Program Review

Master of Physical and Applied Science

College of Science

November 2011

MARSHALL UNIVERSITY
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Program Review
Marshall University

Date:  **October 25, 2011**

Program:  **Master of Science in Physical and Applied Science**

Date of Last Review:  **November 2006**

**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 at a reduced level of activity or with **corrective action**: Corrective action will apply to programs that have deficiencies that the program itself can address and correct. **Progress report due by November 1 next academic year**; or

3. Continuation of the program with identification of the program for **resource development**: Resource development will apply to already viable programs that require additional resources from the Administration to help achieve their full potential. This designation is considered an investment in a viable program as opposed to addressing issues of a weak program. **Progress report due by November 1 next academic year**; or

4. Development of a cooperative program with another institution, or sharing of courses, facilities, faculty, and the like; or

5. Discontinuation of the program

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

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<td>3</td>
<td>Dr. Ralph Oberly and Dr. Howard Richards</td>
<td>10/25/2011</td>
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<td>3</td>
<td>Dr. Nicola Orsini</td>
<td>10/26/2011</td>
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<td>Dr. Charles Somerville</td>
<td>27 October 2011</td>
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<td>Tracy Christofer</td>
<td>January 27, 2012</td>
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College/School Dean’s Recommendation

**Recommendation:** I recommend continuation of the program with recommendation of the program for **resource development** (Recommendation Code #3)

**Rationale:** The Master of Science Program in Physical and Applied Science (MSPAS) program offers areas of emphasis in Biological Sciences (GS61), Chemistry (GS62), Geology (GS63), Mathematics (GS64), and Physics & Physical Science (GS65). The Biological Sciences, Chemistry, and Mathematics areas of emphasis are rarely used because alternative graduate programs exist in those disciplines, and faculty primarily recruit to the graduate programs in their own disciplines. The Geology area of emphasis is used infrequently because of the small size of the department and the limited number of majors. The majority of students who enroll in the Physics and Physical Science area of emphasis are either in-service teachers who are seeking endorsements in Physics, or students with a wide variety of backgrounds who are attracted to the Geobiophysical Modeling program. Both of these student populations are important to the future economic development of the state.

A recent article in *Time* magazine addressing the issues of education and student debt noted that “The U.S. isn’t producing enough science and math majors, so high-paying positions in related fields are going either unfilled or to foreign applicants. A liberal-arts education, the pride of the American undergraduate system, increasingly looks like a road to financial distress” (*Time*, 31 October 2011, p. 42, col 2). Students who enter the MSPAS program are positioned to address that issue in two ways. First, not enough students are entering the STEM pipeline – the total population of students who seek degrees in science, technology, engineering, or math disciplines. Those who do seek STEM university degrees are too often poorly prepared, and fail to complete the degree. Helping to put qualified teachers, with the proper teaching endorsements, in K-12 classrooms is critical to getting more and better prepared students into the pipeline. Second, as mentioned above, too many students graduate but find themselves lacking the technological skills needed to qualify for high-paying jobs. The MSPAS program allows those students an opportunity to demonstrate mastery of an increasingly valuable skill set. The ability to analyze and model spatial data, and display the information in a georeferenced format are skills that are applicable to virtually any discipline. Having these skills makes a person valuable in the same way that a statistician is valuable – his or her skills are in demand for a wide variety of applications.

The reason that this program can be valuable both to in-service teachers and to graduates of many different undergraduate programs is its inherent flexibility. It is a program that is designed to meet the needs of a diverse audience by drawing on courses, expertise and equipment on an as-needed, highly collaborative basis. However, the collaborative nature of the program is both a strength and a weakness. The strengths of interdisciplinary cooperation are many and obvious. The weakness is
that when a program belongs to everyone it also belongs to no one. The program belongs to everyone when we are discussing its successes, and it belongs to no one when it has problems or needs. For too long now, the needs of this program have not been met.

In my opinion, there are three areas relative to this program that need attention. One is the integration of the program into a management structure that addresses weaknesses in assessment, recruiting, budgeting and staffing. The second is an investment in equipment. The third is a desperate need for an additional faculty position. The College of Science will address the first two issues internally. **I am strongly recommending that the university consider dedicating a faculty line primarily to the Geobiophysical Modeling area of emphasis.**

On integrating the program into a more effective management structure, my office has already launched an initiative to reorganize scattered environmental programs and areas of emphasis in the college under a single entity – the “School of the Environment”. The goal of this initiative is to emphasize interdisciplinary collaboration, but to do so within a structure that will stress a culture of assessment, will increase student awareness of the programs, and will provide reliable operating budgets.

On investment in equipment, the college has already moved to purchase new computers for use in this program and will continue to improve the laboratory infrastructure. The college has established strong ties with the Nick J. Rahall Appalachian Transportation Institute (RTI), and will continue to work with RTI, to seek federal and state funding, and through private development activities to bring needed resources to the MSPAS program.

The one major need that we cannot address within the college is the need for a new faculty line. The following review includes biographical information on 15 faculty members who have significantly contributed time and effort to the MSPAS program during the review period. Of those 15, one has resigned (Vaseashta), two have retired (Bellis, Sanderson), one will retire in the next year (Oberly), and one has recently passed away (Brumfield). The loss of expertise has been dramatic. Worse yet, there are only two faculty members who have been primarily responsible for the Geobiophysical Modeling area of emphasis. One is already gone (Brumfield) and the other will soon be gone (Oberly). Complicating the problem is that Professor Brumfield was a member of the Department of Biological Sciences, and Professor Oberly is a member of the Department of Physics & Physical Sciences. The college recognized the problem some time ago, and has obtained agreement from both departments that they will – if given permission to hire to those lines – replace both Professors Brumfield and Oberly with new hires who can teach in the Geobiophysical Modeling curriculum and supervise thesis research in that area. Also, the reorganization of environmental programs mentioned above has been undertaken, in part, to bring more faculty members into participation in Geobiophysical Modeling. Still, the program will not be sustainable
without a new line, primarily because increased teaching and research activity in the Department of Physics & Physical Sciences makes it nearly impossible for that department to provide dedicated faculty support to the MSPAS area of emphasis in Geobiophysical Modeling.

In a separate, 5-year review of undergraduate programs, I have already recommended the addition of a faculty line to the Department of Physics & Physical Sciences. I am not asking for two lines to be added to the department. **I am recommending that a single faculty line be added to the Department of Physics & Physical Sciences to address critical needs at both the undergraduate and graduate program levels.**
I. Consistency with University Mission

The mission of the Marshall University Physical and Applied Science Program is to provide the opportunity for graduates from a variety of disciplines to improve the depth and breadth of their scientific, computer, and mathematical knowledge and skills. The program equips students for productive careers in industry, government, or high-school teaching. The approach is by nature integrated across scientific disciplines and combines instruction and peer learning with practical experience in solving real-world problems. Computer skills are enhanced in all tracks of the program.

The MSPAS program is an excellent example of Marshall fulfilling its missions in education and workforce and economic development. This program 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. Those skills include knowledge of computer hardware and software operating functions. They also include knowledge of current trends in science and technology throughout the sciences and mathematics. Applications of image processing and GIS processes to government and industrial projects constitute a large part of research projects carried on in conjunction with the Rahall Transportation Institute. The core courses in this program are highly project oriented, which provides graduates with working world skills.

The MSPAS 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 spur economic development and create jobs).

In addition the program strives to provide content education in the physical sciences for both in-service and pre-service teachers, a critical shortage area in
West Virginia. In this regard the program works in collaboration with the College of Education. Moreover, students are taking basic science courses, primarily in physics and geology, in preparation for entering PhD programs at other institutions.

II. Accreditation Information

This program is unique to Marshall University. As there is no comparable program in other institutions there are no national or regional evaluation programs. Teachers using the program to add certification areas to their license must complete a core of courses (See curriculum for Physics requirements). In addition, teachers must pass a national exam in Physics in order to add the Physics 9-Adult Comprehensive certification. This exam is taken after they have completed the coursework. To date, all teachers passing through the program have passed the national exam.

III. Program Statement on Adequacy, Viability, Necessity and Consistency with University/College Mission.

A. Adequacy

1. Curriculum: Program Description: This program is unique and innovative in its interdisciplinary approach to technical instruction. Hence the program description is important for understanding the rest of this document.

The Masters of Science in Physical and Applied Science (MSPAS) program has areas of emphasis in Chemistry (GS62), Geology (GS63), Mathematics (GS64), Physics and Physical Science (GS65), and Geobiophysical Modeling (GS66). An additional track in Biological Sciences (GS61) has not been used because of the redundancy with the Masters degree in the Biological Sciences Department (note - the previous Graduate School codes were GS 5x when the program was named Physical Science). The program provides opportunities for graduates from a variety of disciplines to improve the depth and breadth of their scientific and mathematical knowledge and skills through instruction and research. The approach is both specific to each discipline and integrated across disciplines with an emphasis on problem solving.

The MS in Physical Science program originated as a means for public school science teachers to increase their knowledge of science, and in many cases to add the physics, or other, certification areas 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.

In 1998 the Geobiophysical Modeling option was added to the MSPS program as a natural progression of the courses in remote sensing and image processing. The core courses (PS/BSC 410/510 in remote sensing; PS/BSC 411/511 in image processing) have grown out of coursework introduced as special topics courses in the early 1980’s. A Practicum course (PS 470/570) was added later to extend the project development and problem solving capabilities of the students. This has since been changed to PS 670 with the lower numbered courses remaining in the catalog. The PS 670 numbering better reflects the expectations for students enrolled in the course, and helps to alleviate the problems with students not having enough hours at the 600-level to meet the 50% rule.

All of these courses are designed for the student to learn sophisticated software programs. The software packages are used to analyze satellite images, aerial images, and/or Geographic Information Systems (GIS) data to solve specific problems related to, for example, urban development, environmental pollution, ecological studies, and transportation studies. Students learn the software packages IDRISI (410/510) and ERMapper (411/511) as essential components of the coursework. Majors in this Geobiophysical Modeling track of the MSPAS use courses from across the College of Science offerings as well as from other departments outside the College of Science when the courses have technology content to complete their Plans of Study. Recent graduates in this track have been very competitive as they enter the job market earning initial annual salaries up to $65k. The flexibility built into the original MS PS program for teachers has served the purposes of each new track in the program of the MS PAS program.

Special Topics PS 650-651 numbers have been added to highlight current technology topics such as sensor systems and image processing capabilities dealing with timely scientific and technical issues. During the Spring Term 2011, PS 651 was used to teach Image Analysis and Interpretation. Successful versions of such trial courses will in the future be presented for additional specific course numbers at the 600-level. Independent Study PS 660-661 numbers are allowing individuals to work on selected high-level projects suitable for the student’s program. PS 670, Practicum, is a course focused on project definition, project problem solving and project presentation at the 600-level. The problem proposal and solution parts of the courses have been essential for graduates to qualify for the high paying jobs.

Note that the addition of these courses allows the faculty to present material at a higher level. They also help to resolve a long-term problem with students not having enough 600-level courses to satisfy the rule of having 50% of the graduate course
work at the 600-level. With the new courses and thesis work at the 600-level students should be receiving enough credit at the higher level to eliminate requests for waivers of the 500/600 rule.

Software grants worth millions of dollars over the past several years from ERMapper in San Diego, CA.; ESRI in Redlands, CA; and IDRISI at Clark University in Massachusetts, 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 curriculum have been an extension of the College of Science and the laboratory courses for the Department of Physics and Physical Science. The digital component of the program has been funded by software grants and limited digital instrument parts for upgrades as one-time purchases through a Rahall Transportation Institute (RTI) grant.

A source of students for the Geobiophysical Modeling program has emerged from the growth and maturity of the undergraduate Integrated Science and Technology (ISAT) program. This program is now providing students for the MSPAS program with a background in Environmental Assessment and Policy (EAP).

Another source of students for the program has been a 2+2 program designed for technology students from the Community and Technology College (MCTC). Some of these graduates with an Associate Degree are now completing a BS degree through the Board of Regents (BOR) program. Once they have completed the BOR program with a satisfactory GPA they are eligible to apply for admission to the Graduate School. Some of these students who have been accepted into the MSPAS graduate program are now working to complete the Geobiophysical Modeling track.

The MSPAS program works as an umbrella for all of the previously mentioned tracks. The flexibility built into the program allows each student to build on his/her strengths and needs. Several of the program graduates have said that the program’s flexibility is the key to their signing up for the program. Each of the tracks is science and technology oriented and, in particular, has a significant component of computer technology and its applications in 21st century society. Again, the mission in workforce and economic development is served by each of the tracks.

Each of the areas of emphasis within the Physical and Applied Science MS program requires a minimum of 32-36 graduate 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. The thesis option requires a minimum of 32 hours. The non-thesis option requires a minimum of 36 credit hours. A thesis is required in the Geology area of emphasis (GS63) 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 MSPAS accommodates students with a range of backgrounds and career goals so there is no common core of courses that would be ideally suited 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 MSPAS and University degree requirements, yet tailored to individual student needs.

Specific courses are required of in-service teachers who choose the physics area of emphasis (GS65) 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. Example options and requirements are:

a. 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.

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

c. Students working to improve their background in Physics in order to obtain an industrial job or gain admission to a PhD granting institution in Physics typically take a selection of courses from the graduate physics listing. These include:
   - PHY 525 Solid State Physics (3 credit hours)
   - PHY542 Quantum Mechanics (3 credit hours)
   - PHY 545 Mathematical Methods of Physics (3 credit hours)
   - PHY 562 Nuclear Chemistry and Physics (3 credit hours)
   - PHY 563 Nuclear Chemistry and Physics Lab (2 credit hours)
   - PHY 600 Electricity and Magnetism (3 credit hours)
   - PHY 608 Statistical Mechanics (3 credit hours)
   - PHY 610 Special and General Relativity (3 credit hours)
• PHY 616 X-Ray Diffraction (3 credit hours)
• PHY 620 Modern Astrophysics (3 credit hours)
• PHY 625 Condensed Matter Physics (3 credit hours)
• PHY 630 Classical Physics (3 credit hours)
• PHY 640 Fundamentals of Physics (4 credit hours)
• PHY 644 Atomic Physics (3 credit hours)

These courses are offered on an “on demand” basis. Some students take the courses to complete an MS degree. Others take the courses while they are waiting for word on admission to PhD programs.

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.

Geobiophysical Modeling students come from a variety of undergraduate majors including Biology, Physics, Chemistry, Geology, Engineering, Geography, Mathematics and IST. 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. Some students elect to complete the 36 hours required without a thesis. The core courses are:
• Remote Sensing (PS/BSC 510, 4 credit hours)
• Image Processing (PS/BSC 511, 4 credit hours)
• Practicum (PS 670, 4 credit hours)

Additional coursework is chosen to enhance the individual’s science and technology background. To date students have taken courses from the following departments to complete their degrees:
• Biological Sciences (BSC)
• Chemistry (CHM)
• Engineering Management (ENGR)
• Environmental Engineering (ENVE)
• Environmental Science (ES)
• Geography (GEO)
• Geology (GLY)
• Information Systems (IS)
• Mathematics (MTH)
• Physics and Physical Science (PHY, PS)

Selected courses from each of these departments or programs have proven useful to MSPAS students. For example, GEO 526 Principles of GIS, GEO 529 Intermediate GIS – Vector Analysis, and GEO 530 Intermediate GIS – Raster Analysis give students in this track an option of ten credit hours that complement the core courses, and allow the student to have a minor in Geography. Additional courses from the
departments listed above allow students to complete their programs with the advisor's permission and following the graduate school's requirements for degree completion.

Some students with little or no science background are required to take appropriate fundamental science courses before entering the graduate courses. This is especially important for some international students who need exposure to the English terminology used in the science discipline.

Students electing the Geology track (GS63) typically take courses to enhance their knowledge of Geology and Chemistry for work in the mineral extraction industries, or to enhance their backgrounds for application to graduate programs at the PhD level. The list below shows courses taken by a recent graduate in the Geology track. It shows the flexibility of the program allowing the student to enhance his/her background where needed.

Courses for a Geology track graduate:

- GLY 521 Petrology 4 credit hours
- GLY 527 Fossil Fuels 4 credit hours
- GLY 556 Environmental Geology 3 credit hours
- GLY 556L Environmental Geology Lab 1 credit hours
- GLY 640 Physical Aspects Geology 3 credit hours
- GLY 641 Biological Aspects Geology 3 credit hours
- BSC 501 Ichthyology 4 credit hours
- CHM 585 Scanning Electron Microscope 1 credit hours
- EDF 619 Educational Psychology 3 credit hours
- ES 600 Intro to Environmental Science 3 credit hours
- ES 588 WV Environment 1 credit hours
- ENVE 615 Environmental Chemistry 3 credit hours
- IS 645 Geographic Information Systems 3 credit hours

This is only an example of courses taken by a student in the Geology track. Virtually every student has a unique set of courses. Each student must fill out a Plan of Study for the Graduate School showing their program. Every student must have the approval of an advisor for their Plan of Study.

Students may also follow tracks in Chemistry (GS62), Mathematics (GS64), and Biological Science (GS61) in which the student and advisor create a Plan of Study that is tailored to the needs of the student. To the author's knowledge, the Biological Science track (GS61) has not been used. The Chemistry and Mathematics tracks are seldom used. Distinct Masters level degree programs are available in each of these departments, making these tracks in lesser demand.
2. Faculty:

The MSPS 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, and additional selected courses across the graduate catalog. Curriculum vitae for fifteen faculty who are now or who have provided significant instruction for the students in this program are provided in Appendix II. The fifteen faculty listed in the appendix average 18.6 years of service to the University. These faculty are active scholars typically producing an average of five peer-reviewed journal articles, presentations and/or book chapters during the review period. In addition, they participate in discussion groups, student recruiting activities, off-campus science presentations such as science camps, etc.

All listed faculty teaching in the program have full-time appointments. In a typical academic year, two faculty members have team taught a four hour core course (PS/BSC 410/510 fall, PS/BSC 411/511 spring) for the Geobiophysical Modeling track. Faculty from all Science departments contribute independent study or special topics courses for students beyond the normally scheduled courses.

3. Students:

a. The entrance standards for students in the program are the minimum standards for admission to the Graduate School. Namely, a student must have an undergraduate degree from an accredited college or university, and they must have a minimum undergraduate GPA of 2.50. It is preferred that the undergraduate degree be in science or technology. In principle students meeting these criteria can be given full admission to the program. In practice, if the applicant’s GPA is below 3.00 they are given a reminder that they must maintain a minimum GPA of 3.00 to graduate from the program. Occasionally the applicant will be coming from a non-science undergraduate program, e.g., Business Administration. Then the applicant’s transcript is carefully reviewed to see what science background is there. If the science background is weak or non-existent the student is given provisional admission on the condition that selected undergraduate courses be taken to provide prerequisites for the graduate courses. This is especially relevant when the applicant is an international student, as the student would need the introductory courses just to be acquainted with the terminology needed for the advanced courses.

b. Entrance Abilities: The abilities and background of entering students vary considerably. Some examples of the background of students entering the MSPS program are:
   ▪ Students with an undergraduate degree in a specific area of physical science who 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 are often looking 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 MSPAS 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 GPA of at least 3.0 in no less than 12 hours in their major. The nature of the MSPAS 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 MSPAS student population. During the review period the average GPA of MSPAS students was 3.56 which is indicative that MSPS students are making good progress toward their degrees (i.e., maintaining a B or better average). This is based on sixteen students registered for Spring Semester 2011.

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 exam is more broadly based in the discipline and the course work that the student has completed. In-service teachers who add an endorsement to their teaching certificate through the MSPAS program are required to pass a content specialization test administered by the state. Those scores are closely monitored and no MSPAS student to date has been required to repeat this exam.

- **Know how to plan and carry out an investigation or research project.** Many of the MSPAS courses (Appendix V) include lab work and a required independent 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 MSPAS students elect the thesis option, which provides extensive training in research investigation.

- **Competency in computer technology.** The MSPAS 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. Students in Physics, Geology, and Chemistry tracks routinely use computer to process and manipulate data from the laboratory.

- **Competency in written and verbal communication.** MSPAS 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 and 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 MSPAS program uses faculty and facilities (e.g. physics, chemistry, geology, IST, 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. Working agreements between the COS faculty and RTI have eased some of the software licensing costs from the faculty. 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 MSPAS program uses existing courses, which are core requirements or electives in traditional disciplinary degree programs and would be taught on the same schedule even without the MSPAS students. Even the MSPAS spatial analysis courses have students using the courses as electives in other disciplinary degrees.
Like the other degree programs in the College, the MSPAS program depends heavily on lab fees to cover operating expenses. Heretofore there has not been systematic accounting of the expenditures of those fees for the MSPAS 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 MSPAS students. This situation is by no means unique to the MSPAS 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.

As mentioned earlier, several MSPAS graduates are project leaders for the work of the Rahall Transportation Institute (RTI). The project work occurs in the Science Building rooms 259 and 307. These projects are valued over $500K per year. These funds are used to support project development as well as for tuition and salary of up to 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 MSPAS program has no line-item budget. There is no funding for Graduate Assistant positions. Up to twelve students are funded to do project work through RTI.

The facilities, faculty, and staff used in this program exist for each of the respective departments within the College of Science. The cooperative faculty effort and the overlapping curricula for the departments allow students in each program to make progress on their career paths.

b. **Facilities:** The facilities, laboratories and classrooms used in the MSPAS program, are those of the participating departments. The program has no facilities of its own. Two laboratories assigned to the Department of Physics and Physical Science 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:**

Although equipment funds in the College of Science are rarely sufficient for equipment intensive departments there have been some modest steps recently to update the equipment holdings. For example, the optics lab has recently acquired apparatus for an interferometer and a spectrometer. These pieces are used for demonstrations in lower division courses. They are used for educational laboratories for upper division courses, and they can be used for modest research projects by faculty and students. The cooperative nature of faculty in the College of Science makes the issue of equipment less critical. For example, a researcher in
The Geobiophysical Modeling curriculum was able to run absorption spectra in the Chemistry Department. The faculty member in charge of the equipment gladly instructed the researcher in how to use the apparatus and oversaw the procedure. This cooperative mentality allows work to be done that would be limited otherwise.

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 MSPAS 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

Assessment data are being collected from program graduates at this time. A questionnaire has been emailed to thirty-eight recent graduates. At this time five graduates have responded. A partial summary of the responses is given below under Viability. 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. Data will be collected on a continuing basis. The data collected to date will be brought to the attention of the MSPAS Steering Committee. The Steering Committee will interact with faculty teaching in the program concerning needed changes.

The learning objectives for the program are listed in Appendix V. Students completing the program should 1) have a good grasp of fundamental principles within their track, 2) be able to define and carry out a research project, 3) demonstrate basic computer skills, 4) communicate orally and in writing, 5) analyze and develop a solution to complex problems.

An information sheet has been generated for dissemination to students interested in joining the program. 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.

6. Previous Reviews:
A full program review was submitted in 2006. Previous reviews found the program curriculum, faculty and student outcomes adequate. Degree production over the past five-year period has been 29 graduates with the MSPS degree and two students with the MSPAS degree. Over six degrees per year for the review period easily meets the seven in three year criterion for an active program. The previous review recommended continuation at its present level of activity.

Recent reviews for the program have included the following positive observations:

“it is clear...from reading your report that you have an excellent program”

“your program’s student learning outcomes are well stated and stress higher levels of learning”

“the learning outcomes that you’ve specified.....are excellent”

“it is obvious that you have an excellent program; one to which you have devoted much thought within the context of student and workforce needs”

“the MS in Physical Sciences appears to be a challenging, yet practical, course of study that provides numerous tracks to fulfill the varied needs of enrolled students”

While the above comments are strongly positive for the program there are other comments that state that we need to be more specific in our evaluations of each course and the outcomes for the course. In particular, one report states:

“Your report does not, however, contain specific benchmarks, results, or actions taken.”

“It was not apparent….that you have developed scoring rubrics for assessments like comprehensive exam questions…”

These are legitimate concerns, and represent a need to create comprehensive assessment procedures for this program. These concerns will be addressed when the MSPAS Advisory Committee is reformed.

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 the study of issues that are inherently complex and multidisciplinary such as those dealing with the environment.
Projects for graduates in this area are often inherently interdisciplinary.

The broad multidisciplinary nature of the MSPAS 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 and the university in fulfilling the 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 core programs for the various tracks have doctorates and a great deal of teaching and research experience. With the growth and development of IST as a feeder program increased numbers of Physical Science 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 IST and MSPAS program will strengthen both programs.

The flexibility of planning a coursework program for each student to meet the background and 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 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 IST are encouraged to take the Geobiophysical Modeling core courses (PS/BSC 510/511) and then select from a broad range of graduate courses to suit their own needs.

The Program Coordinator has been teaching in the Physical Science program over the past 41+ years and was heavily involved with the creation of the core courses in image processing dating back to about 1980.

**Weaknesses:** The major weakness of the interdisciplinary MSPAS 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 MSPAS 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.

As has been mentioned in the last five assessment reports, the replacement of the core faculty for the Geobiophysical Modeling portion of the curriculum is essential and long overdue. The recent death of one of these faculty members has meant that crucial information and contacts are already lost. In spite of suggestions and requests for help in this area the university has offered nothing.

The university administration has restricted faculty from teaching upper division and graduate courses in the summer terms listing low enrollment as a reason. These courses are essential for providing in-service teachers courses leading to certification and/or in-field MS program work. The teacher certification portion of the program is in jeopardy because of the lack of courses for teachers. Teacher training and certification is a state charge to the university that should not be ignored.

**Suggestions for improvement and continuation:**

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 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 of 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, and flexibility in Plans of Study to suit individual students. This approach is unique and has been very successful if one judges by the number of graduates and their success in obtaining jobs. One faculty member has recently died and the other is ready to retire. A phased withdrawal from the program would allow new faculty to learn the current approach to teaching the core courses. That is too late in the case of Professor Brumfield. Using the existing faculty member to transfer the information is essential due to the unique nature of the classroom approach to the material. As graduates of the program have frequently stated, they would not have done an MS degree without the flexibility in the program.
Computer hardware and software are in need of updating as soon as possible for the geospatial part of the program.

There is a need for acquiring GPS units for the geospatial students.

Internet connections need to be established for all computers in the geospatial laboratory, Science 259. This means having funds for the connection fees charged by the University. The need arises in order for students to have access to geospatial images available on the internet.

New blackout curtains are needed for the Optics Laboratory space. The existing curtains rapidly deteriorated after installation because of bad design and high air flow in the building HVAC.

B. VIABILITY

1. Articulation Agreements:

During the period of this review, no formal articulation agreements were in place. However, as documented elsewhere, there were instances of noteworthy cooperation and interaction with certain institutions, notably the Rahall Transportation Institute. This cooperation provided graduate student support for up to twelve students a term. There is current discussion between the physics faculty and the West Virginia secondary education system. It is hoped that an agreement will be reached whereby the State BOE will provide partial or complete funding for a series of physics certification courses to be offered for in-service teachers. This arrangement has worked successfully on two occasions in the past, once in the mid-80’s and once in the early 90’s.

2. Off-Campus Classes:

During the period of this review, no off-campus classes were offered. Several years ago, classes were offered in Charleston, which is convenient to teachers from a wider area.

3. Online Courses:

No online courses were offered. It is the opinion of the faculty that online courses (a) are inadequate for lab-based science courses, (b) erect a barrier which discourages student participation, (c) inhibit effective communications between students and faculty by making two-way, non-verbal communication impossible, (d) effectively limit testing options to open-book exams, and (e) require a greater element of trust that the person submitting an exam or assignment is the person actually enrolled in the course.
4. Service Courses:

The imaging courses for students in the Geobiophysical Modeling option are also used by students in the GIS certificate program run by the Geography department. Also, depending on his/her individual plan of studies, a student may be required to take courses that are also required for graduate students in Math or Chemistry.

5. Program Course Enrollment:

One of the distinguishing features of the MSPAS is its flexibility, as a result of which there is little distinction between a “required course” and an elective. There is no course which is required for all student plans; rather, the plan is constructed with the assistance of an academic adviser. This fact, and the relatively small number of students in the program at any given time, makes it difficult to meaningfully break down the course enrollment. However, it may safely be said that courses are offered as needed. The courses with the most students enrolled in any single section were “Biological Aspects of Geology”, which had 13 students enrolled once, and “Special Topics in Physical Science”, which had 13 students enrolled twice. “Image Processing / Modeling” had 9 students enrolled in Spring 2009.

6. Program Enrollment:

As shown in Appendix VII, the enrollment of students in the program varied from a high of 21 to a low of 14 during the period of the review, with the minimum being attained at the midpoint of the period and with essentially the same number of students at the end as at the beginning. This variation is consistent with natural fluctuations. During the spring 2011 term there were sixteen students listed as enrolled in the MSPS program and two in the MSPAS program.

7. Enrollment Projections:

No consistent trend is visible in the program enrollment over the 5-year period of this review, so most likely student enrollment will remain steady in the range of 20 students. However, if West Virginia begins requiring high schools to offer physics, the program would be in greater demand from current and prospective high-school teachers. Also, if some classes could be taught in Charleston again, the program might attract teachers who live too far from Huntington to enroll for on-campus courses.

C. NECESSITY:

1. Advisory Committee:
The program has in the past had an advisory committee that met multiple times a year. Time constraints have contributed to this committee not formally meeting over the past few years. The Advisory Committee should be reformed and activated in the coming academic year.

2. Graduates:

Only preliminary figures regarding our graduates are available pending the completion of a survey that was sent to their last known email addresses. Note that the survey is available at:

https://sites.google.com/site/muphyandps/home/mspas-graduate-survey

Nevertheless, the consistency of early responses allows us to conclude that graduates find the program to have been of high quality and beneficial to their careers. The available responses to the following questions ranged from 1="Strongly Disagree" to 5="Strongly Agree".

<table>
<thead>
<tr>
<th></th>
<th>AVG</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program provided a sound understanding of the fundamental principles of the discipline.</td>
<td>4.8</td>
<td>5 5 5 5 4</td>
</tr>
<tr>
<td>The program required planning and carrying out independent investigations or research.</td>
<td>4.6</td>
<td>4 5 4 5 5</td>
</tr>
<tr>
<td>The program helped develop lab skills that are important in my profession.</td>
<td>5.0</td>
<td>5 5 5 5 5</td>
</tr>
<tr>
<td>The program employs current practices, methods, and technologies.</td>
<td>4.8</td>
<td>5 5 4 5 5</td>
</tr>
<tr>
<td>The program helped develop computer skills that are important in my profession.</td>
<td>4.8</td>
<td>5 5 4 5 5</td>
</tr>
<tr>
<td>The program helped develop skills in communicating in writing.</td>
<td>4.6</td>
<td>4 5 5 4 5</td>
</tr>
<tr>
<td>The program helped develop skills in communicating through oral or audio/visual presentations.</td>
<td>4.4</td>
<td>4 5 4 4 5</td>
</tr>
<tr>
<td>The program helped develop critical skills and problem-solving abilities.</td>
<td>5.0</td>
<td>5 5 5 5 5</td>
</tr>
<tr>
<td>The knowledge and skills acquired through the program allowed me to enter the career field of my choice.</td>
<td>4.8</td>
<td>5 4 5 5 5</td>
</tr>
<tr>
<td>The knowledge and skills acquired through the program allowed me to advance within my career.</td>
<td>5.0</td>
<td>5 5 5 5 5</td>
</tr>
<tr>
<td>If I had to do it all over again, I would once again pursue the MSPAS at Marshall University.</td>
<td>4.8</td>
<td>5 5 4 5 5</td>
</tr>
</tbody>
</table>

Of the respondents so far,
- one has completed “All But Dissertation” for a doctorate in Civil Engineering,
- one is currently studying towards a Ph.D. in Physics.

Aside from the one graduate who is still a student and one other who reports no meaningful employment before graduation, students report that graduation increased their annual incomes by $10,000 to $20,000.

3. Job Placement:
Job placement has been very high. From the list of graduates over the past dozen years virtually all have had success in finding jobs that used the technical training gained from the program. A listing of 36 recent graduates has nineteen working in geospatial jobs, seven are teaching science, five are working in related professional fields, two are pursuing PhD degree in science, and three are unknown with regard to their employment.

**Resource Development:**

The program mission statement is given early in this document. The success of recent graduates would say that the program should continue on its current path with upgrades in hardware and software, and an urgent look at replacement faculty. Specifically, new computers for the geospatial part of the program with updated versions of the IDRISI and ERMapper software should be obtained when funds are available. Laboratory equipment for all departments involved with the program are continually in need of replacement. New equipment needs would be GPS units for the geospatial courses for students to have hands-on experience.

Clearly, at this point **the urgent need is to replace faculty** in the case of the deceased faculty member and the about-to-retire faculty member. There needs to be a period of overlap for this process so that new faculty can learn the uniqueness of the classroom approach for the geospatial courses. The suggestions for improving the program are given in an earlier segment of this review. A positive response to these suggestions is urgently needed.

Replacement faculty would be directed toward grant writing for the purposes of upgrading equipment inventories, supporting graduate students, and funding research/thesis work. An effort toward working agreements with the state level Board of Education must be made so that courses resulting in certification for in-service teachers are offered.
Appendix I
Required/Elective Course Work in the Program

Degree Program: M.S. in Physical and Applied Science
Person responsible for the report: Ralph Oberly

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
Practicum, PS 670

Recommended Elective:

Thesis Research, PS 681 (Up to 6 hours for thesis students)
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 Master’s 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
<table>
<thead>
<tr>
<th>Courses Required in Major (By Course Number and Title)</th>
<th>Total Required Hours</th>
<th>Elective Credit Required by the Major (By Course Number and Title)</th>
<th>Elective Hours</th>
<th>Related Fields Courses Required</th>
<th>Total Related Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of Emphasis (Chemistry, Geobiophysical Modeling, Geology, Mathematics, Physics)</td>
<td>12-18</td>
<td>Electives</td>
<td>12-18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Area (Chemistry, Geobiophysical Modeling, Geology, Mathematics, Physics)</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Requirements</td>
<td>32-36</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Expand table as needed.*

Professional society that may have influenced the program offering and/or requirements:
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: ___Maria C. Babiuc-Hamilton_________ Rank: ______Assistant Professor_______

Status (Check one): Full-time__X__ Part-time___ Adjunct ___ Current MU Faculty: Yes _X_ No ___

Highest Degree Earned: _______PhD_________ Date Degree Received: ____June 2000____

Conferred by: ________________“Al. I. Cuza” University, Iasi, Romania

__________________________

Area of Specialization: _________________ Theoretical Physics
__________________________

Professional Registration/Licensure_______________ Agency:
__________________________

Years non-teaching experience __4____
Years of employment other than Marshall ______7____
Years of employment at Marshall ___4_____ years
Years of employment in higher education ___11___
Years in service at Marshall during this period of review ___4___

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 (summer through spring), course number, course 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>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2011</td>
<td>PHY 201</td>
<td>General Physics</td>
<td>44 students</td>
</tr>
<tr>
<td></td>
<td>PHY 480</td>
<td>SpTp:Special &amp; Gen Relativity</td>
<td>3 students</td>
</tr>
<tr>
<td></td>
<td>PHY 610</td>
<td>Special and Gen Relativity</td>
<td>2 students</td>
</tr>
<tr>
<td>Summer 2011</td>
<td>PHY 585</td>
<td>Independent Study: Radiative Processes in Astrophysics</td>
<td>1 student</td>
</tr>
<tr>
<td>Spring 2011</td>
<td>FYS 100</td>
<td>First Year Seminar</td>
<td>16 students</td>
</tr>
<tr>
<td></td>
<td>PHY 350</td>
<td>Biomedical Physics</td>
<td>5 students</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>FYS 100</td>
<td>First Year Seminar</td>
<td>20 students</td>
</tr>
<tr>
<td></td>
<td>PHY 320</td>
<td>Intro Modern Physics</td>
<td>1 student</td>
</tr>
<tr>
<td>Summer 2010</td>
<td>PHY 586</td>
<td>Independent Study: Modern Astrophysics II</td>
<td>1 student</td>
</tr>
<tr>
<td>Spring 2010</td>
<td>PHY 204</td>
<td>General Physics Lab</td>
<td>16 students</td>
</tr>
<tr>
<td></td>
<td>PHY 204</td>
<td>General Physics Lab</td>
<td>15 students</td>
</tr>
<tr>
<td></td>
<td>PHY 583</td>
<td>Independent Study: Modern Astrophysics I</td>
<td>1 student</td>
</tr>
<tr>
<td></td>
<td>PHY 492</td>
<td>Capstone Course II: Introduction to General Relativity</td>
<td>1 student</td>
</tr>
</tbody>
</table>

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

Activities that have enhanced your teaching and or research.

1. Participation and presentation of the proposal: “Is there a formula for success?” as member of the panel: “FYS 100, Year One: Lessons Learned”, 3rd Annual Conference on Teaching and Learning iPED: Inquiring Pedagogies 2011 Marshall University, Huntington, WV.


3. CI-TRAIN Lecture Series Spring 2010, Jan. 11-May 1, 2010, Marshall University, Huntington, WV.

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


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


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.

1. Membership: Society of Physics Students; American Physical Society; American Association of Physics Teachers; Sigma Xi, the Scientific Research Society

2. Jan. 11 –May 1, 2010: The First Year Seminar Faculty Development Workshop, at The Center for the Advancement of Teaching and Learning, Marshall University, Huntington, WV – Participated


Externally funded research grants and contracts you received.

1. March 2010, M. C. Babiuc: (P.I.) “Cauchy-Characteristic Extraction of Gravitational Waves from Binary Black Hole Merger”, TeraGrid Supercomputer Award (30,000 CPU hours), Nr. PHY090008, Type: DAC-TG


4. May 18, 2010, M. C. Babiuc: (P.I.): “Numerical Simulations and Visualizations of Black Holes”, MU-Advance Faculty Fellowship Award ($20,000)
7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.

8) Community service as defined in the Greenbook.
   1. Workshop presenter, Esteem Physics: Experiments in Modern Physics, Expanding Your Horizons outreach event for middle school girls on Saturday April 2nd at Mountain State University in Beckley, WV
   2. Organized “Open-ended Discussion with the Faculty” on campus outreach meetings, Spring 2010, once a month. Marshall University, Huntington, WV
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Robert Elwyn Bellis ___________  Rank: Professor ______

Status (Check one): Full-time X  Part-time__  Adjunct ____  Current MU Faculty:
Yes __  No X

Highest Degree Earned: Ph.D. ___________  Date Degree Received: 9/1/64
Conferred by: University of Wales

Area of Specialization:
  Physics

Professional Registration/Licensure ___________  Agency:

Years non-teaching experience 7
Years of employment other than Marshall 7
Years of employment at Marshall 26
Years of employment in higher education 33
Years in service at Marshall during this period of review 1

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 (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
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</table>

NOTE: Part-time adjunct faculty do 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).

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.

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

8) Community service as defined in the *Greenbook*. 
James O. Brumfield, Ph.D.
Professor, Graduate Programs in Physical Sciences and Biological Sciences,
Marshall University

Fields of specialization:
- 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;

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:
PS/BSC 410/510, Physical Principles of Remote Sensing taught every fall semester;
PS/BSC 411/511, Digital Image Processing and GIS Modeling taught every spring semester;
PHY 582, 101, Instrumentation for Mapping in Transportation Systems and Environment;
PHY 582, 102, Terrorism, Transportation and Rural Crime Scene Mapping;
PS 670 Advanced Practicum taught as needed;
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:

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
(Information for the period of this review)

Name: Aley El-Shazly
Rank: Associate Professor
Status (Check one): Full-time X Part-time Adjunct
Current MU Faculty: Yes X No
Highest Degree Earned: PhD Date Degree Received: April 1991
Conferred by: Stanford University
Area of Specialization: Geology
Professional Registration/Licensure Agency:
Years non-teaching experience 2
Years of employment other than Marshall 13
Years of employment at Marshall 7
Years of employment in higher education 20
Years in service at Marshall during this period of review 7

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 (summer through spring), 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>Spring 09</td>
<td>GLY 210L-203</td>
<td>Earth Materials Lab</td>
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<td>Spring 09</td>
<td>GLY 110-203</td>
<td>General Geology</td>
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<td>Spring 09</td>
<td>GLY 480-201</td>
<td>Geology Lab Techniques</td>
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<td>GLY 483-201</td>
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<td>GLY 210L-104</td>
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<td>Fall 09</td>
<td>GLY 314-101</td>
<td>Mineralogy</td>
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<td>Spring 10</td>
<td>GLY 210L-204</td>
<td>Earth Materials Lab</td>
<td>20</td>
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<td>Spring 10</td>
<td>GLY 421-201/ GLY</td>
<td>Petrology</td>
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<td>GLY 642-201</td>
<td>Chemical Aspects in Geology</td>
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<td>GLY 492-203</td>
<td>Capstone Experience</td>
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<td>GLY 200-102</td>
<td>Physical Geology</td>
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<td>Fall 10</td>
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<td>Geology Lab Techniques</td>
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<td>Fall 10</td>
<td>CHM 585 - 101</td>
<td>Independent Study, Electron Microscopy</td>
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<td>Spring 11</td>
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<td>Earth Materials Lab</td>
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<td>Spring 11</td>
<td>FYS-100</td>
<td>First Year Seminar</td>
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<td>GLY 482</td>
<td>Low Temperature Aqueous Geochemistry</td>
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<td>Spring 11</td>
<td>GLY 680</td>
<td>Chemical Aspects of Geology</td>
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NOTE: Part-time adjunct faculty do 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).


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.

1- Society Membership
- American Geophysical Union
- Geological Society of America
- Mineralogical Society of America

2- Conferences attended
- GSA Annual Meeting, Fall 2008
- GSA Annual Meeting, Fall 2009
- Goldschmidt 2010, Summer 2010
- GSA North central and Northeastern Combined section meeting, Spring 2011.

6) Externally funded research grants and contracts you received.
- Awarded OISE-NSF grant 1004021 ($42K). Origin & Economic Potential of some Banded Iron Ores from Egypt w/ Kovatch and Holmes.

7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
- “Two metamorphic events recorded in granulite facies rocks from the Winding Stair Gap, Central Blue Ridge”. Appalachian State University, Oct 1

8) Community service as defined in the Greenbook.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: __Xiaojuan Fan_________________________ Rank: ____Assistant Professor________

Status (Check one):  Full-time__x___  Part-time_____  Adjunct _____  Current MU Faculty: Yes ____  No ___

Highest Degree Earned: ___Ph.D_________________ Date Degree Received: ___07/01/99__________

Conferred by: __University of Science and Technology of China_____________

Area of Specialization: ___Condensed matter physics___________________________

Professional Registration/Licensure_______________  Agency:___________________________

Years non-teaching experience   __6____
Years of employment other than Marshall   ___13____
Years of employment at Marshall   ___3____
Years of employment in higher education   ___16____

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 (summer through spring), course number, course title and enrollment.  *(Expand the table as necessary)*

<table>
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<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
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<td>PHY201, PHY202</td>
<td>General physics and lab</td>
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<tr>
<td>2011/spring</td>
<td>PHY201, PHY202</td>
<td>General physics and lab</td>
<td>75</td>
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<td>2010/fall</td>
<td>FYS, PHY421</td>
<td>First Year Seminar, Modern physics lab</td>
<td>30</td>
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<td>2010/summer</td>
<td>PHY201, PHY202, PHY204</td>
<td>General Physics and lab</td>
<td>80</td>
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</table>

NOTE: Part-time adjunct faculty do 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.
New course setups: “first year seminar”, “modern physics”, and “modern physics lab”.

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


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

- 2011 Invited talk, Department of Physics, Anhui University, China
- 2011 International Semiconducting, Optical and Photonic, Wuhan, China, talk presentation
- 2011 American Physical Society March Meeting, Austin, TX, talk presentation
- 2010 SigmaX and West Virginia Star Symposium, Marshall University
- 2010 APS March Meeting, Portland, OR, talk presentation
- 2009 American Physical Society March Meeting, Pittsburg, PA, talk presentation
- The 5th international congress of NBCT 2008, San Francisco, CA, talk presentation
- 2008 American Physical Society Spring Meeting, New Orleans, LA, talk presentation
- 2007 MRS Spring Meeting, San Francisco, CA, talk presentation

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.

- NSF SBIR Phase I proposal review panelist, March 2009
- NSF SBIR Phase I proposal review panelist and Aug. 2010

6) Externally funded research grants and contracts you received.

- NASA WVEPCoR Seed Grant, 2009
- NASA WVURC subcontract, 2009
- MU Advance new faculty fellowship, 2010

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

- Invited talk, Anhui University, China

8) Community service as defined in the *Greenbook*.

- Marshall university open house receptions, 2007-2010
James M. Leonard, Ph.D.
Geography Department
Marshall University
1 John Marshall Drive
Huntington, WV 25755
(304) 696.4626 voice
(304) 696.2506 fax
leonard@marshall.edu

Professor of Geography (2001-present), Marshall University
GIS Technical Systems Administrator and GIS Analyst (1996-2001), WV Department of Environmental Protection

Peer-reviewed publications

- “They are just like the rest of us, only with a bigger home:” Spatial Integration of Socio-Economic Classes in Rural Mingo County, West Virginia. *Southeastern Geographer* 49(3) 2009: 267-290.

Textbook publications


Professional consultation


**Teaching and Advising**

- Department Internship Coordinator; students gain real-world experience frequently resulting in permanent employment in the field of geography
- Writing Intensive Instructor, WAC approved 2010
- Online course development and delivery: GEO305 Geography of North America; GEO317 World Regional Geography; GEO623 Regions of North America
- Master’s Thesis Advisor for:
  - Simental, Maria. 2006. Use of GIS in the Provision of Emergency Services in Small Municipalities: Huntington, WV as a Case Study.

**Selected external grants**

- Canadian Embassy Faculty Enrichment Grant, 2007 ($3,000)
- WV Higher Education Planning Commission Improving Teacher Quality Grant – GIS Summer Academies for high school teachers, 2005-2006 ($44,453)
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Ronald L. Martino
Rank: Professor

Status (Check one): Full-time X Part-time ___ Adjunct ___
Current MU Faculty: Yes X No ___

Highest Degree Earned: PhD
Date Degree Received: 1981

Conferred by: Rutgers University - New Brunswick
Area of Specialization: Geology (Stratigraphy & Sedimentation)

Professional Registration/Licensure: Agency: ____________

Years non-teaching experience: ___
Years of employment other than Marshall: ___
Years of employment at Marshall: 32 __
Years of employment in higher education: ___
Years in service at Marshall during this period of review: 5 __

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 (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

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<td>GLY 423</td>
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<td>GLY 210L (201)</td>
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<td>GLY 210L (202)</td>
<td>Earth Materials Lab</td>
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<td>GLY 211L</td>
<td>Historical Geology Lab</td>
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<td>2010/F</td>
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NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.

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

3) Activities that have enhanced your teaching and or research.

4) Papers presented at state, regional, national, or international conferences.
   - Martino, R. L., E. Gierlowski-Kordesch, M. Bascombe Blake, C. F. Eble, . , 2006, Stratigraphy and depositional framework of the Twomile Limestone (Late Pennsylvania) of southern West Virginia Geological Society of America Abstracts w/ program NC Meeting, Akron, OH.

http://www.marshall.edu/sigmaxi/2010%20Sigma%20Xi%20Research%20Day-Program.pdf

Martino, R. L. and Stephen F. Greb, 2006, Walking trails of the giant terrestrial arthropod *Arthropleura* from the Upper Carboniferous of Kentucky, Geol Soc Am. Abstracts w/ Programs, SE Section Meeting, Knoxville, TN.

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.

- American Association of Professional Geologist
- Geological Society of America
- Society of Sedimentary Geology
- Ohio Oil & Gas Association
- Appalachian Geological Society

Regional Conferences attended:
- 2006: Geological Society of America North-Central Meeting, Akron OH
- 2006: Geological Society of America Southeastern Meeting, Knoxville TN
- 2006: Appalachian Geological Society, Charleston, WV 1/24, 2/21, 3/30, 9/26, 11/14
- 2006 American Association of Professional Geologist, Buffalo, NY 10/6-10/12
- 2006 Appalachian Geological Society, Charleston, WV, 5/14/06 – co-leader; outcrop scale reservoir heterogeneity in fluvial sandstones of the Kanawha and New River Formations - fieldtrip guide coauthor
- 2006 Co-chair of North Central Geological Society America technical session (see attached)
- 2006 AAPG Meeting Judge – Best Oral Paper – AAPG – Buffalo, NY
  - Judge – Best Student Paper – AAPG – Buffalo, NY
- 2006-2010: West Virginia Geological and Economic Survey Statemap panel member, reviewer for geologic mapping proposals submitted to the federal government.

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.

2010:
- Reviewed ms. By Jerrett et al. entitled ACCOMMODATION SETTING CONTROL ON COAL SEAM CHARACTER IN THE WESTPHALIAN C (ATOKAN) FOUR CORNERS FORMATION, CENTRAL APPALACHIAN BASIN, USA. (May 13-14) for Journal of Sedimentary Research
- Reviewed 2 mapping proposals for WVGES: 1) Clover Lick 7.5" Quad, 2) Peterstown 7.5" Quad
- 6/2/10 Wayne Elementary School – two presentations to students on dinosaurs and meteorites with hands-on samples from MU
- Phase I Geology Assessment Reports for Stagg Engineering June-August

2009:
- Reviewed 3 Geologic Mapping (Statemap) Proposals for WV Geologic Economic Survey: (completed 10-14-09)
  1) Greenland Gap 7.5" Quadrangle
  2) Peterstown 7.5" Quadrangle
  3) Clover Lick 7.5" Quadrangle
- Participated on WVGES Statemap Panel – involved in revision of evaluation criteria for proposals (meeting 7-28-09 in Elkins, WV)
  - Two Lectures to a total of approx 120 Wayne Elementary School Students on Meteorites and Dinosaur Tracks – May 7, 2009
- Providing information on minerals, rocks, fossils to tri-state area residents: Ex. Rome Hughart – rock identification and interpretation with links 12-20-09

2008
- Refereed 3 Grant Proposals submitted by West Virginia Geologic Survey to the USGS for geologic mapping of 7.5' quadrangles (9/23/08):
  1) Antioch
  2) Paddy Knob and Mustoess (WV parts of each)
  3) Mingo OR Woodrow
- Cooperating Geologist – WV Geologic and Economic Survey
- prepared and presented a workshop on rocks and minerals for 15 students, 3 teaching assistants and 1 teacher from Marshall University early Education Center at request of Kelley Walker, lead teacher) - 12-11-08 attended and provided public input at
hearing sponsored by the US Bureau of Land Management on the proposal by Argus Coal and Rocksprings Development to mine coal near East Lynn Lake (7-31-08)

provided interview and information to Herald-Dispatch newspaper on risks of proposed mining near east Lynn Lake, based on my review of the EIS that was submitted to BLM. Several articles written by Bryan Chambers (H-D reporter) were based in part on information provided and published in September and October. (2 points)

Provided information on minerals, rocks, fossils, and coal and petroleum to tri-state area residents

2007

Reviewed ( refereed paper) for GSA on Late Paleozoic lectures Special publication by B. M. Blake and J.D. Beuthin
“Deciphering the Mid-Carboniferous eustatic event in the Appalachian forestland basin, Southern WV”
Reviewed Geologic Grant Mapping Proposals for WV Geologic Economic Survey
WV Geologic Economic Survey – Cooperating Geologist
Consulting to oil and gas companies
Providing information on minerals, rocks, fossils to tri-state area residents

2006

Consulting report for U.S. Army Corps of Engineers – petrography of rock foundation for Dover Dam

provided information on numerous occasions to general public on oil, gas, coal, minerals, rocks, and fossils.
Appendix II
Faculty Data Sheet
(for the period of this review)

Name: ___________________ Rank: ___________
Huong Nguyen  Associate Professor

Status (Check one):  Full-time___X___ Part-time____ Adjunct____  Current MU Faculty: X__yes ___no

Highest Degree Earned: ___________ Ph.D.  Date Degree Received: _______ 2001

Conferred by:  The City University of New York

Area of Specialization:  ___________ Physics (Condensed Matter Theory)

Professional Registration/Licensure  N/A  Agency: ___________

Years non-teaching experience  _______ 4 _______
Years of employment other than Marshall  _______ 4 _______
Years of employment at Marshall  _______ 7 _______
Years of employment in higher education  _______ 11 _______
Years in service at Marshall during this period of review  _______ 5 _______

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>
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<th>Title</th>
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<td>General Physics Laboratory</td>
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<td></td>
<td>PHY 442/542</td>
<td>Quantum Mechanics</td>
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<td>PHY 425/525</td>
<td>Solid State Physics</td>
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<td>PHY 443/543</td>
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<td>Math Methods of Physics</td>
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<td>Electricity and Magnetism I</td>
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<td>PHY 442/542</td>
<td>Quantum Mechanics</td>
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</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. N/A)

2   Activities that have enhanced your teaching and or research The City University of New York
    Participation in
    • Capstone supervisor for Sarah Hall, “Effect of Magnetic Field on Phononitons”
    • Teach new course PHY 600 (Graduate) Electricity & Magnetism

3   Discipline-related books/papers published (provide a full citation).
4 Papers presented at state, regional, national, or international conferences.
   - 5th International Conferences on Surfaces, Coatings and nanostructured Materials (NANOSMAT-5)
   - Invited Seminar presented to faculty of Physics and Chemistry Departments, WVU April 2009, Inorganic-Organic Hybrid Exciton in Semiconducting Quantum Dot System
   - First International Conference on Multifunctional, Hybrid and Nanomaterials, Tours France, March 2009
   - Michael Jayson Price, Que Huong Nguyen, 2008 APS Spring Meeting of Ohio-Region Section, Effect of Electric Field on Phononitons in Semiconductors

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.
   - Membership of American Physics Society
   - Participation at professional meetings:
     - APS March Meeting, Portland, OR; March 2010
     - APS March Meeting, Pittsburgh, PA; March 2009
     - First International Conference on Multifunctional, Hybrid and Nanomaterials, Tours, France; March 2009
     - Sixth Annual Undergraduate Research Day at Capitol, with Daniel Velazquez 2009
     - APS March Meeting, Colorado, March 2009

6 Externally funded research grants and contracts you received.
   - NSF DMR – MPS SUST ENERGY SCI, December 8, 2009
   - NSF DMR Condensed Matter Physics, November 2, 2009
   - EU COMMISSION MARIE CURIE ACTION, August 2009

7 Awards/honors (including invitations to speak in your area of expertise) or special recognition.
   - Invited speaker:
     - 5th International Conferences on Surfaces, Coatings and nanostructured Materials (NANOSMAT-5)
     - Invited Seminar presented to faculty of Physics and Chemistry Departments, WVU April 2009, Inorganic-Organic Hybrid Exciton in Semiconducting Quantum Dot System

8 Community service as defined in the Greenbook.
   - Supervisor of Vietnamese Student Association
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Ralph Oberly         Rank: Professor

Status (Check one): Full-time X Part-time Adjunct 
Current MU Faculty: Yes X No

Highest Degree Earned: PhD Physics Date Degree Received: June 1970

Conferred by: Ohio State University

Area of Specialization: Physics: High Resolution Molecular Spectroscopy

Professional Registration/Licensure N/AQ Agency:

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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 (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

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<th>Enrollment</th>
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NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain. N/A

(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.
   Attendance at national AAPT meeting in Jacksonville, FL, January 2011
   Advise Society of Physics Students local chapter.

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

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.

   Professional Memberships: Optical Society of America (OSA) 
   American Association of Physics Teachers (AAPT) 
   International Society for Optics and Photonics (SPIE) 


6) Externally funded research grants and contracts you received. N/A

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

8) Community service as defined in the Greenbook.
   • Laser safety presentation to Biology students
   • Electricity – Merit Badge College each of last five years, Marshall University
   • 2 days – hands-on Science/Engineering Days (Chesapeake Middle School)
   • Talk to high school honors class on college prep (Chesapeake High School)

Organized YGS 271 Class field trip to Green Bank Radio Astronomy Observatory

Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Nicola Orsini ______________________ Rank: Professor and Chairman

Status (Check one): Full-time X Part-time _____ Adjunct _____ Current MU Faculty: Yes X No

Highest Degree Earned: Ph.D. ______ Date Degree Received: Sept. 1977

Conferred by: The University of Michigan

Area of Specialization: Atmospheric Physics

Professional Registration/Licensure__________________ Agency: __________________________

Years non-teaching experience ________ 6 __
Years of employment other than Marshall ________ 3 __
Years of employment at Marshall ________ 32 ___
Years of employment in higher education ________ 35 ___
Years in service at Marshall during this period of review ________ 5 ___

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 (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
<thead>
<tr>
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<th>Title</th>
<th>Enrollment</th>
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<td>PHY 201</td>
<td>General Physics</td>
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<td>New Student Seminar</td>
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<td>Spring '10</td>
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<td>Conceptual Physics</td>
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<td>General Physics</td>
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<td>Intercession '10</td>
<td>PHY 101</td>
<td>Conceptual Physics</td>
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<td>Summer II '10</td>
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<td>Conceptual Physics Lab</td>
<td>21</td>
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</table>
If your degree is not in your area of current assignment, please explain.
N/A

(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.
   Demonstrations in the classroom and talks I give to elementary students. It forces me to find ways to simplify more complicated topics. These simplifications have been very useful in the classes I teach at the university.

3) Discipline-related books/papers published (provide a full citation).
   None

4) Papers presented at state, regional, national, or international conferences.
   None

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.
   Chairman of the Physics and Physical Science Department; Member of the American Association of Physics Teachers (AAPT); Member of Partnership Schools Project Advisory Committee; Member of Education Personnel Preparation Advisory Committee (EPPAC); Member of the Mathematics/Science Taskforce (M/ST); Member of the Undergraduate Program Liaisons Committee for Initial Teacher Education (UPLCITE); Liaison faculty member of the College of Science for the COEHS (2000 – present)

6) Externally funded research grants and contracts you received.
   None

7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.
   None

8) Community service as defined in the Greenbook.
   Consultant/Liaison for local high school teachers. Science resource for local TV stations. Workshop on electrostatics for the 3rd grade class at Guyandotte Elementary School. Promote teaching physics in all the state’s high schools as a required science by communicating and providing information to State Senator, State Representatives, and high school teachers. Consultation with Ms. Pam Scaggs of RESA 2 to set up a program to certify middle and high school teachers to teach physics. Consultation with Mr. Joe Gonzales on Higg’s particles. Lectured for Boy Scout Merit Badge Masters on topic of “Astronomy” required for merit badge.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: Howard L. Richards  Rank: Assistant Professor

Status (Check one): Full-time X  Part-time_____  Adjunct _____  Current MU Faculty: Yes ___  No ___

Highest Degree Earned: Ph.D.  Date Degree Received: April 1996

Conferred by: Florida State University

Area of Specialization: Physics

Professional Registration/Licensure________________________  Agency: _______________________________

Years non-teaching experience
Years of employment other than Marshall 11
Years of employment at Marshall 4
Years of employment in higher education 12.5
Years in service at Marshall during this period of review 4

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 (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

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<th>Year /Semester</th>
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<th>Enrollment</th>
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<td>PHY 202</td>
<td>General Physics Lab</td>
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<td>2010 / Spring</td>
<td>PHY 203</td>
<td>General Physics Lab</td>
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<td>2010 / Spring</td>
<td>PS 110</td>
<td>General Physical Science</td>
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<td>HON 280</td>
<td>SpTp: Ancient / Modern Astronomy</td>
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NOTE: Part-time adjunct faculty do not need to fill in the remainder of this document.

1) If your degree is not in your area of current assignment, please explain.
N/A

(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.

Attended WAC retreat October 17-18, 2008. I have used the ideas from this retreat in my Astronomy courses. This semester (fall 2011) I am compiling a portfolio to obtain WAC certification, so that I will be able to teach writing-intensive classes. (On previous occasions I waited too late in the semester – up to about the 3rd week – to begin.)

I have also designed a “problem-solving sheet” for use in PHY 201/203/211/213. Based on How to Solve It by G. Polya, these sheets
  • give students practice in the methodical and systematic solution of physics problems;
  • reward students for setting up problems even if they cannot (initially) see how to finish the solutions;
  • make it obvious to students if they have omitted part of the solution; and
  • simplify the consistent assignment of partial credit to attempted solutions.

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

None. However, I did write all of the labs that I use for PS 400L/PS 500L, so in essence I have written a lab manual (which I am continuing to edit and use this year).

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.

- 2011 March Meeting of the American Physical Society, March 21-25, 2011, Dallas, TX.
- 2010 Annual CISE REU PI Meeting, March 18-19, 2010, Charlotte, NC.
- 2010 SIAM Southeastern and Atlantic Section Meeting, March 20-21, 2010, NC State University.
- 2009 March Meeting of the APS; March 16-20, 2009; Pittsburgh, PA.
- 2008 Spring Meeting of the Ohio-Region Section of the APS; March 28-29, 2008; Youngstown, OH.
- 2008 Fall Meeting of the Ohio-Region Section of the APS; October 10-11, 2008; Fairborn, OH.
- 2010: Participated in 2 NSF proposal review panels.

Member of
- the American Physical Society,
- the IEEE Computer Society,
- the Society for Industrial and Applied Mathematics, and
- Sigma Xi.

Made significant progress towards a master's degree in software engineering:

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<td>WVU</td>
<td>SENG 530 Validation and Verification</td>
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7) Awards/honors (including invitations to speak in your area of expertise) or special recognition.

N/A

8) Community service as defined in the Greenbook.

- Judged the Physics SCORES competition 2 years.
- Served as a judge in a science fair.
- Gave demonstrations at a middle-school science and engineering day.
- Taught Astronomy in 2 Boy Scout Merit Badge events.
Appendix II
Faculty Data Sheet
(Information for the period of this review)

Name: _______Dewey D. Sanderson______________________________   Rank: _Professor______________________

Status (Check one):  Full-time__X__ Part-time_____   Adjunct _____

Highest Degree Earned: _______Ph.D._____________   Date Degree Received: __1972__________

Conferred by: _____Michigan State University__________________________________________

Area of Specialization: _______Geology________________________________

Professional Registration/Licensure_______________     Agency: _______________________________

Years non-teaching experience       0 ______

Years of employment other than Marshall       0 ______

Years of employment at Marshall        40_______

Years of employment in higher education ___40_______

Years in service at Marshall during this period of review      5_______

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 (summer through spring), course number, course title and enrollment. (Expand the table as necessary)

<table>
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<td>GLY 640/101</td>
<td>Physical Aspects of Geology</td>
<td>2</td>
</tr>
<tr>
<td>2011 Spring</td>
<td>GLY 110/201*</td>
<td>General Geology</td>
<td>46</td>
</tr>
<tr>
<td>2011 Spring</td>
<td>GLY 210L/203</td>
<td>Earth Materials Lab</td>
<td>16</td>
</tr>
</tbody>
</table>
2) Activities that have enhanced your teaching and or research.

2009-10 Directed master’s research project for Dale Biller

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.

West Virginia Academy of Science

8) Community service as defined in the Greenbook.


Peer reviewed: 2010 “Tidal rhythmite in a fore arc succession (Mio-Pliocene Misaki Formation), Miura peninsula, Japan and its implications”, [Paper #2010-096], Journal of Sedimentary Research
Appendix II
Faculty Data Sheet
(for the period of this review)

Name: Vaseashta, Ashok

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: 1990

Conferred by: Virginia Polytechnic Institute & State University, Blacksburg, VA

Area of Specialization: Solid State Electronics, Materials Engineering & Science

Professional Registration/Licensure ______________ Agency: __________________________

Years non-teaching experience: 6
Years of employment other than Marshall: 7
Years of employment at Marshall: 10
Years of employment in higher education: 17
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)

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

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.

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

8. Community service as defined in the Greenbook.
ANITA WALZ  
Department of Geography  
Marshall University  
One John Marshall Drive, Huntington, WV 25701  
(304) 696-2504  
walz@marshall.edu

EDUCATION

University of Maryland:  Ph.D. in Marine, Estuarine, and Environmental Sciences (MEES; 2002).
Special Student in Oceanography (1990-1991).
Universität Konstanz:  Diplom in Biology/Limnology (1994; German M.S. equivalent).
Vordiplom in Biology (1988; German B.S. equivalent).

PROFESSIONAL DEVELOPMENT AND EXPERIENCE

Marshall University:  
Associate Professor in the Department of Geography (2008 to present)  
Assistant Professor in the Department of Geography (2003 – 2008)  
Adjunct Faculty in Integrated Science and Technology and the Department of Mathematics (2002 – 2003)

Environmental Systems Research Inc. (ESRI) Authorized Training Program Instructor:

University of Maryland:  
Doctoral Dissertation Research: ‘Associations Between Maryland’s Amphibian Species and Habitat Parameters at Local and Landscape Scales’ (2002). Advisors: Dr. Raymond P. Morgan II and Dr. Mary Ann Ottinger.
Faculty Research Assistant in the Laboratory for Global Remote Sensing Studies: for Dr. Sam N. Goward (1996-1997): Application of remote sensing and Geographic Information System (GIS) techniques to derive near-surface environmental conditions from satellite data.

TEACHING EXPERIENCE

Marshall University: Physical Geography (GEO101), Global Environmental Issues (CT; GEO222), Geographic Field Research (GEO4/520; capstone), Introductory GIS (GEO4/526), Intermediate GIS: Raster Analysis (GEO4/530), Climatology (GEO4/525), Environmental Geography (GEO4/522), Global Climate Change (HON480), Topics in Environmental Geography (GEO620), Applied Environmental Statistics and Database Management (ISTR423/PS523), Concepts and Applications (MTH121)

Secondary Education Teachers of West Virginia: Global Warming and Sea Level Rise Seminar and GIS exercise (2 hours)
University of Maryland: Statistical Design and Analysis (BIOM602 SAS in computer lab), Introduction to Biostatistics (BIOM403 SAS in computer lab), Introduction to Animal Sciences (ANSC101), Principles of Biology (BIOL101)

POSTERS, PRESENTATIONS, REPORTS, and CONFERENCE PROCEEDINGS

56


RECENT GRANTS AND AWARDS


Summer Research Award (2010): process newly acquired satellite data analyze and present in Keystone, CO.

MU-ADVANCE Mini Grant (Spring 2010, $915): cover second half of satellite image

Faculty of the Game award (Fall 2009)

MU-ADVANCE Mini Grant (Spring 2009, time extended; $915): cover half the cost of a satellite image

College of Liberal Arts Faculty Development Award (Spring 2008): landscape ecology research

MU-ADVANCE Faculty Fellowship (Fall 2007 – Spring 2009): work on publications


SERVICE TO COMMUNITY

Participation and consulting the Urban Forestry Advisory Committee in Huntington, WV, 2007 to present


GIS Workshop for WV Secondary Education Teachers, March 24, 2007, Marshall University

Presenting Plate Tectonics to third graders at Cammack Elementary, Huntington, WV (2004).

Presenting Environmental Issues at Elementary Schools and to girl scout troops in Cabell County (2003).

MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS

American Meteorological Society since 2007

American Association of Geographers since 2005

Southeastern Division of American Association of Geographers since 2003.

International Association for Landscape Ecology since 1998.

Ecological Society of America since 1998.
Appendix II
Faculty Data Sheet
(for the period of this review)

Name: Dr. Thomas E. Wilson  
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: 1984

Conferred by: Indiana University

Area of Specialization: Physics  (Condensed Matter)

Professional Registration/Licensure_______________ Agency:________

Years non-teaching experience  2
Years of employment other than Marshall  11
Years of employment at Marshall  18
Years of employment in higher education  28
Years in service at Marshall during this period of review  5

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>
<th>Alpha Des. &amp; No.</th>
<th>Title</th>
<th>Enrollment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall ’09</td>
<td>PHY 211</td>
<td>Principles of Physics</td>
<td>36</td>
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<tr>
<td></td>
<td>PHY 330</td>
<td>Mechanics</td>
<td></td>
</tr>
<tr>
<td>Spring ’10</td>
<td>PHY 203 (2 sections)</td>
<td>General Physics</td>
<td>47</td>
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<tr>
<td></td>
<td>PHY 204</td>
<td>General Physics Lab</td>
<td>22</td>
</tr>
<tr>
<td>Fall ’10</td>
<td>PHY 201</td>
<td>General Physics</td>
<td>29</td>
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<tr>
<td></td>
<td>PHY 630</td>
<td>Classical Mechanics</td>
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</tr>
<tr>
<td>Spring ’11</td>
<td>PHY 203</td>
<td>General Physics</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>PHY 608</td>
<td>Statistical Mechanics</td>
<td>2</td>
</tr>
</tbody>
</table>

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.

N/A

(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.

   Using personal response system in PHY 211/213 for student electronic feedback 2002 – present

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

   TE Wilson, “Fabrication and characterization of granular aluminum/palladium bilayer microbolometer”, in review to Meas. Sci. Technol. 9.27.06


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


   Student (Daniel Velazquez) co-authored paper “Anisotropic Wave Propagation in a Ripple Tan”, Physics Diversity Summit ’09, a joint (NSBP, NSHP) national conference on diversity in physics, held from February 11-15, 2009, at the Nashville Renaissance Hotel.


   Presented paper at Acoustics ’08, a joint international conference on acoustics held from June 29-July 4, 2008, at the Palais de Congrès in Paris, France.
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.

- American Physical Society
- Amer. Assoc. Physics Teachers
- I.E.E.E.,
- Army Research Office Proposal

Externally funded research grants and contracts you received.

- WV EPSCoR Research Seed Grant: “Demonstration of Coherent Phonon Generation at 1.5 THz”, Amount $20,000. (2011)
- National Science Foundation/ENG/ECS/GOALI award 0622600 $245,896: “Coherent acoustic phonon generation and development of Terahertz Cryogenic acoustic microscope” (Sole Principal Investigator), NSF ENG/ECCS/REU Supplement to IV.1 above, Number 0924691, Amount: $6,000 (2006-2011)

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

- Marshall University Distinguished Artist and Scholar Award (2011)

Community service as defined in the Greenbook.

- Arranged for Dr. Wolfgang Grill and public lecture.
- Arranged for Dr. Ronald Walsworth from APS DTL competition
## Appendix IIa
### Teaching Assistant Data Sheet

<table>
<thead>
<tr>
<th>GTA Name</th>
<th>Course No.</th>
<th>Course Name</th>
<th>Year 1 20__-20__</th>
<th>Year 2 20__-20__</th>
<th>Year 3 20__-20__</th>
<th>Year 4 20__-20__</th>
<th>Year 5 20__-20__</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(e.g. 101)</td>
<td></td>
<td>Su</td>
<td>Fa</td>
<td>Sp</td>
<td>Su</td>
<td>Fa</td>
</tr>
<tr>
<td>Not applicable</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Complete graduate teaching assistant’s name; course number and course name taught; indicate enrollment in the semesters taught.

*Expand table as needed.*
## Appendix III

Students’ Entrance Abilities (Graduate Programs)

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Mean Undergraduate GPA</th>
<th>Mean GRE Verbal</th>
<th>Mean GRE Quantitative</th>
<th>Mean GRE Analytical Writing</th>
<th>GMAT Mean</th>
<th>Miller Analogies Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>3</td>
<td>2.61</td>
<td>520.0</td>
<td>690.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2007-08</td>
<td>2</td>
<td>2.92</td>
<td>480.0</td>
<td>600.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2008-09</td>
<td>7</td>
<td>2.93</td>
<td>270.0</td>
<td>550.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2009-10</td>
<td>4</td>
<td>3.05</td>
<td>435.0</td>
<td>635.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2010-11</td>
<td>4</td>
<td>2.90</td>
<td>400.0</td>
<td>565.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Expand table as needed.
## Appendix IV
### Students’ Exit Abilities (Graduate Programs)

<table>
<thead>
<tr>
<th>Year</th>
<th>N</th>
<th>Mean GPA</th>
<th>Licensure Exam Results</th>
<th>Certification Test Results</th>
<th>Other Standardized Exam Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006-07</td>
<td>7</td>
<td>3.57</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
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<tr>
<td>2007-08</td>
<td>13</td>
<td>3.71</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2008-09</td>
<td>6</td>
<td>3.63</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2009-10</td>
<td>2</td>
<td>3.64</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2010-11</td>
<td>3</td>
<td>3.63</td>
<td>N/A</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Expand table as needed.*
Appendix V  
Assessment Summary  
Marshall University  
Assessment of the Program’s Student Learning Outcomes  
5 year summary

Component Area/Program/Discipline: **M.S. Physical and Applied Science**

<table>
<thead>
<tr>
<th>Program’s Student Learning Outcomes</th>
<th>Assessment Measures (Tools)</th>
<th>Standards/Benchmark</th>
<th>Results/Analysis</th>
<th>Action Taken to improve the program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graduates will demonstrate a good grasp of fundamental principles of their discipline</td>
<td>(1) Comprehensive exam for those students in the course option. (2) Defense of thesis for those students in the thesis option</td>
<td>(1) Student must answer questions covering a range of important topics in the emphasis area and do so in some depth. (2) Students must organize and write a complete report of a significant research problem, validate hypothesis and defend the thesis to the satisfaction of the professional judgment of experts in the subject.</td>
<td>Graduates with whom we have contact report that their technical skills are appropriate for their jobs. These graduates are established in jobs related to their field of study and many have had the same job for years.</td>
<td>We plan to upgrade lab hardware and software.</td>
</tr>
<tr>
<td>Candidates/students will demonstrate the ability to plan and carry out an investigation or research project.</td>
<td>All basic science courses and the core courses in the geobiophysical track require laboratory exercises and/or independent study projects which require written reports. In addition, many students choose to write a research thesis, which by its very nature requires the students to demonstrate the ability to plan and carry out a research project.</td>
<td>The ultimate success of any research project or thesis research is a measure of the planning and execution involved. Research is considered successful when it provides convincing evidence in favor of the conclusion and to the exclusion of other possibilities which have been explored.</td>
<td>All graduates met these requirements.</td>
<td></td>
</tr>
<tr>
<td>---</td>
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<td></td>
</tr>
<tr>
<td>Each student will demonstrate basic the computer skills appropriate for his/her track. Examples include the basic use of office software and data management.</td>
<td>Many research projects require the use of computers to generate and/or retrieve data, as well as to analyze it. The oral and written reporting of research results require the use of office software.</td>
<td>Because both research and the presentation of research require basic computer skills, any deficiencies are identified and remedied “on the fly”. A deficiency is any lack of skill that prevents the satisfactory completion and presentation of research.</td>
<td>Faculty in the program are working to upgrade computer hardware and software. This is especially important in the core and laboratory courses where computer skills are critical. New courses are being added at the 600-level which include completion of computer projects.</td>
<td></td>
</tr>
<tr>
<td>Students will demonstrate the ability to communicate scientific concepts, data, and methods both in oral and written format and to audiences of different technical sophistication.</td>
<td>All basic science courses and the core courses in the geobiophysical track require laboratory exercises and/or independent study projects which require written reports. In addition, many students choose to write a research thesis, which requires both a written report and an oral presentation.</td>
<td>Course instructors use their professional judgment to evaluate the clarity of communication in written lab reports. The thesis committee evaluates the clarity of the students' oral and written thesis presentations.</td>
<td>The quality of student communications is observed to improve with practice. Most instructors received little formal training in communications, instead relying on experience and imitating the teaching and presentation styles that were prevalent when they were students.</td>
<td>Instructors are encouraged to take WAC training. Students are encouraged to present research results at professional meetings and for publication.</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>Students will demonstrate the ability to analyze complex problems: (1) identifying which aspects are essential and which can be ignored, (2) forming a model based on the essential parts of the problem, (3) employing experiments, mathematics, or computers to develop an understanding of the model, and (4) relate the results of the model back to the original problem.</td>
<td>These critical-thinking skills are the essence of science. As such, they are integral to all regular course assignments and research projects.</td>
<td>Students will be unable to successfully solve problems without these critical thinking skills.</td>
<td>This is the universal standard for all science degrees.</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Appendix VI
### Program Course Enrollment

<table>
<thead>
<tr>
<th>Course Number</th>
<th>Course Name</th>
<th>Required / Elective / Service</th>
<th>Delivery Method</th>
<th>Location</th>
<th>Year 1 2006-2007</th>
<th>Year 2 2007-2008</th>
<th>Year 3 2008-2009</th>
<th>Year 4 2009-2010</th>
<th>Year 5 2010-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSC 510</td>
<td>Remote Sensing/GIS application</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>BSC 511</td>
<td>Digital Image Proc/GIS Model</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>GEO 526</td>
<td>Principles of GIS</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
<td>10</td>
<td>7</td>
<td>8</td>
<td>3</td>
<td>8</td>
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<tr>
<td>GEO 529</td>
<td>Intermediate GIS – Vector Analysis</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
<td>8</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>2</td>
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<tr>
<td>GEO 530</td>
<td>Intermediate GIS – Raster Analysis</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
<td>9</td>
<td>5</td>
<td>9</td>
<td>3</td>
<td>7</td>
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<td>GLY 510</td>
<td>Big Bend Field Excursion</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
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<td>GLY 521</td>
<td>Petrology</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
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<td>GLY 523</td>
<td>Sedimentary Petrography</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
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<td>GLY 525</td>
<td>Geochemistry</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
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<tr>
<td>GLY 527</td>
<td>Fossil Fuels</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
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<td>GLY 530</td>
<td>Computer Methods of Geology</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
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<td></td>
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<td>1</td>
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<tr>
<td>GLY 551</td>
<td>Principles Geomorphology</td>
<td>E + R</td>
<td>Td</td>
<td>Huntington</td>
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<td>Course Code</td>
<td>Course Title</td>
<td>Credits</td>
<td>Prerequisites</td>
<td>Instructor</td>
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<td>GLY 551L</td>
<td>Principles Geomorphology Lab</td>
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<td>E + R</td>
<td>Huntington</td>
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<td>GLY 555</td>
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<td>E + R</td>
<td>Huntington</td>
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<td>GLY 555L</td>
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<td>E + R</td>
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<td>GLY 556</td>
<td>Environmental Geology</td>
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<td>E + R</td>
<td>Huntington</td>
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<td>GLY 556L</td>
<td>Environmental Geology Lab</td>
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<td>E + R</td>
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<td>GLY 557</td>
<td>Engineering Geology</td>
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<td>E + R</td>
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<tr>
<td>GLY 580</td>
<td>Special Topic</td>
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<td>GLY 585;</td>
<td>Independent Study</td>
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<td>E</td>
<td>Huntington</td>
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<td>Td</td>
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<td>Thesis Research</td>
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<td>Td</td>
<td>Huntington</td>
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</tr>
</tbody>
</table>

68
Indicate all program and service courses. Please include all special topics courses offered as well as independent studies. When listing Independent studies, please list the number of independent study students enrolled, but DO NOT include individual names or the titles of the independent studies. Please use the following codes:

Required/Elective: Required = R; Elective = E (Please indicate all that apply; e.g. E + S, if the course is both an elective and a service course).
Delivery Method: Traditional = Td, Online = O, Hybrid = H
Location: Huntington, South Charleston, Point Pleasant, etc.

Expand table as needed.
### Appendix VII

**Program Enrollment**

<table>
<thead>
<tr>
<th>Students</th>
<th>Year 1 2006-2007</th>
<th>Year 2 2007-2008</th>
<th>Year 3 2008-2009</th>
<th>Year 4 2009-2010</th>
<th>Year 5 2010-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Students Admitted</td>
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<tr>
<td>Principal Majors Enrolled</td>
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<tr>
<td>Area of Emphasis 1:</td>
<td>21</td>
<td>16</td>
<td>12</td>
<td>19</td>
<td>19</td>
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<tr>
<td>Principal Majors Enrolled</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area of Emphasis 2:</td>
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</tr>
<tr>
<td>Principal Majors Enrolled</td>
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<td>Area of Emphasis 3:</td>
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<tr>
<td>Principal Majors Enrolled</td>
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</tr>
<tr>
<td>Additional Areas of Emphasis</td>
<td></td>
<td></td>
<td></td>
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<td>Second Majors Enrolled*</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
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<tr>
<td>Third Majors Enrolled:**</td>
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<tr>
<td>Other Areas of Emphasis (i.e., education specialization majors)</td>
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<td></td>
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<tr>
<td>Minors***</td>
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<tr>
<td><strong>Grand Total of Students Enrolled in the Program</strong></td>
<td>22</td>
<td>17</td>
<td>14</td>
<td>20</td>
<td>21</td>
</tr>
<tr>
<td>Graduates of the program</td>
<td>7</td>
<td>13</td>
<td>6</td>
<td>2</td>
<td>3</td>
</tr>
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</table>

*If known. This information is not completely accurate at this time, as students often do not declare a second major until the junior evaluation or the student has her/his primary major in another college.

**On occasion you may have a student enrolled in your program who is declaring your program as a 3rd major.

***If known. This information is not completely accurate at this time, as students often do not declare minors until the junior evaluation or senior application for graduation.
Figure 1. Trend Line for Total Enrollment and Program Graduates: MS in Physical and Applied Science
## Appendix VIII
### Job and Graduate School Placement Rates

<table>
<thead>
<tr>
<th>Year</th>
<th># of graduates employed in major field</th>
<th># of graduates employed in related fields</th>
<th># of graduates employed outside field</th>
<th># of graduates accepted to further graduate study</th>
<th># of graduates not accounted for</th>
</tr>
</thead>
<tbody>
<tr>
<td>06-07</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
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<tr>
<td>07-08</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>08-09</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<tr>
<td>09-10</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10-11</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Five –Year Total</td>
<td>18</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>7</td>
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</table>
Dr. Ralph Oberly, Chair  
Physical and Applied Sciences  
COS

Dear Ralph,

I have completed my evaluation of the MS in Physical and Applied Science’s assessment of student learning. This letter will provide general comments and suggestions for improvement. Although the scoring rubric I used to evaluate assessment reports is attached, I will not include numerical ratings in this letter. The reason for this is that the rubric is still relatively new and is continuing to be revised. At this time, I ask that you use it for formative purposes to help improve your assessment plan. We also would appreciate your comments concerning this rubric.

Your report contains useful information and, it is clear to me from reading your report that you have an excellent program! However, your report reads more like a mini-program review than like an annual assessment report. For one thing, you are using an outdated template for the report. The current template is available at [http://www.marshall.edu/assessment/assessment_forms.htm](http://www.marshall.edu/assessment/assessment_forms.htm) and should be used for future annual assessment reports. As you know, you will not submit an annual assessment report in December 2011 because you are submitted a five-year program review in November. So, your next annual assessment report will be due in December 2012.

Regarding the part of the assessment report I evaluated with the attached rubric, your program’s student learning outcomes are well stated and stress higher levels of learning, as is appropriate to graduate education and to your discipline. The assessment measures you report using, e.g., comprehensive exam, thesis, course assignments, etc., are appropriate, but vague. Benchmarks and reported results also should be more specific. Rather than simply saying that students must be able to answer questions on an exam or organize and write a report, I recommend that you specify the level of mastery that students should achieve. On the comprehensive exam, it would be helpful to analyze results in terms of specific “fundamental principles.” That way, your results would help you to identify which principles students had grasped relatively well and which they had not. For papers and reports, I recommend that you develop assessment rubrics that specify traits under each outcome. For example, one of your outcomes is that, “Students will communicate effectively, in the discourse of the discipline, both orally and in writing.” It would be helpful to develop written and oral communication rubrics. To do this, you first need to define the criteria (traits) that you want to see in a well written report. At the very least, writing effectiveness, mechanics, and organization are important. If each writing artifact is evaluated against these traits at specified levels (e.g. novice, developing, mastery) your benchmark would be for a specified percentage of students to score at or above a certain level. You can also calculate mean performance across students. The results will show you if students are relatively stronger in some areas of writing than in others. Then, improvement plans should be based on these results.
During the academic year 2011 – 2012, I plan to meet with all programs to assist with further development of assessment plans and look forward to meeting with you. I will be in touch at the end of the summer about scheduling. If you have questions or concerns, please let me know.

Sincerely,

Mary E. Reynolds

Mary E. Reynolds
Director of Academic Assessment

C: Dr. Charles Somerville, Dean, COS
Office of Assessment & Program Review

April 5, 2010

Dr. Nicola Orsini, Chair
Physics
COS

Dear Nico:

I have completed my evaluation of the MS in Physical and Applied Science’s assessment of student learning. This letter will provide my general comments and suggestions for improvement. Although the scoring rubric we used to evaluate assessment reports is attached, I will not include numerical ratings in this letter. The reason for this is that we used the attached rubric is still relatively new and, as you will see, it raises the bar for what is considered excellent assessment. However, I ask that you use it for formative purposes to help improve your assessment plan. We also would appreciate your comments concerning this rubric.

The learning outcomes that you’ve specified on page 5 of the report are excellent. However, they are not repeated in your chart. If possible, I would like to meet with you after Assessment Day to discuss ways to determine appropriate assessments for the outcomes you’ve written and to plan a workable timeline for assessment.

Please see the attached rubric. If you have questions or concerns, please let me know.

Sincerely,

Mary E. Reynolds

Mary E. Reynolds
Director of Academic Assessment

C: Dr. Charles Somerville, Dean, COS
Office of Assessment & Program Review

April 5, 2009

Dr. Ralph Oberly, Chair
MS in Physical and Applied Science
COS

Dear Ralph:

The Graduate Council and I have completed our evaluation of the MS in Physical and Applied Science's assessment of student learning. This letter will provide my general comments and suggestions for improvement. Although the scoring rubric we used to evaluate assessment reports is attached, I will not include numerical ratings in this letter. The reason for this is that we used the attached rubric for the first time this year and, as you will see, it has changed considerably from the ones used in previous years. It raises the bar for what is considered excellent assessment considerably and, since it was not shared with programs before this assessment cycle, I'm not comfortable using it to give programs a formal rating this year. However, I ask that you use it for formative purposes to help improve your assessment plan. We also would appreciate your comments concerning this new rubric.

From reading this report, it is obvious that you have an excellent program; one to which you have devoted much thought within the context of student and workforce needs. Additionally, you have been proactive in keeping the curriculum up to date. Your program's student learning outcomes are well articulated and cover higher levels of learning. However, you need more finely tuned precision in assessing these learning outcomes. It is not enough to say that students complete projects in many courses and that they all perform in a satisfactory manner. You should specify exactly what the projects are and the exact levels at which students will be expected to perform to achieve the outcomes. We encourage you to develop analytic assessment rubrics for this purpose. Then, your benchmarks should set the standard at which you expect students to perform to show they have achieved the outcome. The benchmark might be set at 3 on a 4-point rubric, with 4 meaning "exceeds expectations," and 3 meaning "meets expectations." Results would be the actual levels achieved, which would inform plans for improvement. For example, your first student learning outcome is, "Apply fundamental principles of the discipline to solve problems." You might evaluate this outcome using select essay exam questions from various specified courses, research projects or other papers from specified courses, and the student's thesis. You could use a scoring rubric that the faculty devises that could be adapted to each assessment for this particular outcome. What are the elements you would want to assess to be sure students had fulfilled the outcome? Would they need to identify the problem in question, evaluate the potential of several "fundamental principles" to solve the problem, select the best fundamental principle to solve the problem, explain how to use this principle to solve the problem, etc? By evaluating student performance across these dimensions, you will be able to say, not just that everyone is doing fine, but that students perform relatively better in identifying a problem to be solved than in choosing the most appropriate principle to solve the problem (or vice versa).
Please see the attached rubric and letter to Deans, Chairs, and Faculty detailing general suggestions for an effective assessment program. If you have questions or concerns, please let me know.

Sincerely,

Mary E. Reynolds

Mary E. Reynolds
Director of Academic Assessment

C: Dr. Wayne Elmore, Interim Dean, COS
Office of Assessment & Program Review

April 1, 2008

Dr. Ralph Oberly, Chair
MS in Physical Sciences
COS

Dear Ralph,

The Graduate Council and I have completed our evaluation of the annual program assessment report for the MS in Physical Sciences. This letter will provide feedback in the following manner. First, I will comment generally on each section of your report. Second, I will rate the following areas of the report on a four point scale (0 – 3, with 3 being the highest rating): student learning outcomes, assessment measures, and the feedback loop. Although I considered feedback from committee members, I made the final decision on ratings for all reports submitted. Third, I will offer suggestions for your consideration as you plan your assessment for the 2008-2009 academic year. Fourth, I will include my evaluation using the Primary Traits Analysis rubric and will include reviewers’ comments for your information.

General Comments

The MS in Physical Sciences appears to be a challenging, yet practical, course of study that provides numerous tracks to fulfill the varied needs to enrolled students. Your program goals are well defined. Goals 2 – 6 pertain to student learning and could be easily written as measurable student learning outcomes. You also have listed these in your assessment chart. Some of the outcomes in your chart are written in measurable terms, while others are not. Let me suggest the following wording for your consideration:

Upon completion of the MS in Physical Sciences, students will be able to

1. Apply the fundamental principles of the discipline to solve problems.
2. Plan and carry out a scientific investigation.
3. Choose appropriate computer software packages for particular analyses and use them competently.
4. Communicate effectively, in the discourse of the discipline, both orally and in writing.
5. Critically evaluate data sources to frame research hypotheses and to arrive at solutions to problems.
Your report lists several appropriate direct assessment measures, e.g. regular course assignments, laboratory reports, comprehensive exams, theses, independent study reports, and content specialization tests for students applying for teaching certificates. You report also contains a satisfaction survey for graduates of the program, which can give you a rich source of indirect data.

Your report does not, however, contain specific benchmarks, results, or actions taken. To simply say that students should be able to successfully complete courses or communicate their thinking are much too subjective statements to be useful benchmarks. Also, it was not apparent to me that you have developed scoring rubrics for assessments like comprehensive exam questions, these, laboratory reports, and independent study projects. Developing detailed scoring rubrics with clearly defined criteria in each area of assessment can help you to objectify and quantify the evaluation process. For example, if independent study reports are evaluated on a scale of 4 – 1, with 4 meaning “outstanding,” 3 meaning “good,” and 2 meaning “satisfactory,” you might expect a mean score (across students) of 2.5 on each component of the rubric. Giving results for each component can help you to clearly identify your students strengths and weaknesses. Then, actions taken during the coming year should specifically address weaknesses.

Ratings for Student Learning Outcomes, Assessment Measures, and the Feedback Loop

Student Learning Outcomes = 3. This rating was given because your student learning outcomes are comprehensive, for the most part measurable, support Marshall’s educational goals, and span multiple learning domains. I would suggest some of the rewording mentioned above.

Assessment Measures = 3. This rating was given because your measures stress higher order thinking and allow learning to be gauged over time.

Feedback Loop = 0. This rating was given because, as far as I could tell appropriate benchmarks were not defined, meaningful results were not given, and curricular modification were not based on identified weaknesses in student learning.

Suggestions to Consider as you plan your assessment strategies for the 2008-2009 academic year

First, it is not necessary, or even desirable, to assess all student learning outcomes every year. I encourage you to do a more in-depth assessment of a portion of your student learning outcomes each year. So, you may choose to do an in-depth assessment of the first two outcomes during year 1. If this is done using several assessment measures with detailed rubrics, you will be able to collect detailed data regarding the outcomes. These data should allow you to identify specific strengths and weaknesses regarding student learning (and hence, your program). Changes to strengthen these areas of learning can be implemented the following year, while you assess two more outcomes. This will allow you to assess all outcomes on a three-four year rotation and will give you sufficient time to allow curricular modifications to have an effect before the next assessment.

I appreciate the work you are doing to make your assessment stronger. If I can be of additional help, please do not hesitate to contact me at 62987 or at reynoldm@marshall.edu.
Sincerely,

Mary E. Reynolds
Interim Director of Assessment

C: Dr. Andrew Rogerson, Dean, COS