 2001 which was completed last October. These reports have been reviewed by members of the University Assessment Committee. I am enclosing a copy of the reviewer's comments. I will also provide comments from my review of the assessment report submitted by your program.

2. As we come upon our 10 year self study by the North Central Association's Higher Learning Commission, I am enclosing several other documents for your information. Document 1 is the Departmental Assessment Program Primary Traits Analysis form. This form mirrors the Student Academic Achievement Levels of Implementation provided by NCA. You will notice that there are three areas of importance to be considered: (1) Learning Objectives; (2) Assessment Measures; and (3) Feedback loop. The current report has been evaluated based on these levels. At this point in time, programs should be at Level 2 or better in each of the categories. If your program does not receive marks in Level 2, your program should work on those areas during the coming year. This is important as Marshall will be judged on the NCA committee’s perception of our assessment program in terms of these various levels. After a cursory examination of the assessment report submitted by the MS Physical Science program the following observations were made. Area 1 Learning Outcomes. The program rates mostly at a level 2. The objectives for the most part are fairly vague and don't relate specifically to a MS in Physical Science. Area 2 Assessment Measures. The program rates at a level 1. For the most part none of the measures relate to student competency as they matriculate. GPA/GRE scores are pre program requirements and therefore are not part of the assessment package. Area 3. Feedback Loop. The program rates at a level 1.

3. Document 2 is a chart entitled “Marshall University: Assessment of Student Outcomes.” Each program must begin completing this chart for your records as well as our records. One of the criteria NCA will be using in our accreditation will be patterns of evidence. Patterns of evidence is the documentation that we are using the data we collect in our assessment efforts as a basis for making changes in our programs. This is only one part
of the puzzle, but a very necessary piece of information. All too often, changes in
curriculum are made based on limited evidence. NCA wants each program to be able to
document change based on evidence collected. This chart must be filled out and returned
with the AY 2002 Assessment Review. Please remember that you do not have to assess
every outcome every year, however, within a 3-4 year period of time all of the objectives
must be evaluated, results listed and documentation of actions taken. This form will be
e-mailed to you for your convenience in both Word and WordPerfect formats depending
on which word processing program you use. All you will need to do is to enter the
information in the appropriate places on the form and submit it along with your narrative
summary of your assessment activities. You should continue to update this form as the
years go by. This information will prove invaluable as you begin to prepare your 5 year
program review documents. Some programs completed this form and returned it with the
AY 2001 report. Thanks to you!!

4. The report is voluminous. You have included significantly more than was requested.
However, I do realize that part of this was the justification for the low enrollment special
review to which you were subjected last year. For the upcoming report, please use the
chart described in paragraph 3 above as well as the standard format for assessment
reports. Data summaries and results are included as well as a list of student
objectives/competencies. Please revisit the student outcomes/competencies you have
listed and edit them so that they are more consistent and relate to the field of the Physical
Sciences.

Enclosures

July 24, 2002
C:\2002-2003 Program Assessment\MS Physical Science.wpd
1. Learning Objectives

Level 0
  - No objectives were provided.

Level 1
  - Learning objectives were identified.

Level 2
  - Learning objectives were identified.
  - They describe student behaviors.
  - They are program, not class or course, objectives.
  - They are clear.

Level 3
  - Comprehensive learning objectives are identified.
  - Objectives are appropriate in number.
  - They describe student behaviors.
  - They are program, not class or course, objectives.
  - They are clear.
  - They are measurable.
  - They support Marshall’s educational goals.
  - They span multiple learning domains.

2. Assessment Measures

Level 0
  - No measures were identified.

Level 1
  - Measures were identified.

Level 2
  - Measures were identified.
  - They relate to the learning objectives.
  - They include direct measures of student learning.

Level 3
  - Measures were identified.
  - They relate to the learning objectives.
  - They emphasize direct measures of student learning.

Level 4
  - They are multiple.
  - They emphasize direct learning.
  - They focus on real-world tasks.
  - They stress higher order learning.
  - They are integrated in the curriculum.
  - They allow performance to be gauged over time.

3. Feedback Loop

Level 0
  - The feedback loop was not described.

Level 1
  - Some data are being collected but not interpreted or used.
  - No performance expectations/standards have been established.
  - Assessment is largely the responsibility of the department chair.

Level 2
  - Data are being collected, interpreted, and used by faculty to improve student learning.
  - Performance expectations/standards have been established.
  - Data are being shared by other appropriate constituents.
  - Data are considered in departmental planning and budgeting processes.

Level 3
  - Data are routinely collected, interpreted, and used by faculty to improve student learning.
  - Clear performance expectations/standards have been established for all measures.
  - Data are being shared with other appropriate constituents.
  - Data are an integral part of departmental planning and budgeting processes.
  - The improvement of student learning is central to the department.
  - Assessment is a part of the culture of the department.
<table>
<thead>
<tr>
<th>Assessment Report Guidelines</th>
<th>Evaluator's Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>la. Program Goals</td>
<td>Could not find goals</td>
</tr>
<tr>
<td>b. Learning outcomes</td>
<td>They were written out</td>
</tr>
<tr>
<td>data collection</td>
<td></td>
</tr>
<tr>
<td>c. Results</td>
<td>Written in detail</td>
</tr>
<tr>
<td>(Is there a chart which</td>
<td>Yes  Written in</td>
</tr>
<tr>
<td>identifies the program</td>
<td>quantitative format,</td>
</tr>
<tr>
<td>goals/the appropriate</td>
<td>hard to read.</td>
</tr>
<tr>
<td>assessment tools/</td>
<td></td>
</tr>
<tr>
<td>standards/results/actions</td>
<td></td>
</tr>
<tr>
<td>taken?) A copy of the</td>
<td></td>
</tr>
<tr>
<td>chart is on the back of</td>
<td></td>
</tr>
<tr>
<td>this form for your</td>
<td></td>
</tr>
<tr>
<td>information.)</td>
<td></td>
</tr>
<tr>
<td>II. BOT Initiative #3</td>
<td></td>
</tr>
<tr>
<td>(Undergraduate Programs</td>
<td></td>
</tr>
<tr>
<td>Only.)</td>
<td></td>
</tr>
<tr>
<td>III. Plans for current</td>
<td>I read about plans to</td>
</tr>
<tr>
<td>Year</td>
<td>improve not sure if</td>
</tr>
<tr>
<td>IV. Assistance needed</td>
<td>it's this year or in</td>
</tr>
<tr>
<td>V. Most important</td>
<td>couldn't find</td>
</tr>
<tr>
<td>thing learned</td>
<td></td>
</tr>
<tr>
<td>through this process</td>
<td></td>
</tr>
</tbody>
</table>

Comments:

A detailed commentary included eval. of the students, faculty, & curriculum. It did not follow the style above, but did cover most of the material needed.
Assessment Committee Analysis of Yearly
Departmental/Program Assessment Reports
Report for the Academic Year 2000-2001

Program: **M.S. in Physical Science**

<table>
<thead>
<tr>
<th>Assessment Report Guidelines</th>
<th>Evaluator's Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ia. Program Goals</td>
<td>No program goals</td>
</tr>
<tr>
<td>b. Learning outcomes data collection</td>
<td># outcomes for each section with corresponding methods of assessment and benchmarks.</td>
</tr>
<tr>
<td>c. Results</td>
<td>Yes for each section</td>
</tr>
<tr>
<td>(Is there a chart which identifies the program goals/ the appropriate assessment tools/standards/results/actions taken.) A copy of the chart is on the back of this form for your information.)</td>
<td>Yes</td>
</tr>
<tr>
<td>II. BOT Initiative #3 (Undergraduate Programs Only.)</td>
<td>NA</td>
</tr>
<tr>
<td>III. Plans for current Year</td>
<td>Not specified</td>
</tr>
<tr>
<td>IV. Assistance needed</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>V. Most important thing learned through this process</td>
<td>Not discussed</td>
</tr>
</tbody>
</table>

Comments: *Good beginning, just needs additional sections for guidelines.*

IV, IV, + V.
MEMORANDUM

TO: Dr. James Brumfield, Program Chair, MS Physical Sciences
FROM: Bob Edmunds, Coordinator for Program Review and Assessment
DATE: July 31, 2003

SUBJECT: Program Self-Study Assessment Report Review AY 2002
PROGRAM: MS Physical Sciences

1. Thank you for submitting the 5-year summary of the assessment activities for the program MS Physical Sciences. What follows will be a brief critique of the program review presentation, and some suggestions for the program to consider as it continues its assessment work in 2003-2004.

2. Overview of the data presented:
   1. Principal elements of the assessment plan: The major assessment tools were listed, but no specific comments as to the principal elements of the plan. The steering committee is an excellent tool to help guide the program.
   2. Student Outcomes: No summary of student outcomes is in the narrative of the document. A review of the chart indicated that there are 5 outcomes; however, the outcomes listed are not in measurable behavioral terms. For instance, what does “good grasp” mean? This would be difficult to measure.
   3. Measures/Assessment Tools: The tools are listed, but are not specific. No specific standards have been listed either.
   4. Result/Analysis: No specific data was included in the chart. The statements listed are summary statements presumably based on some evidence, but no specifics were indicated.
   5. Action Taken: Generally the action of the past five years was stated. In upcoming yearly reports specific action should be indicated.
   6. Improvement of Program quality: The only comment regarding the improvement of academic quality was the adding of a new emphasis.
   7. Assessment Chart: a chart was present.

3. The feedback loop from data collection, analysis and interpretation to the addressed faculty will be important in future reports. Specific changes in the courses, program, requirements, etc., should be well documented. Programmatic changes should be based upon careful examination of the data presented.
Primary Traits Analysis: As a part of our ongoing accreditation process with NCA/Higher Learning Commission, UAC has completed a chart identified as Efficacy of Assessment at the Program Level. This is based on the student academic achievement assessment levels of implementation. Here is the committee's perception of the program's Efficacy of Assessment:

1. Learning Objectives: Level 2
2. Assessment Measures: Level 2
3. Feedback Loop: Level 1

Overall Score: 4.7

Level One: Beginning Implementation of Assessment Programs 1-3
Level Two: Making Progress in Implementing Assessment Programs 4-6
Level Three: Maturing Stages of Continuous Improvement 7-9

The program has begun to work on assessment. The student outcomes need to be fine-tuned so as to be able to collect appropriate data from which to make programmatic decisions. At present, only anecdotal evidence is available.

5. The program needs to revisit the student outcomes early this fall. The outcomes need to be stated in behavioral terms and need to be focused on the graduate level. WAC skills, while important in any field, are considered a part of the undergraduate curriculum primarily. Graduate students should focus on writing skills, and should also focus on higher order skills including analysis, synthesis, and evaluation. The outcomes should be more discipline specific. Please review these outcomes, revise them, and begin to collect data for the Yearly Assessment Report due in October 2004.

6. The program has made strides during the past few years; however, because of the low numbers of students, the program needs to develop a focus with its assessment activities.

7. The program needs to begin to collect specific evidence from its assessment tools. General summaries in the results/analysis columns are not sufficient. Describe the specific tools used; present specific evidence, i.e., number of students involved and the results from applying the assessment tools, and an analysis of the results will be very useful.

8. Thank you for your report. If you have any questions please do not hesitate to contact this office.
**Program:** MS Physical Science

Please note: Some programs (those with current program reviews) will not address the questions in the same order.

<table>
<thead>
<tr>
<th>Assessment Report Guidelines</th>
<th>Evaluator’s Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Assessment Information (Student and Programmatic)</td>
<td>Summary of data to collect</td>
</tr>
<tr>
<td>a. Summarize the principal elements of the departmental assessment plan. The plan must include elements to assess student learning and programmatic outcomes</td>
<td>No ed. goals listed</td>
</tr>
<tr>
<td>b. Provide information on the following elements:</td>
<td></td>
</tr>
<tr>
<td>(1) Educational goals of the program</td>
<td>None listed. Specifically—WTC is primarily an undergraduate outcome area.</td>
</tr>
<tr>
<td>(2) Measures of evaluating success in achieving goals</td>
<td></td>
</tr>
<tr>
<td>(3) Identification of the goals which are being successfully met and those which need attention as determined by an analysis of the data.</td>
<td>None</td>
</tr>
<tr>
<td>c. Indicate how the mastery of essential skills is integrated into the departmental assessment plan and how student achievement is being measured</td>
<td>Need for new area of emphasis</td>
</tr>
<tr>
<td>d. Provide information on how assessment data is being used to improve program quality. Include specific examples.</td>
<td></td>
</tr>
<tr>
<td>e. As appropriate, provide information on a quantitatively based means of assessing the knowledge and skills of graduates against a national benchmark or a benchmark established by the institution.</td>
<td>(Reviewers, please note that this section is for Associate and Baccalaureate programs only.)</td>
</tr>
</tbody>
</table>

Is there a chart which identifies the program objectives/appropriate assessment tools/standards/results/action taken?  Yes | Need to be written as OPD student behavior outcomes.
1. Learning Objectives

Level 0
- No objectives were provided.

Level 1
- Learning objectives were identified.

Level 2
- Learning objectives were identified.
- They describe student behaviors.
- They are program, not class or course, objectives.

Level 3
- Comprehensive learning objectives are identified.
- Objectives are appropriate in number.
- They describe student behaviors.
- They are program, not class or course, objectives.
- They are clear.
- They are measurable.
- They support Marshall's educational goals.
- They span multiple learning domains.

2. Assessment Measures

Level 0
- No measures were identified.

Level 1
- Measures were identified. (No Specific ones)

Level 2
- Measures were identified.
- They relate to the learning objectives.
- They include direct measures of student learning.

Level 3
- Measures were identified.
- They relate to the learning objectives.
- They emphasize direct measures of student learning.
- They are multiple.
- They emphasize direct learning.
- They focus on real-world tasks.
- They stress higher order learning.
- They are integrated in the curriculum.
- They allow performance to be gauged over time.

3. Feedback Loop

Level 0
- The feedback loop was not described.

Level 1
- Some data are being collected but not interpreted or not used.
- No performance expectations/standards have been established.
- Assessment is largely the responsibility of the department chair.

Level 2
- Data are being collected, interpreted, and used by faculty to improve student learning.
- Performance expectations/standards have been established.
- Data are being shared by other appropriate constituents.
- Data are considered in departmental planning and budgeting processes.

Level 3
- Data are routinely collected, interpreted, and used by faculty to improve student learning.
- Clear performance expectations/standards have been established for all measures.
- Data are being shared with other appropriate constituents.
- Data are an integral part of departmental planning and budgeting process.
- The improvement of student learning is central to the department.
- Assessment is a part of the culture of the department.
Assessment Committee Analysis of Yearly Departmental/Program Assessment Reports Report for the Academic Year 2001-2002

Program: **MS Physical Science**

<table>
<thead>
<tr>
<th>Assessment Report Guidelines</th>
<th>Evaluator’s Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.a. Program Goals</td>
<td><strong>No</strong></td>
</tr>
<tr>
<td>b. Learning outcomes data collection</td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td>c. Results</td>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>

(Is there a chart which identifies the program objectives/ the appropriate assessment tools/ standards/results/actions taken.)

<table>
<thead>
<tr>
<th>II. BOT Initiative #3 (Undergraduate Programs Only.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(This is for undergraduate programs only.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>III. Plans for current Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV. Assistance needed</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V. Most important thing learned through this process</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>
1. Learning Objectives

Level 0
- No objectives were provided.

Level 1
- Learning objectives were identified.

Level 2
- Learning objectives were identified.
  - They describe student behaviors.
  - They are program, not class or course, objectives.
  - They are clear.

Level 3
- Comprehensive learning objectives are identified.
  - Objectives are appropriate in number.
  - They describe student behaviors.
  - They are program, not class or course, objectives.
  - They are clear.
  - They are measurable.
  - They support Marshall's educational goals.
  - They span multiple learning domains.

2. Assessment Measures

Level 0
- No measures were identified.

Level 1
- Measures were identified.

Level 2
- Measures were identified
  - They relate to the learning objectives.
  - They include direct measures of student learning.

Level 3
- Measures were identified
  - They relate to the learning objectives
  - They emphasize direct measures of student learning.

3. Feedback Loop

Level 0
- The feedback loop was not described.

Level 1
- Some data are being collected but not interpreted or not used.
  - No performance expectations/standards have been established.
  - Assessment is largely the responsibility of the department chair.

Level 2
- Data are being collected, interpreted, and used by faculty to improve student learning.
  - Performance expectations/standards have been established.
  - Data are being shared by other appropriate constituents.
  - Data are considered in departmental planning and budgeting processes.

Level 3
- Data are routinely collected, interpreted, and used by faculty to improve student learning.
  - Clear performance expectations/standards have been established for all measures.
  - Data are being shared with other appropriate constituents.
  - Data are an integral part of departmental planning and budgeting processes.
  - The improvement of student learning is central to the department.
  - Assessment is a part of the culture of the department.
<table>
<thead>
<tr>
<th>Assessment Report Guidelines</th>
<th>Evaluator's Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Assessment Information (Student and Programmatic)</td>
<td></td>
</tr>
<tr>
<td>a. Summarize the principal elements of the departmental assessment plan. The plan must include elements to assess student learning and programmatic outcomes.</td>
<td>Elements listed. No info on make-up of student/com or its duties</td>
</tr>
<tr>
<td>b. Provide information on the following elements:</td>
<td></td>
</tr>
<tr>
<td>(1) Educational goals of the program</td>
<td>Some outcomes</td>
</tr>
<tr>
<td>(2) Measures of evaluating success in achieving goals</td>
<td>Course assignments - lack of data. Do not always have benchmarks on how the program knows the student meets the benchmark - such as standard scores, etc.</td>
</tr>
<tr>
<td>(3) Identification of the goals which are being successfully met and those which need attention as determined by an analysis of the data.</td>
<td>Yes</td>
</tr>
<tr>
<td>c. Indicate how the mastery of essential skills is integrated into the departmental assessment plan and how student achievement is being measured</td>
<td>Equation (2) Some info on measurement</td>
</tr>
<tr>
<td>d. Provide information on how assessment data is being used to improve program quality. Include specific examples.</td>
<td>General Some details</td>
</tr>
<tr>
<td>e. As appropriate, provide information on a quantitatively based means of assessing the knowledge and skills of graduates against a national benchmark or a benchmark established by the institution.</td>
<td>(Reviewers, please note that this section is for Associate and Bachelor's programs only.)</td>
</tr>
<tr>
<td>Is there a chart which identifies the program objectives/appropriate assessment tool/standard/results/ action taken?</td>
<td>Yes / No</td>
</tr>
</tbody>
</table>

Comments for Programs with Program Reviews
1. Learning Objectives

Level 0
- No objectives were provided.

Level 1
- Learning objectives were identified.

Level 2
- Learning objectives were identified.
- They describe student behaviors.
- They are program, not class or course, objectives.
- They are clear.

Level 3
- Comprehensive learning objectives are identified.
- Objectives are appropriate in number.
- They describe student behaviors.
- They are program, not class or course, objectives.
- They are clear.
- They are measurable.
- They support Marshall's educational goals.
- They span multiple learning domains.

2. Assessment Measures

Level 0
- No measures were identified.

Level 1
- Measures were identified.

Level 2
- Measures were identified.
- They relate to the learning objectives.
- They include direct measures of student learning.

Level 3
- Measures were identified.
- They relate to the learning objectives.
- They emphasize direct measures of student learning.

3. Feedback Loop

Level 0
- The feedback loop was not described.

Level 1
- Some data are being collected but not interpreted or not used.
- No performance expectations/standards have been established.
- Assessment is largely the responsibility of the department chair.

Level 2
- Some data are being collected, interpreted, and used by faculty to improve student learning.
- Performance expectations/standards have been established.
- Data are being shared by other appropriate constituents.
- Data are considered in departmental planning and budgeting processes.

Level 3
- Data are routinely collected, interpreted, and used by faculty to improve student learning.
- Clear performance expectations/standards have been established for all measures.
- Data are being shared with other appropriate constituents.
- Data are an integral part of departmental planning and budgeting process.
- The improvement of student learning is central to the department.
- Assessment is a part of the culture of the department.
5. Assessment information

a. Elements of Assessment Plan: Student academic progress is closely monitored as are GPA, performance on classroom exams, written project reports and theses. Other assessment elements are GRE results, performance on Comprehensive Exams and Content Specialization Tests (for teachers), student advisement sessions and anecdotal information about post-graduation employment and doctoral study.

The PS Steering Committee will discuss ways in which student evaluation of instruction and other assessment tools can be better utilized to evaluate and improve the PS program as a whole not merely course instruction. Also, with only a few graduates annually, the responses to the University’s survey of graduate satisfaction have been too few to be meaningful, possibly because PS graduates associate themselves more with their emphasis area than with the degree program. The Steering Committee will consider ways to effectively gather feedback from PS graduates.

b. Assessment Summary – Chart I
<table>
<thead>
<tr>
<th>Component Area/Program/Discipline: Master's of Science in Physical Science</th>
<th>5 year summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assessment of Student Outcomes: Component/Course/Program Level</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Component Area/Program/Discipline</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Person or Office Responsible</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Assessment Tool or Approach</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Standards/Benchmark</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Results/Analysis</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Action Taken</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Component Outcome</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Student should be able</strong></td>
<td></td>
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<tr>
<td><strong>to answer questions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>covering a range of</strong></td>
<td></td>
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<tr>
<td><strong>important topics in the</strong></td>
<td></td>
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<tr>
<td><strong>emphasis area and to do so</strong></td>
<td></td>
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<tr>
<td><strong>in some depth.</strong></td>
<td></td>
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<tr>
<td><strong>Defend thesis</strong></td>
<td></td>
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<tr>
<td><strong>for those students in the</strong></td>
<td></td>
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<tr>
<td><strong>thesis option.</strong></td>
<td></td>
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<tr>
<td><strong>Successful completion</strong></td>
<td></td>
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<tr>
<td><strong>of a number of courses</strong></td>
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<tr>
<td><strong>required, independent</strong></td>
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<tr>
<td><strong>project, research project, and/or a</strong></td>
<td></td>
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<tr>
<td><strong>thesis.</strong></td>
<td></td>
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<tr>
<td><strong>Course instructors/thesis</strong></td>
<td></td>
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<tr>
<td><strong>supervisors</strong></td>
<td></td>
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<tr>
<td><strong>Ability to plan and carry out an investigation or a</strong></td>
<td></td>
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<tr>
<td><strong>research project.</strong></td>
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<tr>
<td><strong>Inclusion of several courses related to assignment and/or independent study courses in each student's program.</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Encourage students to select thesis option.</strong></td>
<td></td>
</tr>
<tr>
<td>Action Taken</td>
<td>Results/Analysis</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>PS 370, 391, 511, and 529</td>
<td></td>
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<tr>
<td>Inhibitory courses such as</td>
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<tr>
<td>lower one computer</td>
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<tr>
<td>All students should</td>
<td></td>
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<tr>
<td>have comprehensive</td>
<td></td>
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<tr>
<td>knowledge of the</td>
<td></td>
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<tr>
<td>desktop and mobile</td>
<td></td>
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<tr>
<td>environments</td>
<td></td>
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<tr>
<td>and should be able to</td>
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<tr>
<td>effectively use</td>
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<td>the specific skills</td>
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<td>appropriate to their</td>
<td></td>
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<tr>
<td>degree of completion</td>
<td></td>
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<tr>
<td>All students completing</td>
<td></td>
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<tr>
<td>the program have a</td>
<td></td>
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<tr>
<td>foundation in the</td>
<td></td>
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<tr>
<td>specific areas of</td>
<td></td>
</tr>
<tr>
<td>the subject including</td>
<td></td>
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<tr>
<td>the Advanced and intermediate</td>
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<tr>
<td>stages of the systems</td>
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<tr>
<td>and networks and</td>
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<td>security</td>
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</tbody>
</table>
e. **Program Quality Improvements:** The major PS program improvement during the current reporting period is the implementation of the Geobiophysical Modeling emphasis area in response to employer surveys indicating employee advancement is dependent on development of the additional skills and training associated with a graduate degree. The Geobiophysical Modeling emphasis area was specifically designed to provide that additional education to graduates of the Environmental Science, ISAT and closely related baccalaureate degree programs.

Other improvements resulting from student and employer feedback included introduction of WAC certified courses and integration of more computer based work in the curriculum.

d. **Graduate and Employer Satisfaction:** There is no comprehensive data on student or employer satisfaction with the PS program because until the recent implementation of the Geobiophysical program relatively few students received PS degrees and those that did viewed themselves as more closely associated with one of the participating traditional disciplines than with the PS program itself. The growth of the ISAT baccalaureate as a PS program feeder will change that and the PS Steering Committee will design a more comprehensive survey of graduate and employer satisfaction.

6. **Previous Reviews:** A full program review was submitted in December 1996. The Graduate Degree Program Committee for the University System deferred action on this program as structured and a follow-up report was submitted in October 1997. The follow-up report described a new area of emphasis, Geobiophysical Modeling, in accord with the suggestion that there should be a curriculum modification emphasizing integrated science. In response to the October 1997 follow-up report, the Committee noted that the program had recently undergone reorganization in an effort to maintain a vigorous and viable program and requested a full self study report in the year 2000 which was submitted 2/15/2000 and approved by President Angel 2/29/2000.

Previous reviews found the program curriculum, faculty and student outcomes adequate including degree production which averaged 2.3 annually (7 degrees in three years) and recommended continuation at its present level of activity. The 1996 review took note of the equipment repair and maintenance needs.

HEPC included the PS program in its special review of low degree production programs and requires the program to produce 7 master’s degrees during the period 2003 – 2005 or be subject to special justification by the institutional governing board.

Major actions during the review period include development of the Geobiophysical option which has proved very popular and the full development of the ISAT program as the principle feeder of the PS degree. Other improvements resulting from student and employer feedback included introduction of WAC certified courses and integration of more computer based work in the curriculum. Reinvigoration of the PS Steering Committee will facilitate the College developing effective funding
TO: Dr. Joe Bragin, Dean, College of Science
FROM: Bob Edmunds, Coordinator for Program Review and Assessment
DATE: June 18, 2004

SUBJECT: Yearly Assessment Report for MS Physical Science

The University Assessment Committee did not receive a yearly assessment report for the MS Physical Science program for the Academic Year 2002-2003.

In order to comply with Marshall University's assessment plan from 1995, we must indicate that all of our programs have a functioning assessment program and that periodic reports (in our case yearly) be prepared and become a record of assessment efforts by each program at the university. A Yearly Assessment Report must be sent to this office for the Academic Year 2003-2004 no later than October 1, 2004.

If you need any assistance, please let me know.

Cc: Dr. Frances Hensley, Associate VPAA
Office of Program Review & Assessment

To: Ralph Oberley, Coordinator, MS Physical Sciences
From: Bob Edmonds, Coordinator for Program Review and Assessment
Date: October 28, 2005

Yearly Assessment Report for:  MS Physical Sciences

Thank you for submitting the Program Review Assessment Report. Please use the information in this report to guide your assessment activities during AY 2005-2006.

The Yearly Assessment Report for documenting AY 2004-2005 assessment activities is due by October 3, 2005. If the program is scheduled for a program review during the 2005-6 academic year, the Program Review will suffice as the documentation of assessment activities and no separate report will be due.

Reviewer summary of yearly assessment report:
What follows is a brief critique of the report you submitted for the academic year 2003-2004. In most cases the report has been reviewed by 3 members of the University Assessment Committee.

<table>
<thead>
<tr>
<th>Program Review Assessment Report Critique</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Summarize the principal elements of the departmental assessment plan</td>
</tr>
<tr>
<td>II. Provide summary information on the following elements: Student Outcomes: Assessment Tools or approaches/Standards/Benchmarks (BOT Initiative #3 if applicable) Results/Analysis Action Taken</td>
</tr>
<tr>
<td>IV. Provide information on how assessment data is used to improve program quality. Include at least 3 specific examples drawn from the past 5 years.</td>
</tr>
<tr>
<td>V. Is there a chart which identifies the program objectives/appropriate assessment tools/Standards/results/action taken</td>
</tr>
</tbody>
</table>

Efficacy of Assessment:

As Marshall approaches its ten year self-study by the North Central Association's Higher Learning Commission, programs will be measured in terms of their efficacy of assessment. Programs are evaluated in terms of the development of measurable learning outcomes, the use of viable assessment measures, and the implementation of an effective feedback loop. The current report has been evaluated based on these categories. This year the report shows program scores from 2000-2001 to the present.
Scores:

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Learning Outcomes</td>
<td>2, 2, 0, 2</td>
</tr>
<tr>
<td>II. Assessment Measures</td>
<td>1, 2, 0, 2</td>
</tr>
<tr>
<td>III. Feedback Loop</td>
<td>1, 1, 0, 2</td>
</tr>
<tr>
<td>Total Overall Score:</td>
<td>4, 4.7, 0, 6</td>
</tr>
<tr>
<td>Level of Implementation (efficacy of assessment)</td>
<td>1, 1, No, 2</td>
</tr>
</tbody>
</table>

Score Ranges

- A score of 0 indicates minimum activity in the category.
- A score of 1 indicates a program is in the beginning stages of assessment.
- A score of 2 indicates a program is making progress toward implementing a viable assessment program.
- A score of 3 indicates a program is in the maturing stages of its assessment program.

Levels of Implementation

<table>
<thead>
<tr>
<th>Efficacy of Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A total overall score between 0 and 3 indicates</td>
</tr>
<tr>
<td>Level 1: the program is in the beginning stages of its assessment of student academic achievement.</td>
</tr>
<tr>
<td>A total overall score between 4 and 6 indicates</td>
</tr>
<tr>
<td>Level 2: the program is making progress toward implementing a viable assessment program.</td>
</tr>
<tr>
<td>A total overall score between 7 and 9 indicates</td>
</tr>
<tr>
<td>Level 3: the program is in the maturing stages of continuous improvement of student academic achievement.</td>
</tr>
</tbody>
</table>

The goal is to have the majority of our programs in level 3 by May 2006.

Interpretation:

The scores for this year indicate, after a review of the interim 5-year program review report on viability, that the program is a viable entity. The program should continue to monitor its assessment practices and report those findings to the College and UAC. The program is a multi-disciplinary program and must gather information from a number of sources to complete the report.

Recommendations:

The program should prepare a complete assessment report for the 2004-2005 academic year and submit it as soon as possible.

General Comments:

It is imperative that programs maintain a record of their assessment activities and have this information available for the NCA/IILC site committee if requested.

Thanks so much for continuing to aid Marshall in its ongoing assessment efforts.

Enclosures
Efficacy of Assessment at the Program Level
Marshall University
PRIMARY TRAIT ANALYSIS
NCA Levels of Implementation 2003-2004
DATE: Spring 2005

1. Learning Objectives

Level 0
No objectives were provided.

Level 1
Learning objectives were identified.

Level 2
All in Level 1 plus:
- They describe student behaviors.
- They are program, not class or course, objectives.
- They are clear.

Level 3
All in Level 1 and Level 2 plus:
- They are comprehensive.
- They are appropriate in number.
- They are measurable.
- They support Marshall's educational goals.
- They span multiple learning domains.

2. Assessment Measures

Level 0
No measures were identified.

Level 1
Measures were identified.

Level 2
All in Level 1 plus:
- They relate to the learning objectives.
- They include direct measures of student learning.

Level 3
All in Level 1 and Level 2 plus:
- They emphasize direct measures of student learning.
- They are multiple.
- They focus on real-world tasks.
- They stress higher order learning.
- They are integrated in the curriculum.
- They allow performance to be gauged over time.

3. Feedback Loop

Level 0
The feedback loop was not described.

Level 1
Some data are being collected but not interpreted or not used.
- No performance expectations/standards have been established.
- Assessment is largely the responsibility of the department chair.

Level 2
Data are being collected, interpreted, and used by faculty to improve student learning.
- Performance expectations/standards have been established.
- Data are being shared with other appropriate constituents.
- Data are considered in departmental planning and budgeting processes.

Level 3
Data are routinely collected, interpreted, and used by faculty to improve student learning.
- Clear performance expectations/standards have been established for all measures.
- Data are being shared with other appropriate constituents.
- Data are an integral part of departmental planning and budgeting process.
- The improvement of student learning is central to the department.
- Assessment is a part of the culture of the department.
Date: November 22, 2004

Program: Master's of Science in Physical Science

Date of Last Review: 2003

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 (for example, reducing the range of optional tracks or merging programs); or
3. Identification of the program for further development (Please be specific; identify areas and provide a rationale in your request); 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.)

Signature of person preparing the report: ____________________________ Date: 12/6/04

Signature of Program Chair: ____________________________ Date: 12/6/04

Signature of Academic Dean: ____________________________ Date: 12/6/04

Signature of Chair, Academic Planning Committee: (Baccalaureate programs only) ____________________________ Date: 3/19/05

Signature of President, Faculty Senate Chair, Graduate Council: ____________________________ Date: 3/19/05

Signature of Provost and Senior Vice-President for Academic Affairs: ____________________________ Date: 3/18/05

Signature of the President: ____________________________ Date: 

Signature of Chair, Board of Governors: ____________________________ Date: 

<table>
<thead>
<tr>
<th>Component/course/ Program level</th>
<th>Student Outcome</th>
<th>Person or Office Responsible</th>
<th>Assessment Tool or Approach</th>
<th>Standards/Benchmark</th>
<th>Results/Analysis</th>
<th>Action Taken</th>
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<td></td>
<td>A good grasp of fundamental principles of their discipline.</td>
<td>Instructors/advisors</td>
<td>Comprehensive exam for those students in the course option. Defense of thesis for those students in the thesis option.</td>
<td>Student should be able to answer questions covering a range of important topics in the emphasis area and do so in some depth. Student should be able to organize and write a complete report of a significant research problem, validate hypothesis and defend the thesis to experts in the subject.</td>
<td>Going back to the calendar year 1999 there have been 29 graduates from the program distributed among the tracks. The past four years there has been an average of six graduates per year. There are currently 32 students enrolled in the program. Many of the graduates have elected to do a thesis. A small number of students have left the program to transfer to another program or to seek employment.</td>
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<td>Ability to plan and carry out an investigation or research project.</td>
<td>Course instructors/thesis supervisors.</td>
<td>Reports on objects type laboratory exercises, independent study projects and/or a research thesis.</td>
<td>Successful completion of a number of courses requiring an open-ended project, independent study project and/or successful defense of a thesis.</td>
<td>Many students complete the degree program with the thesis option.</td>
<td>The core courses in the geophysical track all require project work. All basic science courses require knowledge of experimental technique and the completion of written courses.</td>
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<td>Computer Skills</td>
<td>Course instructor/thesis</td>
<td>Regular course assignments,</td>
<td>Must be able to use general (i.e. word processing, spreadsheet, database) and</td>
<td>All students completing the program have an appropriately high level of</td>
<td>Faculty in the program are working to upgrade computer hardware and software. This is</td>
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<td>advisors</td>
<td>independent study projects,</td>
<td>discipline specific computer software to archive and retrieve data, analyze</td>
<td>communication skill.</td>
<td>especially important in the core and laboratory courses where computer skills are</td>
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<td>thesis.</td>
<td>information and present it effectively to professionals as well as the general</td>
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<td>critical. New courses are being added at the 600-level which include completion of</td>
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<td>public.</td>
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<td>computer projects.</td>
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<td>Communication Skills</td>
<td>Course instructor/thesis</td>
<td>Regular course assignments,</td>
<td>Students must be able to communicate their thinking and defend their answers to</td>
<td>All students completing the program have an appropriately high level of</td>
<td>Courses require written and oral reports. Laboratory courses require extensive written</td>
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<td>advisors</td>
<td>independent study projects,</td>
<td>questions, both orally and in writing, and to faculty as well as other students.</td>
<td>communication skill.</td>
<td>reports. Instructors are encouraged to take WAC training. Students are encouraged to</td>
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<td>thesis.</td>
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<td>present research results at professional meetings and for publication.</td>
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<td>Critical thinking skills</td>
<td>Course instructor/thesis</td>
<td>Regular course assignments,</td>
<td>Students must demonstrate critical thinking skills in completing regular class</td>
<td>All students completing the degree program have demonstrated their ability to think</td>
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<td>advisors</td>
<td>written and oral reports on</td>
<td>assignments, independent study projects, comprehensive exam or thesis.</td>
<td>critically about the subject matter in their emphasis area.</td>
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<td>independent study projects,</td>
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<td>comprehensive exam or thesis</td>
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<td>Content specialization test</td>
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<td>for teacher certification.</td>
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