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Dr. Hong Chen

Dr. John E. Anderson

Dr. Nirmal G. Patel

Dr. Lynn B. (Barry) Albright, III
I. DEPARTMENT GOAL AND MISSION

GOAL
The University of North Florida (UNF) Department of Physics aspires to become the best undergraduate physics department in the State of Florida and a program of national acclaim.

MISSION
The mission of the Department of Physics is to provide excellent undergraduate education by offering courses in physics, astronomy, and earth science. Our students should gain an appreciation of the physical world and an understanding of scientific methods of inquiry. The physics major consists of eight tracks: traditional physics, physics-material science, physics-electrical engineering, physics-mechanical engineering, physics-computing emphasis, physics-civil engineering, astrophysics, and pre-medical physics. In addition, the department offers a physics teaching option that consists of a major in physics combined with a minor in education. The department aspires to offer programs that instill in our students the principles, motivation, comprehension, and vision to prepare them for careers in physics and related fields and for intellectual growth throughout their lives. Toward these ends, the department seeks to focus its resources to develop curricula that inspire our students to gain a firm and operative understanding of fundamental ideas in physics and related fields, and to provide opportunities for faculty to mentor undergraduates in original research in theoretical, experimental, and computational physics. Faculty and staff engage in continuous assessment and improvement in order to ensure that the department most effectively achieves its goals. The department is working toward the creation of a Master of Science degree with a focus in materials physics. The department will continue to seek to engage in new initiatives that impact the local, state, and international communities.
II. OVERVIEW AND CHANGES SINCE LAST REVIEW IN 2005

The Physics program at UNF is a relatively new program. Prior to 1998 UNF offered only a minor in physics. The Bachelor of Science in Physics was initiated Fall 1998 and awarded its first degree in May of 2000. Before 2003 the physics program was housed in the Departmental of Natural Sciences along with the biology and chemistry programs. From 2003 until 2008 physics was part of the Department of Chemistry and Physics. In 2009 the Department of Physics was formed as a separate department from Chemistry. The Department of Physics is still in its infancy.

In Fall 2005 there were six tenure-track physics faculty (Drs. Huebner, Gay, Garner, Pekarek, Gasparov, and MacGibbon) and three laboratory lecturers (Drs. Anderson, Patel, and Mr. Mao). In Fall 2011 there will be six tenure-track physics faculty (Drs. Garner, Pekarek, Gasparov, MacGibbon, Chen, and Arenas), Dr. Gay (who is half-time while on phased retirement), four laboratory lecturers (Drs. Albright, Anderson, Patel, and Mr. Mao), and three full-time visitors (Drs. Douglas, Kar, and Mr. Montgomery). Two searches to replace visitors Drs. Douglas and Kar with tenure-track assistant professors occurred in 2010-2011. These searches resulted from the resignation in Fall 2010 of assistant professor, Dr. Wurtz, and laboratory lecturer, Ms. Toazmin Siddiqui. One search resulted in the hire of Dr. Arenas. During 2011-2012 two tenure-track assistant professor searches will be underway to replace Dr. Wurtz and laboratory lecturer, Dr. Cruz, who resigned Spring 2011.

The Physics Department contributes to the UNF general education program by offering introductory lecture and laboratory classes in introduction to physics, basic astronomy, and earth science. Recently, the department offered two new conceptual physics courses as part of the COAS venture studies program: The World of Physics and The Evolution of Modern Physics and Astrophysics. Two-semester lecture and laboratory sequences in calculus-based physics and in algebra-based physics support programs in physics, chemistry, engineering, computer science, construction management and biology. For the first time, during Spring 2011 the department offered an honors version of our calculus-based Physics I lecture. The Honors-in-the-Physics major program also commenced during Spring 2011.

Academic year physics enrollment has increased from approximately 7,000 student credit hours in 2004-2005 when the last Physics Program Review occurred to nearly 10,000 in 2010-2011 without a corresponding increase in the number of faculty. As a result, class sizes have increased dramatically. Additional tenure-track faculty are needed in order to reduce the size of lower-division lecture classes, offer upper-division physics electives more frequently, and support the Honors and Venture Studies programs. The UNF Physics Department is unusual in that the department offers not only physics and astronomy courses but also a very large Earth science lecture and laboratory program.

In Fall 2005, when the last Physics Program review was conducted, there were five tracks in the physics major: Traditional Physics and four Engineering Physics tracks (Mechanical, Electrical, Computing and Civil). The latter are intended to prepare physics majors to enter positions in industry upon graduation or to provide preparation for professional graduate programs. Since the last program review in Fall 2005 three additional tracks have been added: Astrophysics (Fall 2009), Pre-Medical Physics (Fall 2010) and
Physics-Materials Science (Fall 2011). The department also offers a Physics Teaching Option which consists of a physics major combined with an education minor.

The physics faculty are active in scholarship and grant writing while imparting to undergraduate physics majors a rigorous curriculum that provides a strong foundation in the core areas of the discipline. The physics faculty regularly publish research papers in peer-reviewed journals and give presentations at national and international conferences. Most have attracted external support for research. In the period since the initiation of the B.S. program in 1998, peer-reviewed research proposals from physics faculty have been won from the National Science Foundation, Research Corporation, the Petroleum Research Fund of the American Chemical Society, NASA and the Department of Defense. Research contracts active from 2005-2011 total more than six million dollars.

Undergraduates in the program have been mentored in research, contributed to publications and given presentations at national conferences. The department continues to offer two Summer Student Research Grants (funded through COAS) wherein a student works on research under the direction of a faculty member.

Graduates from the program have successfully matriculated to high-quality graduate programs in physics and in the professions, entered the military as officers, landed positions as high school teachers, and have entered the workforce by taking positions in industry and national laboratories.

In Fall 2010 an innovative Physics Teaching Apprenticeship Program commenced where the physics major receives a departmental scholarship to assist a local high school physics teacher eight hours per week. The Apprenticeship Program intends to address the critical national shortage of well-qualified high school physics teachers by encouraging physics majors to enter the teaching field as a career.

In Fall 2011 a new Physics Internship Program will be offered for the first time. The aim of the internship program is to involve physics majors in working in a “real world” company environment or in a research laboratory outside UNF. The goal of the internship program is to broaden the horizons of physics majors so they will learn that physics is also useful beyond the academic world of universities.

An international exchange program was started Spring 2011 that involves student exchanges between UNF Physics and the University of Technology in Troyes, France. The first UTT exchange student arrived at UNF Spring 2011.

With an eye toward a possible future graduate program in physics at the masters level, the department formed a Physics Advisory Group (PAG) during Fall 2010. The PAG is a group of physicists who work in local firms. This group of applied physicists will be helpful to the department as it studies the feasibility of creating a professional physics science masters program in materials science and applied physics.
III. STUDENT PROFILE

In section A, we review the credit hours generated by the department of Physics with an emphasis on the lower-level courses. In section B, we review the data on declared physics majors and graduation numbers for the BS in physics degree. In part C, we review the place of employment or school for our physics majors after graduation as well as present demographic information for our physics majors. In section D, we review the data on physics minors.

A. Credit hours generated

About 96% of the physics department credit hours are from lower-level courses (Table III.1), which is a percentage that is far above any other department in the College of Arts and Sciences (COAS) and the university. Like most Physics departments across the country, the large enrollment in lower-level lecture courses financially balances the lower enrollments in the upper level courses.

Graph III.1 shows the Physics Department credit hours per year. The trend in credit hours for the department continues to increase and is in line with the increasing numbers of students at UNF over time. The slight dip around 2008-2009 corresponds to UNF’s realignment of the number of students’ supported at UNF by state funds with the total number of students enrolled at UNF. Before that time, UNF enrolled a significant number of students that were not supported by the state. After the number of students at UNF came into alignment with the state funding, the credit hours resumed its growth. This past year (2010-2011), the credit hours for the Physics department exceeded the credit hours for the Chemistry department for the first time.

The physics major is a tremendous bargain for UNF given the research productivity and grant revenue generated by the physics faculty. Such success is conditioned by having physics as a major at UNF.

The number of faculty lines supporting the BS physics program is 1.5 (9 courses/year), the physics minor requires 0.5 lines (3 courses/year) while the number of lines required to service the department’s general education classes is 11.5 lines. Therefore, compared to the total number of physics faculty (13.5) only (1.5/13.5 =) 11% of the lines are used for the BS physics program.

<table>
<thead>
<tr>
<th>Table III.1 UNF Physics Department Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Source: Beth Clements, Assistant to the COAS Dean)</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Lower-Division</td>
</tr>
<tr>
<td>% of COAS</td>
</tr>
<tr>
<td>Upper-Division</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>% of COAS</td>
</tr>
</tbody>
</table>
Graph III.2 shows the percentage of lower-level credit hours per academic year. As can be seen, roughly 50% of the lower-level credit hours are generated by the physics courses. Roughly 30% are generated by earth science. Roughly 20% are generated by astronomy.

**Graph III.2 Percentage of Lower-Level Credit Hours per Academic Year**
(Source: James Garner, Department of Physics Chair)
Graph III.3 shows the total upper-level credit hours generated per year. As can be seen, the 2005-2008 upper-level CH’s were flat at around 331 while during 2008-2011 the upper-level CH’s have been flat at around 446. This increase is in alignment with the increasing trend in BS physics degrees at UNF.

**Graph III.3 Total Upper-Level Credit Hours per year**
(Source: James Garner, Department of Physics Chair)

B. Physics Majors

Table III.4 and Graph III.4 show the number of UNF Physics BS graduates per year over the past 12 years. Like undergraduate physics departments around the nation, the number of BS graduates per year is small. The UNF Physics Department has graduated an average of 4 BS graduates per year, which is 33% higher than the national average of 3 BS graduates per year for an undergraduate physics department. The average number of BS graduates per year continues to increase over time. In the last three years, the BS graduation rate has been more than double the national average. Compared to the national average, the UNF Physics Department is doing quite well.

Table III.5 and Graph III.5 compares the average number of BS Physics degrees per year in the SUS. As one of the youngest universities in the state, UNF is second to last in the SUS. However, UWF (5.3 BS Physics degrees/year from 2003-2009) and UNF (4.8 BS Physics degrees/year from 2003-2009) offer only BS physics degrees. It should be noted that the other 7 of the 9 SUS Universities listed have Ph.D. programs in physics and therefore they should be expected to graduate significantly more BS degrees in physics than the Universities that only offer a BS in Physics. Both UNF and UWF are graduating BS Physics degrees significantly above the national average.

Table III.6 and Graph III.6 show the number of declared Junior and Senior physics majors. The number of declared Physics majors is about ten times the number of BS graduates per year. The number of
declared physics majors continues to trend upward. This indicates a substantial interest in the BS physics degree well above the number of students that graduate with the BS physics degree.

Table III.4 Number of UNF Physics BS Graduates per Year
(Source: J. Garner, UNF Physics Department Chair)

<table>
<thead>
<tr>
<th>Year</th>
<th>No. Graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>3</td>
</tr>
<tr>
<td>2001</td>
<td>5</td>
</tr>
<tr>
<td>2002</td>
<td>0</td>
</tr>
<tr>
<td>2003</td>
<td>2</td>
</tr>
<tr>
<td>2004</td>
<td>4</td>
</tr>
<tr>
<td>2005</td>
<td>2</td>
</tr>
<tr>
<td>2006</td>
<td>6</td>
</tr>
<tr>
<td>2007</td>
<td>3</td>
</tr>
<tr>
<td>2008</td>
<td>1</td>
</tr>
<tr>
<td>2009</td>
<td>9</td>
</tr>
<tr>
<td>2010</td>
<td>6</td>
</tr>
<tr>
<td>2011</td>
<td>7</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>4</strong></td>
</tr>
</tbody>
</table>

(US Median = 3)

Graph III.4 Number of UNF Physics BS Graduates per Year
**Table III.5 Comparison of Average No. of BS Physics Degrees per Year in the SUS (2003-2009)**

(Source AIP, Statistical Research Center)

<table>
<thead>
<tr>
<th>Year</th>
<th>UF*</th>
<th>FSU*</th>
<th>USF*</th>
<th>UCF*</th>
<th>FIU*</th>
<th>UWF**</th>
<th>FAU*</th>
<th>UNF**</th>
<th>FAMU*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008-2009</td>
<td>32</td>
<td>16</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>5</td>
<td>3</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>2007-2008</td>
<td>37</td>
<td>6</td>
<td>13</td>
<td>13</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>2006-2007</td>
<td>33</td>
<td>24</td>
<td>8</td>
<td>12</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2005-2006</td>
<td>36</td>
<td>23</td>
<td>11</td>
<td>13</td>
<td>4</td>
<td>7</td>
<td>4</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2004-2005</td>
<td>17</td>
<td>12</td>
<td>16</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2003-2004</td>
<td>24</td>
<td>13</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>8</td>
</tr>
</tbody>
</table>

Nat. Median

* offers Physics PhD 12
** offers Phys. BS only 3

**Graph III.5 Comparison of Average No. of BS Physics Degree per year in the SUS**

(* indicates university offers Ph.D; ** indicates university offers B.S. degree only)
Table III.6  Number of UNF Physics Majors per Year
(Source: Beth Clements, Assistant to the COAS Dean)

<table>
<thead>
<tr>
<th>Fall of Year</th>
<th>Number of UNF Junior-Senior Physics Majors</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>17</td>
</tr>
<tr>
<td>2004</td>
<td>15</td>
</tr>
<tr>
<td>2005</td>
<td>24</td>
</tr>
<tr>
<td>2006</td>
<td>37</td>
</tr>
<tr>
<td>2007</td>
<td>28</td>
</tr>
<tr>
<td>2008</td>
<td>35</td>
</tr>
<tr>
<td>2009</td>
<td>32</td>
</tr>
<tr>
<td>2010</td>
<td>47</td>
</tr>
</tbody>
</table>
Student Clubs

The Physics Department has an active Society of Physics Students (SPS). SPS has a room located near the faculty research laboratories and offices where they regularly meet to study, offer free tutoring, and gather socially. They regularly schedule activities such as an egg drop competition, Jeopardy style competitions, an annual Spring BBQ, trips to physics research facilities (e.g., The National High Magnetic Field Laboratory, NASA, University of Florida, Florida State University, University of Central Florida, etc.). The SPS has made custom T-shirts to advertise the physics major around UNF. An active SPS group is needed to achieve an environment for a healthy physics degree and is important for recruiting and retaining physics majors. Dr. Lev Gasparov is the SPS faculty advisor.

In Fall 2010, the Department of Physics started the UNF Astronomy Club. The club is an officially sanctioned UNF student club supported by UNF Student Government funds as well as club fundraising activities. The membership base is wide and not just limited to physics majors and Basic Astronomy students. The faculty mentors of the Astronomy Club are Dr John Anderson, Dr Jane MacGibbon, and Mr Lawrence Mao. Past club events have included regular Deep Sky observing nights in the Osceola National Forest in conjunction with the Northeast Florida Astronomical Society and on-campus speakers. A trip to NASA Kennedy Space Center to tour space research facilities is planned for 2011-2012.

C. 2000-2011 Place of Employment/School after Graduation and Demographics for Physics Majors

As is evident by the list below of the wide array of institutions our BS physics graduates have entered on graduation from UNF, it is clear the UNF BS Physics Program has been a striking success story since its inception in 1998 and our first graduates in 2000.

<table>
<thead>
<tr>
<th>Physics Graduate School</th>
<th>Professional School</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stanford University</td>
<td>UNF Biology</td>
</tr>
<tr>
<td></td>
<td>UNF Mathematics</td>
</tr>
</tbody>
</table>
Ohio State University
University of California-Berkeley
University of South Florida
Cologne University in Germany
University of Florida (3)
Auburn University
Florida State University (2)
University of California-Davis

UNF MBA Program
SUNY-Buffalo Law School (Patent Law)
Johns Hopkins Univ. Medical Physics Graduate Program
Univ. of Florida Science Journalism Graduate Program
Cornell University (Chemistry)
Stetson University Law School
American U. Beirut (Electrical Engineering)
University of Florida Medical Physics Graduate Program
Mayo Clinic Medical School, joint PhD/MD Program
Graduate Institute of World Politics, Washington DC

Private Industry
General Electric-Unison Industries
Blue Cross – Blue Shield Insurance
Merrill-Lynch Investments
Maxwell House (Quality Control Engineer)
Lockheed Martin

Teaching
Douglas Anderson School of the Arts
Sandalwood High School
Paxon School for Advanced Studies
Robert E. Lee High School

Military (6)
United State Air Force (1)
United States Navy (4)
United State Marine Corps (1)

National Laboratories
NASA
Los Alamos
In Table III.7 is shown a summary of the demographic make-up of the UNF physics majors from fall 2005 through fall 2010. On average, whites and females make up 78% and 12% of the students, respectively. The percentage of females has seen a steady decline which is disturbing; it is not known whether such a trend exists at the national level.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Male</th>
<th>Female</th>
<th>%Female</th>
<th>White</th>
<th>Other</th>
<th>%White</th>
<th>%Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2005</td>
<td>26</td>
<td>11</td>
<td>30</td>
<td>28</td>
<td>9</td>
<td>76</td>
<td>24</td>
</tr>
<tr>
<td>Fall 2006</td>
<td>85</td>
<td>20</td>
<td>19</td>
<td>81</td>
<td>24</td>
<td>77</td>
<td>23</td>
</tr>
<tr>
<td>Fall 2007</td>
<td>47</td>
<td>14</td>
<td>23</td>
<td>48</td>
<td>13</td>
<td>79</td>
<td>21</td>
</tr>
<tr>
<td>Fall 2008</td>
<td>48</td>
<td>10</td>
<td>17</td>
<td>50</td>
<td>8</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td>Fall 2009</td>
<td>57</td>
<td>6</td>
<td>10</td>
<td>45</td>
<td>18</td>
<td>71</td>
<td>29</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>62</td>
<td>8</td>
<td>12</td>
<td>53</td>
<td>17</td>
<td>76</td>
<td>24</td>
</tr>
</tbody>
</table>

(Source Rick Powell, UNF Director of Institutional Research, Data Administrator)

In Table III.8, we show the physics majors grouped by year at UNF. The attrition from Freshman to Sophomore occurs before the students have contact with the Physics Department. The increase in the Junior year is due to transfers from the community colleges. It is unclear why we lose so many of the physics majors listed in the Freshman and Junior years. This is a question that we have uncovered in this program review and will try to understand why this occurs and attempt to improve the retention of students already declared as physics majors.

<table>
<thead>
<tr>
<th>Class</th>
<th>Fall 2008</th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
<th>Averages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>10</td>
<td>15</td>
<td>13</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>Sophomores</td>
<td>11</td>
<td>8</td>
<td>10</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Juniors</td>
<td>24</td>
<td>23</td>
<td>35</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>Seniors</td>
<td>10</td>
<td>7</td>
<td>11</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>53</td>
<td>69</td>
<td>58</td>
<td>59</td>
</tr>
</tbody>
</table>
Table III.9 and Graph III.9 shows the Fall 2011 Number of Physics majors by concentration.

**Table III.9 Fall 2011 Number of Physics Majors by Concentration**

<table>
<thead>
<tr>
<th>Concentration</th>
<th>No.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>traditional</td>
<td>31</td>
<td>53.4%</td>
</tr>
<tr>
<td>astrophysics</td>
<td>6</td>
<td>10.3%</td>
</tr>
<tr>
<td>physics-civil engineering</td>
<td>6</td>
<td>10.3%</td>
</tr>
<tr>
<td>pre-med physics</td>
<td>6</td>
<td>10.3%</td>
</tr>
<tr>
<td>physics-mechanical eng.</td>
<td>5</td>
<td>8.6%</td>
</tr>
<tr>
<td>physics-electrical eng.</td>
<td>2</td>
<td>3.4%</td>
</tr>
<tr>
<td>physics-computing</td>
<td>1</td>
<td>1.7%</td>
</tr>
<tr>
<td>physics-material science</td>
<td>1</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

**GRAPH III.9 Fall 2011 Number of Physics Majors by Concentration**

[Bar chart showing the number of physics majors by concentration for Fall 2011]
D. Physics Minors

Table III.10 and graph III.10 displays the number of physics minors at UNF from 2004 to 2010. Although the numbers are small (<11) the trend is clearly steadily upward.

<table>
<thead>
<tr>
<th>FALL</th>
<th>HEADCOUNT No. of PHYSICS MINORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>4</td>
</tr>
<tr>
<td>2005</td>
<td>6</td>
</tr>
<tr>
<td>2006</td>
<td>6</td>
</tr>
<tr>
<td>2007</td>
<td>8</td>
</tr>
<tr>
<td>2008</td>
<td>8</td>
</tr>
<tr>
<td>2009</td>
<td>11</td>
</tr>
<tr>
<td>2010</td>
<td>10</td>
</tr>
</tbody>
</table>

(Source Rick Powell, UNF Research, Data Administrator)  
Director of Institutional
IV. FACULTY PROFILE

In part A, we list the department faculty and compare our department to the physics departments in aspirant and similar universities. In part B, we list faculty accomplishments in the area of research. The UNF physics faculty form two major research groups: Solid State-Optical Physics and Nuclear-Astrophysics. Our primary concentration is in the first group. In part C, we list faculty accomplishments in the area of service.

A. The faculty of the department as of July 2011

During Fall 2010 three physics faculty (Dr. Wurtz, Dr. Cruz, and Mrs. Siddiqui) resigned to take positions elsewhere or for family reasons. Two searches for tenure track assistant professor positions took place during 2010-2011, with one search resulting in hiring Dr. Arenas. Two searches for tenure track assistant professors will commence in August 2011. Table IV.1 lists current tenured and tenure track faculty of the Department together with their rank, the degree and the field of specialization. Table IV.2 lists other teaching related staff.

<table>
<thead>
<tr>
<th>Professors</th>
<th>Associate Professors</th>
<th>Assistant Professors</th>
<th>Professors Emeriti</th>
</tr>
</thead>
<tbody>
<tr>
<td>James Garner, PhD, Ohio State University Theoretical Solid State Physics</td>
<td>Jane MacGibbon, PhD, University of Cambridge Theoretical Astrophysics</td>
<td>Hong Chen, PhD, Ohio University Experimental Solid State Physics</td>
<td>Jay S. Huebner, PhD, University of California Riverside, Experimental Solid State Physics</td>
</tr>
<tr>
<td>Tom Pekarek, PhD, Purdue University Experimental Solids State Physics</td>
<td></td>
<td>Daniel Arenas, PhD, University of Florida Experimental Optics replaced Ms. Siddiqui</td>
<td>Jack Humphries, PhD, University of Florida, Experimental Nuclear Engineering</td>
</tr>
<tr>
<td>Lev Gasparov, PhD, Institute of Solid State Physics, Moscow, Russia Experimental Optics</td>
<td></td>
<td>Visitor (Dr. Douglas) replacing Dr. Greg Wurtz</td>
<td>Dennis Gay, PhD, Florida State University Experimental Nuclear Physics (on phased retirement) ½ time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visitor (Dr. Kar) Replacing Dr. Cruz</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Visitor (Mr. Montgomery) Replacing Dr. Gay</td>
<td></td>
</tr>
</tbody>
</table>
Table IV.2 Fall 2011 Roster of Non Tenure Track Faculty and Other Teaching Related Staff

<table>
<thead>
<tr>
<th>Laboratory Lecturers</th>
<th>Other teaching related staff</th>
</tr>
</thead>
</table>
| **Senior Lecturer, John Anderson, PhD, Harvard University**  
  Experimental Biophysics                         | **Lawrence Mao, BA, San Francisco State University, Physics** (Helps teach lower level labs) |
| **Senior Lecturer, Nirmalkumar Patel, PhD, Patel University, India**  
  Experimental Solid State Physics                 | **Phil Davis, PhD, Rice University, Experimental Physical Chemistry** (Teaches two courses per academic year and is the Physics Department Lab Manager) |
| **Lecturer, Barry Albright, PhD, University of California-Riverside, Geology and Paleontology** | **Ron Nelson, MS, Naval Post Graduate School, CA, Meteorology and Oceanography,**  
  (Part time faculty, teaches Earth Science Labs) |
| **Karl Pezdirtz, PhD, SUNY, Experimental Solid State Physics,**  
  (Part time faculty teaches venture studies course) |                                               |

The table IV.3 clearly shows that the UNF physics department has roughly the same number of upper level physics students as our aspirant and similar institutions. However the number of the lower level physics students per faculty at UNF is at least 2.6 to 3.7 times that of the aspirant and similar institutions. This clearly indicates that the department’s faculty carry a significantly higher load as compared to aspirant institutions.

Table IV.3 Comparison to a Few Similar Universities Outside of Florida (Fall 2009)

<table>
<thead>
<tr>
<th></th>
<th>UNF</th>
<th>College of NJ</th>
<th>Cleveland State</th>
<th>James Madison</th>
<th>Northern Iowa</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Tenure-Track Physics Faculty</td>
<td>7.5</td>
<td>10</td>
<td>11</td>
<td>19</td>
<td>10</td>
</tr>
<tr>
<td>No. upper-level physics majors</td>
<td>30</td>
<td>32</td>
<td>31</td>
<td>47</td>
<td>34</td>
</tr>
<tr>
<td>No. first term lower-level physics department students</td>
<td>1768</td>
<td>864</td>
<td>987</td>
<td>1187</td>
<td>776</td>
</tr>
<tr>
<td>No. of lower-level students per faculty</td>
<td>236</td>
<td>86</td>
<td>90</td>
<td>63</td>
<td>78</td>
</tr>
</tbody>
</table>

The tenure track faculty in the department have a standard teaching course load per semester of two lectures plus one lab or sometimes one lecture plus two labs (for those with an external grant). Even with this relatively high teaching load, the faculty have been productive researchers. The following sections list the faculty accomplishments in the area of research.
Tables IV.4 and IV.5 summarize faculty accomplishments in research.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer reviewed papers</td>
<td>Conference presentations</td>
<td>Patents</td>
</tr>
<tr>
<td>54</td>
<td>70</td>
<td>8</td>
</tr>
</tbody>
</table>

Table IV.5 Secured Funding 2005-2011.

<table>
<thead>
<tr>
<th>Internal UNF grants</th>
<th>External peer reviewed grants</th>
<th>External plus-up grants</th>
</tr>
</thead>
<tbody>
<tr>
<td>$115,600</td>
<td>$1,257,011</td>
<td>$5,003,640</td>
</tr>
</tbody>
</table>

**TOTAL SECURED FUNDING: $6,376,251**

B. **Research Publications, Awards, Grants, Patents and Conferences/Seminars.** (* indicates undergraduate student co-author/presenter)

**PEER-REVIEWED PUBLICATIONS**

Total of **54** peer reviewed publications 2005-2011

**Year 2011**


**Year 2010**


**Year 2009**


Year 2008


J. Garner, The Physics of the Natural Philosophers (Pearson, 358 pp. May 2008.)


**Year 2007**


Year 2006


Year 2005


AWARDS

Thomas Pekarek, UNF Distinguished Professor Award, 2011
Thomas Pekarek, Distinguished Professor Runner Up 2010, 2010
Thomas Pekarek, Terry Presidential Professorship, 2009
Lev Gasparov, Outstanding Faculty Scholarship Award, 2009
Thomas Pekarek, Outstanding Undergraduate Teaching Award, 2007
Thomas Pekarek, Outstanding Faculty Scholarship Award, 2005
GRANTS

Total of $6,376,251 ($1,257,011 from the peer reviewed grants) 2005-2011

Year 2011

$7,500  H. Chen received UNF Summer Research grant “Electronic Transport Properties of Tetraphenylcyclopentadienone and Its Derivatives.”
$3,000  L. Gasparov received UNF Faculty Fellow award “Faculty Learning Community: Grant Writing.”
$1,500  L. Gasparov and Chris Knab received UNF Student Mentored Academic Research Team (S.M.A.R.T.) grant.
$50,000 J. Huebner, Department of Defense, Methanol Sensors, , Sub-Contract on BAA W909MY-07-R-0016

Year 2010

$5,000  L. B. Albright was awarded a research grant from the Department of the Interior to conduct a paleomagnetic survey in southern Utah. (Extension of the 2009 award)
$7,500  H. Chen received UNF Summer Research grant “Investigation of Organic Semiconductor Nanodevices.”
$104,047 L. Gasparov received National Science Foundation MRI-R2 grant “Acquisition of the Optical Cryostat for Research and Teaching.”
$7,500  L. Gasparov received UNF Proposal Development award to establish infrastructure to support introductory optics teaching laboratory.
$2,920  (€2,300) L. Gasparov received Alexander von Humboldt Foundation travel grant for a 5 week visit to the Prof. G. Güntherodt Raman laboratory at the II Physikalisches Institut RWTH Aachen, Germany to perform Raman measurements on magnetite.
$20,000 J. Huebner, Department of Defense, Methanol Sensors grant, Sub-Contract on BAA W909MY-07-R-0016
$1,500  G. A. Wurtz received a Dean’s Council Undergraduate Research Assistantship that funded “Development of an experimental bench for studying ultrafast energy conversion pathways in nanoscale materials.”

Year 2009

$10,000  L. B. Albright was awarded a research grant from the Department of the Interior to conduct a paleomagnetic survey in southern Utah.
$4,000  H. Chen received a Dean’s Council Undergraduate Research Assistantship that funded research on “Magnetotransport measurement of semiconductor materials.” by providing support to a research student.
$2,000  H. Chen received a departmental summer research grant to support a research student for summer 2009.
$7,000  L. Gasparov received National Science Foundation Research Experience for the Undergraduates supplemental award to his ongoing NSF RUI award.
$5,000  L. Gasparov receive UNF Transformational Learning Opportunity award “Raman Spectroscopy at UNF and abroad.”

$1,500  L. Gasparov, Z. Shirshikova and T. Hayams received UNF Student Mentored Academic Research Team (S.M.A.R.T.) grant.


$5,450  N. G. Patel received funding for “Detection of ozone and nitrogen oxides in stratosphere using nanocrystalline sensors array on high altitude balloon flight (HASP2009) and rocket (RockSat IV 2009)” by Florida Space Grant Consortium.

$14,396  N.G. Patel (PI) was awarded research grant from NASA-Florida Space Grant Consortium for the research project on “Nanocrystalline gas sensors arrays for detecting gases in stratosphere and mesosphere”

$54,000  G. A. Wurtz received Research Corporation grant, “Near field optical scattering from defect-mode plasmonic crystals.”

$7,500  G. A. Wurtz received UNF Faculty Research Grant, “Non-linear optical properties of plasmonic crystals”.

$2,000  G. A. Wurtz received a departmental summer grant to support a research student for summer 2009.

$1,500  G. A. Wurtz received UNF Student Mentored Academic Research Team (S.M.A.R.T.) grant that funded research on “Manipulating Light at the Nanoscale: harvesting, converting and transferring solar energy”

**Year 2008**

$3,875  L.B. Albright received the Charleston Scientific and Cultural Education Fund award for “Magnetostratigraphy and Cenozoic Vertebrate Biostratigraphy of South Carolina.”

$158,734  L. Gasparov received National Science Foundation award “RUI: Optical Studies Of Magnetic, Charge and Orbital Ordering in Lone-Pair Compounds and Magnetite”.

$4,000  L. Gasparov received COAS Dean’s Leadership Council Award.

$1,500  L. Gasparov and A. Rush received UNF Student Mentored Academic Research Team (S.M.A.R.T.) grant.

$4,999  N. G. Patel received National Aeronautics and Space Administration, Dakota Space Society award funded through the University of North Dakota “HASP Student Payload: Ozone Sensor Technology Development and Atmospheric Experimentation.”

$20,000  T.M. Pekarek received for the Mark Workman Fellowship for the “Establishment of a High-Quality Single-Crystalline Growth Facility at UNF And Individual Mentoring of UNF Faculty and Students By the World-Class Crystal Grower Dr. Irek Miotkowski”, UNF (2008-2009).

$2,000  G. A. Wurtz received a departmental summer research grants to support a student for summer 2008.

**Year 2007**

$8,690  L.B. Albright received the National Geographic Society’s Committee award for Research and Exploration for “New Marine Reptiles from the Late Cretaceous Tropic Shale Formation, southern Utah, with implications for biodiversity of the Cretaceous Western Interior Seaway shortly following the Cenomanian-Turonian global marine extinction event (Oceanic Anoxic Event II).”
$888,180 J. Huebner (PI), D. Bowers, S. Chalk, M. Lufaso and N. G. Patel received a Dept. of Defense, Edgewood Chemical Biological Center award, “Rapid Response Sensing Networks for Multiple Applications”, Phase 3.

$2,000 H. Chen and T. Crawford received Department Student Research Award "Growth and Characterization of Organic Semiconductor Materials."

$7,500 J. Garner received University Summer Teaching Grant: “Proposal to Revamp PHY 1020C Introduction to Physics: New Textbook, Peer Instruction, and Web Resources” to continue the development of the introductory physics textbook for PHY 1020C and to create clicker questions for this course.

$2,100 J. Garner received a Department Research Grant to support a student Mr. Dinakar Meda for summer 2007 research.

$3,105 (€2,300) L. Gasparov received Alexander von Humboldt Foundation travel grant for a 5 week visit to the Prof. G. Güntherodt Raman laboratory at the II Physickalisches Institut RWTH Aachen, Germany to perform Raman measurements on magnetite.

$225,000 T.M. Pekarek received National Science Foundation award “RUI: Exploration of the New Class of Layered III-VI Diluted Magnetic Semiconductors.”

$2,000 G. Wurtz and J. Campbell, received Summer Research Award, “Non-linear optical properties of hybrid plasmonic nanostructures studied by Finite Element Modeling and Atomic Force Microscopy”.

Year 2006

$2,920 (€2,300) L. Gasparov received Alexander von Humboldt Foundation travel grant for a 6 week visit to the Prof. G. Güntherodt Raman laboratory at the II Physickalisches Institut RWTH Aachen, Germany to perform Raman measurements of the magnetic ordering in novel cobalt telluride bromides.

$269,780 T.M. Pekarek received National Science Foundation grant “MRI: Acquisition of a Physical Property Measurement System for Research and Education” (2006-2007).

Year 2005

$5,000 J. Garner received University of North Florida Summer 2005 Scholarship Grant “Theory of Electronic Specific Heat of III-VI DMS.”

$5,500 J. Garner and J. Gregory received Florida Space Research Institute grant “Project Launch Space Science Institute.”

$40,384 L. Gasparov received Research Corporation Cottrell College Science Award “Raman and Infrared Studies of the Layered Transition Metal Chalcogenides.”

$35,000 L. Gasparov received the Petroleum Research Fund of the American Chemical Society, “Infrared and Raman studies of 1T-TiTe2.”

$95,478 D.L. Gay received National Science Foundation Major Research Instrumentation/Research at Undergraduate Institutions grant, “Development of a position resolving high count rate detector system for low energy nuclear physics.” (2002-2005)

$858,060 J. Huebner (PI), L. Gasparov (Co-PI) received the Office of Naval Research grant “Advancing Chemical Sensor Science and Technology.”

$916,000 J. Huebner (PI), John Alexander (Co-PI) received the Department of Defense grant “Rapid Response Sensor Networking for Multiple Applications (phase2).”

$5,000  J. H. MacGibbon received University of North Florida Summer 2005 Summer Research Grant “Delta Electron Database for the Calculation of Astronaut Dose Rate and Cell damage from Space.”

$163,433  T.M. Pekarek received the National Science Foundation (NSF) “RUI: Exploration of the New Class of Layered III-VI Diluted Magnetic Semiconductors and Their Magnetic Properties”. Grant (2003-2007).


PATENTS:

Total of eight patents were issued during 2005-2011

Indian patent, No 196514, A biosensor for the detection of lactic acid, N. Patel, granted June 24, (2005)


CONFERENCES AND SEMINARS

Total of 70 conference presentations 2005-2011

Year 2011


Z. Shirshikova, L. Gasparov, V. Struzhkin, A. Gavriliuk, H. Berger, “Raman Study of the Verwey Transition in Magnetite (Fe3O4) at High Pressure and Low Temperature: Effect of Aluminum Doping.” March Meeting of the American Physical Society, Dallas, TX, March 2011.

Year 2010

J. Garner, Moderated a Conference Session on the Recruitment of Physics Majors at the Biannual Physics Chairs Conference at The American Center for Physics in Greenbelt, MD. The June 2010 conference was sponsored by The American Physical Society, American Institute of Physics and American Association of Physics Teachers.

J. Garner, Presentation to the Material Sciences and Nanotechnology Groups at the University of Technology of Troyes, France, “Physics Research and the Physics Department at the University of North Florida”, May 4, 2010.


Year 2009

H. Chen contributed toward a conference oral presentation “Oscillatory quantum interference effects in narrow-gap semiconductor heterostructures” presented by Dr. J. Heremans at the 14th International Conference on Narrow Gap Semiconductors and Systems, Sendai, Japan, July 2009.


MacGibbon J.H., Carr, B.J. and Page, D.N. “Can a Chromosphere be Formed in Black Hole Decays” Hengstberger Symposium on Extra Dimensions and Mini Black Holes, Heidelberg Germany July 24 - 25 2009


MacGibbon J.H., “Current Hypotheses and the Data Collection”, Teach-the-Teacher workshop on Climate Change and Sea Level Impact on Florida, UNF Environmental Center and PBS&J (October 26, 2009)


Year 2008


J. Saredy and N.G. Patel “ITO Thin Film Semiconductor as Gas Sensors”, poster at the 72nd Annual Meeting, Florida-Georgia Academy of Science at Jacksonville University during March 14-15, 2008.


T.M. Pekarek (w/ D. Meda, J. Brewer, J. Blackburn, J. Garner, I. Miotkowski, and A.K. Ramdas). “The singlet model calculations for the layered III-VI diluted magnetic semiconductor In$_{1-x}$Mn$_x$Se (x = 0.01 and 0.10),” MMM November 11-14, 2008.


Year 2007


D. Schmittle, J. Goertzen, G. Shelburne, **T.M. Pekarek**, J.E. Shield, P.M. Shand, D. Haskel, and D. Leslie-Pelecky “Ferromagnetism above the Gd Curie Temperature in Gd100-xFe, (x = 0 – 10) Nanostructures”, 10th Joint MMM/Intermag Conference, Jan. 7-11, 2007, Baltimore, Maryland.


**Year 2006**


**Year 2005**


C. **Overview of Faculty Service**

The following listing of faculty service is a sampling of the total number and range of such activities undertaken by department faculty.

a. In addition to serving on the department’s standing committees, faculty members have served on five departmental (tenure-line and instructor) search committees, two mid-tenure review committees, two promotion and tenure committees and on numerous COAS and university-wide search committees.

b. Faculty have served on a range of other COAS and university committees; they have participated in many university events and initiatives; and they have accepted various positions of responsibilities, including:

- University Academic Standards Committee (2010-2011)
- University Budget Advisory Committee (2007-2011)
- University Bookstore Advisory Committee (2010-2011)
- University Academic Programs Committee (2010-2011)
- University Strategic Planning Committee (2005-2006)
- University Selection Committee for the Outstanding Undergraduate Teaching Award (2007-2008)
- University Flagship Program Selection Committee (2006-2007)
- University Presidential Professorship Selection Committee (2006)
- University Honor’s Council (2010)
- Provost Special Task Force (2008-2009)
- Resource Allocation Goal Committee (2009)
- The COAS Curriculum Committee (2007-2011)
- Faculty Friends Program (2011)
- UNF Office of Research and Sponsored Program Review Committee (2008-2009)
- General Education Assessment Task Force (2007, 2009)
- University General Education Council (2005)
- Hercules Endowed Scholarship Committee (2005-2011)
- Faculty Inquiry/Faculty Insight committee (2010-2011)

c. Faculty members have served the profession in the following ways:

• As a Conference section chair for the APS March Meeting Conference, Magnetism and Magnetic Materials Conference, and Low Temperature Physics Conference.

• As outside reviewers for the National Science Foundation, Research Corporation for Science Advancement, Science Center Programs of the U.S. Department of State, American Chemical Society’s Petroleum Research Fund, Chilean Superior Council of the National Fund for Scientific & Technological Development National Research Funding Competition.

• As panel reviewers for major review panels such as IMR/MRI panels, NIRT panel, and CAREER panel

• As outside reviewers of user proposals for the Center for Nanoscale Materials at Argonne National Laboratory (15 proposals)

• Physics, Astronomy and Earth Science textbooks (6 textbooks).

• As external tenure reviewer (1 tenure and promotion dossier).

• As external PhD proposal reviewer for the French Ministry of Research


d. Faculty members have undertaken numerous service activities either in conjunction with students or with the aim of providing educational opportunities for them outside of the classroom; to these ends they have served in the following positions, initiated the following activities, or taken on the following responsibilities:

• Provided advising for the UNF chapter of the Society of Physics Students (SPS)
• Organized trips for the SPS members to the University of Florida, National High Magnetic Field Laboratory, Kennedy Space Center and Proton Therapy Institute at Shands Jacksonville.
• Organized the UNF Astronomy Club
• Organized Transformational Learning Opportunity activities at UNF, in Aachen, Germany and in Troyes, France


e. Faculty members have written a very large number of letters of reference:

• Students are appreciative of the time and energy that faculty devote to their quests for jobs, fellowships, admission to graduate school, and so on.

• The letters testify to our individual and collective commitment to advising, mentoring, and otherwise providing students ongoing guidance throughout their time in our program and then beyond their graduation.
V. CURRICULUM REVIEW

In Part A, we discuss the courses offered and developed by the Department of Physics in 2005 - 2011. In Part B, we present the curricula for the eight Concentrations (or Tracks) within the Major in Physics, including newly-added Concentrations, and the curriculum for the Minor in Physics. In Part C, we list further curriculum-related initiatives undertaken by the Department of Physics in 2005 – 2011.

A. Courses Offered by the Department of Physics

A complete list of all courses offered by the Department of Physics is given in Appendix A. In addition to the courses for the Major and Minor in Physics programs, the Department of Physics provides many lower level courses which satisfy the General Education requirements of non-science majors and required physics courses for the Bachelor of Science in Electrical, Mechanical and Civil Engineering and Bachelor of Science Major in Chemistry, Computer Science, Construction Management, and Biology degrees.

The Physics Department offers the General Education courses: Introduction to Physics, Introduction to Physics Lab, Basic Astronomy, Basic Astronomy Lab, Earth Science, Earth Science Lab, Algebra Physics I, Algebra Physics I Lab, Calculus Physics I and Calculus Physics I Lab.

About two thirds of the students enrolled in the Introduction to Physics course take it as remedial preparation for later physics courses and about one third select it as part of the General Education component of their UNF degree. In Fall 2009, the previously-combined lecture and lab course Introduction to Physics PHY1020C was split into the lecture course PHY1020 and the lab course PHY1020L. The Introduction to Physics courses are offered in the Fall and Spring terms, and enroll a total of approximately 495 students annually.

Total annual enrollment in the Basic Astronomy and Earth Science courses is currently about 1,800 students and expected to increase further in 2011 and beyond. In Fall 2010 the previously-combined Earth Science lecture and lab course ESC2000C was split into two separate courses ESC2000 (lecture) and ESC2000L (lab) accompanied by a 1 credit hour increase in the lecture component. The split allowed the maximum enrollment in the Earth Science lecture course, which had previously been capped by lab room capacity at 240 students per semester, to be raised to 400 students per semester. In Spring 2011, the Earth Science and Basic Astronomy courses had full enrollment. Because of the popularity of these courses, further expansion of capacity is being explored. Although the vast majority of Basic Astronomy and Earth Science students are non-science majors, the lecture courses AST2002 and ESC2000 have been added as required contextual courses for the new Astrophysics track for Physics majors. The ESC2000 course content is atmospheric physics, physical oceanography and geophysics for which we do not have dedicated upper level physics courses.

Venture Studies courses are General Education courses which are based on the reflective judgment philosophy of education. The 3 credit hour conceptual physics courses, World of Physics (which
emphasizes demonstrations) and Evolution of Modern Physics & Astrophysics were offered in 2010 – 2011 and had enrollments of 59 students and 17 students, respectively. These and similar courses will continue to be offered as staffing levels permit.

The new lower level Honors Physics course PHY2048H is designed to be a more challenging version of the Calculus Physics I course PHY2048. Enrollment is open to Honors and other students with a high GPA. The course was offered for the first time in Spring 2011 and was oversubscribed. It is planned to offer this course every year provided we have sufficient faculty.

In 2010, the lab fee for consumables charged to students enrolled in Department of Physics lab courses was changed to an equipment fee. These funds, the majority of which are generated by the lower level lab courses, are being used for ongoing upgrade of our teaching lab facilities.

At the upper level, the core courses (PHY3101 Modern Physics, PHY3101L Modern Physics Lab, PHZ3113 Mathematical Physics, PHY3220 Classical Mechanics, PHY3320 Electricity & Magnetism, PHY3424 Optics, PHY3722C Electronics for Scientists w/Lab, PHY4604 Quantum Mechanics, PHY4523 Thermodynamics & Statistical Mechanics, PHY4802L Advanced Physics Lab, PHY4905 Directed Independent Studies and PHY4910 Physics Research & Seminar) are taken by most Physics majors and minors, together with some Chemistry, Mathematics and Engineering majors.

In 2008, Astrophysics was offered as a new permanent Major Elective course and in 2009 was further split into two courses AST3712 Astrophysics I (Stellar Astrophysics) and AST3402 Astrophysics II (Galactic and Extragalactic Astrophysics). As well as being open to interested students of any discipline who have completed PHY2049 Physics II with a grade of B or higher, both courses are upper level requirements for the new Astrophysics track for Physics majors. Other Major Elective courses for the Major in Physics include Solid State Physics, Nuclear Physics and Advanced Topics in Physics.

It is anticipated that an upper level course Optics Lab will be offered in Fall 2012. Continuing upgrade to the upper level teaching labs has been aided by the lab student equipment fee funds.

Most upper-level physics students also undertake research with faculty. Consequently, the research course PHY4905 Directed Independent Studies is taken by most Physics majors.

**B. Curricula for the Major in Physics and the Minor in Physics**

**a. Major in Physics**

The curriculum of the UNF Bachelor of Science degree program in Physics provides its graduates with a strong background in the principles that serve as a basis for all disciplines of physics. As students progress through the curriculum, they gain a solid foundation in the major branches of classical and modern physics and first develop, then hone their proficiency in theoretical analysis and laboratory techniques, as well as the relevant essential mathematical skills.
Eight tracks (also known as Concentrations) are presently offered for the Major in Physics at UNF: Traditional Physics, Astrophysics, Materials Science, Pre-Medical Physics, (Electrical, Mechanical and Civil) Engineering Physics and Computing-emphasis Physics. The Program of Study for each track is attached in Appendix B.

Our most popular track is Traditional Physics, chosen by the majority of Physics majors. Additionally, a number of students attracted to other tracks end up graduating in the Traditional Physics track. Beginning in Fall 2011, students in the Traditional Physics track will be required to complete two (instead of one) Major Electives in physics and the number of Free Elective credit hours will be correspondingly reduced.

In Fall 2009, the Department of Physics initiated the Astrophysics track within the Major in Physics, motivated by strong student interest in astrophysics. The new Astrophysics concentration is grounded in the core course work of the Traditional Physics track and requires the two lower level contextual courses AST2002 Basic Astronomy and ESC2000 Earth Science and the two new upper level courses AST3712 Astrophysics I (Stellar Astrophysics) and AST3402 Astrophysics II (Galactic and Extragalactic Astrophysics), replacing the Electronics for Scientists requirement of the Traditional Physics track.

In Fall 2010, the Department of Physics introduced the Pre-Medical Physics concentration. The Pre-Medical Physics track is designed to prepare students for graduate study in Medical Physics and to excel on the Medical College Admissions Test (MCAT) needed for entry into Medical Colleges. In recent years a number of UNF Physics BS graduates have entered graduate programs in Medical Physics and Medical Colleges. Encouraging students in this choice are statistics which show that nationally Physics majors score among the highest of all majors on the MCAT exam. The interdisciplinary Pre-Medical Physics concentration builds on the foundation of the Major in Physics core physics coursework by incorporating additional coursework in chemistry and biology. It is anticipated that students who complete this concentration successfully will be competitive for entering graduate programs in Medical Physics or Medical Colleges.

The new Materials Science track will start in Fall 2011.

b. Minor in Physics

To obtain the Minor in Physics, the student must complete 20 credit hours in Physics courses including two upper level courses. The full Program of Study required for a Minor in Physics is attached in Appendix C. The students who minor in Physics at UNF are predominantly BS student majoring in Chemistry, Mathematics or Engineering. In 2010, there were 10 upper level Physics minor students (see Section III).

C. Initiatives 2005 - 2011

At the upper level, the new Physics Teaching Option, Physics Teaching Apprenticeship Program, Physics Department Internship Program, Physics Exchange Program, Physics Department Student Summer Research Grants and Honors in the Major have been introduced in 2005 – 2011.
a. Physics Teaching Option

The Physics Teaching Option is designed for Physics majors who plan to teach high school physics after graduation. The student majors in Physics (e.g., the Traditional Physics track) and completes a minor in Education from the UNF College of Education and Human Services. The Physics Teaching Option provides the student with the necessary credentials to teach at the secondary school level. Students choosing this option are encouraged to also apply to our Physics Teaching Apprenticeship Program in order to get on-the-job training in the classroom. Additionally, students choosing this option are encouraged to complete a physics teaching internship offered by the UNF College of Education and Human Services.

b. Physics Teaching Apprenticeship Program

The Physics Teaching Apprenticeship Program is a competitive $1000 per semester award to full-time UNF students majoring in Physics, with preference given to students who are Education minors or considering careers in high school physics teaching. As a Physics Teaching Apprentice, the student assists a local public or private high school physics teacher in class and/or lab for at least 8 hours per week for 14 weeks. Each application must be signed by the high school teacher, school principal, and the UNF Department of Physics chairperson. The applicant must have a GPA of at least 2.5 in the PHY 2048-2049 sequence. The Physics Teaching Apprenticeship Program is aimed at enriching physics teaching in the Jacksonville community as well as improving the teaching skills of UNF students by giving them real-world classroom experience. A UNF student has served as a Physics Teaching Apprentice in Fall 2010 and Spring 2011 at Paxon School for Advanced Studies.

c. Physics Department Internship Program

The Physics Department Internship Program, which commences in Fall 2011, provides UNF Physics students with an opportunity to gain hands-on experience in certain aspects of physics (scientific research, engineering research and development, laboratory work, scientific and/or engineering related problem-solving, scientific and/or engineering related computer programming, medical physics work, environmental physics work, astrophysics related work, other physics related work, etc.) for academic credit. To obtain academic credit, the student registers for the PHY4940 Physics Internship course each semester they are employed in the internship position. Internships must be paid positions which comply with federal US Department of Labor regulations. The student is responsible for securing the internship position but all positions must be approved by the Physics Department chairperson. Students are eligible to participate in the Internship Program if they are Physics majors in their Junior or Senior year with a minimum GPA of 3.0, although these requirements may be waived by the Department chairperson in certain circumstances. PHY4940 may be repeated for up to 12 credit hours and are considered Free Electives in the Major in Physics program of study. Each credit hour represents approximately 4 hours of internship activity per week throughout the semester. At the end of each semester, students are required to complete a written assignment that demonstrates that the internship was a reflective learning activity related to their Major in Physics and complete an internship evaluation form that assesses the quality of the internship experience. Intern supervisors are also asked to complete an intern evaluation form to aid in assessing student performance.
d. Physics Exchange Program

The Physics Department is partnering with the University of Technology of Troyes (UTT) in France to establish an exchange program for Physics majors. Under this program a UNF student typically will spend a summer doing research with UTT physicists, and reciprocal arrangements made for a UTT student to participate in research and coursework at UNF. The airline and living expenses are borne by the student but there are grant opportunities (coordinated by the UNF International Center) which may partially support the UNF student’s costs. The UNF student may also wish to earn PHY4940 Physics Internship credit hours by participating in the exchange program. The Physics Exchange Program was inaugurated in Spring 2011 and a UTT student (Mr Theo Jegorel) is conducting research with UNF faculty and attending courses at UNF for Spring – Fall 2011.

e. Physics Department Student Summer Research Grants

(See Section VII of this report). These grants help financially support Physics students in their research courses.

f. Honors in the Major

Honors in the Major, introduced in Spring 2011, is a new upper-level program designed to engage the student in intensive research within their major field of study. Requirements for admission to Honors in the Major in Physics are: completion of at least 60 credit hours of college credit including at least 12 graded upper-division credit hours at UNF; a GPA of at least 3.5 within the Major and a GPA of at least 3.2 in all upper-division courses. Students must also obtain approvals from the Department of Physics chairperson and the director of the UNF Collaborative Undergraduate Scholarship Program. Honors in the Major in Physics is awarded upon completion of an advanced Honors Thesis, and 3-6 credit hours of the PHY4969 Directed Independent Studies – Honors in Physics Research and 3-12 credit hours of the PHY4970 Directed Independent Studies – Honors in Physics Thesis courses. The Free Electives requirement for the Major in Physics is correspondingly reduced from 18 credit hours to 0-12 credit hours to accommodate the new courses and fulfill the UNF 60 credit hour degree requirement.
VI. STUDENT LEARNING OUTCOMES AND ASSESSMENT

In part A we list the student learning outcomes the department seeks to instill in physics majors. In part B we list a brief summary of assessment of learning by UNF physics majors.

A. Student Learning Outcomes (SLO) for the B.S. in Physics

Direct and indirect measures of student learning are employed to assess mastery of the intended student learning outcomes (SLO). We evaluate direct measures including student responses to questions on examinations and quizzes, homework assignments, written and oral laboratory reports, assigned papers, and written and oral reports on capstone research projects. Indirect measures may include employer or alumni surveys, student perception surveys, job placement, and graduate school placement rates.

UNF students who graduate with a Bachelor of Science degree in Physics should be able to perform the following student learning outcomes:

Content

1. Demonstrate good understanding and retention of basic principles of physics in the core areas of physics: classical mechanics, special relativity, electricity and magnetism, optics and waves, thermodynamics and statistical mechanics, quantum mechanics and atomic physics.
2. Apply a single principle of physics to solve simple quantitative problems.
3. Perform laboratory experiments based on fundamental principles of physics that employ instrumentation commonly used by physicists and adhere to departmental standards of laboratory safety.

Critical Thinking

4. Combine principles of physics with appropriate mathematics to solve complex quantitative problems.
5. Demonstrate the capability to infer correct conclusions and consequences from experimental data.
6. With guidance from a principle investigator, generate physically valid results that are consequences of research methods appropriate to a physics research project.

Communication

7. Write in a clear, well-organized, and mechanically correct style appropriate to physics.
8. Give an oral report to an audience of peers of work in physics that is organized well and presented clearly.
9. Demonstrate the ability to conduct a literature search and organize bibliographic sources to support conclusions from their research in a style appropriate to physics.
B. Assessment

The assessment of UNF physics major’s learning is undergoing change. First, a short description is provided below of how the UNF Physics Department assessed learning during the previous five years. Second, a description will be given of how assessment was handled during 2010-2011 and how it will be conducted in the future.

In past years the assessment of UNF Physics majors involved an analysis of the upper-level student’s problem-solving skills in addition to the faculty grading a sampling of the junior’s laboratory reports, and senior’s written and oral research reports. Questions were placed on final exams in upper-level lecture courses. The questions were graded by a team of physics faculty. Questions were categorized as relatively simple, to address SLO questions 1 and 2 or complex, to address SLO question 4. The SLO questions 3 and 5-9 were addressed by having a team of faculty grade laboratory reports from the Modern Physics Laboratory course or grade the written reports and oral presentations from the senior-level Physics Research and Seminar course.

The Physics faculty concluded that the above approach is inadequate for a variety of reasons. First, each semester and each year the courses that were assessed varied. This made the evaluation process rather uneven and cumbersome. Moreover, the number of students evaluated each year was relatively small since the number of upper-level students is small. The faculty came to the conclusion that our method of assessment is based on too little data and too sporadic data.

For the first time this past year our majors in the Physics Research and Seminar course took the Physics Major Field test offered by the Educational Testing Service (ETS). The ETS exam is a national exam that covers all areas of lower-level physics as well as all areas of upper-level physics. The physics ETS exam has been administered to ~2700 students at 127 or more institutions since 2004. The percentile rankings quoted in the two tables below are percentiles relative to all ~2700 students. The advantage is clear- our students can be compared to this ETS national database of physics majors.

The ETS exam addresses both content (SLO question 1) and simple (SLO question 2) as well as complex (SLO question 4) problem-solving skills. For the remaining SLO questions (3 and 5-9) we will continue to assess laboratory skills as we did in the past by examining lab reports in the Modern Physics Laboratory and the written and oral research reports in the Physics Research and Seminar course.

The new assessment approach outlined above has the advantage of comparing our students to others in the nation when that makes sense while maintaining our local comparisons that deal with our unique laboratory and research experiences.

To give more details gathered from the ETS major field exam, we now will provide the exam results from the Spring 2011 graduating senior’s class.
DEPARTMENTAL SUMMARY OF ASSESSMENT INDICATORS

Test: Physics  
Form Code: 4AMFC  
Institution: University of North Florida  
Cohort: Physics_2011  
Closed on: April 07, 2011

<table>
<thead>
<tr>
<th>Assessment Indicator Number</th>
<th>Assessment Indicator Title</th>
<th>Mean Percent Correct</th>
<th>*Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Classical Mechanics and Relativity</td>
<td>57</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>Electromagnetism</td>
<td>63</td>
<td>90</td>
</tr>
<tr>
<td>3</td>
<td>Optics/Waves and Thermodynamics</td>
<td>37</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Quantum Mechanics and Atomic Physics</td>
<td>58</td>
<td>80</td>
</tr>
<tr>
<td>5</td>
<td>Special Topics</td>
<td>47</td>
<td>45</td>
</tr>
</tbody>
</table>

Students responding to less than 50% of the questions: 0  
Students in frequency distribution: 5  
Students tested: 5  
*Percentile results are relative to all ~2700 students in the ETS national database of physics majors since 2004.

The data in the table above addresses SLO questions (1, 2 & 4) that pertain to physics content, solving simple physics problems and solving complex problems, respectively. The third column in the table gives the percentage scores in various subfields of physics of the five physics seniors who took the major field exam. The fourth column gives the percentile rank for the UNF students in each category.

Overall the students did very well in comparison to other physics majors in the nation. For Classical Mechanics and Relativity, Electromagnetism, and Quantum Mechanics and Atomic Physics, our students ranked in the top 20% in the nation. Even though our physics majors ranked about average in the special topics category, we previously recognized that this was a weakness in our required curriculum. Beginning 2011-2012, the traditional physics majors will be required to take an additional physics elective course beyond the one they were required to take previously.

To further strengthen our physics curriculum, we would like to address the current weakness in how we have distributed the upper-level credit hours. Many of the core physics major upper-level courses (i.e. Quantum Mechanics, Electricity & Magnetism, Classical Mechanics, Thermodynamics & Statistical Mechanics, and Advanced Physics Topics) are currently four credit hour lectures, but several of these core courses need to be split into the standard two-semester sequence of three credit hour courses. For
example, at most other universities, physics majors take Electricity & Magnetism I (3 credits) as well as Electricity & Magnetism II (3 credits).

These data suggests the one area that seems to need more attention is Optics/Waves and Thermodynamics where the average student score was ranked in the bottom 5%. It is not clear from these data whether this particular lower score indicates a need for the department to place greater stress on optics and thermodynamics in our Calculus Physics sequence (Phy 2048 & Phy 2049) or whether the problem is in our upper-level courses in Optics (Phy 3424) and Thermodynamics (Phy 4523). At any rate, the department’s new optics laboratory course that will accompany the current Optics (Phy 3424) lecture course should help to improve our students’ knowledge in optics and waves. By splitting the Electricity & Magnetism course from a single 4 credit course to two 3 credit courses, we would be able to cover the additional chapters on optics and waves at the end of the Electricity & Magnetism textbook that cannot be covered in a single course. We have also just increased our old 3 credit hour Thermodynamics and Statistical Mechanics course to 4 credit hours. Naturally, we would need to add only another faculty member to implement these and other changes.

Additional ETS major field exam results are presented below.

### DEPARTMENTAL ROSTER

**Test:** Physics  
**Form Code:** 4AMFC  
**Institution:** University of North Florida  
**Cohort:** Physics_2011  
**Closed on:** April 07, 2011

<table>
<thead>
<tr>
<th>*STUDENT</th>
<th>TOTAL SCORE</th>
<th>SUBSCORE 1</th>
<th>SUBSCORE 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Score</td>
<td>*Percentile</td>
<td>Score</td>
</tr>
<tr>
<td>1 (UNF)</td>
<td>174</td>
<td>90</td>
<td>68</td>
</tr>
<tr>
<td>2 (UWF)</td>
<td>174</td>
<td>90</td>
<td>70</td>
</tr>
<tr>
<td>3 (UNF)</td>
<td>172</td>
<td>85</td>
<td>70</td>
</tr>
<tr>
<td>4 (UNF)</td>
<td>144</td>
<td>35</td>
<td>39</td>
</tr>
<tr>
<td>5 (FSCJ)</td>
<td>124</td>
<td>1</td>
<td>26</td>
</tr>
<tr>
<td><strong>MEAN</strong></td>
<td><strong>158</strong></td>
<td><strong>80</strong></td>
<td><strong>55</strong></td>
</tr>
</tbody>
</table>

Subscore 1: **Introductory Physics** *Students taking Physics I & 2 at UNF indicated by (UNF).*  
Subscore 2: **Advanced Physics** *Those taking Physics I & 2 elsewhere listed by other Univ.*

**Number of students tested:** 5  
*Percentile results are relative to all ~2700 students in the ETS national database of physics majors since 2004.
In the above table the total score and subscores 1 and 2 are reported as scale scores and percentiles. The scale range for the total score is 120-200 while the subscore scale range is 20-100. The standard error of measurement, an index of the variation in all test scores due to the imperfect precision of the measurement process, should be considered when interpreting individual test results. See the "MFT Comparative Data Guide" on the web at [www.ets.org/hear/mft/compare.html](http://www.ets.org/hear/mft/compare.html) for an explanation and listing of the standard errors of measurement.

The Introductory Physics exam portion (Subscore 1 above) maps onto our SLO questions 1 and 2 while the Advanced Physics portion (Subscore 2) maps to SLO questions 1 and 4. For these five students, the average Introductory Physics subscore is ranked at 75% compared with the national value while the average Advanced Physics subscore is ranked at 85%. The average total score for our students is ranked at 80%. Not surprisingly, the two students with the lowest ETS exam scores also earned the lowest GPA in our UNF physics courses.

It is worth noting that the three students that took our PHY 2048 & 2049 sequence did very well with two students ranking in the top 85-90% overall, but the third ranked at 35%. The transfer student from the local community college (now FSCJ) ranked at the bottom 1% level. We should note here that this particular student performed reasonably well, but below other physics majors, in our upper-level physics coursework. In view of this fact, this student may not have taken this ETS exam seriously enough. Our transfer student from a sister university in Florida ranked at 90% overall. It should be kept in mind that we are currently dealing with only 5 students, so any broad conclusions are not likely to be statistically significant at this time.

These data will be more useful as we continue to use the field test in future years since we will then be able to compare senior students over a multiple year time period and this will give us information on curricula weaknesses and trends.
VII. RESOURCES AND SUPPORT SERVICES

In section A we list the department personnel resources. In section B we list the department’s general operating expenses. In section C we list the department’s facility resources and in section D we list the resources available to physics majors.

A. DEPARTMENT’S PERSONNEL RESOURCES

Faculty Lines

In 2010-11 the department had six active full time tenured or tenure track faculty members, eight full time staff including visitors, lab lecturers, and other teaching related employees, and three emeritus professors which includes one professor emeritus who is on phased-retirement and therefore taught half-time, one professor emeritus active in research, and one professor emeritus who was inactive.

During Spring 2010 the COAS Dean’s Office wrote a strategic plan that determined the number of faculty lines needed in the College for each department based on each department’s student credit hour generation. The conclusion for physics was the physics department needs an additional 4.2 tenure-track faculty lines which was based on the 2009-2010 data.

Due to three faculty resignations, two searches for tenure track assistant professor positions took place during 2010-2011, with one search resulting in hiring Dr. Arenas. Two more searches for tenure track assistant professor positions are planned for the 2011-2012 academic year. It must be borne in mind, the searches last year (2010-2011) and for this year (2011-2012) are to replace faculty who resigned—they are not growth positions and therefore, are not contributing toward our need for the 4.2 tenure-track faculty lines alluded to in the previous paragraph.

Faculty Salaries

During 2010-11 UNF faculty were given an average 3% salary raise which was the first raise since 2005. The Florida legislature, faced with a budget shortfall, opted to reduce this shortfall by cutting the state (employer) portion of retirement benefits by 3%. To assure that The Florida Retirement System is solvent, the legislature mandated a 3% retirement contribution from the employees and thus erased the previously provided 3% salary increase. The bottom line of this action is, UNF faculty have not seen a base salary raise since 2005. Assuming a 2.5% annual inflation rate, this amounts to roughly a 14% pay cut over six years.

The salary analysis presented here is based on data from the College & University Professional Association for Human Resources (CUPA-HR). The data was provided by the United Faculty of Florida Union (UFF) in the Spring semester of 2011.

The conclusion of the analysis is fairly bleak. The UNF College of Arts and Sciences (COAS) average faculty salary is the lowest in the university in comparison to the market data and the Physics faculty salary is the lowest in the COAS, Graphs VII.1 and VII.2.

The average salary of a full time faculty member in the UNF Department of Physics is 79% of the national average salary for physics faculty at similar universities. This corresponds to an average underpay in excess of $14,800/year. Individual values of underpay range from $10,500 up to $23,500.

Neither the administration nor union have articulated any plans for rectifying the underpayment for the “Hard Science” faculty in general and Physics faculty in particular.
GRAPH VII.1  FACULTY SALARIES IN THE COLLEGES AND LIBRARY AT UNF COMPARED TO MARKET RATES  
(Source: UFF)

CUPA Market Data by UNF College

Notations:  
- CCB = Coggin College of Business  
- CCEC = College of Computing, Engineering and Construction  
- CEHS = College of Education and Human Services  
- BCH = Brooks College of Health  
- COAS = College of Arts and Sciences

GRAPH VII.2  FACULTY SALARIES IN COAS COMPARED TO MARKET RATES  
(Source: UFF)

COAS Departments
Visiting Assistant Professors, Visiting Instructors, and Part-Time Faculty

The Physics Department employs a number of full-time visiting assistant professors and instructors as well as part-time faculty:

- Visiting Assistant Professors have been paid ~$44,000 depending on degree.
- Since Fall 2006, the part-time faculty have been paid $2,000-$2,700 per course depending on degree and years in service.

Physics Staff

The Physics staff consists of a laboratory manager (Dr. Phil Davis) and an office manager (Ms. Sandy Bernreuter). The lab manager’s primary duty is to assist the chair in handling the budget, scheduling, and maintenance of lectures and laboratories among other duties. Dr. Davis also teaches a course each Fall and Spring semester.

Start-up Funds

In recent years, the university has increased start-up costs for new faculty. Currently, a physics faculty member in experimental physics typically receives about $150,000, but this varies somewhat by the specific needs of the new faculty member’s research.

Tenure-Line Faculty Funding for Research-Related Travel

The Physics department receives a travel budget that provides $1,500 for travel expenses for the tenure-line faculty members. If a tenure-line faculty member does not spend the full amount, the unspent money can be used to defray the expenses of those who exceed the initial $1,500 limit. If the tenure-line faculty members do not incur expenses equal to the total department allocation, unspent money can be applied to reimburse instructors for travel expenses related to pursuing their scholarship.

University and College Resources for Faculty Enhancement

The COAS and the university provide a number of grants to support faculty endeavor in research and teaching. The Department’s faculty took advantage of the following university and college funding sources:

- Summer Research Award ($7,500)
- Proposal Development Award ($7,500)
- Course Development Award ($7,500)
- Dean’s Council Leadership Award ($4,000)
- Faculty Fellow Program ($3,000)
- Fellowship Award to invite a renowned scholar to conduct research at UNF (up to $20,000)

B. GENERAL OPERATING EXPENSES

Per Student Funding

According to the State University System of Florida 2010 report: “...per student funding only increased by a little over 15% since 1998 and actually declined by almost 10% in the most recent three years. The decline in per student funding would have been much greater without the substantial increase in tuition...”
revenues (25%) as well as $161 million in funding from the American Recovery and Restoration Act in FY 2009-10.” Graph VII.3 illustrates the trend.
Taking 2006-07 actual per FTE funding of $11,767 as a baseline and assuming an average annual 2.5% inflation rate we arrive at $12,991. The estimated 2010-11 per FTE funding of $11,174 is $1,817 (14%) short of the inflation adjusted funding of $12,991.

Prior to the 2009-10 academic year the Department of Physics and the Department of Chemistry were a part of a joint Department of Chemistry and Physics. For the years prior to 2009 the share of Physics expenses was estimated to be 45% of the total Chemistry and Physics budget. Since the 2009-10 academic year, the Physics department has had its own budget separate from the old Department of Chemistry and Physics.

The trend in the operational expenses is illustrated in Table VII.1 and Fig. VII.4

<table>
<thead>
<tr>
<th>Year</th>
<th>Department of Physics E&amp;G (Operating) Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-2005</td>
<td>$45,200*</td>
</tr>
<tr>
<td>2005-2006</td>
<td>$43,796*</td>
</tr>
<tr>
<td>2006-2007</td>
<td>$45,266*</td>
</tr>
<tr>
<td>2007-2008</td>
<td>$45,653*</td>
</tr>
<tr>
<td>2008-2009</td>
<td>$42,812*</td>
</tr>
<tr>
<td>2009-2010</td>
<td>$41,613</td>
</tr>
<tr>
<td>2010-2011</td>
<td>$39,764</td>
</tr>
</tbody>
</table>

* These are physics numbers, 45% of Department of Chemistry & Physics.
Taking the 2004-2005 budget of $45,200 as a baseline and assuming an average annual 2.5% inflation rate we arrive at a $52,418 inflation adjusted 2010-11 budget. The Department’s 2010-11 operational budget of $39,764 is $12,654 (25%) short of the inflation adjusted budget of $52,418.

**Equipment/Lab Fee Auxiliary Account**
The department recently changed its lab consumable fee to an equipment fee. Previous to the formation of the Physics Department in 2009, 90% of the total physics student’s lab fees (over $40,000/yr in 2008) were diverted to support the UNF chemistry program because the fee could only be used to purchase consumables. The new equipment fee now raises approximately $42,000 per year to support the teaching laboratories. This change has allowed the Physics Department to initiate a major effort of laboratory development that has been lacking since the beginning of UNF.

**Lab Manual Royalty Auxiliary Account**
Students in the lower-level physics laboratory courses that use a laboratory manual written by UNF physics department faculty are charged a $5 laboratory manual royalty fee. The royalty funds, totaling approximately $4,000/yr, are used to fund the Department’s Research Colloquium Series.

**Excellence Foundation Account**
The department has an excellence account which collects donations primarily from faculty and outside donors. These funds support various activities such as meals for students to speak with new faculty applicants and colloquium speakers.
C. FACILITY RESOURCES

Office Space and Equipment:
The Department of Physics occupies a fraction of the first and second floor of the east wing of building 50.

- Each full-time faculty member has an office (approximately 120 sq ft).
- Each full-time faculty line has a dedicated computer, which is upgraded or replaced according to the university’s “currency” program, office furniture, and a telephone.
- In 2009-2010, the former Chemistry and Physics main office became the Department of Physics main office (50/2600). The office includes the Chair’s office, a reception area, a conference room, and a copier and mail room. The latter two rooms and the copier are currently still shared with the Chemistry Department.

Laboratory Space and Equipment
- In addition to regular classrooms, the department employs seven teaching laboratory rooms that host the Introductory Physics, Astronomy, Earth Science, Physics I, Physics II, Modern Physics/Electronics for Scientists, and Advanced Physics Laboratories.
- Each faculty member who is active in experimental physics research has a dedicated lab. The labs range in size from 400 to 900sf. A total of six research labs are currently occupied by experimentalists. The laboratory space for future hires is a significant concern.
- The research laboratory equipment includes a number of major setups such as a SQUID magnetometer, PPMS, Scanning Electron Microscope, Atomic Force Microscope (AFM), and Raman Spectrometer which were all purchased by external research grants or gifts (in the case of the AFM). The total cost of these major equipment setups exceeds one million dollars.
- Miscellaneous imaging, spectroscopic, vacuum, thin film/crystal growth equipment are also available.
- Theoretical physicists are given an additional office to support their research program. The additional office space for future hires is a significant concern.

Research Support facilities.
- Physics faculty are attempting to gain access to a machine shop.
- A helium liquefier is currently not available but is desperately needed.
- UNF is now at the point where an external liquid nitrogen tank should be available on campus.

D. SUPPORT FOR STUDENTS

A number of competitive scholarships are available to the physics majors. These scholarships include the Hercules Scholarship (three per semester), the Summer Student Research Grant (two per summer), the Teaching Apprenticeship (one per semester), and three Student Awards. Additional funds are available through the University Student Mentored Academic Research Team (S.M.A.R.T.) grants and Transformational Learning Opportunity (TLO) program.
**Hercules Endowed Scholarship**

The Physics Department offers several full and partial tuition scholarships endowed by the Hercules Foundation. A typical scholarship is about $500 per student per semester. Scholarships are available for declared academic majors in physics who plan to pursue industrial, governmental, and academic employment or graduate school in the discipline following graduation. Candidate students should meet the following minimum qualifications:
1. Declared major in Physics.
2. Sophomore, Junior, or Senior class standing during the 2011-2012 academic year.
3. Full time student status taking a minimum of 12 hours at UNF during the Fall 2011 term.
4. Minimum overall GPA of 3.00 and minimum GPA of 3.00 in major with a minimum of 1 semester completed at UNF.
5. Reside in Florida for tuition purposes.

Summer Student Research Grants
Funds to support two summer research students are provided to the department by the COAS.

Each award consists of a grant of $1,800 per student plus $200 for supplies and an opportunity to conduct research with a faculty member.

Interested students and faculty submit a joint research proposal consisting of the following:

Faculty: a project proposal outlining the purpose, scope, and approaches of the research along with the responsibilities of the student.

Student: a personal document outlining career goals and how the proposed research will help in their achievement. A copy of the latest grade transcript should also be attached. Applicants must still be a student during the summer term.

Note: the student receiving this award presents a research poster at the natural sciences seminar during the fall term or at the UNF Research Symposium during the spring term.

Student Awards
Each spring semester the department makes the following awards: Outstanding Physics Graduate, Outstanding Physics Research and Outstanding Calculus-Based Physics. The student receives a plaque and his or her name is placed on a large plaque in the lobby of the Science and Engineering building near to the lecture halls where introductory physics courses meet.

University Student Mentored Academic Research Team (S.M.A.R.T.) grant
SMART Grants are competitive grants awarded to undergraduate students and their faculty mentors who are engaged in collaborative scholarly endeavors. The grant provides a $1000 stipend for the faculty member to supervise the project and $500 for a student to offset proposal’s operational expenses such as materials and supplies or travel.

Transformational Learning Opportunity (TLO) program
The program provides funding for a transformational learning opportunity. According to the TLO web page: “A transformational learning opportunity, whether inside or outside the classroom, has the potential to enrich student learning and personal development. Such transformational experiences are an integral component of UNF’s strategic plan and institutional mission. These unique and engaging educational opportunities broaden and deepen students’ intellectual and world views. These opportunities may occur within a course, extend beyond the framework of a specific course, or be co-curricular in nature application samples. The common denominator among “TLOs,” whether they occur inside or outside the classroom, is the potential for significantly impacting the student’s professional and personal development.” The funding varies from TLO to TLO; however a typical funding of $1000 per students per TLO is customary.
VIII. ACHIEVEMENTS, STRENGTHS, WEAKNESSES, OPPORTUNITIES, AND THREATS

Achievements

Since 2009, three new physics tracks have been initiated: Astrophysics, Pre-Medical Physics and Physics-Materials Science (to start Fall 2011). The Physics Internship, the Physics Teaching Apprenticeship, the “Honors-In-The-Physics Major”, the Physics Advisory Group, and the UNF-Troyes Physics International Exchange Program with France, were started during the past two years.

Since 2005 faculty in the department published 54 papers in peer-reviewed journals and have authored or co-authored at least 70 presentations at local, national and international conferences. Undergraduates have been mentored by departmental faculty and have co-authored published papers and conference presentations.

Since 2005, our physics faculty were principal investigators for grants and awards (from the Department of Defense, National Science Foundation, Research Corporation, etc.) totaling $6,376,251.

In 2011 one of the physics faculty won the Distinguished Professor Award and is a Presidential Professor while another professor was awarded a 2010 Outstanding Faculty Research Award. The faculty is active in professional, community, university, college and department service.

In Fall 2010 the department commenced collecting a new equipment fee that was converted from a consumable fee. This fee makes possible significant upgrades to the teaching laboratories and the creation of a new optics lab. The department initiated a funded colloquium series.

New department brochures, posters and signs were created or updated this past year.

Strengths

Since 2005, our physics faculty were principal investigators for grants and awards (from the Department of Defense, National Science Foundation, Research Corporation, etc.) totaling $6,376,251. This has funded Major Research Instrumentation including a SQUID magnetometer, PPMS, Raman Spectrometer, Scanning Electron Microscope, and an Atomic Force Microscope (AFM). These are state-of-the-art instruments. It is uncommon and impressive for an undergraduate department to have this wide array of research equipment. It is remarkable that the physics faculty have been able to amass such an array of research equipment given the previously low start-up funds.

Over the past few years, the UNF administration has markedly improved funds for start-up for new faculty in physics and the other sciences. This allows new faculty a better chance of initiating a competitive research program and will help us to retain current strong faculty in the department.

The tenure-track faculty are highly successful in research while imparting to undergraduate majors a curriculum that provides a strong foundation in the core areas of the discipline. Undergraduates in the
The lectures program have been mentored in research and have contributed to publications and to presentations at national conferences. Grants have offered opportunities for most of our majors to receive financial support for summer research.

The configuration of our offices, teaching and research laboratories, and student study areas creates an environment that promotes interactions between students and faculty and a sense of community for our students.

The program provides a rigorous and comprehensive curriculum to its majors. Graduates from our program who have continued their education at major research institutions have performed well. Informal feedback from graduates who have sought immediate employment indicates that their background has prepared them well for their jobs.

The UNF Society of Physics Students continues to be an especially active organization, making significant contributions by holding meetings and events, and tutoring lower-level physics students in varying programs of study from across the campus.

**Weaknesses**

The most glaring weaknesses of the physics department are the small number of tenure-track faculty, the lack of sufficient faculty laboratory research space, the lack of standard facilities such as a Helium liquefier, and the lack of recitation sections in the lower-level physics courses.

The department will have only six tenure-track faculty in fall 2011. Two searches for new tenure-track assistant professors will occur in the 2011-2012 academic year. This number is less than sufficient to meet the overall instructional and research goals of the department as evidenced by the continued collection of lecture courses (i.e. Introduction to Physics, Astronomy, Earth Science, Venture Study, etc. lectures) taught by visiting faculty, laboratory instructors, and adjuncts/part-time faculty.

As a consequence of an insufficient number of physics faculty, the curriculum for our physics majors are negatively impacted. First, only one or two elective classes can be taught for physics majors annually. Second, many of the core physics major upper-level courses (i.e., Quantum Mechanics, Electricity & Magnetism, Classical Mechanics, Thermodynamics & Statistical Mechanics, and Advanced Physics Topics) are currently four credit hour lectures, but several of these core courses need to be split into the standard two-semester sequence of three credit hour courses. For example, at most other universities, physics majors take Electricity & Magnetism I (3 credits), Electricity & Magnetism II (3 credits).

The lack of a graduate program impinges on our ability to recruit and retain good students and physics faculty at UNF.

A significant number of our majors have transferred to UNF from community colleges. In the past, we have had indirect evidence that many of the students who completed the Mathematics and Physics sequences at a community college are not as well prepared for upper-level courses in Physics as our other students. However, as long as state law requires UNF to accept transfer credits for Physics I and Physics II, it is not clear that it will be possible to effectively address this weakness.
Given the accomplishments of the physics faculty, their dramatically low salaries relative to the rest of the university and the CUPA market data indicates how UNF views the physics faculty. However, it is not clear that the administration has any mechanism to address this.

**Opportunities**

With the new and separate Department of Physics that commenced Fall 2009 it has become possible to devote much more attention to expanding and improving the Physics program. One action we can now pursue is to understand why we lose so many of the physics majors listed entering as Freshmen and Juniors and attempt to improve the retention of these declared physics majors. Even modest gains of adding even three physics majors per year will dramatically increase the number of physics graduates.

Due to recent resignations, the department has embarked on searches for three new faculty members which, when completed, will reinvigorate an already active and successful faculty. The first new hire will start in Fall 2011.

UNF currently has the Department of Physics listed as a priority for starting a new Master of Science program. The department will be in a better position to pursue this once the current searches have been filled.

**Threats**

Compared to market Data, the low salaries for the Physics faculty is currently affecting department morale. This is aggravated further since the Physics faculty’s salaries are the lowest in the university compared to every other college at UNF and the other COAS departments. This may become a significant factor in retaining and recruiting physics faculty. It is not uncommon to hear conversations about physics faculty looking for jobs at other universities. It should be noted that a very talented Assistant Professor left our department just last year along with 2 laboratory lecturers.

Increasing costs of liquid helium presents a major threat to the experimentalists in the department. Liquid helium is required for measurements on the SQUID magnetometer, PPMS, and Raman (totaling ~$million dollars worth of major research instrumentation). The cost of liquid helium has roughly quadrupled in the past decade pushing an already significant expense into a prohibitively expensive range of just under ~$200,000/year for all of these instruments combined. This will make our chances for successfully obtaining future external grants very difficult, particularly in the current economic environment.

Acquisition of a helium liquefier could address this concern, however this would be a significant infrastructure investment of ~$400,000 that may not be supported by major funding agencies such as NSF. Past attempts to fund a helium liquefier for the SQUID magnetometer and the PPMS through NSF was rejected since NSF considers this to be an “infrastructure” expense that should be paid by UNF.

If funded, the helium liquefier would pay for itself in liquid helium costs in less than two years. The data generated by the continuous measurements would allow UNF to collaborate with other institutions at a dramatically increased rate. This would raise the stature of UNF in the national and international research communities. Our ability to secure future external grants would be greatly enhanced and
should generate enough overhead costs allowing UNF to recover the initial ~$400,000 investment in the helium liquefier in around 2 grant cycles.

As for most physics departments, a continuing challenge for UNF is recruiting and retaining excellent physics majors and physics faculty.

A declining university budget presents another threat to our plans for improving the program. If the trends of the last few years continue, execution of our plans for recruiting new faculty, expanding research, and adding breadth and depth to our regular course and program offerings is likely to be set back.

Lack of adequate preparation in Mathematics and Science for many of the students entering UNF directly from high school creates difficulties in attracting solid students to our bachelor of science program and poorly prepared students impedes our ability to attract and retain good physics faculty. We also find many students who transfer as juniors into our programs from community and state colleges are not as well prepared for the academic rigor of our upper-level courses as students who have successfully completed their prerequisite courses in Science and Mathematics at UNF.
IX. CONTINUOUS IMPROVEMENT PLAN AND STRATEGIC PLANNING

The physics external reviewer, Dr. Steven Whisnant, made the following suggestions. The page number of his report is given in parentheses and in italics. The UNF Physics Department responses are in bold and are to become part of our Department Strategic Plan.

1. **Helium liquefier (pp.12-13)**

   The Physics Department’s #1 critical need is to purchase a helium liquefier. Liquid helium is used in several physics research laboratories to run 4 state-of-the-art major research instruments totaling ~$1.3 million dollars in the research laboratories of Dr. Pekarek, Dr. Gasparov, and Dr. Arenas. The helium liquefier also impacts the research of Dr. Garner, several future physics hires, Dr. Lufaso (chemistry), and (potentially) Dr. Mullen (chemistry). The helium liquefier is needed to maintain and expand the level of research and grant productivity within physics as well as a few additional chemistry research groups. The lack of a helium liquefier could realistically reduce or end future external funding for one or multiple research groups. The Physics Department would like to meet with the COAS Dean’s office, AA, and ORSP to determine how we may proceed to meet this critical Physics Department need.

2. **Insufficient number of tenure-track faculty, heavy teaching load (pp. 11,14-17)**

   The department will seek growth positions that are desperately needed. The large lectures typically have 100-200 students per section. This limits the individual help the physics faculty can give to our students. This probably has a negative impact on the students’ mastery of the material and a corresponding lowering of grades in physics courses that has received significant attention recently. This can be partially addressed by reducing the enrollment in the 100-200 student lecture courses as well as adding a recitation component to this course as is typically found at universities around the USA. However, to achieve these goals, additional tenure track faculty will be needed.

   In addition, we will change the current 4 credit hour required course in Quantum Mechanics to 3 credits. We will change the current 4 credit hour elective Advanced Topics in Physics class to 3 credits, rename it to Advanced Quantum Mechanics, and make this a required course. The net effect is to change these courses to the standard 3 credit course and shift 2 credits from the elective to the required category. It will also reduce the number of faculty carrying an overload in their teaching assignment due to 4 credit courses. The Classical Mechanics, Thermodynamics, and Electricity and Magnetism
courses will also need to be reduced to the standard 3 credit load once we have sufficient faculty.

3. *Access to machine shop* (pp. 4,12)

   The department will use the physics lab equipment fee to outfit a Physics machine shop. The location of the shop will be determined once Biology vacates Building 4. In the short term, we could seek to gain access to the Machine Shop in the Science and Engineering Building if this is a workable option.

4. *Improve recruiting of majors with help from admissions* (pp. 4, 18, 21)

   The Physics Department requests that UNF Admissions provide the Physics Chair (or her/his designee) the names and contact information of all prospective physics majors as these students are identified. The chair will send recruitment packets to these individuals and invite these students for tours.

5. *Improve retention of majors with help from advising, first semester course* (pp. 4, 19-21)

   The department will request ACE, Honors, and COAS Advising to require all physics majors to meet with the Physics Chair (or his/her designee) to get final approval of their course registration each semester.

   The Department has already submitted the APC form to create a new 1 credit course to be offered each fall for all newly declared physics majors to commence Fall 2012. This course will prepare new physics majors to be successful at UNF and help with retention of physics majors.

6. *Low physics salary relative to CUPA data* (pp. 11, 17)

   The department will continue monitoring the CUPA data and continue to point out to the administration that physics salaries stand in last place in the university relative to the CUPA data.
7. **Administrative rights to faculty PC’s (pp. 17-18, 21)**

   For effective day-to-day teaching and research activities in any physics department, the faculty need administrative rights to computers in their office, research laboratories, teaching laboratories, etc. This should be the default for all current or new physics faculty. Additionally, research students in many research groups also need administrative rights for the computers they are working on.

8. **Space is very tight (pp. 12, 17)**

   Physics will get additional space in Building 4 in early spring 2012 when the Biology Department moves to its new building.

9. **Hire more non-Solid State faculty (p. 10)**

   As part of the department hiring plan, when Dr. Gay ends phased retirement we will hire a non-solid state physicist as his replacement. In addition, we will consider hiring additional broadening areas physicists when we are given growth positions.

10. **Add additional questions to the Educational Testing Service Major Field Test (ETS MFT) (pp. 7,13)**

    We concur with this suggestion but with a minor modification. In the future, a separate exam will become part of the Physics Research and Seminar course taught each spring to many of the graduating physics seniors. We believe this to be a better way of adding our own questions to our assessment than adding our own questions to the ETS MFT. We will continue to use the ETS MFT since this allows us to compare to a national data base of physics majors.

11. **Create a 3-2 physics/engineering program (pp. 6,13-14, 21)**

    The department agrees with this suggestion. When we tried to create such a program several years ago, the UNF Engineering College opposed the idea. We believe this notion deserves a second look given the benefits of such a program to physics with negligible effects on UNF Engineering as Dr. Whisnant argued.

12. **Create an Astronomy minor (pp. 6,14)**
This suggestion deserves further study. At present, physics does not have a sufficient number of faculty to implement this suggestion.

13. Move Electricity and Magnetism to Junior Year and Optics to Senior Year (p.6)

The department will study this idea further. Given the constraints of the number of faculty and the background of physic majors transferring into UNF as juniors, we do not see the benefit of implementing this suggestion for our students at this time.

In part A, we present a tentative 5-year hiring plan for the Department. In part B, we present the undergraduate program. In part C, we present a potential graduate program.

A. HIRING PLAN

Following the three faculty resignations that occurred during 2010-2011 the faculty met and developed a five year hiring plan as shown below. Overall, this plan moves us toward the creation of two areas of focus and faculty expertise in the department: Solid State-Optical Physics and Nuclear-Astrophysics. The assumption is made that over this period the tenure-track faculty will grow by two positions, well short of the 4.2 positions needed according to the COAS Dean’s Spring 2010 study. As physicists, we are trying to be realistic.

2010-2014 Department of Physics Five Year Asst. Prof. Hiring Plan

| Fall 2010 | 
| STARTED Search: | Ms. Siddiqui Replacement | [Chair of Search: Jane MacGibbon] |
| Area of Specialization: | Experimental Solid State-Optical Physics |
| RESULT: | Hired Dr. Daniel Arenas |

| Fall 2010 | 
| STARTED Search: | Dr. Wurtz Replacement | [Chair of Search: Jane MacGibbon] |
Area of Specialization: Experimental Solid State-Optical Physics

RESULT:
Failed Search

x Fall 2011
Begin Search: Dr. Wurtz Replacement
Area of Specialization: Experimental Solid State Physics
[Chair of Search: Lev Gasparov]

y Fall 2011
Begin Search: Dr. Cruz Replacement
Area of Specialization: Theoretical Solid State Physics
[Chair of Search: Lev Gasparov]

z Fall 2012
Begin Search: new position-growth line
Area of Specialization: Experimental Solid State-Optical Physics

v Fall 2013
Begin Search: new position-growth line
Area of Specialization: Experimental Solid State-Optical Physics

w Fall 2014
Begin Search: Dr. Gay Replacement
Area of Specialization: Experimental Nuclear Astrophysics

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2011 Makeup of Tenure-Track Faculty

<table>
<thead>
<tr>
<th>Solid State-Optics (5)</th>
<th>Nuclear-Astrophysics (1)</th>
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<tbody>
<tr>
<td>(4) Experiment:</td>
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<tr>
<td>Pekarek, Gasparov,</td>
<td></td>
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<tr>
<td>Chen, and Arenas</td>
<td></td>
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<tr>
<td>(1) Theory:</td>
<td></td>
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<tr>
<td>Garner</td>
<td>(1) Theory: MacGibbon</td>
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</tbody>
</table>

Experimental 4/6 = 66% Theory 2/6 = 33%

Final Makeup of Tenure-Track Faculty under this Plan

<table>
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<tr>
<th>Solid State-Optics (9)</th>
<th>Nuclear-Astrophysics (2)</th>
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<tr>
<td>Pekarek, Gasparov,</td>
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<td>Chen, and Arenas, x,</td>
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<td>(2) Theory:</td>
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<td>Garner, y</td>
<td>(1) Experiment: w</td>
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<td></td>
<td>(1) Theory: MacGibbon</td>
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</table>

Experimental 8/11 = 73% Theory 3/11 = 27%

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B. UNDERGRADUATE PROGRAM

Our graduation rates of BS physics degrees are strong compared with the national average. Our credit hour generation continues to grow. Over the next few years we will have hired three tenure-track Assistant Professors that will add new directions of research and additional help in strengthening the Physics Department. In addition to these and other successes, we have a number of areas we are focusing on improving.

For our teaching laboratory courses, we will continue the upgrade of all of our teaching labs now that the laboratory equipment fee is in place. We are working on obtaining new space in the old Biology building that will allow us to move the Earth Science and Astronomy laboratories into that building and free up space for the new optics lab and create additional space for faculty research. This new upper-level optics laboratory will accompany our Optics lecture course.

During Spring 2011 a UNF administrative study found the Physics I lecture to be the most demanding of all lower level courses at UNF. We are currently discussing creating a recitation period within our three
hour Physics I laboratory course. This could help us improve the student retention rate in our Physics I classes.

The new Physics Teaching Apprenticeship Program can help recruit physics majors straight out of the local high schools. Our exchange and internship programs will help in the recruitment and retention of physics majors particularly in the current economic situation.

The Physics Department hopes to improve retention of the declared physics majors now that the department has been split from chemistry and we can focus more on our own majors.

The Physics Department needs growth lines in addition to replacement lines for faculty who have left.

It is hoped that even in these difficult economic times the university will recognize the low salaries of our productive physics faculty and will be willing and able to do something about this problem. This should help toward retaining and recruiting good physics faculty.

C. POTENTIAL NEW GRADUATE PROGRAM

Before the three faculty resignations alluded to throughout this report, the physics faculty studied the possibility of creating a Master’s program in physics. The development of such a program has been slowed somewhat by the departure of the three faculty and the need to replace them, but it is still important for the department to keep this aim in focus. Several ideas emerged over the past three years: one possibility that was explored was a research-intensive MS in Materials Physics that would also involve engineering and chemistry, while another idea involved the development of a Professional Science Master (PSM) degree. A third idea has been abandoned, i.e. a Medical Physics degree in collaboration with Mayo Clinic-Jacksonville. The Medical Physics idea was dropped due to an insufficient number of medical physicists at both Mayo and UNF. Below is a summary of our PSM plans.

PROFESSIONAL SCIENCE MASTERS in APPLIED PHYSICS (From the COAS 2010-2020 Strategic Plan)

NEED
Professional Science Master’s (PSM’s) programs are a relatively new movement within the Nation. PSM’s constitute a revolutionary change in focus for master’s programs in the sciences.

REGIONAL FIT
The State of Florida is giving serious consideration to dramatically increasing the funding in the SUS especially in STEM areas such as Physics. In the New Florida Initiative the State is seeking to transition to a knowledge-based economy rather than rely so heavily on population growth, tourism and agriculture as has been done in the past. One of the primary focuses in the Initiative will be to enhance graduate education in the sciences. It is an opportune time for UNF to establish PSM programs in all of the sciences to fully utilize these new funds to meet statewide needs. Currently, among the UNF sciences only Biology has a MS program. At this time there are no opportunities in Jacksonville for a student to obtain a graduate degree in Physics.

The PSM physics graduates will be able to contribute toward enhancing and creating new high-tech local industries. A complete list of such current companies may be found by examining the First Coast Manufacturer’s Association (FCMA) website, www.fcmaweb.com , where over 300 local industrial and high-tech companies are listed. In Table IX.1 we give a few examples of local companies from the FCMA
list among other companies who have a Florida presence. These firms could potentially benefit from the problem-solving, computer, experimental and mathematical skill set of mastersprepared applied physicists. As part of our preparation for the PSM the physics department will create a survey of local and regional companies in Florida and neighboring states to ascertain how a Physics PSM might benefit these companies. In addition, the Physics Department created a Physics Advisory Group (PAG) of technology professionals. The PAG will help in the formation and continuing development of the PSM making certain the PSM is and remains relevant to local needs. The Physics Department will only proceed with the development of the PSM if there is sufficient interest expressed in our survey of the business community. By its very nature a PSM will only be successful if the region is supportive by creating student internships.

The above addresses the possible benefit of a Physics PSM to current industries. Physicists could also aid in establishing new industries. Physicists contributed toward the creation of high-tech companies in such areas of the US as Silicon Valley in California, in the high-tech corridors near Orlando, near Boston, in the research triangle of North Carolina, and in Texas. To cite just one important example, one of the founders of Intel was a physicist. Closer to home, the founder of the prominent local company, Unison, is a physicist as well as some of the executives of the first-rate steel company, Gerdau Ameristeel, located near Interstate 10 and SR 301 (private communication with Mr. Lad Daniels, President of FCMA).
TABLE IX.1 EXAMPLES OF LOCAL AND FLORIDA COMPANIES

<table>
<thead>
<tr>
<th>Industrial</th>
<th>Environmental/Energy</th>
<th>Defense/Government</th>
<th>Medical Devices</th>
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<tbody>
<tr>
<td>Annheuser-Busch</td>
<td>Florida Power and Light</td>
<td>BAE Systems</td>
<td>Biomet</td>
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<tr>
<td>Automation Engineering</td>
<td>Industrial Power Systems</td>
<td>Northrup-Grumman</td>
<td>Medtronic</td>
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<tr>
<td>CSX</td>
<td>JEA</td>
<td>US Navy and Air Force</td>
<td>Vistakon+</td>
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<tr>
<td>Engineered Lining Systems</td>
<td>Army Corp of Engineers</td>
<td>NASA-Applied Physics Lab</td>
<td>Shands-Jax</td>
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<td>Georgia Pacific</td>
<td>Owens Corning</td>
<td>Boeing</td>
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<td>Goodrich</td>
<td>Pure Water Technologies</td>
<td>Siemens</td>
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<td>Harris Lighting</td>
<td>Safe Light Optical</td>
<td>Cecil Field</td>
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<td>JaxPort</td>
<td>ThermoServe</td>
<td>Naval Air Station-Jax</td>
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<td>Maxwell House-Kraft</td>
<td>Water Recovery</td>
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<td>Advanced Environmental Lab</td>
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<td>Oak Institute</td>
<td>Aerostar Environmental Services</td>
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<td>Pilot Pen</td>
<td>Energy Pure Solutions</td>
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<td>Precision Standards</td>
<td>Environmental Conservation Labs</td>
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<td>Ring Power</td>
<td>Environmental Resource Management</td>
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<td>Saft Battery</td>
<td>Shaw Environmental</td>
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<td>Swisher</td>
<td>Water and Air Research</td>
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<td>Tesla Electric Armature</td>
<td>Weather Engineers</td>
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<td>Alternate Energy Technologies</td>
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STRENGTHS

The strength of the PSM in Physics will be in the area of applied physics internships. The UNF physics faculty have created a strong foundation at UNF. They are energetic investigators and have been successful in obtaining external and internal grants. Over the past decade, the physics faculty won more than seven million dollars in external grant support. These funds have enabled the department to acquire excellent top-grade equipment valued in the millions of dollars. Major instruments include a SQUID magnetometer, PPMS, Raman Spectrometer, two Atomic Force Microscopes, Scanning Electron Microscope and a pulsed high-frequency laser. The faculty engaged undergraduate physics majors in this work. Given a demonstrated demand for a PSM program, the faculty will support helping students find suitable internships with companies. A graduate PSM program should spur much more interaction between the physics department and companies through the success in establishing physics internships. The primary benefits of a Physics PSM to the Physics Department at UNF will be the improvement of the undergraduate physics program by increasing the number of physics majors and, in some cases, creating a shift in faculty research toward more practical industrial problems. The PSM is the future for thriving graduate physics programs at comprehensive universities.

PROJECTED ENROLLMENTS

Table IX.2 lists comparisons of UNF with our peer-aspirant institutions who offer a MS program in Physics.
The above 2009-2010 numbers suggest, at least from a very general perspective, UNF is close to ready to launch a master’s in Physics. UNF should soon resume its growth pattern and this growth will only strengthen the UNF case for the graduate program. In the above table is also included a UNF five-year projection assuming a 5% per year compounded growth rate in the UNF numbers. The 2014-2015 UNF data (in bold) suggest that by year 2015 UNF will have numbers that are greater than or very close to the averages of our peer-aspirants who currently offer an MS in Physics.

Table IX.3 gives some indication of how many students we might expect in a UNF Physics PSM program. The table lists the total number of MS Physics Graduate Students at peer-aspirant and similar institutions that offer the MS in Physics but we have not included the peer-aspirant universities who offer a Ph.D. in physics.

<table>
<thead>
<tr>
<th>TABLE IX.2 ENROLLMENT COMPARISONS TO PEER-ASPIRANTS</th>
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<table>
<thead>
<tr>
<th>Headcount No. Students</th>
<th>No. FTE Students</th>
<th>No. Junior&amp;Senior Phys. Majors</th>
<th>1st Semester Physics Enrollments</th>
</tr>
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<tbody>
<tr>
<td>Average for Peer-Aspirants who offer Physics MS</td>
<td>17655</td>
<td>15683</td>
<td>47</td>
</tr>
<tr>
<td>UNF 2009-2010</td>
<td>15954</td>
<td>12437</td>
<td>34</td>
</tr>
<tr>
<td>Projected UNF 2014-15</td>
<td>20362</td>
<td>15873</td>
<td>43</td>
</tr>
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</table>

Next we consider the question, given a physics PSM at UNF, where would the students come from? During the past ten years on average four students per year graduated with a UNF BS in physics and approximately two-thirds of these graduates continued their studies in a graduate or professional program. In Spring 2010, the UNF Physics Department polled the sixty UNF Physics majors (among whom 34 are at the upper-level) asking the question:

If UNF offered a masters in Physics would you
1. Certainly enroll in the program (33% or 4 students)
2. Probably enroll in the program (42% or 5 students)
3. Probably not enroll in the program (8% or 1 student)
4. Definitely not enroll in the program (17% or 2 students)
The numbers to the right give the percentage and number of the responders to this question in each response category. A total of 12 students responded to the survey among whom 75% (9 students) expressed an interest in enrolling in a UNF master’s program in physics.

At Cleveland State University (CSU) most of the MS physics students are from the local Cleveland area (Private Communication with CSU Physics Chair, Dr. Miron Kaufman). At the University of Northern Iowa (UNI) about one-half of the PSM physics students are from Iowa with most of the rest from other states in the US. Many of the entering UNI PSM students are graduates of private liberal arts colleges. (Private Communication with UNI Physics Chair, Dr. Cliff Chancey). UNF Physics faculty member, Dr. Nirmal Patel, who is originally from India, worked in Indian universities for twenty-three years, and visits India often, has on numerous occasions stated that he believes “he could recruit a sizable number of Indian students to come to UNF to enter our new masters program in Physics and these graduate students would pose a relatively low cost to UNF”. Given these data and observations, it is reasonable to assume UNF will be in a position to initiate a PSM in Applied Physics no later than the year 2015 with an initial enrollment of a total of approximately ten graduate students with five entering students each year. This assumes each year one UNF student and one student from other Florida (or other states’) colleges enters the program and three other, potentially international students, are attracted into the program. This is a conservative estimate since it assumes a total number of UNF physics graduate students (10) that is less than half the average number found at our peer-aspirant institutions (22.6).

RESOURCE NEEDS
The PSM program will be in Applied Physics which is the area of physics that is the primary focus of the UNF Physics Department. Currently five of the UNF tenure-track physics faculty are applied materials physicists (Drs. J. Garner, T. Pekarek, L. Gasparov, H. Chen and G. Wurtz) and one (astrophysicist Dr. MacGibbon) has among her research interests topics in space radiation safety and numerical modeling. Physics lab lecturer, Dr. Nirmal Patel, is also trained in and active in Applied Physics. The program might also have support from other science faculty in the university who could possibly contribute toward the curriculum given their professional overlap with applied physics, e.g. Drs. Mike Lufaso in Materials Chemistry and Paul Eason in Materials Science and Engineering. The specific resource needs include partial tuition coverage for the students (e.g. waiver of out-of-state graduate tuition). No new faculty are needed to start the PSM. However, one of the tenure-track physics faculty has started phased-retirement. When this person fully retires in the coming years, the department will seek to hire a tenure-track full-time assistant professor in Applied Physics as his replacement in order to strengthen the PSM. As the university continues to grow, we anticipate at some point in time, it will become feasible and cost-effective for the Physics Department to hire some first-year PSM physics graduate students as graduate teaching assistants (GTA’s). This should increase the likelihood of future enrollment growth in the PSM program. The success of the program will also depend on assistance from the Graduate College via Graduate Admissions and Advisement and the Office of Career Services. We anticipate initially two tracks could be established in the program: a five-year program tailored primarily for UNF students and a two-year program that would attract students from outside UNF who have already completed their BS elsewhere in physics or a related area. Presumably some of the students who enter the five-year PSM program will desire to continue toward a Ph.D. at other universities, while nearly all of those completing the two-year program will desire immediate employment in private industry, education, national laboratories, and the military. However, some may desire to continue their education in other professional fields. As mentioned previously, the precise nature of the PSM curriculum will depend on the advice we obtain from the PAG, the results of our industry poll of the specific needs of the region, and the interests and needs of the department. The curriculum of the PSM will be interned focused with the salaries of the interns provided by the company they are employed
by. Further, we anticipate requiring three to four graduate applied physics lecture or laboratory courses directed toward immediate employment. The exact content of these courses will be determined once the PAG advice and poll results are obtained. Some of the courses might be cross-listed with undergraduate physics courses. We assume the remaining coursework will consist of internships under company supervision, departmental colloquia focused mostly on applied physics, and electives drawn from applied graduate courses or cross-listed courses from other UNF departments (e.g., applied statistics, applied chemistry, engineering, and business management). The elective courses chosen will depend on the specific interests of the students. Based on their ultimate career plans, this approach allows the students a great measure of flexibility in designing their individual program while seeking to meet the needs of industry in order to be employable on completion of the program. Part of the student’s education will involve their identifying suitable companies to work for as interns and their successful completion of the internship.
APPENDIX A: Courses Offered by the Department of Physics

**Lower level**

**General Education**
- AST2002 Basic Astronomy
- AST2002L Basic Astronomy Lab
- ESC2000 Earth Science
- ESC2000L Earth Science Lab
- PHY1020 Introduction to Physics
- PHY1020L Introduction to Physics Lab
- PHY2048 Calculus-based Physics I
- PHY2048L Calculus-based Physics I Lab
- PHY2053 Algebra-based Physics I
- PHY2053L Algebra-based Physics I Lab

**Venture Studies**
- World of Physics
- Evolution of Modern Physics & Astrophysics

**Science and Engineering Majors**
- PHY2049 Calculus-based Physics II
- PHY2049L Calculus-based Physics II Lab
- PHY2054 Algebra-based Physics II
- PHY2054L Algebra-based Physics II Lab
- PHY2930 Selected Topics in Physics

**Honors**
- PHY2048H Honors Physics

**Upper-Level**

**Core**
- PHY3101 Modern Physics
- PHY3101L Modern Physics Lab
- PHY3220 Classical Mechanics
- PHY3320 Electricity & Magnetism
- PHY3424 Optics
- PHY3722C Electronics for Scientists w/Lab
- PHZ3113 Mathematical Physics
- PHY4604 Quantum Mechanics
PHY4523 Thermodynamics & Statistical Mechanics
PHY4802L Advanced Physics Lab
PHY4910 Physics Research & Seminar

**Electives**
AST3712 Astrophysics I
AST3402 Astrophysics II
PHY4905 Directed Independent Study in Physics
PHY4930 Selected Topics in Physics
PHZ3404 Solid State Physics
PHZ4301 Nuclear Physics
PHZ4160 Advanced Topics in Physics

**Honor in the Major**
PHY4969 Directed Independent Studies – Honors in Physics Research
PHY4970 Directed Independent Studies – Honors Thesis in Physics

**Physics Internship**
PHY 4940 Physics Internship
APPENDIX B: Major in Physics

Major: Physics
Concentration: Traditional Physics
Degree: Bachelor of Science
Prerequisites (30 credit hours)

CHEMISTRY 1 REQUIREMENT

- CHM 2045 General Chemistry I
- CHM 2045L General Chemistry I Lab
  Acceptable substitutes: (CHMX040 and CHMX041) or CHMX045C

CHEMISTRY 2 REQUIREMENT

- CHM 2046 General Chemistry I
- CHM 2046L General Chemistry I Lab
  Acceptable substitutes: CHMX046C

MATHEMATICS REQUIREMENT

- MAC2311 4 G(M) Calculus I
  Acceptable substitutes: MACX281
  Prereq: MAC 1147
- MAC2312 4 G(M) Calculus II
  Acceptable substitutes: MACX282
  Prereq: MAC 2311
- MAC2313 4 G(M) Calculus III
  Acceptable substitutes: MACX283
  Prereq: MAC 2312

PHYSICS REQUIREMENT

- PHY 2048 Calculus Physics I
- PHY 2048L Calculus Physics I Lab
- PHY 2049 Calculus Physics II
- PHY 2049L Calculus Physics II Lab

Major Requirements (33 credit hours)
Courses must be taken in prerequisite order. Electronic approval for courses requiring prerequisites must be obtained each registration. Grades of C or above must be earned in all physics requirements.

PHY3101 3 Modern Physics
Prereq: PHY 2049; Coreq: MAC 2313
PHY3101L 1 Modern Physics Lab
Coreq: PHY 3101
PHZ3113 3 Mathematical Physics
Prereq: PHY 2049 & MAC 2313; Coreq: MAP 2302
PHY3220 4 Classical Mechanics
Prereqs: PHY 2049 & MAC 2313
Coreq: MAP 2302
PHY3320 4 Electricity and Magnetism
Prereqs: PHY 2049 & MAC 2313
PHY3424 3 Optics
Prereqs: PHY 2049 & MAC 2313
PHY3722C 4 Electronics for Scientists
Prereqs: PHY 2049 & MAC 2313
PHY4604 4 Quantum Mechanics
Prereqs: PHY 3101, MAC 2313 & MAP 2302
PHY4523 4 Thermodyn and Statistical Mech
Prereqs: PHY 3101, MAC 2313 & MAP 2302
PHY4802L 2 Advanced Physics Laboratory
Prereq: PHY 3101L
PHY4910 1 Physics Research and Seminar
Prereq: PHY 3101

Major Electives (3 credit hours) (For Fall 2011 onwards: 6 credit hours)

SELECT ONE FROM THE FOLLOWING:

- AST 3217 Astrophysics I
- AST 3402 Astrophysics II
- PHZ 3404 Solid State Physics
- PHZ 4160 Adv Topics Physics
- PHZ 4303 Nuclear Physics

Contextual Courses (6 credit hours) (For Fall 2011 onwards: 3 credit hours)

COP2220 3 Computer Science I
MAP2302 3 G(M)Ordinary Differ Equations
Prereq: MAC 2312

Free Electives (18 credit hours)

SELECT 18 HRS (3000/4000 LEVEL)
This degree requires a minimum of 120 total credit hours with 48 upper (3000/4000) level credit hours. Free electives may be courses in any discipline (provided the required prerequisites are met) and they are the credit hours needed to satisfy the total credit hour requirement. These credit hours may vary (the student should consult their academic advisor about free elective credit hours needed to graduate).

Traditional physics majors are advised to follow the sequence of courses shown in the table below.

Table B.1 Typical Sequence of Science and Math courses for the traditional physics major

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introduction to Physics*  2 SH</td>
<td>Honors Calculus Physics I with Lab* 5 SH</td>
</tr>
<tr>
<td></td>
<td>4 SH</td>
<td>Calculus II 4 SH</td>
</tr>
<tr>
<td></td>
<td>General Chemistry I with Lab 4 SH</td>
<td>General Chemistry II with Lab 4 SH</td>
</tr>
<tr>
<td>Freshman</td>
<td>Calculus I 4 SH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calculus III 4 SH</td>
<td>Computer Programming 3 SH</td>
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<tr>
<td></td>
<td></td>
<td>Ordinary Differential Equations 4 SH</td>
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<tr>
<td>Sophomore</td>
<td>Calculus Physics II with Lab 5 SH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mathematical Physics 3 SH</td>
<td>Quantum Mechanics 4 SH</td>
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<tr>
<td></td>
<td>Optics with Lab** 4 SH</td>
<td>Classical Mechanics 4 SH</td>
</tr>
<tr>
<td>Junior</td>
<td></td>
<td>Electronics for Scientists with Lab 4 SH</td>
</tr>
<tr>
<td></td>
<td>Modern Physics with Lab 4 SH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mathematical Physics 3 SH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optics with Lab** 4 SH</td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td>Thermal &amp; Statistical Physics 4 SH</td>
<td>Physics Research &amp; Seminar 1 SH</td>
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<tr>
<td></td>
<td>Electricity &amp; Magnetism 4 SH</td>
<td>Advanced Physics Lab 2 SH</td>
</tr>
<tr>
<td></td>
<td>Physics Elective*** 3-4 SH</td>
<td>Physics Elective*** 3-4 SH</td>
</tr>
</tbody>
</table>
*Students lacking a minimum grade of “B” in high school AP physics must take Introduction to Physics (PHY 1020) before enrolling in Honors Calculus Physics I. Students who are not mathematically prepared to take Calculus I in the fall of their freshman year should be prepared to take Calculus I in the spring of their freshman year and take the Calculus Physics I & II sequence during their sophomore year.

**A new optics lab to accompany the optics lecture course is currently under construction.

***Choose from Astrophysics I, Astrophysics II, Solid State Physics, Nuclear Physics, and Advanced Topics in Physics.

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**Major:** Physics  
**Concentration:** Astrophysics  
**Degree:** Bachelor of Science  

**Prerequisites (30 credit hours)**

**CHEMISTRY 1 REQUIREMENT**

- CHM 2045 General Chemistry I  
- CHM 2045L General Chemistry I Lab  
  Acceptable substitutes: (CHMX040 and CHMX041) or CHMX045C

**CHEMISTRY 2 REQUIREMENT**

- CHM 2046 General Chemistry I  
- CHM 2046L General Chemistry I Lab  
  Acceptable substitutes: CHMX046C

**MATHEMATICS REQUIREMENT**

- MAC2311 4 G(M) Calculus I  
  Acceptable substitutes: MACX281  
  Prereq: MAC 1147  
- MAC2312 4 G(M) Calculus II  
  Acceptable substitutes: MACX282  
  Prereq: MAC 2311  
- MAC2313 4 G(M) Calculus III  
  Acceptable substitutes: MACX283  
  Prereq: MAC 2312

**PHYSICS REQUIREMENT:**

- PHY 2048 Calculus Physics I  
- PHY 2048L Calculus Physics I Lab  
- PHY 2049 Calculus Physics II  
- PHY 2049L Calculus Physics II Lab

**Major Requirements (37 credit hours)**

Courses must be taken in prerequisite order. Electronic approval for courses requiring prerequisites must be obtained each registration. Grades of C or above must be earned in all physics requirements.

- AST3217 4 Astrophysics I  
  Prereq: PHY2049; Coreq: PHY3101  
- AST3402 4 Astrophysics II  
  Prereq: AST3217  
- PHY3101 3 Modern Physics  
  Prereq: PHY 2049; Coreq: MAC 2313
PHY3101L 1 Modern Physics Lab
Coreq: PHY 3101
PHZ3113 3 Mathematical Physics
Prereq: PHY 2049 & MAC 2313; Coreq: MAP 2302
PHY3220 4 Classical Mechanics
Prereqs: PHY 2049 & MAC 2313
Coreq: MAP 2302
PHY3424 3 Optics
Prereqs: PHY 2049 & MAC 2313
PHY3320 4 Electricity and Magnetism
Prereqs: PHY 2049 & MAC 2313
PHY4604 4 Quantum Mechanics
Prereqs: PHY 3101, MAC 2313 & MAP 2302
PHY4523 4 Thermodyn and Statistical Mech
Prereqs: PHY 3101, MAC 2313 & MAP 2302
PHY4802L 2 Advanced Physics Laboratory
Prereq: PHY 3101L
PHY4910 1 Physics Research and Seminar
Prereq: PHY 3101

**Major Electives (3 credit hours)**
SELECT ONE FROM THE FOLLOWING:

- PHY 3722C Electronics for Scientists
- PHZ 3404 Solid State Physics
- PHZ 4160 Adv Topics Physics
- PHZ 4303 Nuclear Physics

**Contextual Courses (12 credit hours)**
AST2002 3 Basic Astronomy
COP2220 3 Computer Science I
ESC2000 3 Earth Science
MAP2302 3 G(M)Ordinary Differ Equations
Prereq: MAC 2312

**Free Electives (8 credit hours)**
SELECT 8 HRS (3000/4000 LEVEL)
This degree requires a minimum of 120 total credit hours with 48 upper (3000/4000) level credit hours. Free electives may be courses in any discipline (provided the required prerequisites are met) and they are the credit hours needed to satisfy the total credit hour requirement. These credit hours may vary (the student should consult their academic advisor about free elective credit hours needed to graduate).

---

**Major: Physics**
**Concentration: Electrical Engineering**
**Degree: Bachelor of Science**

**Prerequisites (30 credit hours)**
CHEMISTRY 1 REQUIREMENT

- CHM 2045 General Chemistry I
- CHM 2045L General Chemistry I Lab
  Acceptable substitutes: (CHMX040 and CHMX041) or CHMX045C

CHEMISTRY 2 REQUIREMENT
• CHM 2046 General Chemistry I
• CHM 2046L General Chemistry I Lab
  Acceptable substitutes: CHMX046C

MATHEMATICS REQUIREMENT

• MAC2311 4 G(M) Calculus I
  Acceptable substitutes: MACX281
  Prereq: MAC 1147
• MAC2312 4 G(M) Calculus II
  Acceptable substitutes: MACX282
  Prereq: MAC 2311
• MAC2313 4 G(M) Calculus III
  Acceptable substitutes: MACX283
  Prereq: MAC 2312

PHYSICS REQUIREMENT:

• PHY 2048 Calculus Physics I
• PHY 2048L Calculus Physics I Lab
• PHY 2049 Calculus Physics II
• PHY 2049L Calculus Physics II Lab

Major Requirements (47 credit hours)
Courses must be taken in prerequisite order. Electronic approval for courses requiring prerequisites must be obtained each registration. Grades of C or above must be earned in all physics requirements.

PHY3101 3 Modern Physics
  Prereq: PHY 2049; Coreq: MAC 2313
PHY3101L 1 Modern Physics Lab
  Coreq: PHY 3101
PHZ3113 3 Mathematical Physics
  Prereq: PHY 2049 & MAC 2313; Coreq: MAP 2302
PHY3220 4 Classical Mechanics
  Prereqs: PHY 2049 & MAC 2313
  Coreq: MAP 2302
PHY3320 4 Electricity and Magnetism
  Prereqs: PHY 2049 & MAC 2313
PHY3424 3 Optics
  Prereqs: PHY 2049 & MAC2313
PHY4604 4 Quantum Mechanics
  Prereqs: PHY 3101, MAC 2313 & MAP 2302
PHY4802L 2 Advanced Physics Laboratory
  Prereq: PHY 3101L
PHZ3404 3 Solid State Physics
EEL3111 3 Circuit Analysis I
EEL3112 3 Circuit Analysis II
EEL3304 3 Electronic Circuits I
EEL3303L 1 Electrical Circuits Laboratory
EEL4744C 4 Microcontroller Applications

SELECT 1 FROM THE FOLLOWING:

• CDA 3101 Introduction to Computer Hardware
• EEL 3701C Introduction to Digital Systems

SELECT 1 FROM THE FOLLOWING:

• EEL 3135 Signals & Systems
- EEL 4309C Electronic Circuits II

**Contextual Courses (6 credit hours)**

COP2220 3 Computer Science I  
MAP2302 3 G(M)Ordinary Differ Equations  
Prereq: MAC 2312

**Major Electives (7 credit hours)**

Grades of C or higher required in all engineering electives.  
SELECT 7 HOURS @ 3000/4000 LEVEL

- EEL

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**Major: Physics**  
**Concentration: Mechanical Engineering**  
**Degree: Bachelor of Science**

**Prerequisites (30 credit hours)**

**CHEMISTRY 1 REQUIREMENT**

- CHM 2045 General Chemistry I  
- CHM 2045L General Chemistry I Lab  
  Acceptable substitutes: (CHMX040 and CHMX041) or CHMX045C

**CHEMISTRY 2 REQUIREMENT**

- CHM 2046 General Chemistry I  
- CHM 2046L General Chemistry I Lab  
  Acceptable substitutes: CHMX046C

**MATHEMATICS REQUIREMENT**

- MAC2311 4 G(M) Calculus I  
  Acceptable substitutes: MACX281  
  Prereq: MAC 1147  
- MAC2312 4 G(M) Calculus II  
  Acceptable substitutes: MACX282  
  Prereq: MAC 2311  
- MAC2313 4 G(M) Calculus III  
  Acceptable substitutes: MACX283  
  Prereq: MAC 2312

**PHYSICS REQUIREMENT:**

- PHY 2048 Calculus Physics I  
- PHY 2048L Calculus Physics I Lab  
- PHY 2049 Calculus Physics II  
- PHY 2049L Calculus Physics II Lab

**Requisites (3 credit hours)**

MAP2302 3 G(M)Ordinary Differ Equations

**Major Requirements (45 credit hours)**

Courses must be taken in prerequisite order. Electronic approval for courses requiring prerequisites must be obtained each registration. Grades of C or above must be earned in all physics requirements.

PHY3101 3 Modern Physics
Prereq: PHY 2049; Coreq: MAC 2313
PHY3101L 1 Modern Physics Lab
Coreq: PHY 3101
PHZ3113 3 Mathematical Physics
Prereq: PHY 2049 & MAC 2313 Coreq: MAP 2302
PHY3220 4 Classical Mechanics
Prereqs: PHY 2049 & MAC 2313
Coreq: MAP 2302
PHY3320 4 Electricity and Magnetism
Prereqs: PHY 2049 & MAC 2313
PHY3424 3 Optics
Prereqs: PHY 2049 & MAC2313
PHY3722C 4 Electronics for Scientists
Prereqs: PHY 2049 & MAC 2313
PHY4523 4 Thermodyn and Statistical Mech
Prereqs: PHY 2049, MAC 2313 & MAP 2302
PHY4802L 2 Advanced Physics Laboratory
Prereq: PHY 3101L
EGN3311 3 Statics
EGN3331 3 Strength of Materials
EML3100 3 Thermodynamics I
EGN3203 3 Modern Computational Methods
EML3015 3 Fluids I
EML4140 3 Heat Transfer

Major Electives (9 credit hours)
Grades of C or higher are required in all engineering electives.
SELECT 9 HRS @ 3000/4000 LEVEL

- EGN EML

Major: Physics
Concentration: Computing Emphasis
Degree: Bachelor of Science

Prerequisites (30 credit hours)
CHEMISTRY 1 REQUIREMENT

- CHM 2045 General Chemistry I
- CHM 2045L General Chemistry I Lab
  Acceptable substitutes: (CHMX040 and CHMX041) or CHMX045C

CHEMISTRY 2 REQUIREMENT

- CHM 2046 General Chemistry I
- CHM 2046L General Chemistry I Lab
  Acceptable substitutes: CHMX046C

MATHEMATICS REQUIREMENT

- MAC2311 4 G(M) Calculus I
  Acceptable substitutes: MACX281
  Prereq: MAC 1147
- MAC2312 4 G(M) Calculus II
  Acceptable substitutes: MACX282
  Prereq: MAC 2311
• MAC2313 4 G(M) Calculus III  
Acceptable substitutes: MACX283  
Prereq: MAC 2312

PHYSICS REQUIREMENT:

• PHY 2048 Calculus Physics I  
• PHY 2048L Calculus Physics I Lab  
• PHY 2049 Calculus Physics II  
• PHY 2049L Calculus Physics II Lab

Major Requirements (39 credit hours)
Courses must be taken in prerequisite order. Electronic approval for courses requiring prerequisites must be obtained each registration. Grades of C or above must be earned in all physics requirements.

PHY3101 3 Modern Physics  
Prereq: PHY 2049; Coreq: MAC 2313  
PHY3101L 1 Modern Physics Lab  
Coreq: PHY 3101  
PHZ3113 3 Mathematical Physics  
Prereq: PHY 2049 & MAC 2313 Coreq: MAP 2302  
PHY3220 4 Classical Mechanics  
Prereqs: PHY 2049 & MAC 2313  
Coreq: MAP 2302  
PHY3320 4 Electricity and Magnetism  
Prereqs: PHY 2049 & MAC 2313  
PHY3424 3 Optics  
Prereqs: PHY 2049 & MAC2313  
PHY3722C 4 Electronics for Scientists  
Prereqs: PHY 2049 & MAC 2313  
PHY4604 4 Quantum Mechanics  
Prereqs: PHY 3101, MAC 2313 & MAP 2302  
PHY4802L 2 Advanced Physics Laboratory  
Prereq: PHY 3101L  
COT3100 3 Computational Structures  
COP3530 4 Data Structures  
SELECT 1 FROM THE FOLLOWING:

• COP 3601 Introduction to System Software  
• CDA 3101 Introduction to Computer Hardware

Contextual Courses (6 credit hours)

COP2220 3 Computer Science I  
MAP2302 3 G(M)Ordinary Differ Equations  
Prereq: MAC 2312

Major Electives (15 credit hours)
Grades of C or higher required in all computer science requirements and computer science electives.  
SELECT 15 HOURS (3000/4000)

• COT COP CDA

Major: Physics  
Concentration: Civil Engineering  
Degree: Bachelor of Science  
Prerequisites (30 credit hours)
CHEMISTRY 1 REQUIREMENT

- CHM 2045 General Chemistry I
- CHM 2045L General Chemistry I Lab
  Acceptable substitutes: (CHMX040 and CHMX041) or CHMX045C

CHEMISTRY 2 REQUIREMENT

- CHM 2046 General Chemistry I
- CHM 2046L General Chemistry I Lab
  Acceptable substitutes: CHMX046C

MATHEMATICS REQUIREMENT

- MAC2311 4 G(M) Calculus I
  Acceptable substitutes: MACX281
  Prereq: MAC 1147
- MAC2312 4 G(M) Calculus II
  Acceptable substitutes: MACX282
  Prereq: MAC 2311
- MAC2313 4 G(M) Calculus III
  Acceptable substitutes: MACX283
  Prereq: MAC 2312

PHYSICS REQUIREMENT:

- PHY 2048 Calculus Physics I
- PHY 2048L Calculus Physics I Lab
- PHY 2049 Calculus Physics II
- PHY 2049L Calculus Physics II Lab

**Requisites (3 credit hours)**
MAP2302 3 G(M) Ordinary Differ Equations

**Major Requirements (40 credit hours)**
Grades of C or higher required in all physics and engineering courses.
PHY3101 3 Modern Physics
Prereq: PHY 2049; Coreq: MAC 2313
PHY3101L 1 Modern Physics Lab
Coreq: PHY 3101
PHZ3113 3 Mathematical Physics
Prereq: PHY 2049 & MAC 2313 Coreq: MAP 2302
PHY3220 4 Classical Mechanics
Prereq: PHY 2049 & MAC 2313
Coreq: MAP 2302
PHY3320 4 Electricity and Magnetism
Prereq: PHY 2049 & MAC 2313
PHY3722C 4 Electronics for Scientists
Prereq: PHY 2049 & MAC 2313
PHY4523 4 Thermodyn and Statistical Mech
Prereqs: PHY 2049, MAC 2313 & MAP 2302
PHY4802L 2 Advanced Physics Laboratory
Prereq: PHY 3101L
EGN3311 3 Statics
EGN3202 3 Computer Aided Engineering
CES3104C 3 Mechanics of Materials
CWR3201 3 Fluid Mechanics

**Major Electives (17 credit hours)**
Grades of C or above required in all engineering courses.
SELECT 17 HRS (3000/4000)

- CGN

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**Major: Physics**  
**Concentration: Pre-Medical Physics**  
**Degree: Bachelor of Science**

**Prerequisites (30 credit hours)**

**CHEMISTRY 1 REQUIREMENT**

- CHM 2045 General Chemistry I  
- CHM 2045L General Chemistry I Lab  
  Acceptable substitutes: (CHMX040 and CHMX041) or CHMX045C

**CHEMISTRY 2 REQUIREMENT**

- CHM 2046 General Chemistry I  
- CHM 2046L General Chemistry I Lab  
  Acceptable substitutes: CHMX046C

**MATHEMATICS REQUIREMENT**

- MAC2311 4 G(M) Calculus I  
  Acceptable substitutes: MACX281  
  Prereq: MAC 1147
- MAC2312 4 G(M) Calculus II  
  Acceptable substitutes: MACX282  
  Prereq: MAC 2311
- MAC2313 4 G(M) Calculus III  
  Acceptable substitutes: MACX283  
  Prereq: MAC 2312

**PHYSICS REQUIREMENT:**

- PHY 2048 Calculus Physics I  
- PHY 2048L Calculus Physics I Lab  
- PHY 2049 Calculus Physics II  
- PHY 2049L Calculus Physics II Lab

**Contextual Courses (19 credit hours)**

BSC1010C 4 General Biology I  
BSC1011C 4 General Biology II  
MAP2302 3 G(M) Ordinary Differ Equations  

**ORGANIC REQUIREMENT**

- CHM 2210 Organic Chemistry I  
- CHM 2210L Organic Chemistry I lab  
- CHM 2211 Organic Chemistry II  
- CHM 2211L Organic Chemistry II lab
Major Requirements (30 credit hours)
Courses must be taken in prerequisite order. Grades of C or above must be earned in all physics requirements.

PHY3101 3 Modern Physics
Prereq: PHY 2049; Coreq: MAC 2313
PHY3101L 1 Modern Physics Lab
Coreq: PHY 3101
PHZ3113 3 Mathematical Physics
Prereq: PHY 2049 & MAC 2313; Coreq: MAP 2302
PHY3220 4 Classical Mechanics
Prereqs: PHY 2049 & MAC 2313
Coreq: MAP 2302
PHY3320 4 Electricity and Magnetism
Prereqs: PHY 2049 & MAC 2313
PHY3424 3 Optics
Prereqs: PHY 2049 & MAC 2313
PHY3722C 4 Electronics for Scientists
Prereqs: PHY 2049 & MAC 2313
PHY4604 4 Quantum Mechanics
Prereqs: PHY 3101, MAC 2313 & MAP 2302
PHY4523 4 Thermodyn and Statistical Mech
Prereqs: PHY 3101, MAC 2313 & MAP 2302

Major Electives (12 credit hours)
SELECT 12-13 HRS FROM THE FOLLOWING:

- BSC 2012C Biology III
- BCH 4033 Biochemistry
- BCH 4033L Biochemistry lab
- CHM 3120C Quantitative Analytical Chemistry
- PCB 3023C Molecular & Cell Biology
- PCB 3063C Genetics
- PHY 4802L Advanced Physics Lab
- PHY 4910 Physics Research & Seminar
- PHZ 3404 Solid State Physics
- PHZ 4303 Nuclear Physics

Free Electives (6 credit hours)
SELECT 5 HRS (3000/4000 LEVEL)
This degree requires a minimum of 120 total credit hours with 48 upper (3000/4000) level credit hours. Free electives may be courses in any discipline (provided the required prerequisites are met) and they are the credit hours needed to satisfy the total credit hour requirement. These credit hours may vary (the student should consult their academic advisor about free elective credit hours needed to graduate).

Major: Physics
Concentration: Material Science
Degree: Bachelor of Science

The UNF Bachelor of Science physics program focuses on preparing graduates for employment in a wide array of technical and non-technical fields. To that end, the department has recently developed an official program of study for a new Materials Science track of the Physics major.

The new track will be offered beginning in the Fall 2011 semester.
Major: Physics  
Concentration: Materials Science  
Degree: Bachelor of Science

**General Education (24 Credits)**  
(Non Math and Science, i.e., Social Sciences, Literature, Arts, etc.)

**Prerequisites (30 Credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 2045</td>
<td>General Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHM 2045L</td>
<td>General Chemistry I Lab</td>
<td>1</td>
</tr>
<tr>
<td>CHM 2046</td>
<td>General Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHM 2046L</td>
<td>General Chemistry II Lab</td>
<td>1</td>
</tr>
<tr>
<td>MAC 2311</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MAC 2312</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MAC 2313</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHY 2048</td>
<td>Calculus Physics I</td>
<td>4</td>
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<td>PHY 2048L</td>
<td>Calculus Physics I Lab</td>
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<tr>
<td>PHY 2049</td>
<td>Calculus Physics II</td>
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</tr>
<tr>
<td>PHY 2049L</td>
<td>Calculus Physics II Lab</td>
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</tr>
</tbody>
</table>

**Contextual Courses (11 credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 2210</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHM 2210L</td>
<td>Organic Chemistry I Lab</td>
<td>1</td>
</tr>
<tr>
<td>CHM 2211</td>
<td>Organic Chemistry II</td>
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<tr>
<td>CHM 2211L</td>
<td>Organic Chemistry II Lab</td>
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</tr>
<tr>
<td>MAP 2302</td>
<td>Ordinary Differential Eqs</td>
<td>3</td>
</tr>
</tbody>
</table>

**Major Requirements (29 Credits)**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY 3101</td>
<td>Modern Physics</td>
<td>3</td>
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<tr>
<td>PHY 3101L</td>
<td>Modern Physics Lab</td>
<td>1</td>
</tr>
<tr>
<td>PHz 3113</td>
<td>Mathematical Physics</td>
<td>3</td>
</tr>
<tr>
<td>PHY 3220</td>
<td>Classical Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHY 3320</td>
<td>Electricity and Magnetism</td>
<td>4</td>
</tr>
<tr>
<td>PHY 3424</td>
<td>Optics</td>
<td>3</td>
</tr>
<tr>
<td>PHY 4604</td>
<td>Quantum Mechanics</td>
<td>4</td>
</tr>
<tr>
<td>PHY 4523</td>
<td>Therm. &amp; Statistical Mech.</td>
<td>4</td>
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<tr>
<td>EML 3520C</td>
<td>Material Science I</td>
<td>3</td>
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</table>

**Major Electives (22 Credits): A minimum of 19 credits must be upper-division.**

<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tr>
<td>PHZ 3404</td>
<td>Solid State Physics</td>
<td>3</td>
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<tr>
<td>PHY 4802L</td>
<td>Advanced Physics Lab</td>
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<tr>
<td>PHY 4910</td>
<td>Physics Research &amp; Seminar</td>
<td>1</td>
</tr>
<tr>
<td>PHY 3722C</td>
<td>Electronics for Scientists</td>
<td>4</td>
</tr>
<tr>
<td>CHM 4410C</td>
<td>Physical Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHM 3120C</td>
<td>Quantitative Analytical Chem</td>
<td>4</td>
</tr>
<tr>
<td>CHM 3610</td>
<td>Inorganic Chemistry</td>
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<tr>
<td>CHM 3610L</td>
<td>Inorganic Chemistry Lab</td>
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<tr>
<td>CHM 4627</td>
<td>Solid State Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>EGN 3311</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>EGN 3331</td>
<td>Strength of Materials</td>
<td>3</td>
</tr>
<tr>
<td>EML 4930</td>
<td>Material Characterization</td>
<td>3</td>
</tr>
<tr>
<td>EML 4320C</td>
<td>Integrated Design and Manufacturing</td>
<td>4</td>
</tr>
<tr>
<td>EML 4930</td>
<td>Microstructural Evol.</td>
<td>3</td>
</tr>
<tr>
<td>COP 2220</td>
<td>Computer Science I (Intro to C)</td>
<td>3</td>
</tr>
<tr>
<td>COP 2251</td>
<td>Intro to OO Programming (Intro to Java)</td>
<td>3</td>
</tr>
<tr>
<td>COP 22010</td>
<td>Intro to V&amp;P Programming</td>
<td>3</td>
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<tr>
<td></td>
<td>(Intro to Visual Basic)</td>
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</tbody>
</table>

**Free Electives (4 Credits)**
APPENDIX C: Minor in Physics

Minor: Physics (20 credit hours)
All courses required for the minor may be transferred with prior approval of the department chair.
A cumulative GPA of 2.5 is required.

PHY2048 4 Calculus-Based Physics I
PHY2048L 1 Calculus-Based Physics I Lab
PHY2049 4 Calculus-Based Physics II
PHY2049L 1 Calculus-Based Physics II Lab
PHY3101 3 Modern Physics
PHY3101L 1 Modern Physics Lab

SELECT 2 FROM THE FOLLOWING:

- PHZ 3113 Mathematical Physics
- PHY 3220 Classical Mechanics
- PHY 3320 Electricity & Magnetism
- PHY 3424 Optics
- PHY 3722C Electronics for Scientists
- PHY 4604 Quantum Mechanics
- PHY 4523 Thermodynamics & Statistical Mechanics
- PHZ 3404 Solid State Physics
- PHZ 4304 Nuclear Physics
APPENDIX D: Tenure-Track Faculty CV's

VITA

James Luther Garner, II

BIRTHDATE: July 27, 1955

MARITAL STATUS: married, two children [ages 15 & 17]

EDUCATION: Ph.D., Physics, 1983
Ohio State University
Columbus, Ohio

B.S. (Magna Cum Laude) Physics, 1978
Cleveland State University
Cleveland, Ohio

FIELD: Condensed Matter Theoretical Physics

EXPERIENCE:

2009 - present Professor of Physics and Chairperson
Department of Physics
University of North Florida
Jacksonville, FL 32224

2008 - 2009 Professor of Physics and Chairperson
Department of Chemistry and Physics
University of North Florida
Jacksonville, FL

2006 - 2008 Professor of Physics
University of North Florida
Jacksonville, FL

1996 - 2005 Associate Professor of Physics with tenure
University of North Florida
Jacksonville, FL
<table>
<thead>
<tr>
<th>Years</th>
<th>Position and Details</th>
</tr>
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<tbody>
<tr>
<td>1993 - 1995</td>
<td>Assistant Professor of Physics&lt;br&gt;Department of Natural Sciences&lt;br&gt;University of North Florida&lt;br&gt;Jacksonville, FL</td>
</tr>
<tr>
<td>1990 - 1993</td>
<td>Associate Professor of Physics with tenure&lt;br&gt;Department of Physics&lt;br&gt;Bradley University&lt;br&gt;Peoria, IL</td>
</tr>
<tr>
<td>1985 - 1989</td>
<td>Assistant Professor of Physics&lt;br&gt;Department of Physics&lt;br&gt;Bradley University&lt;br&gt;Peoria, IL</td>
</tr>
<tr>
<td>1991</td>
<td>Sabbatical and Visiting Scientist&lt;br&gt;Material Sciences Division&lt;br&gt;Argonne National Laboratory&lt;br&gt;Chicago, IL</td>
</tr>
<tr>
<td>1984 – 1985</td>
<td>Assistant Professor of Physics&lt;br&gt;Department of Physics&lt;br&gt;Olivet Nazarene College&lt;br&gt;Kankakee, IL</td>
</tr>
<tr>
<td>1980 – 1983</td>
<td>Research Associate&lt;br&gt;Department of Physics&lt;br&gt;Ohio State University&lt;br&gt;Columbus, OH</td>
</tr>
<tr>
<td>1978 – 1979</td>
<td>Teaching Assistant&lt;br&gt;Department of Physics&lt;br&gt;Ohio State University&lt;br&gt;Columbus, OH</td>
</tr>
</tbody>
</table>

**ORGANIZATIONS:**
American Physical Society

**REFEREE:**

**RESEARCH INTERESTS:**
models of magnetic semiconductors, electrical transport of thin film-gas systems, layered superconductors, electronic structure of solids, composite media, physics history and teaching
**PEER REVIEWED PAPERS**

* indicates undergraduate student who I mentored  † indicates a post-doc

**Peer Reviewed Basic Physics Research Papers**


5. “Electronic Structure Calculations by Nonlinear Optimization: Applications to Metals”, C.
Woodward+ , B. I. Min+, R. Benedek, and J. Garner, Eds. D.P.Landau and H. B. Schuttler, Computer
Simulation Studies in Condensed Matter Physics:Recent Developments, Springer Proceedings in
Benedek, B. I. Min+, and J. Garner, Material Sciences Forum 37, 87(1989).
3. “Model Calculation of Two-Dimensional Angular Correlation for Positron Annihilation at a Metal
1. “Influence of Macroscopic Defects on Transport Properties in Anisotropic Conductors”, J. Garner and

Peer Reviewed Physics History or Education Papers or Books
7. “The Pendulum as a Vehicle for Transitioning from Classical to Quantum Mechanics: History,
Quantum Concepts, and Educational Challenges”, M. Barnes, J. Garner, and D. Reid*, Journal of
6. “Hypothetical Pre-Classical Equations of Motion”, Ed Disy and J. Garner, The Physics Teacher, 37, 42
(1999). (Ed was a physics teacher at Nease High School in Jacksonville.)
Garner (Invited Talk), American Association of Physics Teachers Announcer 26, No. 4, 40(1996). This
conference was held in January 1997 in Phoenix, AZ.
4. “Repackaging Undergraduate Physics Programs”, J. Garner, The International Conference on
Undergraduate Physics Education: The Changing Role of the Physics Department in Modern
399, 787(1997). This conference was held at the University of Maryland in Summer 1996.
3. “Numerical Solution to the Schrodinger Equation by Constrained Optimization”, J. Garner,
Computers in Physics, Jul/Aug 1990.
2. “Applications of Newtonian Dynamics to Curve Fitting”, S. Swanson* and J. Garner, American
1. “A Numerical Investigation of the Classical Dynamics of a Particle in a Time-Dependent Magnetic

PRESENTATIONS AND WORKSHOPS:
* indicates undergraduate student who I mentored  * indicates a post-doc
46. Moderated a Conference Session on the Recruitment of Physics Majors at the Biannual Physics
Chairs Conference at The American Center for Physics in Greenbelt, MD. The June 2010 conference
was sponsored by The American Physical Society, American Institute of Physics and American
Association of Physics Teachers.
45. Presentation to the Material Sciences and Nanotechnology Groups at the University of Technology
of Troyes, France, J. Garner, “Physics Research and the Physics Department at the University of
North Florida”, May 4, 2010.
44. Presentation at the 52nd MMM meeting 11/2007 in Tampa, Florida. “Magnetization of In1-xMnxSe:
a new III-VI diluted magnetic semiconductor”, D. Meda*, J. Garner, T. Pekarek, I. Miotkowski and A.
K. Ramdas.

42. Presentation for the 50th MMM meeting in San Jose, CA in Nov. 2005. “Explorations of the Magnetization of Ga1−xMnxS over a wide range of concentrations, 1<x<0.19%”, J. Garner, J. L. Tracy*, R. Mourad*, T. M. Pekarek, I. Miotkowski, and A. K. Ramdas,


GRANTS AND AWARDS:
31. 2008 UNF Teaching Grant $ 7,500
30. 2007 UNF Research Grant $2300 (for student)
29. 2006 UNF Research Grant $2300 (for student)
28. 2005-2006 United States Department of Defense $43,936 (JG) of a total sum of $858,060
27. 2005 UNF Research Grant $5000
26. 2005 UNF Research Grant $2300 (for student)
25. 2005 NASA Grant: Project Launch $5,000
24. 2004 UNF Research Grant $2300 (for a student)
23. 2003 UNF Research Grant $5000
22. 2003 UNF Research Grant $2300 (for student)
21. 2002 Physics Consultant for NSF-Funded Urban Systemic Initiative Grant $5000
20. 2001 Nominated for a UNF Outstanding Undergraduate Teaching Award
19. 1999-2001 Research Corporation Grant $37,670
18. 2001 UNF Research Grant $2,300 (for a student)
17. 2000 UNF Research Grant $5,000
16. 2000 Higher Educational Consortium Grant $2,300
15. 1999 UNF Research Grant $5,000
14. 1999 UNF Research Grant for a student $2,000
13. 1998 Nominated for a UNF Outstanding Undergraduate Teaching Award
12. 1994 UNF TSI Grant $3,000
11. 1992-1994 National Science Foundation Grant $47,000
10. 1992 Argonne National Laboratory Visiting Scientist Grant $7,000
9. 1991 Argonne National Laboratory Sabbatical Grant $25,000
8. 1990 Bradley Research Grant $3,000
7. 1990 Amoco Research Grant $3,000
6. 1989 Burlington Northern Outstanding Bradley Faculty Research Award $1,500
5. 1989 Heuser Research Grant $1,500
4. 1988 Bradley Research Grant $1,500
3. 1987 Bradley Research Grant $1,500
2. 1986 Argonne National Laboratory Research Grant $6,000
1. 1985 Argonne National Laboratory Research Grant $6,000

TEACHING EXPERIENCE:

Lower Level Undergraduate

- Introduction to physics with lab
- Calculus physics I and II with labs
- Honor’s class on the arms race

Algebra physics I and II with labs
Statics and dynamics
Honor’s class on physics of everyday life

Upper Level Undergraduate

- Classical mechanics
- Electricity and magnetism
- Quantum mechanics
- Non-linear dynamics and chaos
- Solid state physics

Mathematical physics
Optics
Statistical mechanics
Advanced topics in physics
Advanced classical dynamics
Thomas M. Pekarek
Department of Physics
University of North Florida
1 UNF Drive
Jacksonville, FL 32224
tpekarek@unf.edu

EDUCATION
Ph.D., Physics, Purdue University, 1996
M.S., Physics, Purdue University, 1993
B.S., Physics, University of Wyoming, 1991
B.S., Mathematics, University of Wyoming, 1991

PROFESSIONAL EXPERIENCE

2010-present  Presidential Professor, University of North Florida

2006-2010  Professor, University of North Florida

2001-2006  Associate Professor, University of North Florida

1997-2001  Assistant Professor, University of North Florida

1996-1997  Visiting Assistant Professor, Purdue University

1993-1997  Manager of SQUID magnetometer user facility, Purdue University

1993-1996  Research Associate, Purdue University

1991-1995  Teaching Assistant, Purdue University

1989-1991  Undergraduate Research Associate, University of Wyoming

Students Supervised: 15 Undergraduates & 3 High School Teachers

Publications: (39 Total; =39 published + 0 accepted + 0 submitted; 24 in 1998-2005)


$14,000  “Calorimetric and magnetic studies of III-VI diluted magnetic semiconductors” from Research Corporation’s “Partners in Science Program.” This grant funded Mr. S. Bruce Hughes, who teaches physics at Stanton College Preparatory School, to conduct research at UNF (summers of 1998 and 1999).

$5,000  “Magnetic and Calorimetric Studies on the Non-Linear Optical Material Ga$_1-x$Mn$_x$S”, Summer 1999 Undergraduate Space Research Participation Program and Collins Scholar, Florida Space Grant Consortium (Summer 1999).

$3,000  “Magnetic and Calorimetric Studies on the Non-Linear Optical Material Ga$_1-x$Mn$_x$Se”, Academic Year Undergraduate Program, Florida Space Grant Consortium (1999-2000).


Publications:


4. “Magnetic Studies of the Metal-Insulator Transition in CuIr$_2$S$_{4-x}$Se$_x$ (x = 0, 0.1, and 4),” J. Appl. Phys. 79, 5401 (1996) (w/ P. Somasundaram, J. M. Honig, and B. C. Crooker).


8. “Magnetic and Specific Heat Studies of the Effect of Sulfur Non-Stoichiometry in \( \text{Culr}_{2}\text{S}_{4+x} \) \( (x = -0.1, 0.0, \text{and} \ 0.1) \),” J. Appl. Phys. 81, 4618 (1997) (w/ P. Somasundaram, D. Kim, and J. M. Honig).


10. “Magnetic and Structural Studies of the Metal-Insulator Transition in \( \text{Culr}_{2}\text{S}_{4-x}\text{Se}_x \) \( (0 \leq x \leq 4) \),” J. Appl. Phys. 83, 7243 (1998) (w/ P. Somasundaram, D. Kim, J. M. Honig, T. Gu, and A. I. Goldman).


32. “Explorations of the magnetization of Ga\(_{1-x}\)Mn\(_x\)S over a wide range of concentrations, 0.008 < x < 0.18,” J. Appl. Phys. 99, 08D507 (2006), (w/ J.L. Tracy, R. Mourad, J. Garner, I. Miotkowski, A. K. Ramdas).


**Invited Talks:**

1. “Magnetic and Heat Capacity Measurements on Zn$_{1-x}$Cr$_x$Te and Cd$_{1-x}$Cr$_x$Te,” April 25, 1995, University of Northern Iowa, Cedar Falls, Iowa.

2. “Magnetic and Magnetoresistance Measurements on Iron-Based Nano-Clusters in In$_{0.53}$Ga$_{0.47}$As or GaAs,” April 2, 1997, Lamar University, Beaumont, Texas.

3. “Magnetic and Magnetoresistance Measurements on Iron-Based Nano-Clusters in In$_{0.53}$Ga$_{0.47}$As or GaAs,” April 7, 1997, University of Southeastern Louisiana, Hammond, Louisiana.


**Contributed Talks:**


5. "Magnetic Measurements on Cd$_{1-x}$Cr$_x$Te and Zn$_{1-x}$Cr$_x$Te", 40th Annual Conference on Magnetism and Magnetic Materials (MMM), Nov. 6-9, 1995, Philadelphia, Pennsylvania (w/ I. Miotkowski and B. C. Crooker).


7. "Magnetic and Magnetoresistance Measurements on Iron-Based Nano-Clusters in n-In$_{0.53}$Ga$_{0.47}$As or GaAs or GaAs", 41st Annual Conference on Magnetism and Magnetic Materials (MMM), Nov. 12-15, 1996, Atlanta, Georgia (w/ B. C. Crooker, S. Li, M. McElfresh, J. C. P. Chang, E. S. Harmon, M. R. Melloch, and J. M. Woodall).


15. “Research on Ga$_1$-xMnxSe and Ga$_1$-xMnxS at the National High Magnetic Field Laboratory and UNF”, Tenth National Conference on Research Partnership for High School Teachers, Jan 14-15, 2000, Tucson, Arizona, (w/ S. Bruce Hughes).


33. “Magnetic and transport measurements on the layered III-VI Diluted Magnetic Semiconductor In$_{1-x}$Mn$_x$Se”, The 49th Annual Conference on Magnetism and Magnetic


38. “Ferromagnetism above the Gd Curie Temperature in Gd$_{100-x}$Fe$_x$, (x = 0 – 10) Nanostructures”, 10th Joint MMM/Intermag Conference, Jan. 7-11, 2007, Baltimore, Maryland (w/ D. Schmitter, J. Goertzen, G. Shelburne, J.E. Shield, P.M. Shand, D. Haskel, and D. Leslie-Pelecky).


44. “The singlet model calculations for the layered III-VI diluted magnetic semiconductor In$_1$xMnxSe (x = 0.01 and 0.10),” MMM November 11-14, 2008, (w/ D. Meda, J. Brewer, J. Blackburn, J. Garner, L. Miotkowski, and A.K. Ramdas).

SERVED AS GRANT PROPOSAL REFEREE

- NSF CMP CAREER review panel (1 time)
- NSF NIRT review panel (1 time)
- NSF MRI/IMR review panel (2 times)
- NSF Solid-State Chemistry—DMR (1 time)
- NSF Condensed Matter Physics—DMR (1+3 times)
- Science Center programs of the U.S. Department of State—STCU (1 time)
- Research Corporation (4 times)
- American Chemical Society Petroleum Research Fund (2 times)

SERVED AS PEER-REVIEWED JOURNAL REFEREE

- Journal of Applied Physics
- Science
- Electrochemical and Solid-State Letters

COURSES TAUGH

- Introduction to Physics (for non-science majors)
- Algebra-based Physics I
- Algebra-based Physics II
- Calculus-based Physics I
- Calculus-based Physics II
- Algebra-based Physics I Laboratory
- Calculus-based Physics I Laboratory
- Optics (Jr./Sr. undergraduate level)
- Electricity and magnetism (Jr./Sr. undergraduate level)
- Solid State Physics (Jr./Sr. undergraduate level)
- Advanced Physics Laboratory (Jr./Sr. undergraduate level)
- Independent Study in Physics
HONORS

- UNF “Distinguished Professor 2011” (Spring 2011).
- UNF “Terry Presidential Professor” (Spring 2010).
- UNF “Distinguished Professor Runner Up 2010” (Spring 2010).
- Award “For 10 years of consecutive sponsored programs funding” (Feb. 27, 2008).
- Provost Special Task Force (2007-2008)
- “Outstanding Undergraduate Teaching Award” (2007).
- UNF John A. Delaney Presidential Professorship runner-up (Spring 2005).
- Full-pay, one-semester sabbatical Fall 2005 (only 3 awarded at UNF per year).
- Named office “Given in appreciation of UNF Faculty”—provided by $1,500 gift to UNF from the family of a former student (2005).
- “Outstanding Faculty Scholarship Award” (2004-2005).
- Nominated for the UNF “2004-2005 Outstanding Undergraduate Teaching Award”.
- Nominated for the UNF “2003-2004 Outstanding Faculty Scholarship Award”.
- “The Akeley-Mandler Award for Graduate Student Teaching Excellence”, Purdue Univ. (1995)
- Purdue Research Foundation Research Assistantship, Purdue Univ. (1994-1995)
- Scholars Stipend—undergraduate, Univ. of Wyoming (1987-1991)
- 1st Place Team, 12th Place Individual: CSU Physics Bowl (1987)
- President of the University of Wyoming’s Society of Physics Students, (1990-1991)
- Eagle Scout

HONORS—mentoring students

Lydia Ranger — Undergraduate Travel Scholarship to MMM conference Nov. 2005
Melissa Duffy — 1st Astronaut Mike Collins Space Exploration Leadership Scholar
Alex Graf — one of UNF’s Berry M. Goldwater Scholarship Nominees
MEMBERSHIPS
(APS) American Physical Society

REFERENCES

Prof. J. Garner  Department Chair
Department of Chemistry & Physics
University of North Florida
1 UNF Dr.
Jacksonville, FL 32224

Telephone: (904) 620-1947
Fax: (904) 620-1989
e-mail: jgarner@unf.edu

Prof. Ben C. Crooker  Major Professor
Department of Physics
Fordham University
441 East Fordham Road
Bronx, NY 10458-9993

Telephone: (718) 817-4191
Fax: (718) 817-4167
e-mail: crooker@fordham.edu

Prof. Paul M. Shand  Collaborator
205 Physics Building
University of Northern Iowa
Cedar Falls, IA 50614-0150

Telephone: (319) 273-2930
Fax: (319) 273-7136
e-mail: Paul.Shand@uni.edu
Curriculum Vitae

Lev GASPAROV, Ph.D. (Solid State Physics)

Department of Physics
University of North Florida
1 UNF Drive
Jacksonville, FL 32224

Phone: (904) 620-1933
Fax: (904) 620-1989
E-mail: lgasprov@unf.edu

EDUCATION:

Moscow Institute of Steel and Alloys, Moscow, USSR (1982-1988)

Dissertation: Phonon Raman Scattering in high-temperature superconductors
Major Professor: Dr. Vladimir V. Kulakovskii

APPOINTMENTS:

*Associate Professor (2006-present), Department of Physics, University of North Florida, Jacksonville, Florida
Assistant Professor (2000-2006), Department of Chemistry and Physics, University of North Florida, Jacksonville, Florida
Visiting Assistant Professor (1999-2000), Department of Chemistry and Physics, University of North Florida, Jacksonville, Florida
Postdoctoral Research Associate (1997-1999) Department of Physics, University of Florida Gainesville, Florida
Alexander von Humboldt Fellow (1996-1997), II. Physikalisches Institut RWTH-Aachen, Germany
Visiting Scientist (1995-1996), II. Physikalisches Institut RWTH-Aachen, Germany
Junior Researcher (1992-1995), Institute for Solid State Physics, Chernogolovka, Russia

HONORS AND AWARDS:

2010 Recipient of the UNF Outstanding Faculty Scholarship Award
2010 Nominated for the UNF Outstanding Undergraduate Teaching Award
2009 Nominated for the UNF Outstanding Undergraduate Teaching Award
2009 Nominated for the UNF Outstanding Faculty Scholarship Award
2004 First place at the First Annual UNF Research Day Poster Competition.
1996-1997 Alexander Von Humboldt Fellowship. The Alexander von Humboldt Foundation is a non-profit foundation established in 1953 by the Federal Republic of Germany for the promotion of international research cooperation. It enables highly qualified scholars outside of
Germany to spend extended periods of research in Germany and promotes the ensuing academic contacts.

**FUNDING:**

1. UNF Proposal Development award. **$7500 (2010)**
2. National Science Foundation grant DMR-0958349 "MRI-R2: Acquisition of the Optical Cryostat for Research and Teaching" budget **$104,047. (2010-2011)**
3. COAS Dean's Leadership Council Award, **$4000 (2008-2009)**
5. Advancing Chemical Sensor Science and Technology, ONR (NAVY), co-PI with Dr. Huebner, budget **$859,060. (2006-2007)**
7. **Research Corporation Cottrell College Science Award # CC 6130:** Raman and infrared studies of the layered transition metal chalcogenides. **$40,384** for a three-year study (May 2004-May 2009).
8. **UNF Summer Research Scholarship:** Optical studies of order - disorder transition in magnetite and NbSe$_2$. **$5,000** for summer 2003.
9. **UNF Proposal Development grant.** Development of the proposal for National Science Foundation Research Instrumentation programs (Major research Instrumentation, Instrumentation for Materials Research). **$5,000** for summer 2002.
10. **UNF Summer Research Scholarship.** Optical studies of the transition metal chalcogenides. **$5,000** for summer 2001.
11. **Research Corporation Cottrell College Science Award # CC 5290:** Raman and infrared studies of the layered transition metal chalcogenides. **$39,000** for a three-year study (May 2001-May 2004).

**ORGANIZATIONAL MEMBERSHIPS: AMERICAN PHYSICAL SOCIETY**

**COLLABORATORS AND CO-EDITORS:** H. Berger (EPFL), L. Forro (EPFL), J. Garner (UNF), G. Güntherodt (RWTH-Aachen), R.J. Hemley (Geophysical Laboratory), T. Pekarek (UNF); C. Petersen (Trinity College, Dublin), V.V. Struzhkin (Geophysical Laboratory), D.B. Tanner (UF)

**GRADUATE AND POSTDOCTORAL ADVISORS:**
D.B. Tanner, University of Florida, Gainesville, Fl (Post-doc);
G. Güntherodt, II. Physicalisches Institut-RWTH Aachen, Germany (Post-doc);
V. Kulakovskii, ISSP-Chernogolovka, Russia (Ph.D. advisor)
Teaching EXPERIENCE:

Solid State Physics  (mixed majors), UNF, (1999 – present)
Optics (mixed majors), UNF, (1999 – present)
Physics Research and Seminar (physics majors), UNF, (2002 – present)
Direct Independent Study  (mixed majors), UNF, (2007-present)
(Raman Spectroscopy)
Calculus Physics I  (mixed majors), UNF, (2004 – present)
Calculus Physics II  (mixed majors), UNF, (2000 – present)
Calculus Physics I lab  (mixed majors), UNF, (2004 – present)
Calculus Physics II lab  (mixed majors), UNF, (1999 – present)
Algebra Physics II  (non- majors), UNF, (1999 – present)
Algebra Physics II lab  (non- majors), UNF, (1999 – present)
Algebra Physics I lab  (non- majors), UNF, (1999 – present)
Introductory Physics  (non- majors), UNF, (2001 – present)

Transformational Learning Opportunity: Raman spectroscopy at UNF and abroad:
Summer 2010 at UNF and in Germany

UNDERGRADUATE Research Students (IN CHRONOLOGICAL ORDER CURRENT STUDENTS FIRST):

1. Theo Jegorel ( Exchange student, University of Technology of Troyes)
2. Chris Knab, currently UNF Physics
3. Zhanna Shirshikova: currently UNF Physics *(see the picture below)*
4. Billy Olsen: currently UNF Physics
5. James Jaap-currently in the Physics Graduate program of the Florida State University
6. Andrew Rush: former UNF Physics, currently Law School in the Stetson University *(see the picture below)*
7. James Tracy: former UNF physics, graduated Physics graduate program at the Auburn University
9. Tristan Hyams: currently UNF Computer Science
10. Aaron Lewis: high school student (senior)
11. Young Ge: currently Business School in Harvard
12. Ed Randtke: currently at the Department of Chemistry, Florida State University
13. Daniel Arenas: former UNF Physics; Ph.D from the University of Florida, currently visiting lecturer at UNF.
15. Korkut G. Brown: former UNF engineering; graduated masters program in mechanical engineering at the University of South California.
UNIVERSITY AND COLLEGE SERVICE:

Member of the Office of Sponsored Research Program (ORSP) review committee (2008-2009)
Member of the General Education Assessment Task Force (2008-2009)
Member of the Department of Chemistry and Physics Bylaw committee (2007-2010)
Chair of the Chemistry-Physics Track organization committee (2008)
Chair of the Chemistry and Physics Search committee (2005)
Member on Chemistry and Physics search committees (2002-2010)
Member of the Natural Sciences Curriculum committee (2002-2003)
Member of the College of Arts and Sciences Budget Committee (2002-2003)
Member of the University Support Services committee (2004 –2005)
Member of the University Food Service committee (2004-2005)
Natural Sciences Representative on UNF General Education council (2004-2005)
Member of the Presidential Professorship Selection committee (2005)
Member of the UNF Flagship Program Selection committee (2005, 2006, 2007)

Professional Service:

- Proposal reviewer for the National Science Foundation. Participated in two NSF onsite panel reviews in May 2011 (Major Research Instrumentation Award panel) and in October 2009 (CAREERE award panel). Over 30 NSF proposals have been reviewed.
- Proposal reviewer for the National Fund for Scientific and Technological Development (FONDECYT) of the Chilean Government Commission for Scientific and Technological Development (CONICYT)
- Proposal reviewer for the Research Corporation for Science Advancement.
- Served as a session chair on the “HTS: Optical and Raman” session during March 2002 meeting of the American Physical Society, March 18-22, Indianapolis, IN.
- Served as a session chair on the “Superconductivity” session during 49th Annual Conference on Magnetism and Magnetic Materials, November 7-11, 2004, Jacksonville, Fl
- Served on Advisory committee for the 24th International Conference on the Low Temperature Physics, August 10-17, 2005, Orlando Fl,
Published Peer reviewed Papers


SUPERVISED STUDENT PAPERS (NON PEER- REVIEWED):


CONFERENCE TALKS:


4. Raman studies of doped magnetite above and below the Verwey transition, L. Gasparov, A. Rush, T. Pekarek, N. Patel, H. Berger, (talk was given by Andrew Rush). 53$^{d}$ Annual Conference on Magnetism and Magnetic Materials, Austin, TX, November 10-14, 2008.


18. “Electronic Raman scattering in Tl₂Ba₂CuO₆₋d: Symmetry of the order parameter, oxygen doping effects, and normal-state scattering.” L.V. Gasparov, P. Lemmens, N.N.

19. “Phonon modes in high-\(T_c\) superconductors.” **L.V. Gasparov.** Physique en Herbe 94, European Conference for PhD students in Physical Science, July 4-8\(^{th}\) 1994, Montpellier, France.

**INVITED SEMINARS**

1. “Magnetite: Raman study of the high-pressure and low-temperature effects.”
   Department of Physics, University of Central Florida, Orlando, Fl. November 10, 2004.


6. “Infrared studies of 1T-TaS\(_2\).” II Physikalisches Institut RWTH-Germany, June 10, 2002, Aachen, Germany.

7. “Anharmonicity of the Bridge Oxygen Vibrations in YBa\(_2\)Cu\(_3\)O\(_{7-x}\) crystals.” II Physikalisches Institut RWTH, September 12, 1994, Aachen, Germany.
JANE HELENA MACGIBBON
Curriculum Vitae

Nationality: Australian

Degrees:
- Ph.D. (Theoretical Astrophysics) University of Cambridge, presented Jan 28, 1989, started 1983
- B.Sc. (1st class honours, Math & Phys), University of Queensland 1979-1982

Awards and Honours:
- British Commonwealth Scholarship to University of Cambridge (Institute of Astronomy) 1983-1986
- University Medal (Physics), University of Queensland 1983
- Duncan McNaughton Scholarship (top Faculty of Science graduate), University of Queensland 1982
- Australian National University Vacation Scholarship (Astronomy), Mt. Stromlo-Siding Spring Observatory 1981-1982
- Stevenson Memorial Prize (Pure Math), University of Queensland 1981
- Hulbert Memorial Prize (Pure Math), University of Queensland 1980

Positions:
- Assistant Professor in Astrophysics, University of North Florida 2004 - present
- Assistant Professor in Physics and Astronomy, Baker University KS 2002 - 2003
- JSC-ISSO Post-Doctoral Aerospace Fellow, NASA Johnson Space Center and Research Post-Doctoral Fellow, Dept of Physics, University of Houston TX 1998-2001
- NAS/NRC Senior Research Associateship at NASA Johnson Space Center, Houston TX 1995-1998 (advisor Dr. Gautam Badhwar)
- NAS/NRC Research Associateship Post-Doctoral at NASA Goddard Space Flight Center, Greenbelt MD 1989-1992 (advisor Dr. Floyd Stecker)

Additional Information:
- Visitor at University of Wales, Bangor 2002 (invited by Prof. Sam Braunstein)
Visitor at University of London, Queen Mary and Westfield Colleges 2001 (invited by Prof. Bernard Carr)
Visitor at Laboratory of Neurosciences, National Institute on Aging, National Institutes of Health, Bethesda MD 1994-1995 (invited by Dr. Stanley Rapaport)
Visitor at Harvard-Smithsonian Center for Astrophysics 1988-1989 (invited by Prof. Bill Press)
Visitor at Fermilab National Accelerator Laboratory 1984, 1986 (invited by Prof. E. Kolb)

Research Topics to Date:
- 2011 - 1996 Hawking Evaporation from Primordial Black Holes, with Bernard Carr (QMWC, University of London) and Don Page (University of Alberta)
- 2011 – 2008 Primordial Black Hole Bursts with GWU/NASA-GSFC
- 2011 – 2008 Exoplanets with Ian Stevens (University of Birmingham)
- 2011 – 2002 Quantum Entanglement in Curved Space Time, with Sam Braunstein (University of York)
- 2011 – 2002 Black Hole Entropy
- 2011 – 1995 Astronaut Risk from Galactic, Solar and Trapped Particle Radiation, NASA/JSC, with Gautam Badhwar (NASA/JSC) and Hooshang Nikjoo (Karolinska Institute)
- 2011 – 2001 Tau Neutrinos from Astrophysical and Cosmological Sources, with Ubi Wichoski (CENTRA-IST Portugal)
- 2001 Nuclear Cross-Section Data Analysis with Cary Zeitlin (LBL, NASA/JSC)
- 2001 – 1998 FLUKA Simulation Development for UHE Detector and Shielding Application, with Tom Wilson and Gautam Badhwar (NASA/JSC) and Lawrence Pinsky (University of Houston)
- 2001 – 1997 Cosmic Rays from Cosmic String Loops, with Robert Brandenberger and Ubi Wichoski (Brown University)
- 1998 – 1996 Black Holes from Cosmic String Loops, with Robert Brandenberger and Ubi Wichoski (Brown University)
- 1995 – 1994 MRI, PET observations of Glucose Metabolism, Atrophy etc in Alzheimer Disease, NIH, with John Van Meter (National Institute on Aging/National Institutes of Health)
- 1992 – 1991 Gamma Ray, Neutrino and Cosmic Ray Production from Annihilations of Supersymmetric Particles, NASA/GSFC, with Marc Kamionkowski (Princeton), Floyd Stecker (NASA/GSFC) and Bryan Webber (University of Cambridge)
- 1991 – 1990 Particle Production from Textures, NASA/GSFC, with Robert Brandenberger (Brown University) and Floyd Stecker (NASA/GSFC)
• 1991 – 1990 Gamma Rays Bursts from Primordial Black Holes, NASA/GSFC, with Francis Halzen (Wisconsin), Enrique Zas and Trevor Weekes
• 1991 – 1989 Black Holes from Cosmic Strings, NASA/GSFC, with Robert Brandenberger (Brown University)
• 1991 – 1988 Cosmic String Cusp Annihilation and Cosmic Rays from Strings, NASA/GSFC, with Robert Brandenberger (Brown University)
• 1991 – 1983 Cosmic Particle Evaporation from Primordial Black Holes, University of Cambridge, Fermilab, Harvard, NASA/GSFC
• 1991 – 1983 Cosmic Particle Evaporation from Primordial Black Holes, University of Cambridge, Fermilab, Harvard, NASA/GSFC
• 1989 – 1988 Cosmic Annihilations of Supersymmetric Particles, Harvard-Smithsonian Center for Astrophysics, with Katie Freese (MIT)
• 1987 Thermal Fluctuations in Chaotic Inflation, with Robert Brandenberger and Hume Feldman
• 1987 – 1986 Planck Mass Black Holes
• 1987 – 1983 Ph.D. Thesis: Evaporating Primordial Black Holes (see page 5), University of Cambridge, supervisor Bernard Carr (cosmologist, QMC University of London/University of Cambridge) with Bryan Webber (particle physics phenomenologist, University of Cambridge)
• 1984 Monte Carlo Lattice Gauge Theory, with Nathan Mhyrvold (University of Cambridge)
• 1983 Wigner Operators in SU(3), with Prof.A.J. Bracken (University of Queensland)
• 1982 Radio Transmission and Reflection by the Ionosphere, with Prof.J.D. Whitehead (University of Queensland)
• 1982 – 1981 Smoothed Point Hydrodynamics, with Bob Gingold and Colin Coleman (MSSSO, Australian National University)

Publications:

Citations in Published Articles to Above Publications: At least 582 citations in refereed journal articles to above articles authored by J.H. MacGibbon, as of June 2010 (not including citations in or of preprints and conference proceedings). Citation list details available upon request.

As of 6/1/2010: 582

Conference Proceedings:
• MacGibbon J.H., Carr, B.J. and Page, D.N. “Can a Chromosphere be Formed in Black Hole Decays” Hengstberger Symposium on Extra Dimensions and Mini Black Holes (Heidelberg Germany July 24 - 25 2009)
- Thomas, R., Barbin, V., Gille, P., Léveillé, R., MacGibbon, J.H., Miko, L. Ramboz, C., and Westall, F. “Cathodoluminescence for Planetary Probes” 5th Canadian Space Exploration Workshop (Saint-Hubert, Québec May 12-13, 2005)
• Pinsky, L.S., MacGibbon, J.H. & Wilson, T.L. “A Monte Carlo Simulation of Space Radiation” Joint Texas Fall Meeting of APS, AAPT, SPS and NHS (Houston USA October 2000) abstract B5.011

Preprints:
• Pinsky, L., MacGibbon, J.H., Badhwar, G. and Wilson, T. “Development of a Space Radiation Monte-Carlo Computer Simulation Based upon the Fluka Code”
In Preparation:

- MacGibbon, J.H., Carr, B.J. and Page, D.N. “Limits on the Distribution of Primordial Black Holes"
- MacGibbon, J.H. “The Electron Production Cross-Section from Light and Heavy Ion Impact”
- MacGibbon, J.H. “Quark and Gluon Jet Emission from Evaporating Black Holes: The Emission from a Distribution of Primordial Black Holes”

Teaching Experience:

- 2011 Lecturer Course AST3712 Stellar Astrophysics for level 3 students, Dept of Physics, University of North Florida
- 2011 - 2010 Lecturer & Lab Lecturer Courses ESC2000 Earth Science and ESC2000L Earth Science Lab for Gen Ed students, Dept of Physics, University of North Florida
- 2011 - 2009 Lecturer Course AST2002 Basic Astronomy for Gen Ed students, Dept of Physics, University of North Florida
- 2010 - 2004 Lecturer & Lab Lecturer Course ESC2000C Earth Science for Gen Ed students, Dept of Physics, University of North Florida
- 2008, 2006 Lecturer Course PHY4930 Astrophysics for level 3 students, Dept of Physics, University of North Florida
- 2009, 2006, 2005 Lecturer Course PHY3220 Classical Mechanics for level 3 students, Dept of Chemistry & Physics, University of North Florida
- 2008, 2007, 2005 Lecturer Course PHY2049 Electromagnetism for level 2 students, Dept of Chemistry & Physics, University of North Florida
- 2003 Lecturer Course 340 Astrophysics for level 3 students, Dept of Physics, Baker University
- 2003 Lecturer Course 226 Electromagnetism for level 2 students, Dept of Physics, Baker University
- 2003 Lecturer Course 141 The Solar System for Gen Ed students, Dept of Physics, Baker University
- 2003 Lecturer Course 126 Electromagnetism for level 1 students, Dept of Physics, Baker University
- 2002 Lecturer Course 325 Optics and Quantum Physics for level 3 students, Dept of Physics, Baker University
- 2002 Lecturer Course 225 General Physics for level 2 students, Dept of Physics, Baker University
• 2002 Lecturer Course 140 Astronomy for Gen Ed students, Dept of Physics, Baker University
• 2002 Lecturer Course 125 Introductory Physics for level 1 students, Dept of Physics, Baker University
• 1999 Lecturer Course 1302 Electromagnetism for first year students, Dept of Physics, University of Houston
• 1999 Lecturer Course 2313 Electromagnetism for third year engineering students, Dept of Physics, University of Houston
• 1984 Part 1 Pure Math Supervisor, University of Cambridge
• 1983 Pure Math for Engineering Year 1 Tutor, University of Queensland

Journal Refereeing:

Referees:
• Prof. Bernard Carr, School of Math Sciences, Queen Mary, University of London, Mile End Road London E1 4NS England
  Ph. (207) 882 5492 email: B.J.Carr@qmul.ac.uk FAX (208) 983 3522
• Prof. Sam Braunstein, Computer Science, University of York, York YO10 5DD, UK
  Ph. (1904) 432722 email: schmuel@cs.york.ac.uk FAX (1904) 432767
• Prof. Robert Brandenberger, Dept of Physics, McGill University, 3600 rue University, Montréal, QC Canada H3A 2T8
  Ph. (514) 398 6512 email: rhb@physics.mcgill.ca FAX (514) 398 8434
• Dr. Floyd Stecker, Code 665, NASA Goddard Space Flight Center Greenbelt MD 20771 USA
  Ph. (301) 286 6057
• Prof. Robert Fraga, Chair, Depts of Math, Physics and Computer Science, Baker University P.O. Box 65, Baldwin KS 66006 USA
  Ph. (785) 594 8379
• Dr. Gautam Badhwar (deceased Aug 2001), Code SN3, NASA Johnson Space Center Houston TX 77058 USA
  Ph. (281) 483 5065
  FAX (281) 483 5276
• Warren Minami, Director, BCS, International Monetary Fund, 700 19th St. N.W., Washington D.C. 20341 USA
  Ph. (202) 623 7500

Address for Correspondence:
• Jane H. MacGibbon, Dept of Physics, University of North Florida, 1 UNF Drive, Jacksonville Florida 32224
  jmacgibb@unf.edu Ph. (904) 620 1923
• Jane H. MacGibbon, 312 Yacht Club Lane, Seabrook Texas 77586 USA
  janemacgibbon1@netscape.net macgibbonj@aol.com Ph. (281) 532 1319
• Jane H. MacGibbon, 37 Neulans Rd., Indooroopilly, Brisbane Qld 4068 Australia Ph. (07) 3371 7221
Summary of Ph.D. Thesis

Quark and Gluon Evaporation from Primordial Black Holes

The Ph.D. thesis investigates the Hawking evaporation of quark and gluon jets by primordial black holes (PBHs), the cosmological consequences of the emission and its interactions. The emission is simulated by convolving the Hawking emission formulae with the Monte Carlo QCD jet code written by B.R. Webber (University of Cambridge) to describe e+e- annihilation accelerator events. After considering the interactions of the PBH emission with other particles in the Universe, the final state spectra are compared with the observed proton, anti-proton, e+e-, gamma-ray and neutrino backgrounds. Because of the huge increase in degrees of freedom and final decay states when quarks and gluons are emitted, and the low average energy of the final states, the spectra differ substantially from the work of previous authors which did not include jet emission and its decays. If black holes form from initial density perturbations in the early Universe, their evaporation may explain or contribute significantly to the observed extragalactic gamma-ray and interstellar anti-proton, positron and electron backgrounds between 0.1-1 GeV, provided the PBHs cluster to the same degree as other matter in the Galactic halo. PBH emission is unlikely to produce the observed e+e- annihilation line from the center of the Galaxy, or its diffuse component. The final explosive burst from an individual hole is extremely unlikely to be observed in the standard model, unless a Hagedorn-type exponential growth in particles states occurs as the PBH temperature approaches 100-300 MeV. The emission may explain the 6-10 MeV gamma-ray shoulder in a less natural scenario. As first pointed out in the thesis, PBHs are also candidates for the ‘missing matter’ in the Universe if they evaporate down to (quasi-)stable Planck mass objects: for holes forming from initial density perturbations in the standard radiation-dominated early Universe, the constraint on the density of black holes required to explain the cosmic ray observations implies a density in Planck mass remnants today of Omega~0.1-1.

TEACHING PROFILE

Teaching Experience:

- 2010 - 2009 Lecturer Course AST2002 Basic Astronomy for Gen Ed students, Dept of Physics, University of North Florida
- 2008, 2006 Lecturer Course PHY4930 Astrophysics for level 3 students, Dept of Physics, University of North Florida
- 2010 - 2004 Lecturer & Lab Lecturer Course ESC2000C Earth Science for Gen Ed students, Dept of Physics, University of North Florida
- 2009, 2006, 2005 Lecturer Course PHY3220 Classical Mechanics for level 3 students, Dept of Chemistry & Physics, University of North Florida
- 2008, 2007, 2005 Lecturer Course PHY2049 Electromagnetism for level 2 students, Dept of Chemistry & Physics, University of North Florida
- 2003 Lecturer Course 340 Astrophysics for level 3 students, Dept of Physics, Baker University
• 2003 Lecturer Course 226 Electromagnetism for level 2 students, Dept of Physics, Baker University
• 2003 Lecturer Course 141 The Solar System for Gen Ed students, Dept of Physics, Baker University
• 2003 Lecturer Course 126 Electromagnetism for level 1 students, Dept of Physics, Baker University
• 2002 Lecturer Course 325 Optics and Quantum Physics for level 3 students, Dept of Physics, Baker University
• 2002 Lecturer Course 225 General Physics for level 2 students, Dept of Physics, Baker University
• 2002 Lecturer Course 140 Astronomy for Gen Ed students, Dept of Physics, Baker University
• 2002 Lecturer Course 125 Introductory Physics for level 1 students, Dept of Physics, Baker University
• 1999 Lecturer Course 1302 Electromagnetism for first year students, Dept of Physics, University of Houston
• 1999 Lecturer Course 2313 Electromagnetism for third year engineering students, Dept of Physics, University of Houston
• 1984 Part 1 Pure Math Supervisor, University of Cambridge
• 1983 Pure Math for Engineering Year 1 Tutor, University of Queensland

Lecturing Courses in 2004 – 2010 at University of North Florida involves preparing and delivering all course material, setting all exams, pop quizzes and weekly problem sets and running regular office ‘clinics’ for students to individually discuss problems with me. I also set up and maintain web-based Blackboards site for each course.

Lecturing Courses in 2002 and 2003 at Baker University involved preparing and delivering all course material, setting all exams, pop quizzes and weekly problem sets and running regular office ‘clinics’ for students to individually discuss problems with me.

Courses 140 and 141 presented astronomy and solar system physics to non-physics students. Courses 125 and 126 presented introductory algebra-based general physics to students mainly pursuing science-related or pre-med degrees. Courses 225, 226 and 325 presented calculus-based physics to students pursuing science-related, engineering or pre-med degrees. Course 340 presented astrophysics as a higher-level undergraduate course for physics or related majors.

Lecturing Courses 1302 and 2313 in 1999 at University of Houston similarly involved preparing and delivering all course material, setting all exams, pop quizzes and weekly problem sets and running a regular office and email ‘clinic’ for students to individually discuss problems with me.

My official rating as lecturer for Courses 1302 and 2313, as rated by the student body, was above the faculty average (documentation provided on request).
Course 1302 covered electromagnetism, optics and atomic physics and was taught using high school algebra. The students in Course 1302 were mainly first year students pursuing degrees in other majors, such as pre-medicine, biology, architecture, chemistry, government. They represented a wide range of abilities in math and physics and nationalities - University of Houston is a predominantly minority campus which also recruits students from outside the U.S., particularly Asia and Central and South America.

Course 2313 covered electromagnetism for engineering and computer science majors and was taught at a higher level using calculus.

Teaching Philosophy:
I strongly believe in concentration on the understanding of concepts and developing of critical thinking, rather than rote learning of formulae and facts.

This is particularly important for students of other disciplines who learn skills in conceptual thinking in physics and maths which they can apply immediately to other subjects. These skills also prepare them to be able to understand future scientific and technological developments which will occur during their lifetimes.

In the case of students specializing in physics and maths and higher degree students, this approach should better hone their professional skills and give them greater flexibility for what for many will inevitably be later career changes.

Outreach:
I have also participated in Outreach by successfully lecturing publicly and being available to answer queries from interested members of the community. I believe public outreach should be a significant duty of any research or teaching department. Such outreach included lecturing to explain advances in scientific thinking to the lay public of all ages, who underwrite most of the research, and to specialized amateur or interest groups such as local astronomical or engineering societies.

Another important component is outreach to high school students both to inform them of scientific developments and to provide information and greater options for making career or study decisions.

STATEMENT OF RESEARCH INTERESTS 2010

Quantum Entanglement
- ongoing research with Prof Sam Braunstein (University of York) on the transportation of quantum states and information

Do Photospheres / Chromospheres form around Black Holes?
- the major issue concerning the possible observability of Hawking radiation from astrophysical primordial black holes and from higher dimensional accelerator black holes
• the MacGibbon-Carr-Webber approach to black hole emission above 100 MeV applies standard QCD jet physics; in the Heckler black hole scenario, QED and QCD photospheres form above 100 MeV leading to significant change in the final state particle spectra and detectability; other scenarios also exist for black hole photosphere production; analytic work is needed to establish which approach is correct
• primary collaborators/advisors – Bernard Carr (QMC, University of London), Don Page (University of Alberta), Bryan Webber (University of Cambridge)

Primordial Black Hole Burst Spectra for FERMI
• modeling of spectra as would be seen by the FERMI Gamma-Ray Space Telescope detectors due to the final burst from an expiring primordial black hole
• methods - analytical; numerical modeling using eg HERWIG
• primary collaborators/advisors Tilan N. Ukwatta (NASA GSFC/George Washington University), Kalvir S. Dhuga (GWU), W. C. Parke (GWU), D. C. Morris (NASA GSFC/GWU), A. Eskandarian (GWU), N. Gehrels (NASA GSFC) and Bryan Webber (University of Cambridge)

Varying Fundamental Constants
• derivation of limits using the Generalized Second Law of Entropy

Bio-Radiation Modelling
• continuation of NASA-JSC work on astronaut risk from space radiation
• construction of extensive database of all available experimental data of double differential cross-section for production of delta electrons in light and heavy ion- heavy ion impact, primarily gaseous phase but also liquid and solid targets
• manipulation and parameterization of database
• apply to analytical and numerical modeling of ion track through astronaut tissue
• primary original collaborator/advisor Gautam Badhwar (NASA JSC) (deceased Aug 2001); current collaborator/advisor Hooshang Nikjoo (Karolinska Institute Sweden)

Exoplanets
• investigation of magnetic behaviour of stars with exoplanets with Ian Stevens (University of Birmingham)

Tau neutrinos from Astrophysical and Cosmological Sources
• high energy tau neutrinos from hadronic decays in sources were omitted in most work of previous authors, however they can contribute significantly to the neutrino spectra expected at Earth
• need to calculate correct tau neutrino spectra from AGNs, relic X decay, evaporating black holes etc
• need to distinguish tau neutrino production at the source from tau neutrinos created by mu neutrino oscillations in transit
• methods - analytical; numerical modeling using eg HERWIG62
• primary collaborators/advisors Ubi Wichowski (Laurentian University) and Bryan Webber (University of Cambridge)

Cosmic Rays, Photons and Neutrinos From Astrophysical and Cosmological Sources
• produce spectra for present, future and proposed particle telescopes
test particle physics, cosmology and Early Universe models
• 100 MeV to above the GZK energy and to the Planck energy
• implications of neutrino oscillations, improvements in Galactic and extragalactic particle propagation and cascade modeling, improvements in and alterations to cross-sections
• present areas of uncertainty - fragmentation function of particle decay, propagation and cascade, extragalactic magnetic fields, physics beyond the Standard Model
• effect of SUSY, Higgs and other Standard Model extensions to production, propagation and detection of spectra
• apply above to Top-Down astrophysical and cosmological particle sources eg relic X, cosmic strings, primordial black holes, AGNs
• Primordial Black Holes as sources - need to re-calculate observable Hawking emission in light of new information of particle physics and better modeling of particle propagation, look at different initial mass spectra to test conditions in the Early Universe, look at ultra high energy black hole emission, investigate implications for primordial nuclear synthesis etc
• ways to distinguish signal between various sources eg AGNs, TD sources including cosmic strings, relic X decay and annihilation, SUSY and black holes; ways to distinguish between standard, SUSY and other beyond-Standard Model physics; ways to distinguish signal out of backgrounds
• ways to improve limits on detection; null detections also give important limits on cosmological, Early Universe and particle physics models
• methods - analytical; numerical modeling using eg HERWIG62
• primary collaborators/advisors Robert Brandenberger, Ubi Wichoski, Bryan Webber, Bernard Carr

Referees:
• Prof. Bernard Carr, School of Math Sciences, Queen Mary, University of London, Mile End Road London E1 4NS England
  Ph. (207) 882 5492  FAX (208) 983 3522  email: B.J.Carr@qmul.ac.uk
• Prof. Robert Brandenberger, Dept of Physics, McGill University, 3600 rue University, Montréal, QC Canada H3A 2T8
  Ph. (514) 398 6512  FAX (514) 398 8434  email: rhb@physics.mcgill.ca

Teaching Referee:
• Prof. Robert Fraga, Chair, Depts of Math, Physics and Computer Science, Baker University P.O. Box 65, Baldwin KS 66006 USA  Ph. (785) 594 8379
  email: Robert.Fraga@bakeru.edu

Work Experience at INTERNATIONAL MONETARY FUND, Washington DC

• Rapid, research, design, prototyping, piloting, evaluation and documentation of new technology applications in dynamic, tight-knit engineering team
• Object-oriented analysis and development of information and workflow systems in client/server environment

Referee:
• Warren Minami, Director BCS, International Monetary Fund, 700 19th St., N.W., Washington DC 20341 USA Ph (202) 623 7500
**Employment**

*University of North Florida, Jacksonville, Florida (Aug. 2006–Present)*  
Assistant Professor of Physics  

*Virginia Tech, Blacksburg, Virginia (Jan. 2006–Aug. 2006)*  
Postdoctoral Research Associate: Spintronics, mesoscopic physics, molecular electronics  

Postdoctoral Research Associate: Spintronics, mesoscopic physics, molecular electronics

**Education**

*Ohio University, Athens, Ohio, 1996–2002*  
PhD in Physics (November 2000) GPA: 3.99  
Dissertation: “Study of Nitride films Grown by Sputtering”  
MS in Computer Science (August 2002) GPA: 4.0  
Thesis: “Monitoring Network Quality of Service in a Dynamic Real-Time System”

*University of Science and Technology of China (USTC), Hefei, Anhui, China, 1989-1996*  
MS in Physics (July 1996)  
BS in Physics (July 1993)

**Research Experience**

**Study of Organic Semiconductor Materials**
- Study of electronic transport properties of organic semiconductor materials  
- Fabrication of organic thin film devices on micro-electrodes  
- Characterization of organic thin films including electrical and magnetotransport properties  
- Development of automated instrument control and data acquisition using LabVIEW programs

**Study of Spintronics in Semiconductor Materials**
- Fabrication of mesoscopic structures on 2D electron systems (InSb, InAs and GaAs) and study of their electronic transportation properties, especially spin-dependent transportation properties  
- Study of spin-polarized reflection of electrons in a 2D electron system, which provides experimental evidence for a new method to achieve spin polarization in an electron system subject to strong spin-orbit coupling  
- Study of ballistic transportation and spin effects in InSb/AlInSb and InAs/AlGaSb antidot lattices  
- Hands-on experience in nanofabrication and magnetoresistance measurement, including optical and e-beam lithography, etching, metal evaporation, cryogenic system, lock-in amplifier, SEM and AFM imaging.  

**Study of Molecular and Organic Electronics**
- Fabrication and characterization of mesoscopic devices for the study of molecular and organic electronics  
- Study of current–voltage characteristics of DNA molecules, and gate tunable electron injection in submicron pentacene transistors
Synthesis and Characterization of Semiconductor and Other Thin Films
- Deposition of compound semiconductor thin films in a UHV magnetron sputtering system
- Band gap engineering using AlGaN alloy: achieved band gap ranging from 3.2~6.0 eV
- Study of rare-earth (Er) doped nitride films and their luminescence properties
- Characterization of semiconductor materials using XRD, optical measurement, IR spectrum, and RBS
- CVD growth and characterization of polycrystalline diamond thin films
- Growth and characterization of multi-layer magnetic metal films

Teaching Experience
Assistant Professor, University of North Florida, Jacksonville, Florida, 2006–present
- Taught lower and upper level physics lectures and labs
Teaching Assistant, Tutor, Ohio University, Athens, Ohio, 1996–2000
- Tutored a student with learning disability in physics and electrical engineering courses
- Taught undergraduate physical science labs, graded homework and held help sessions for physics courses
- Won Outstanding Teaching Assistant Award of the year
Co-Instructor and Teaching Assistant, USTC, Hefei, Anhui, China, 1993-1995
- Co-instructed undergraduate physical science class with Prof. Dasheng Jin: giving lectures, preparing and grading exams and homework
- Graded homework and held help sessions for undergraduate and graduate physics courses

University Governance Experience
College of Arts and Sciences Curriculum Committee, member, 2010-present
University Bookstore Advisory Council, member, 2011-13
Faculty Association Budget Advisory Committee, member, 2007-2011

Honors & Memberships
Member, American Physical Society (APS)
Student Member, Association for Computing Machinery (ACM), 2001
Condensed Matter and Surface Science (CMSS) Studentship, Ohio Univ., 1998
Student Member, Material Research Society (MRS), 1998
Outstanding Teaching Assistant, College of Arts and Sciences, Ohio Univ., 1997
Student Member, American Association of Physics Teachers (AAPT), 1997
GuangHua Education Foundation Fellowship, USTC, 1995 and 1992
Fellowship of the Science and Technology Industry Park of Shenzhen, USTC, 1993
The 2nd Zhang Zhonzh Science and Technology Fellowship, USTC, 1989

Publications & Presentations
In Preparation
1. “Electronic transport properties of tetraphenylcyclopentadienone”, Hong Chen et al.

Refereed Journal Publications

Conference Publications and Presentations

21. “Two-contact and four-contact magnetoresistance in InSb/Au hybrid structures”, E.A. Ward, Hong Chen, J.J. Heremans (presented at the APS meeting, March 2007)
27. “Localization and antilocalization in InSb and InAs antidot lattices”, J. A. Peters, Hong Chen, Yue Pan, Yafei Guan, J. J. Heremans, N. Goel, S. J. Chung, M. B. Santos, W. Van Roy and G. Borghs (poster, the 16th International Conference on Electronic Properties of Two-Dimensional Systems, July 2005)
32. “Experimental investigation of the influence of DNA structure on its the charge transport properties”, V. Soghomonian, B. Hartzell, Hong Chen, J.J. Heremans (presented at the APS meeting, March 2005)
40. “Gate tunable carrier injection in submicron pentacene transistors”, V. Soghomonian, J. Jo, J.J. Heremans, F. Bradbury, Hong Chen (presented at the APS meeting, March 2004)
44. “Factors influencing the measurement of DNA current-voltage characteristics”, V. Soghomonian, B. Hartzell, D. Asare, Hong Chen, B. McCord, J.J. Heremans (presented at the APS meeting, March 2003)
45. “Investigation of sputter deposition of nitride semiconductor films including rare earth dopants”, Hong Chen (presented at Physics Department, Montana State University, 8 July 2002)
49. “Specification and modeling of network resources in dynamic, distributed real-time system”, L. Tong, C. Bruggeman, B. Tjaden, Hong Chen, and L.R. Welch, 14th International Conference on Parallel and Distributed Computing Systems (Dallas, Texas, August 8-10, 2001)
CURRICULUM VITAE
John E. Anderson

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jeanders@unf.edu

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+1-904-620-3988 (work phone)
+1-904-620-1989 (work fax)

Education
Florida Junior College (now FSCJ) Jacksonville, FL A.A. 1976
University of Florida Gainesville, FL B.S. (with high honors) 1978, Physics
Harvard University Cambridge, MA Ph.D. 1985, Biophysics

Professional Experience
Senior Research Lecturer, Department of Physics, University of North Florida, 2005-
UNF Faculty Advisor, Jacksonville Joe Berg Seminars, 2003-
Director, Center for Science and the Public, University of North Florida, 2001-2011
Director, Science and Culture Initiative, University of North Florida, 2011-
Assistant Director, Northeast Florida Science, Technology, and Mathematics Center for Education, University of North Florida, 2001-2011
Faculty Member, Jacksonville Planning Committee, Yale National Initiative Teachers Institute 2005-2006
Lecturer in Physics, Department of Chemistry & Physics, University of North Florida, 1999-2005
Visiting Laboratory Lecturer in Physics, Department of Natural Sciences, University of North Florida, 1998-1999
Professor of Physical Science, Department of Natural Sciences, Florida Community College at Jacksonville, 1997-1998
Senior Research Associate, Department of Computer and Information Sciences, University of North Florida, 1996-1998
Adjunct Professor of Chemistry and Biology, Department of Natural Sciences, Florida Community College at Jacksonville, 1996-1997
Independent Scholar, Jacksonville, Florida, 1994-1996
Guest Senior Biophysicist, Brookhaven National Laboratory, 1992-1994
Senior Staff Investigator, Cold Spring Harbor Laboratory, 1986-1994
Postdoctoral Fellow, Harvard University, 1984-1986
Research Assistant, Harvard University, 1980-1984

**Teaching Experience**

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<tr>
<th>Course</th>
<th>Institution</th>
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<tr>
<td>Undergraduate Research Program</td>
<td>Cold Spring Harbor Laboratory</td>
<td>Summer 1987-1992</td>
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<tr>
<td>Summer Research Experience</td>
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<tr>
<td>BSC 1005</td>
<td>Florida Community College at Jacksonville</td>
<td>1996-1998</td>
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<td>Life in Its Biological Environment</td>
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<td>BSC 1005L</td>
<td>Florida Community College at Jacksonville</td>
<td>1997-1998</td>
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<td>Biology Laboratory</td>
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<td>CHM 1020</td>
<td>Florida Community College at Jacksonville</td>
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<td>Chemistry for Liberal Arts</td>
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<td>CHM 1025C</td>
<td>Florida Community College at Jacksonville</td>
<td>1996-97</td>
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<tr>
<td>Introduction to General Chemistry</td>
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<tr>
<td>CHM 2045C</td>
<td>Florida Community College at Jacksonville</td>
<td>1996-1997</td>
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<td>General Chemistry and Qualitative Analysis</td>
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<td>PHY 2048L</td>
<td>University of North Florida</td>
<td>1999-</td>
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<td>Calculus-based Physics I Laboratory</td>
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<td>PHY 2049L</td>
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<td>PHY 2053L</td>
<td>University of North Florida</td>
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<td>Algebra-based Physics I Laboratory</td>
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<td>PHY 2054L</td>
<td>University of North Florida</td>
<td>1998-</td>
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<td>PHY 1020C</td>
<td>University of North Florida</td>
<td>2000</td>
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<td>Introduction to Physics</td>
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<td>AST 2002</td>
<td>University of North Florida</td>
<td>2002-</td>
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<td>Basic Astronomy</td>
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<td>PHY2053</td>
<td>University of North Florida</td>
<td>2010-</td>
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</table>

**Research Interests**

- Theoretical neuroscience – structure and dynamics of semantic networks
- Science and religion – similarities and differences
- The nature of living systems and astrobiology
Publications


J. Anderson working title "Neurosemantic dynamics" in preparation.

J. Anderson working title "What is a living thing?" in preparation.

J. Anderson working title "Why religion won't go away" in preparation.
Nirmalkumar G. Patel’s Curriculum Vita

Education:
- B.S. (Physics), Sardar Patel University, Vallabh Vidyanagar, Gujarat, India (1972-1976)
- M.S. (Physics), Sardar Patel University (SPU), India (1976-1978)
- Ph. D. (Physics) Sardar Patel University, India (1978-1984)

Professional Employment:
- 2003-Present- Lab Lecturer, Department of Physics, University of North Florida (UNF), Jacksonville, Florida
- 2001-2003-Visiting Lab Lecturer, Department of Chemistry and Physics, UNF, Florida
- 1991-2001-Professor, Department of Electronics, Sardar Patel University, India
- 1988-199- Associate Professor, Department of Electronics/ Physics, SPU, India
- 1984-1988- Lecturer, Department of Physics, Sardar Patel University, India
- 1979-1984- Electron Microscope Operator, Department of Physics, SPU, India
- 1978-1979-Research Fellow, Department of Physics, Sardar Patel University, India

Visiting Scientist
- Worked with Prof. Karl Cammann, Director, Institute for Chemical and Biosensors (ICB), Munster, Germany (Sept.-Nov.1996, June-Aug. 2000 and Sept.-Nov. 1999)
- Worked with Dr. Ute Troppenz, Electroluminescence Laboratory, Heinrich Hertz Institute for Telecommunication, Berlin, Germany (Nov. 1996)
- Worked with Prof. A.G. Fischer, Optoelectronics Group, University of Dortmund, Dortmund, West Germany (1986-87)

Research Grants Received at University of North Florida, Jacksonville, FL
(i) Sensor Array for Multiple Applications (SAMA), Edgewood Chemical Biological Center (ECBC), US Army, US Department of Defense, $141,550.00 (2009-2011).
(ii) Nanocrystalline gas sensor arrays for detecting gases in stratosphere and mesosphere, NASA-Florida space Grant Consortium, $14,396.00 (2009-2010).
(iii) HASP2009 and Rocket-RockSat IV 2009, Florida Space Grant Consortium, $5,450.00 (2008-2009)
(v) HASP Student Payload: Ozone Sensor Technology Development and Atmospheric Experimentation, University of North Dakota/National Aeronautics and Space Administration, $4,990.00 (2007-2008)
(vi) Advancing Chemical Sensor Science and Technology, Office of Naval Research, Department of Defense, $300,000.00 (2005-2006)
(ix) Aquatic Real-time Monitoring Systems (ARMS) for Bioterrorism Events, Department of the Defense, University of South Florida, $24,969.60 (2002-2003)

Patents
(i) Quartz crystal microbalance with nanocrystalline oxide semiconductor thin films and method of detecting vapors and odors including alcoholic beverages, explosive materials and volatilized chemical compounds. U.S Patent No. 7,930,923 B2, Patent Granted on April 26, 2011
(iii) A biosensor for the detection of lactic acid, Indian patent No 196514. Patent Granted on June 24, 2005.

Selected Referred Publications on Sensors (from a total of ~40)
(2) Solid-State Sensors Behavior in Reduced Pressure Environments Demonstration Using an Experimental Indium Tim Oxide Ozone Gas Sensors for Ozone Sounding Nathan Ambler, Ronald Fevig and Nirmal Patel, Proceedings of 59th International Astronautical Congress, Glasgow, (Sept 29-Oct 3, 08), C2.I.17
(3) Odor Sensing with Indium Tin Oxide Thin Films on Quartz Crystal Microbalance Nirmal Patel, Jay Huebner, Jason Saredy and Brian Stadelmaier, Sensors & Transducers, 91 (2008)116-126. This paper was selected as the 10 best papers published during 2008.

Collaborators:
(1) Dr. Ronald Fevig, Department of Space Studies, University of North Dakota, Grand Forks, ND. Working on balloon and rocket atmospheric sampling and sensing. Worked on NASA’s, RockSat 2009 and HASP2008, 2009, 2010 and 2011 NASA balloon flights payload projects.
(2) Prof. Jay Huebner, Department of Physics, University of North Florida, Jacksonville, FL. Working on sensors arrays for multiple applications and ITO-QCM sensors
(3) Dr. Mike Lufaso, Department of Chemistry, University of North Florida, Jacksonville, FL. Working on the development and fabrication of gas sensors using new oxide materials.
(4) Dr. Hong Chen and Dr. Greg Wurz, Department of Physics, University of North Florida, Jacksonville, FL. Working on the development of nano sensors chips using lithography techniques.
Lynn Barringer (Barry) Albright III

**Address:**

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**Education:**

University of California, Riverside, 1997, Ph.D. Geology  
Louisiana State University, 1991, M.S. Geology  
Florida Institute of Technology, 1980, B.S. Oceanography  
Postdoctoral Fellowship, Florida Museum of Natural History, Dept. of Vertebrate Paleontology, University of Florida, 1997-1999

**Employment:**

*Faculty*, Dept. of Chemistry and Physics, University of North Florida, Jacksonville, FL, Current.  
*Adjunct Faculty*, Dept. of Science and Mathematics, Florida Community College at Jacksonville, Jacksonville, FL, 2004-2006.  
*Adjunct Faculty*, Dept. of Chemistry and Physics, University of North Florida, Jacksonville, FL, 2003-2006.  

**Additional Experience:**

*Geology Field Camp Instructor*, for Sonoma State University, CA, in conjunction with California State University, Fullerton. January, 1997.
Field Experience:

Paleontological field studies in Antarctica, Patagonia, Mexico, California, Oregon, Utah, Arizona, Montana, Texas, Kansas, South Carolina, Florida; 1973-present

Professional Affiliations:


The Geological Society of America

The Paleontological Society

National Audubon Society, Board Member of St. Johns County Chapter, Florida.

Research Associate, Dept. of Geology, Museum of Northern Arizona, Flagstaff

Research Associate, Dept. of Earth Sciences, Natural History Museum of Los Angeles County, CA

Research Associate, Dept. of Earth Sciences, San Bernardino County Museum, Redlands, CA

Grants and Awards:

GA4. National Park Service (Glen Canyon National Recreation Area) Research Grant, 2001-03.
GA16. University of California, Riverside, Outstanding Teaching Assistant Award, 1993-1994
GA17. Louisiana State University Museum of Geoscience Research Grant, 1989-1990

Publications:

Papers in press/review


Published papers


Book reviews

References:
Dr. Michael O. Woodburne
Professor, Emeritus
Dept. of Geological Sciences
University of California, Riverside
Currently: Honorary Curator of Paleontology
Museum of Northern Arizona
3101 N. Fort Valley Rd.
Flagstaff, AZ  86001
928-226-0345

Dr. Alan L. Titus
Grand Staircase-Escalante National Monument
Bureau of Land Management
190 East Center St.
Kanab, UT  84741
435-644-4332

Mr. Phillip L. Petersen
Interim Dean, Liberal Arts and Sciences
Florida Community College at Jacksonville, South Campus
11901 Beach Blvd.
Jacksonville, FL  32246
904-646-2096

Dr. Theodore J. Fremd
John Day Fossil Beds National Monument
HC 82, Box 126
Kimberly, OR  97848
541-987-2333, x-219