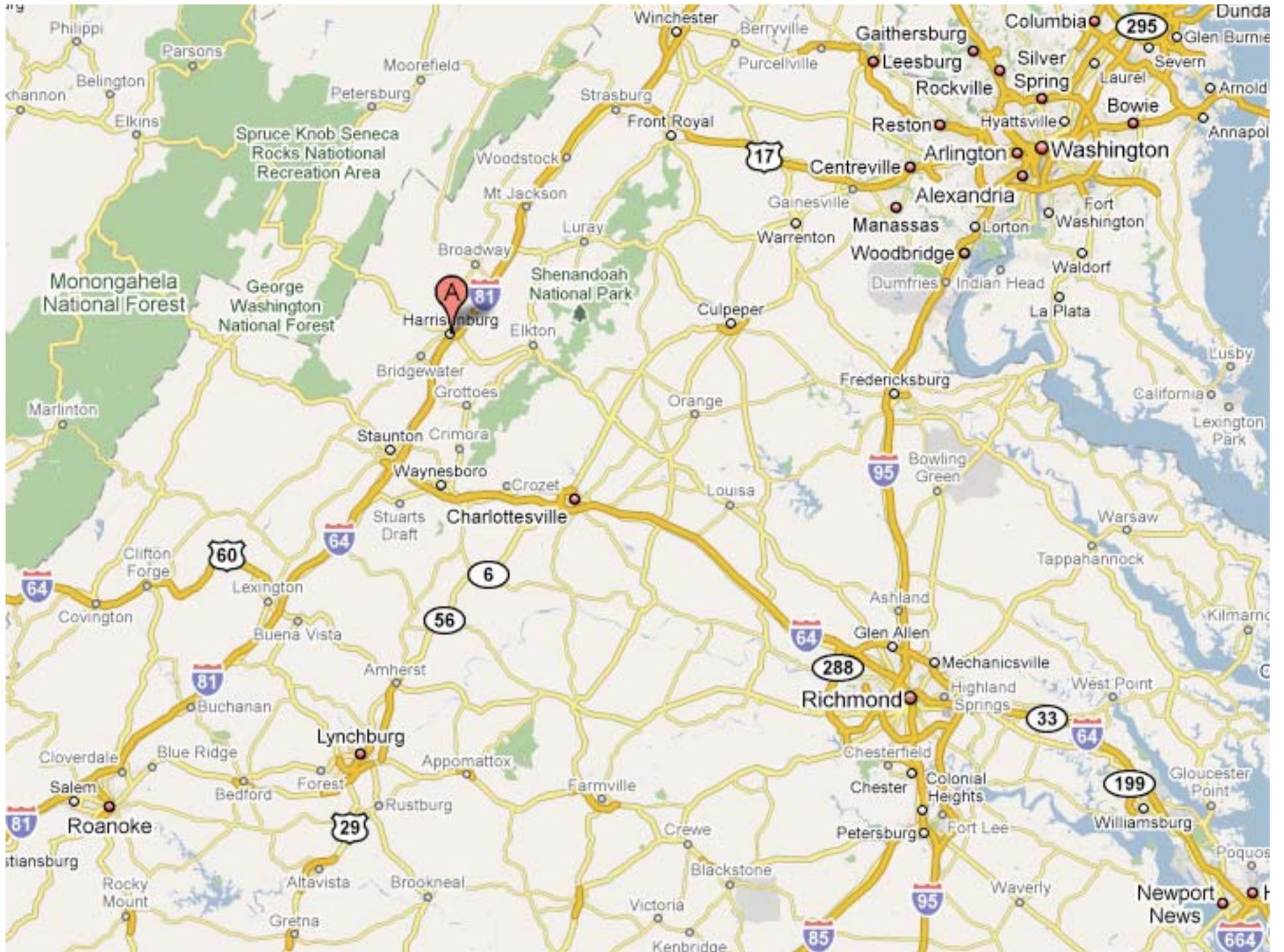


Physics and Astronomy James Madison University

**C. Steven Whisnant
Professor & Head**



University Thumbnail

- Degrees

- Undergraduate : 68
- Masters : 30
- Educational Specialist: 2
- Doctoral : 6
- **Total : 106**

- Students

- Undergrad Degree-Seeking: 16,619
- Graduate Degree-Seeking: 1,136
- Non-Degree-Seeking: 209
- Full-Time: 17,078
- Part-Time: 886
- In-State: 70.3%
- Out-of-State: 29.7%
- **Total on-campus enrollment : 17,964**

Student population ~ 60:40 Female:male

PHYSICS COMMUNITY 15

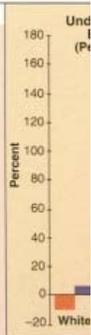
The End of Physics?

Your dream is to become a physicist, you might want to steer clear of James Madison University (JMU) in Harrisonburg, Virginia. Last month the school stunned students and faculty by announcing that it was eliminating its physics major as well as all the positions of its 10 tenured physics faculty.

The decision, part of a major budget-driven restructuring of the state-supported school, came as a shock to most on campus. "We had no idea it was coming. The extreme measure was a total surprise," says physics department head Kent Moore. Although the university has a faculty committee to advise it on restructuring, that committee wasn't consulted on the physics decision, according to Moore and other JMU faculty.

The department, which averages only seven physics majors a year, had been criticized as overstaffed in comparison with more popular departments like biology. But JMU professors are appalled at what they see as an end run around faculty consultation, says physics professor Dorn Peterson. Indeed, Peterson and others wonder if the abrupt move was, in part, aimed at getting rid of Peterson himself, a critic of the administration who until recently headed the Faculty Senate. Peterson thinks it's "more than a coincidence" that the announcement came the day after the senate had objected to school president Ronald Carrier naming his son as a provost without consulting the faculty.

Doug Brown, an associate vice president for academic affairs at JMU, dismisses this connection as absurd. He says that paring down physics was a painful but necessary step, and "to increase faculty involvement even more would have prolonged the agony." Brown adds that some physics courses will continue to be taught, and the school will now make a "good-faith effort" to redeploy the physics faculty to other departments.



bachelor's study decade Asian women science and earned 37% In 1991 v They domi shunned en fax a requ

But it may i the growing i campus. Stud letters protest of the physics January, 305 c ulty voted the fidence in Ca

New Health Clinic

Hoping to sta ture of its f search faculty ences Center i smith Hospita don, the U.S ical Research last week app diatrics and ch professor A McNeish as d

Last May, develop CSC world-class o gene-therapy were thrown i ray when Dire Oxford genet vies complained that the job car- ried too heavy a burden of politi- cal and administrative tasks asso- ciated with a government-man-

James Madison University to Eliminate Physics Major, Terminate Contracts

The administration of James Madison University, in Harrisonburg, Virginia, announced on 13 January that it will terminate the contracts of its ten tenured physics faculty in August 1996 and cease offering a physics major as of the 1995-96 academic year. JMU is the largest US physics program to be eliminated in the last two decades, and the announcement generated intense debate throughout the university and on the other state campuses in Virginia. "It was really a bombshell," said physics professor Raymond Serway.

Douglas Brown, JMU's associate vice president for academic affairs, said that "physics will continue as an important component" of study at the university. Bethany Oberst, JMU's vice president for academic affairs, went further: "I think we're going to come out with a stronger presence of physics within the general education program." JMU's two-year-old interdisciplinary College of Integrated Science and Technology offers courses that contain physics, but the courses are not taught by faculty members of the physics department.

Despite the termination of faculty contracts and the elimination of the major, Oberst insisted, "We did not terminate the physics department." She said an academic program review of the physics department will begin immediately. Brown assured us that "all students currently in the program who are physics majors will be permitted to complete the program."

These actions further a restructuring that has been under way at JMU for the past year and a half. Oberst portrayed the previous dissolution of the human resources development department, whose remaining programs are now affiliated with other departments, as a situation where "positive steps" were taken "to address program redesign and organization." Similarly, she contrasted the physics department with the dance program, which merged with the theatre program into one department—"another example of positive change."

Calibrating a department

As measured by the number of faculty,

As the faculty and the administration at James Madison University battle over a restructuring that removes the physics major from the curriculum, physicists elsewhere might ask, Can it happen here?

JMU's physics department lies in the top 10% of BS-granting physics departments in the US, according to Patrick Mulvey of AIP's education and employment statistics division. The division profiled the nearly 600 physics departments that grant the bachelor's as their highest degree. The average number of faculty is 4-5, the average number of degrees granted each year is 4.5, and the average number of students taking their first introductory course is about 250. For the 11 departments with 10 or 11 faculty members, that last average rises to approximately 475, which is about the number for the JMU department. (The total number of JMU students taking physics courses has been 650-700 in each of the last three years.) The department also teaches an introductory astronomy course that enrolls between 250 and 300 students each year.

How unusual is the removal of a program of this size? According to Mulvey's data, when a physics department vanishes, it is often one that already had existed in combination with another science discipline. Over the last five years, on average two to three departments, with three or four faculty members each, have been dissolved each year. Those departments have typically graduated one or two majors per year. Numbers from the JMU department chairman, H. Kent Moore, show that over the last five years an average of seven students have graduated in physics each year.

JMU's physics department has done more than teach. In a letter sent to the local newspaper summarizing the strengths of the department, Moore, Serway and associate professors Jon Staib and Kevin Giovanetti wrote that detector development research for Virginia's Continuous Electron Beam Accelerator Facility has brought in grant money and "involved

ten undergraduate students who have presented at least 15 papers at scientific meetings" over the last five years.

Dollars per student

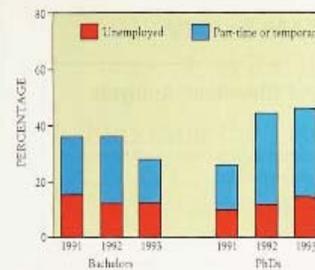
Ten days after the initial announcement, Oberst released a "Dear Colleague" letter to explain the decision more fully. In it she gave two main arguments. First, compared with other departments at JMU, the relatively low enrollments in the physics department mean "the student-faculty ratios have been very low." Second, the "direct instructional cost per full-time equivalent student taught in physics at JMU is \$3888," which, according to the administration's interpretation of results of a "National Study of Instructional Costs and Productivity" conducted by the University of Delaware, is \$2169 above the average cost for comparable institutions. Also, said Oberst, the physics department's average cost per student is more than \$1000 higher than the JMU department with the next highest cost.

Commenting on the rationale, Bernard Khoury, executive officer of the American Association of Physics Teachers, said that "the need to look at data in an input-output mode has pervasively grown. People are focusing on accountability and are using a narrow production model: You have a numerator and a denominator and you can divide them, but what does it mean?" Oberst herself told us that "this issue is not one of academic quality."

JMU began examining its educational configuration in the fall of 1993, about a year before the state requested the "restructuring" efforts now taking place throughout the Virginia system. Much anger is being directed at the new Republican governor, George Allen, over these events, but according to Beverly Sgro, Virginia's secretary of education, the fiscal education budget has varied little over the last six years: \$1.242 billion for 1990-92, \$1.173 billion for 1992-94 and \$1.232 billion for 1994-96.

The second year of the latest budget contains about 823 million less than the first year, but Sgro said that the missing funds should not affect students in classrooms. She did

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EMPLOYMENT STATUS of physics bachelors and PhDs (excluding those with postdocs) who had not secured potentially permanent jobs as of the winter following the year of graduation.

"Hell, that's not unemployment," he said, "that's full employment." But the 1994 Initial Employment Follow-Up of 1993 Physics Degree Recipients, a new report from the education and employment statistics division of the American Institute of Physics, shows that about 65% of new physics PhDs remain unemployed in the winter following their graduation, more than six months after receiving their degree.

Equally important, by reformulating the survey instrument, authors Michael Neuschatz and Patrick Mulvey have been able to pinpoint for the first time the proportion of PhD recipients who enter the job market with nonpostdoctoral temporary positions. When Neuschatz and Mulvey exclude the 70% with postdocs, they find that about half of the remaining 30% of the new PhD recipients either take part-time or temporary jobs or remain unemployed (see graph above). But, as Neuschatz told PHYSICS TODAY, a temporary nonpostdoctoral position does not always represent an undesirable position.

With the number of postdocs (about 3000) now more than double the number of new PhDs produced each year, Neuschatz suspects that the number of PhDs who enter or reenter the nonpostdoctoral job market with a year or more of seasoning exceeds the number who enter fresh from graduate school. The scientists comprising this reservoir of talent also compete with even more experienced PhDs who are exiting from both industry and the Federal government as funding for basic and applied research is cut.

The AIP survey also examined the connection between career expectations and employment outcomes. When questioned about career goals, one-quarter of the new PhD recipients said they were looking for non-academic positions, another quarter said they would be flexible and the re-

maining half expressed a desire for positions in academe. Among those taking postdocs, more than half want academic positions. The authors note that other AIP data suggest "that the fraction of new physics PhDs who will finally get permanent academic positions in the US is closer to one-fifth than one-half." Congressman Boehlert noted back in July that advanced-degree holders are not alone in experiencing career disappointment. "Join the rest of us," he said.

The AIP survey detects evidence of unemployment and underutilization for bachelor's and master's degree recipients too. From the order in which jobs are taken, the authors infer that individuals with BS degrees begin by looking for work that will enable them to make maximum use of their schooling, but then, unable to find such jobs, they broaden their search. In the end, 57% said they had accepted a position "where they would use little or none of their physics background."

This report may be obtained from AIP, Education and Employment Statistics Division, One Physics Ellipse, College Park MD 20740-3843. Single copies are free, and multiple copies may be ordered.

DENIS F. CIOFFI

Physics at James Madison University Gets a New Life

"There were probably about a 100 better ways to have gotten to this point," said H. Kent Moore, the retired chairman of the physics department at James Madison University in Harrisonburg, Virginia, "but now we see this as an opportunity to strengthen the department." On 21 July the JMU administration reversed a major part of its January decision and de-

clined not to send letters of termination to the physics faculty (see PHYSICS TODAY, March, page 81).

The reprieve came in the form of a prepared statement by Norman Garrison, the interim dean of the college of science and mathematics. Garrison said that he had told JMU administrators of the physics department's "good faith effort to increase teaching productivity" by having some physics faculty teach in other departments and by designing new courses "to meet specific needs."

An internal committee composed of Moore and three other physics professors proposed a redefinition of the major. A five-member external review team that was headed by A. Jerry Benson, the dean of the college of education, and included Judy Franz, the executive officer of the American Physical Society, reviewed the department's plans. The exact status of the major has not been decided as of this writing, but strong consideration is being given to a multitrack system.

The first track would be the traditional preparation for graduate school. Another track may combine physics and engineering and would be undertaken with the assistance of the engineering school of the University of Virginia (JMU and UVA are both part of the state university system). More speculative is a "liberal arts" track, which would be designed for those who want to combine studies of, say, physics and business, or physics and law. Thus, JMU appears to be one of several US universities and colleges now expanding opportunities for undergraduates who want to study physics but do not necessarily wish to pursue an advanced degree (see, for example, PHYSICS TODAY, June, page 47).

In addition to restructuring its physics major JMU has reduced its physics faculty for the 1995-96 academic year from 10 to 7.5 members. Moore retired at the end of August. Raymond Serway is away on a previously planned educational leave and another faculty member is teaching half-time at JMU's College of Integrated Science and Technology.

Meanwhile, a legal suit against the university continues. Filed by non-physics faculty, the suit concerns the process by which the administration attempted to remove the major and the faculty. This dispute about authority and regulations is also being played out elsewhere. As funding for higher education falls (and outside scrutiny rises), faculty layoffs are being considered at other universities in the US and Canada.

DENIS F. CIOFFI

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medical imaging, and immunology and transplants.

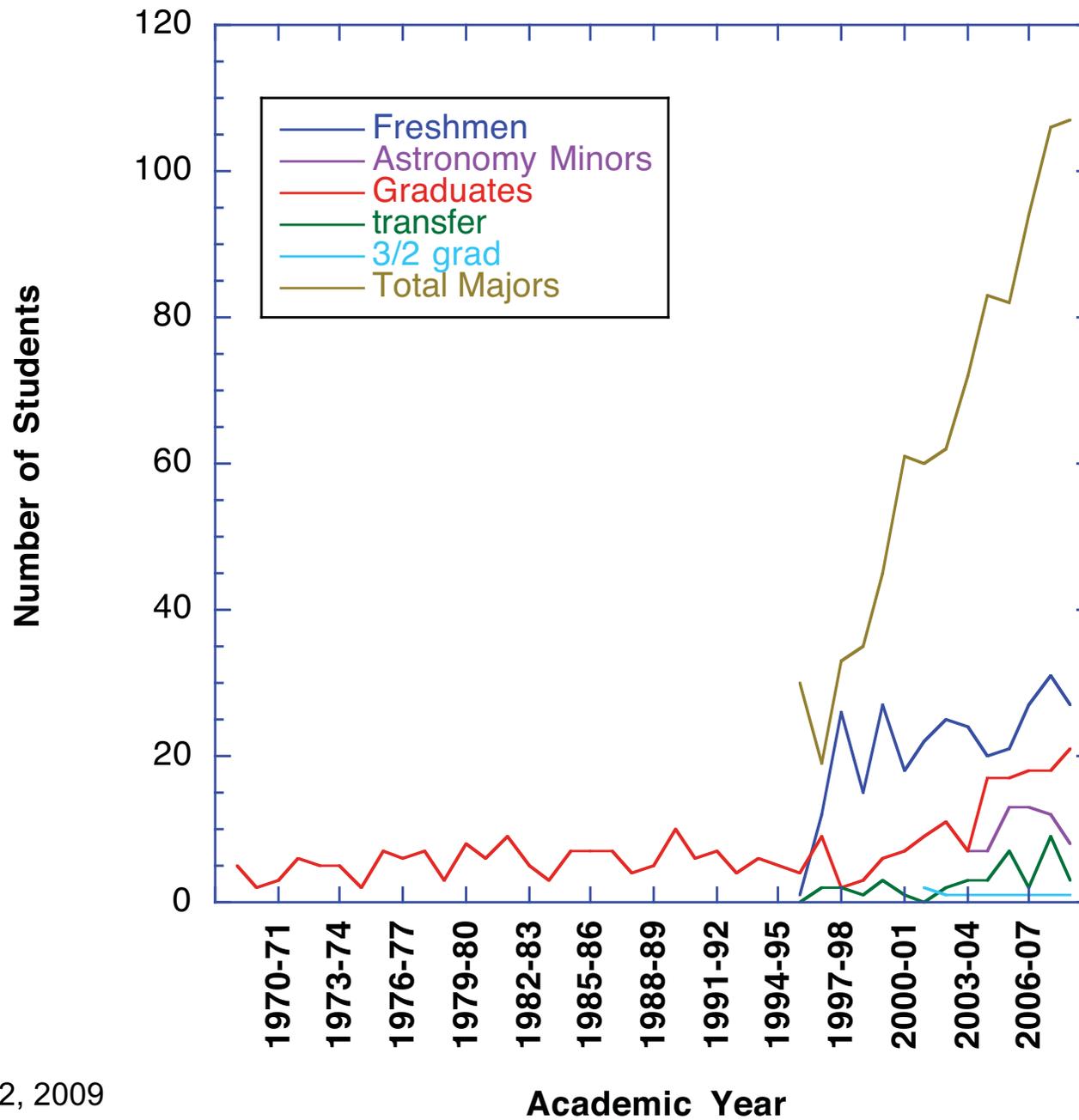
McNeish, who starts work on 1 April, will be steering CSC

used for a series of test dives. Scientists hope that these will culminate next month in another go at Challenger Deep.

Plan for Growth

- Revise curriculum: diversify
 - Include tracks in the major
 - Embrace the teaching of general education
 - Make the department more cost effective & indispensable
 - Renewed focus on undergraduate research
 - Create and market a clear identity
-
- Find a new university president

Student Population Evolution



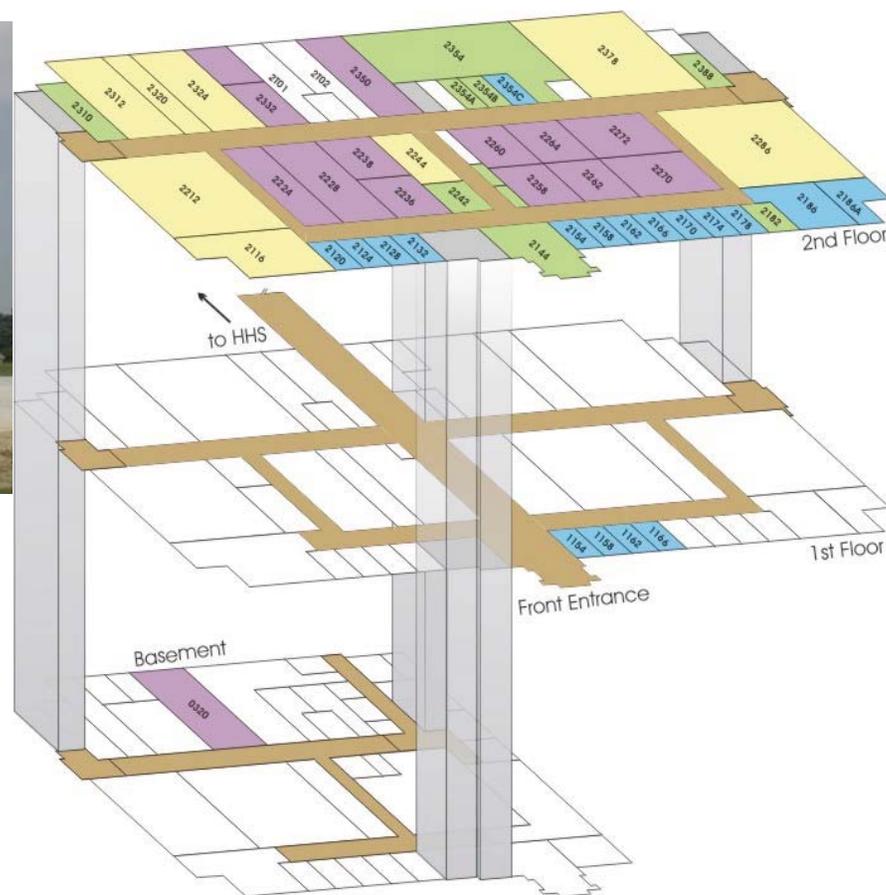
September 12, 2009



Student Recruiting

- Get list of applicants from admissions in January (~90)
- Invite the better students to campus (~70)
 - Students visit with parents at time they choose
 - Student takes scholarship exam
 - Have lunch with faculty, give 'em the hard sell
 - Tour department, meet students, see facilities
- Award scholarships (≤ 10)
 - 1 endowed, 3 JMU funded (ongoing)
 - This year, 6 additional Second Century Scholars - 4 year awards (for the next few years)
- Yield: ~25-30 freshmen

Physics & Chemistry Building



- Occupied in 2005
- State provided ~\$2.7M for equipment
- >40% increase in space for the department
- Additional classroom space in adjacent building
- Clean room and additional lab space next door

- Now out of office and lab space
 - Faculty in three other buildings
- Minimal storage available

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Introductory Lab



Nuclear Laboratory



Hydrogen Distillery



Microscopy Lab

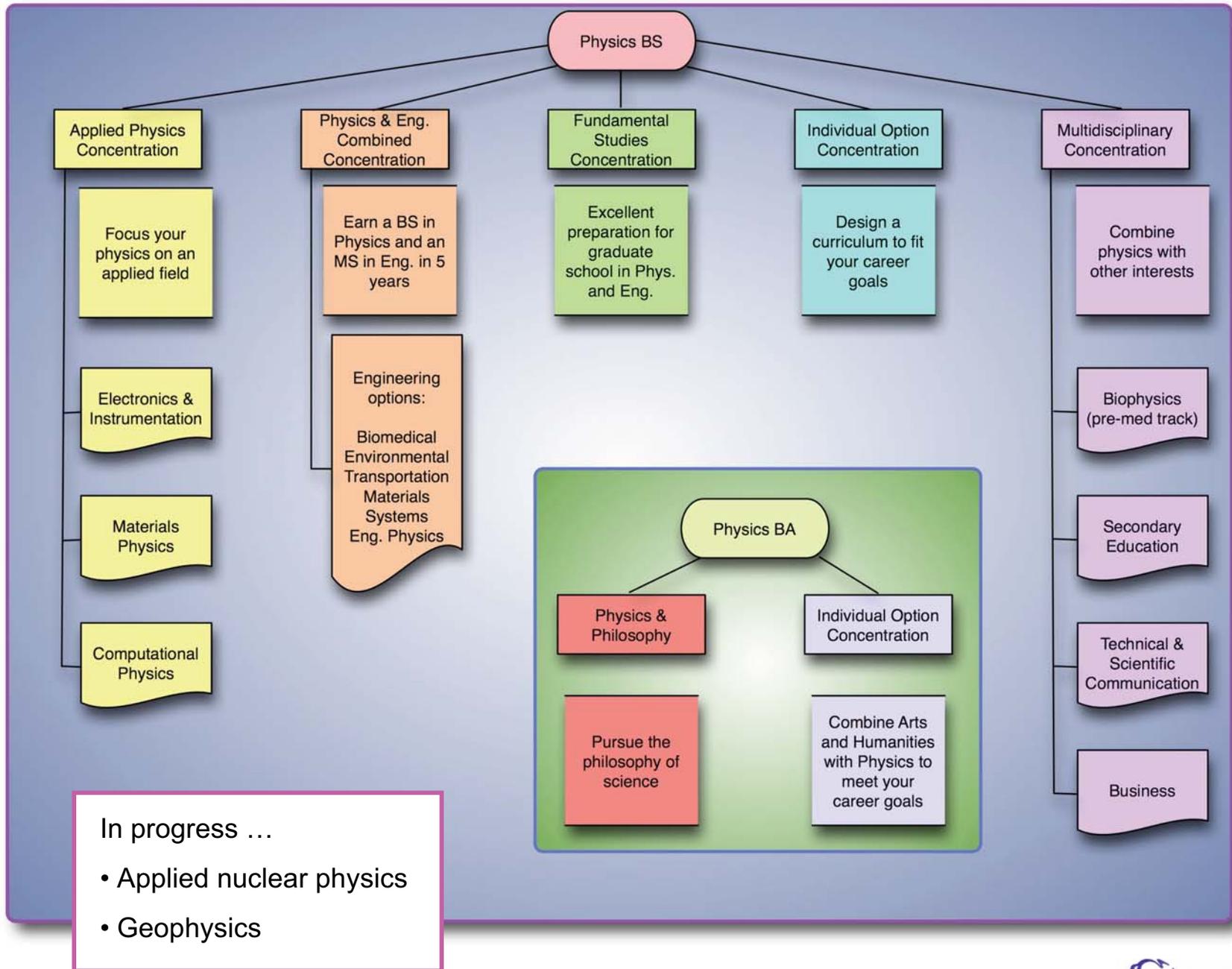


Faculty/Student Machine Shop



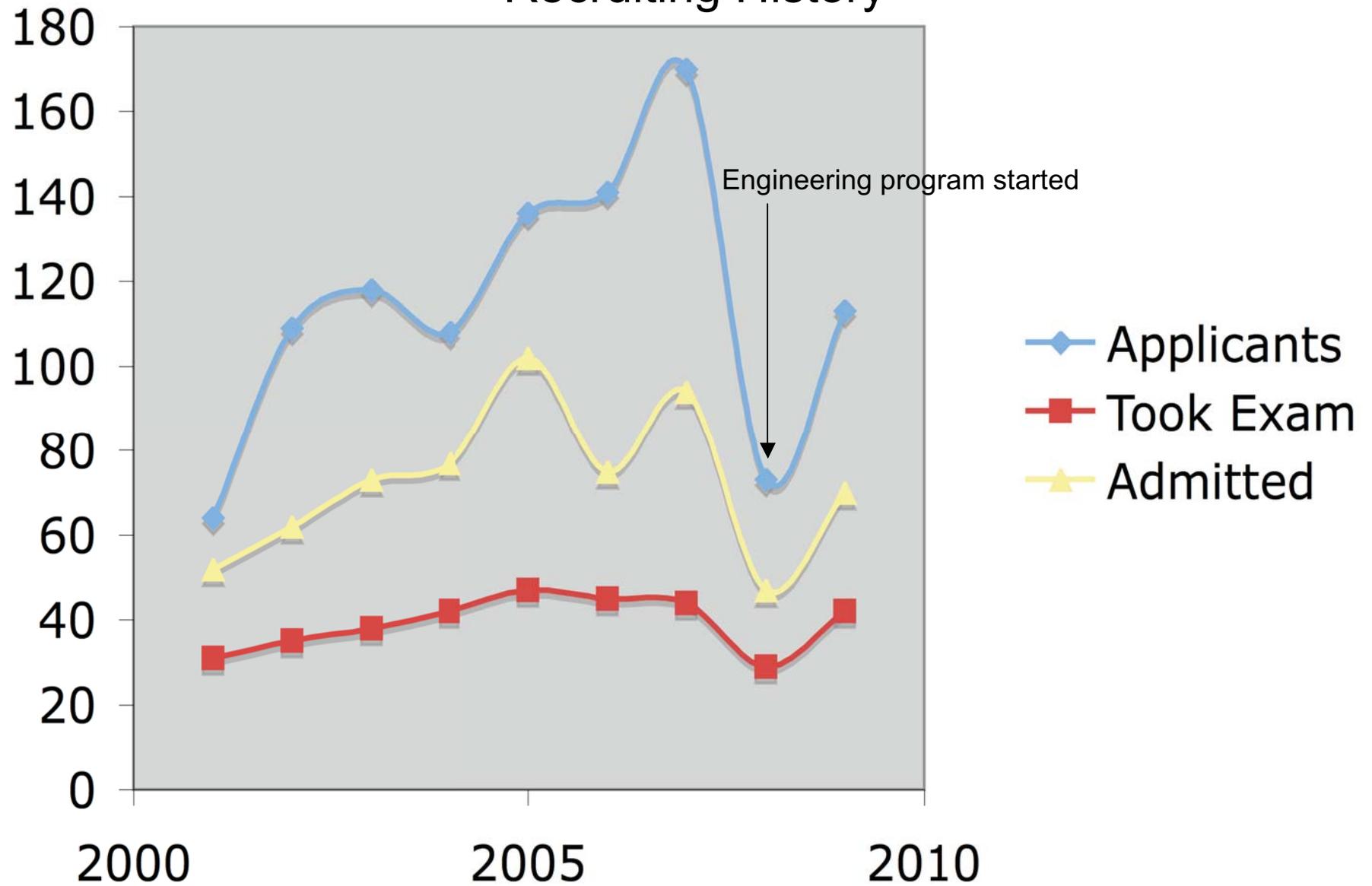
Student Library/Lounge

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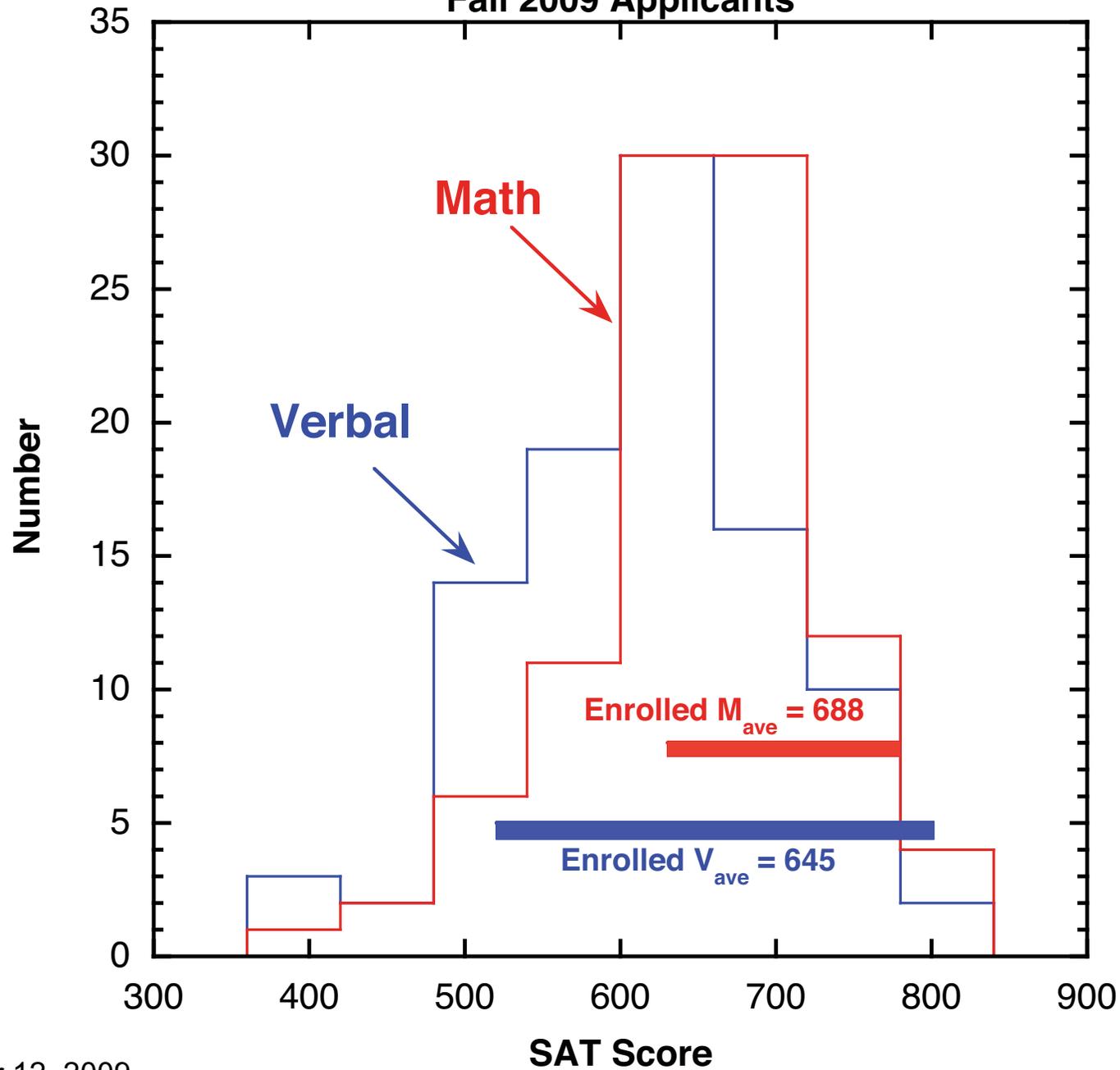
Recruiting History



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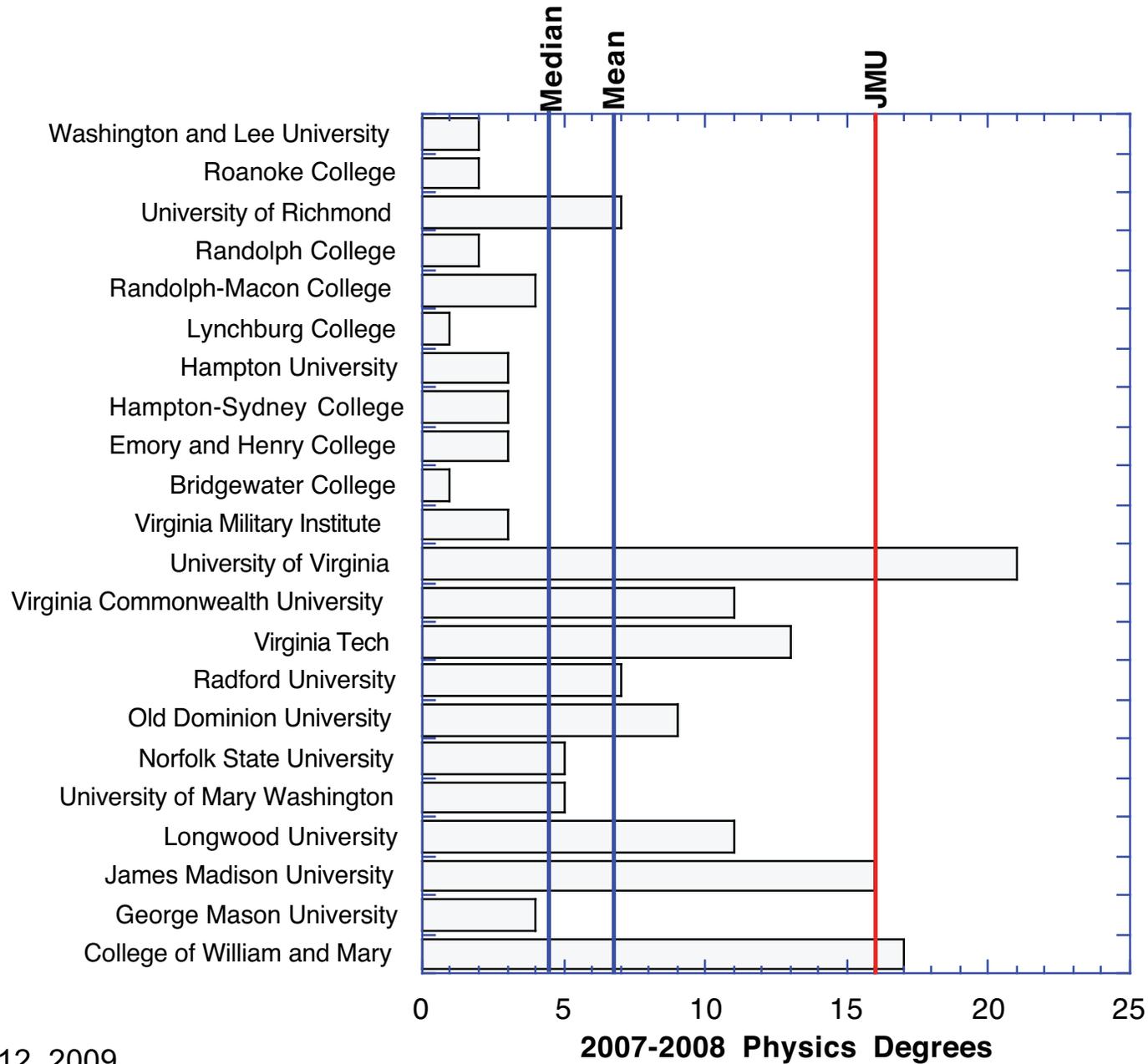
Distribution of SAT Scores for Fall 2009 Applicants



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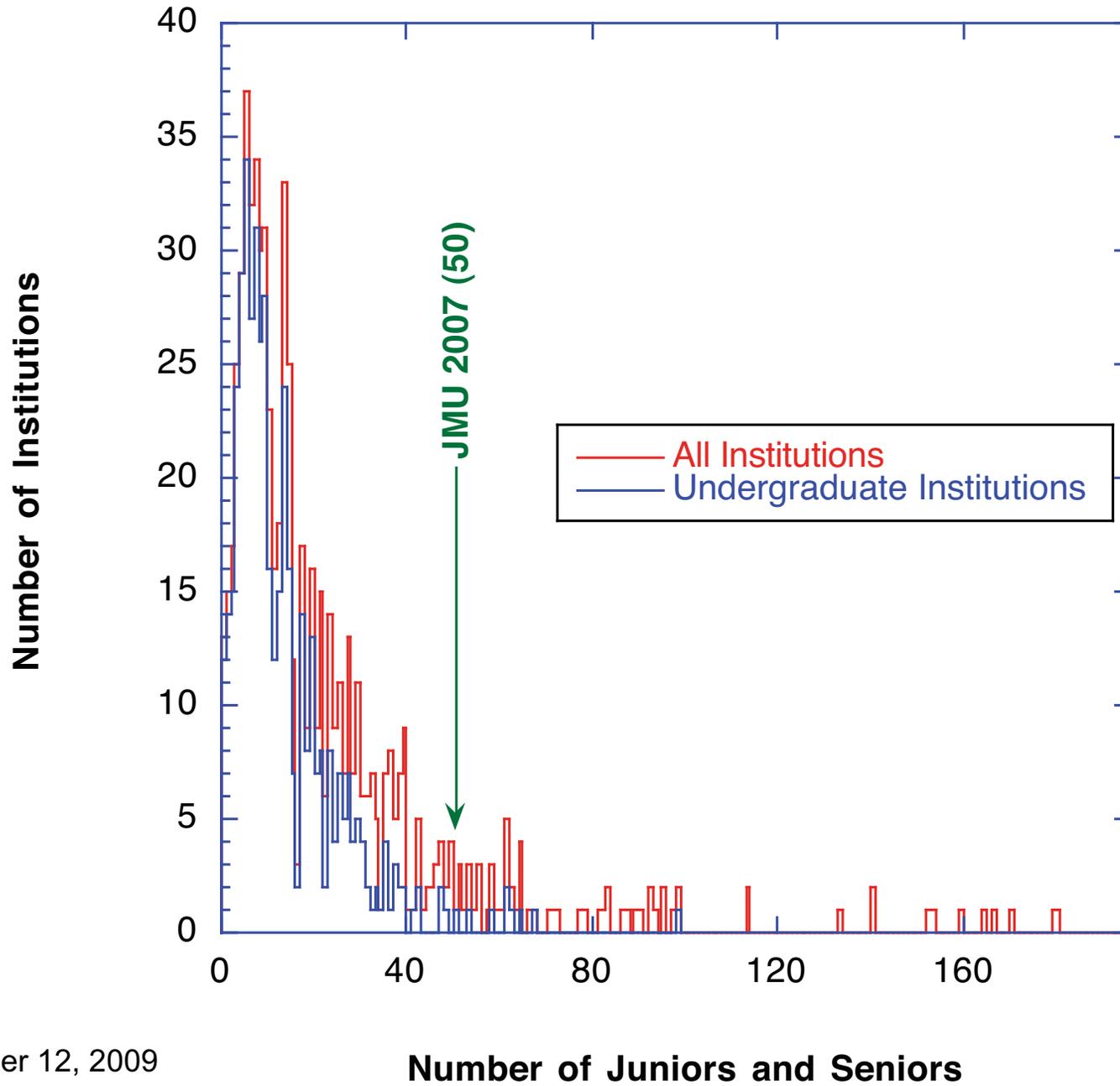
Comparison with Virginia Institutions



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AIP 2007 Data

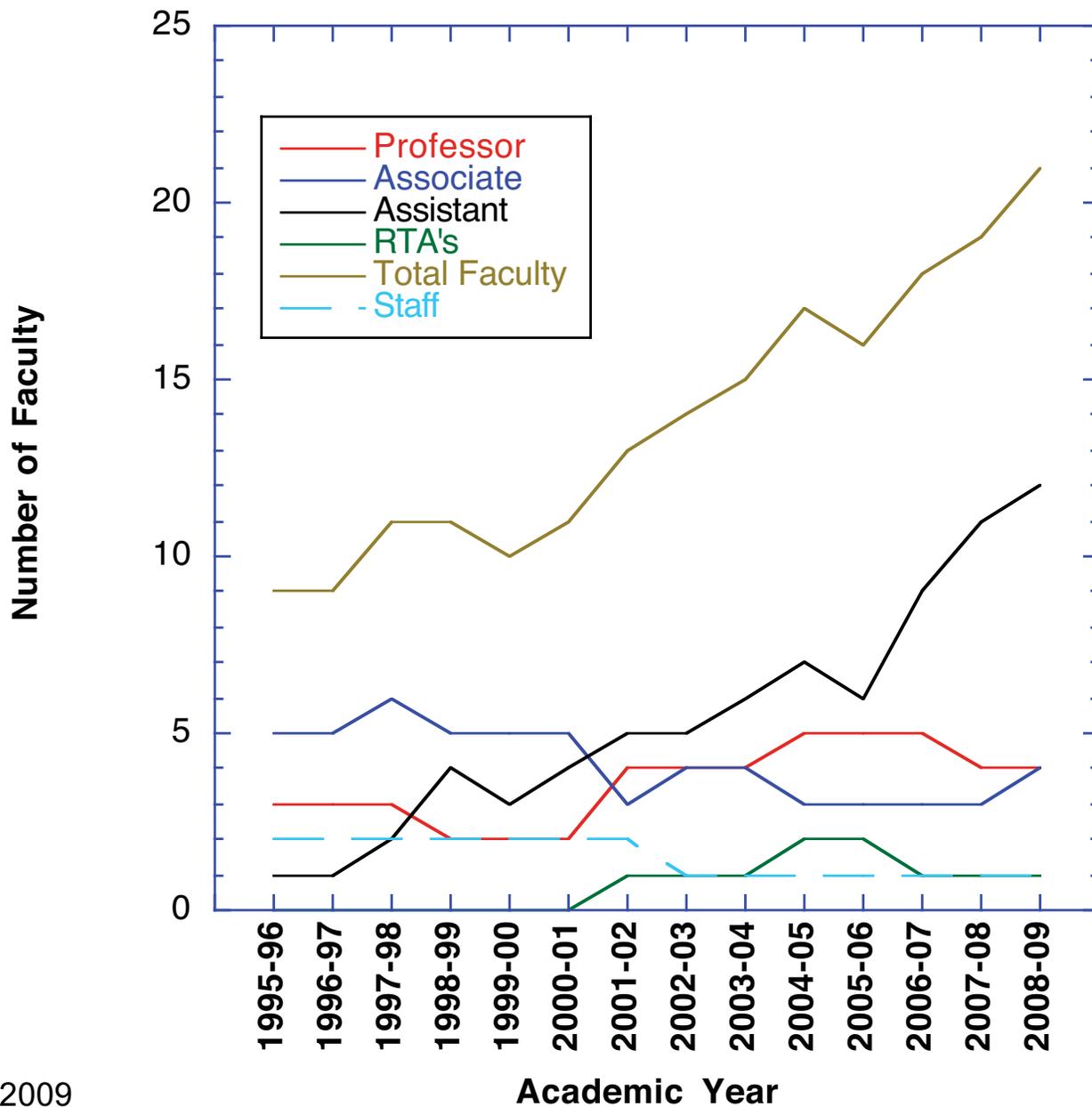


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Faculty History

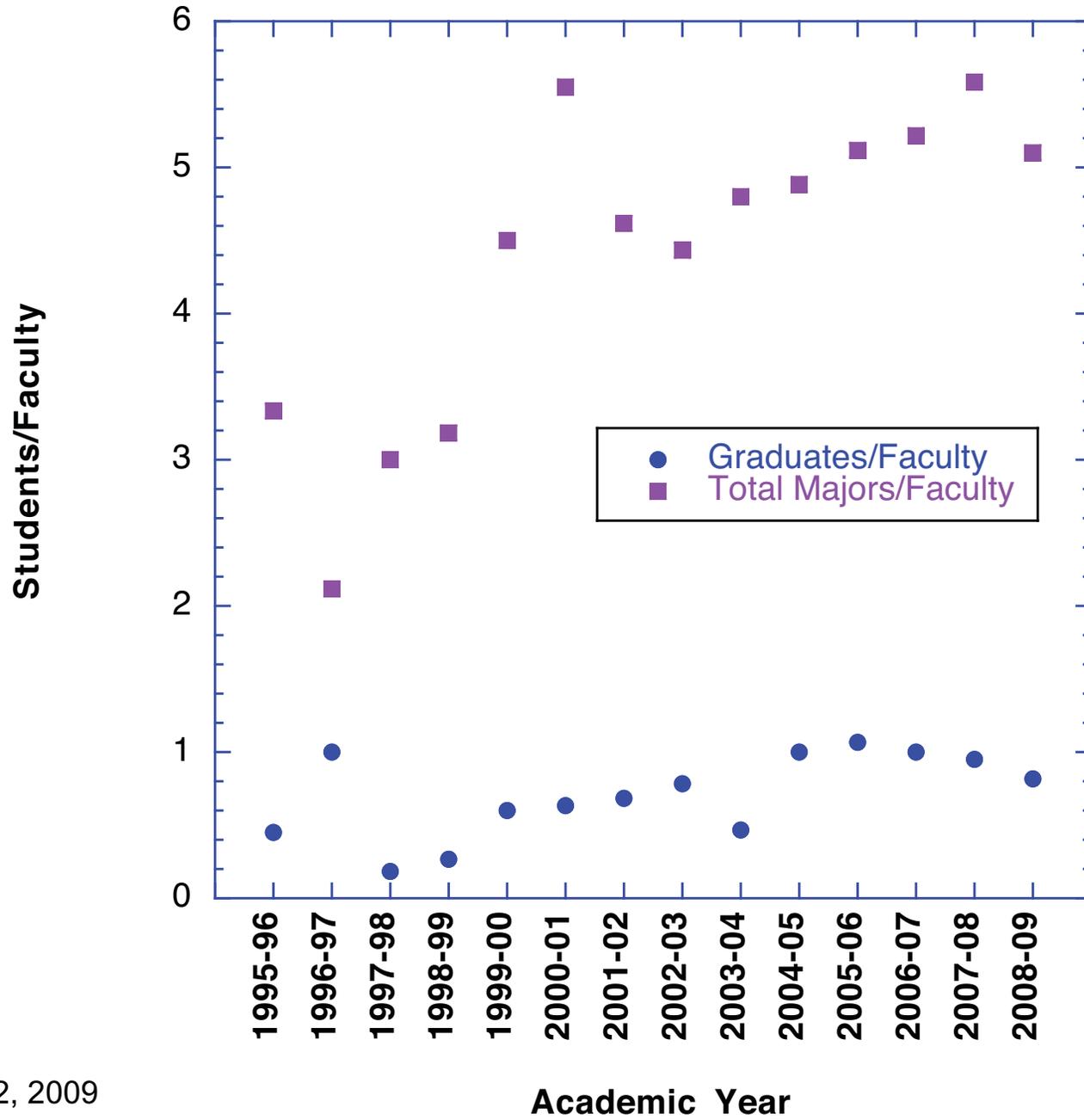
Department Growth Since 1995



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Student/Faculty Ratio



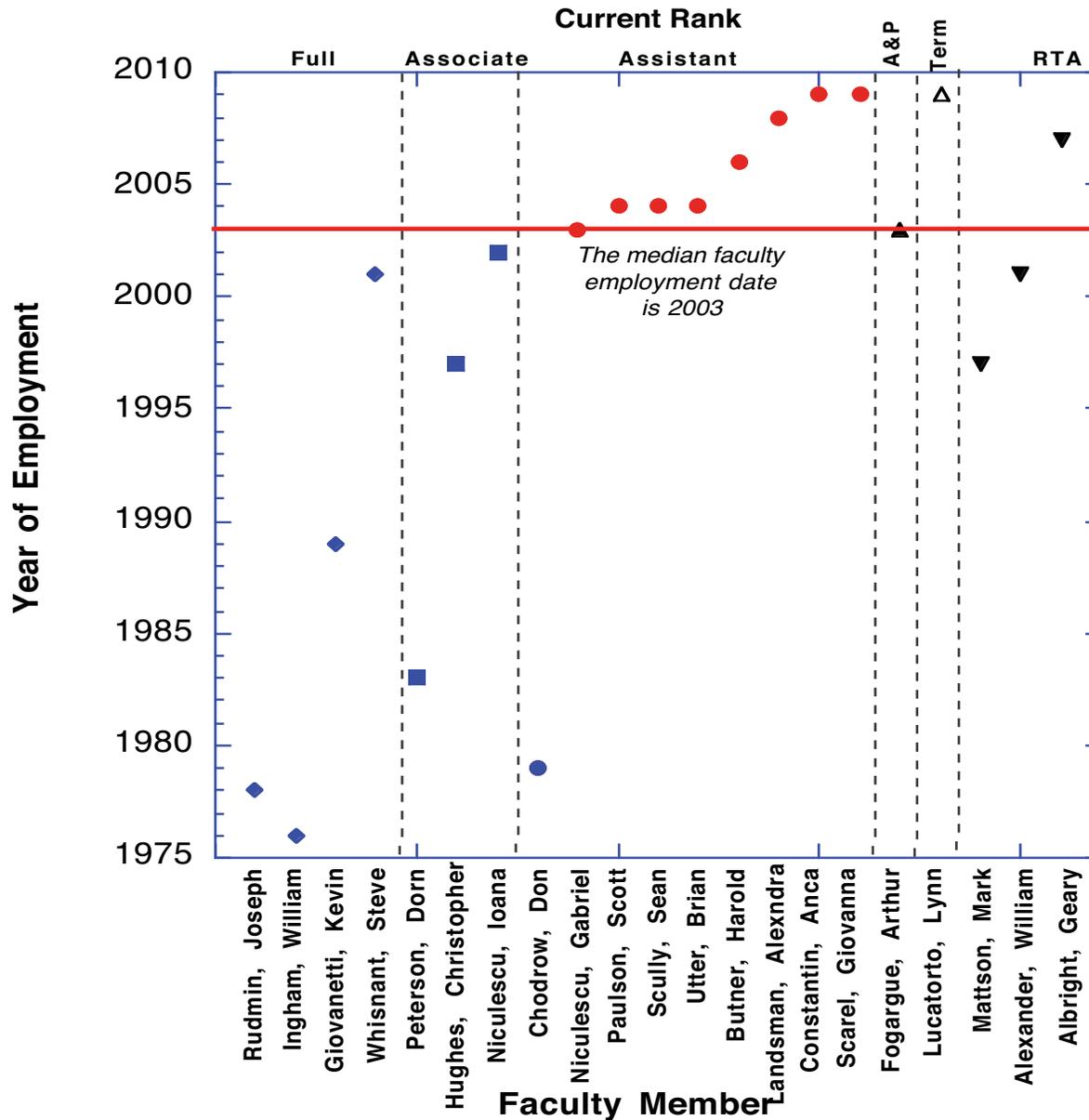
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Faculty Snapshot

- 15 T/TT+ 1 one-yr + 4 perm. non-TT + TIR = 21
- Of the 15 T/TT faculty
 - 11 are externally funded and involve students in research
 - Grants in effect 2008-2009: **\$3,362,678**
 - Research is both on- and off-campus
 - Astronomy, nuclear, materials, granular/non-linear, computational
 - We have a REU grant for materials (1 of 4 at JMU)
 - Three are women
- This year we search for two faculty
 - Replace a retirement and a junior faculty who left
 - Search for nuclear physics and soft condensed matter

Current Department Profile

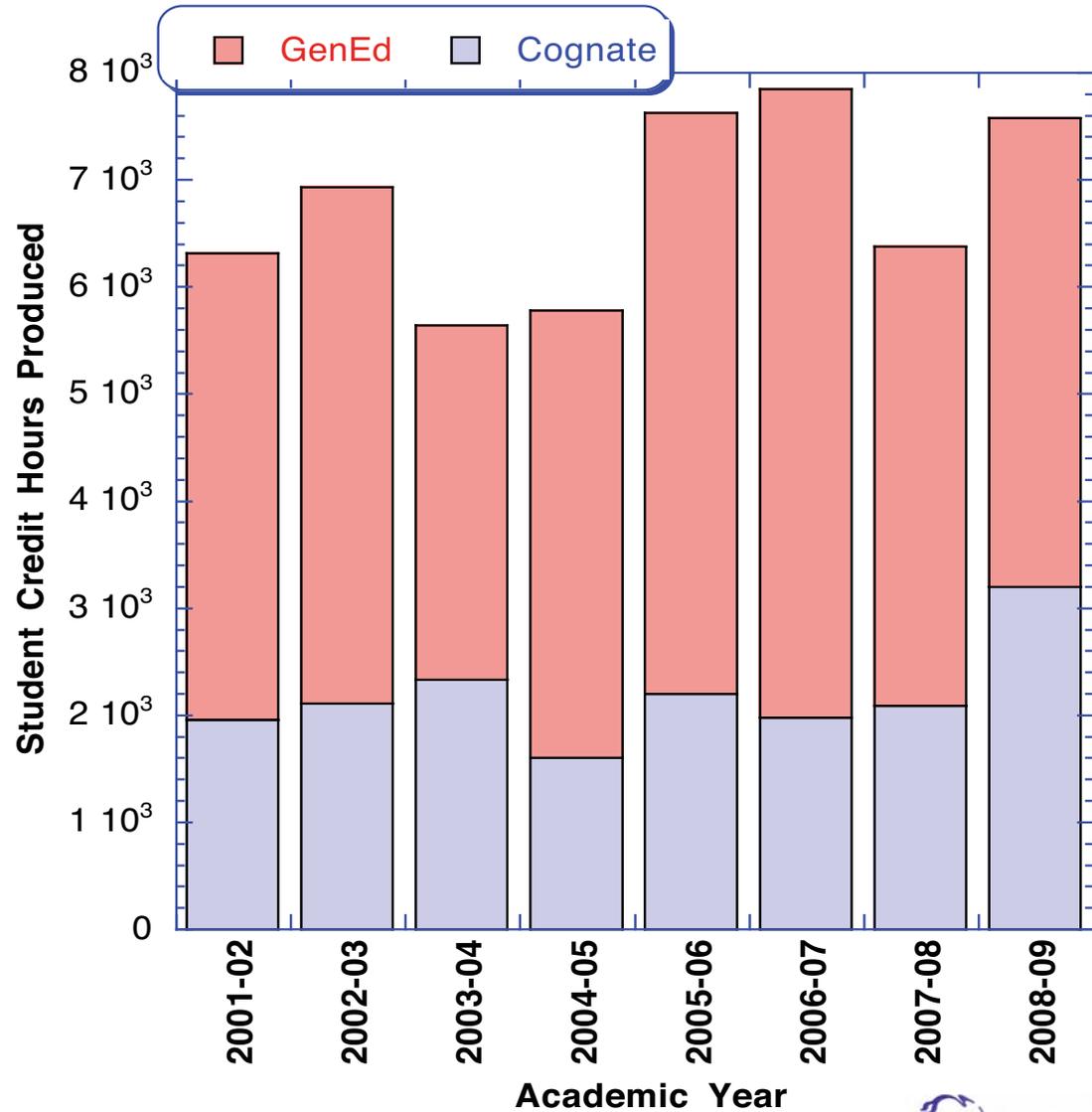


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Service Obligations

- Our department, like all physics departments, generates a lot of student credit hours in general education and cognate courses
- Load has been roughly constant
- As Physics load increases (enrg., university growth) we try to cut back on Gen Ed offerings



Balancing Teaching & Research

- Teaching accommodations
 - Introduced LON-CAPA (2007)
 - Double book 1st semester intro labs (2009)
 - Prepare in- and out-of-class experiments
 - A student in lab every two weeks
 - Extensive use of part-time faculty
 - Use student assistants in selected labs (~2003)
 - Reformat Intro Astro lab for larger enrollments (2009)
 - Three faculty share course, divide into sections
 - Planetarium, observation, classroom
 - Allow some GenEd section sizes to grow (<2000)
 - Restructured advanced lab to encourage students into research labs (2006)

- Research Accommodations
 - Define “Research Active” faculty
 - engage in an on-going program of scholarship with clearly defined goals;
 - routinely disseminate their work in refereed journals and at conferences and workshops;
 - actively seek external funding;
 - meaningfully engage students in their scholarship.
 - Teaching load for Research Active Faculty: 2/2
 - Other faculty have heavier loads
 - Permit load sharing between faculty pairs: 1/3-3/1
 - Research Semester
 - Internal sabbatical w/ only grade reporting duties: every 6-7 years
 - Report Advanced lab and for-credit research grades
 - 1st semester is for untenured faculty in 3rd-4th year
 - Provides contiguous summer and semester dedicated to research
 - Flexible: Can supplement/complement university sabbatical

– Technical support

- Currently only one technical staff member
- Hope to add technician for nuclear physics

– Shared facilities/support

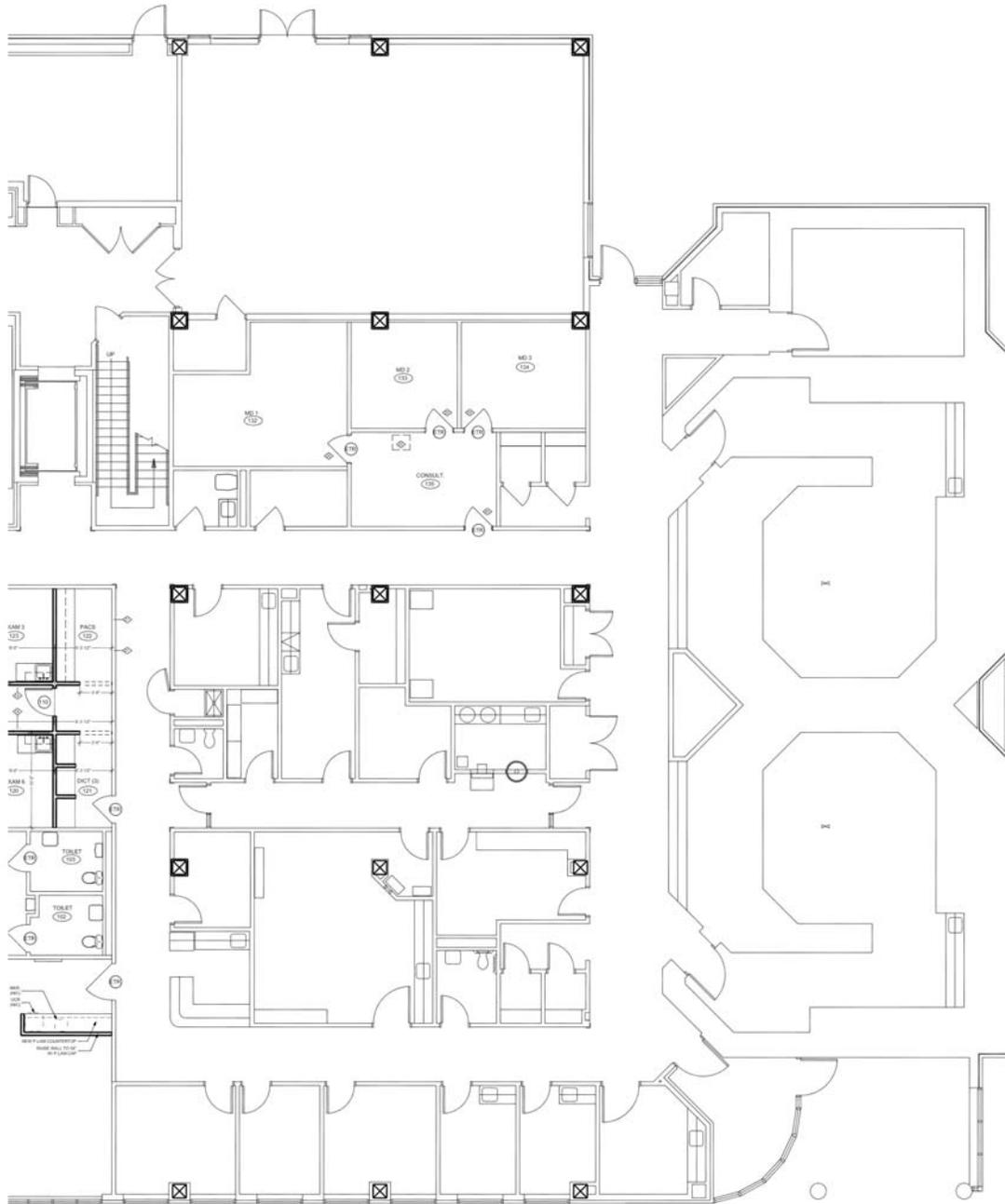
- All tools are shared across departments and colleges
 - SEM, TEM, AFM, optical microscopes, FTIR, X-ray, clean room, etc.
- Computer technician shared with Chemistry
- Chem/Phys adding materials technician this year

Advanced Lab: Research/Teaching Interface

- Identify a set of ~15 laboratory competencies
 - Eg., low temperature, optical, historical, etc.
- All faculty contribute & supervise projects
 - Include research activities as part of this
 - Two credits of research are required of all students
 - Require a few traditional projects
 - Instructor of record is faculty on Research Semester
- Students move directly from intro lab to Ad lab
 - Three semesters to complete requirements

Applied Nuclear Physics

- CCLI proposal for equipment
- New courses
 - Two labs and one intro lecture
- Existing courses (Jr/Sr level)
 - Nuclear, particle and nuclear chemistry
- Established relationship with local hospital
 - We are now beginning internships in medical physics
- Prepare students for:
 - Medical physics
 - Nuclear engineering
 - Nuclear/Particle physics
 - Homeland security applications



Applied Nuclear Physics

- Hospital has donated equipment
 - Two 15 MeV electron linacs
 - 140 KeV x-ray machine
- University bought hospital
 - Take occupancy in 2012
 - Physics gets shielded vaults
 - Item in the university master plan
- Need a technician to support this program

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John C. Wells Planetarium

- Originally built in the mid-'70's
- Rebuilt after a fire in the late '70's
- ~\$1.5M remodel and upgrade in 2008
- GOTO Hybrid system
 - Full dome video aligned with star projector
 - Full digital control, Dolby sound system
- Total audience this year ~6800



Radio Astronomy



- One ~2 meter radio telescope online
- Second dish has arrived and will be mounted soon
- Used in astronomy methods class, advanced labs
- Green Bank is ~1 hr west and annual trips are made with the students in the astronomy methods class

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Astronomy Park

- Provides on-campus venue for star-gazing
- Fixed telescope mounts to permit rapid set-up
- Gives the department visibility on- and off-campus



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Opportunities & Challenges

- Increasing service teaching load
 - A faculty member was added last year to help
 - Try to shift to Phys **not** Gsci
 - Replacing retirements with research active faculty adds pressure
 - Space, teaching loads, ...
- Strategic plan finalized this year
 - Three retirements in next five years - set dept. direction
 - Build case for resources
- Need more support staff
 - Technical (nuclear), administrative, recruiting/advising
 - Move tasks from faculty to staff to make more room for teaching and research

- Lobby admin. for dark-sky observatory
- Educate administration about our needs
 - P&A often lumped in with STEM as a whole
 - Recruiting focus lost in hoards of Bio & Eng students
 - Retention initiatives are typically one-size-fits-all
- Completely out of lab and office space!
 - Department is already dispersed into 3 bldgs & a trailer
 - Facilities/layout have strong effect on communication and culture

- Faculty at a critical size
 - At ~20, decisions as a committee of the whole are difficult
 - Committee structure more important
 - Hallway conversations - politics become more apparent
 - Unwritten rules are now being formalized
 - <http://acadine.physics.jmu.edu/cgi-bin/manual>
 - Research groups begin to acquire identity
 - Young faculty - 'institutional memory' fading
 - Some priorities being discussed are those of groups not the whole
 - Need to work harder at maintaining department coherence

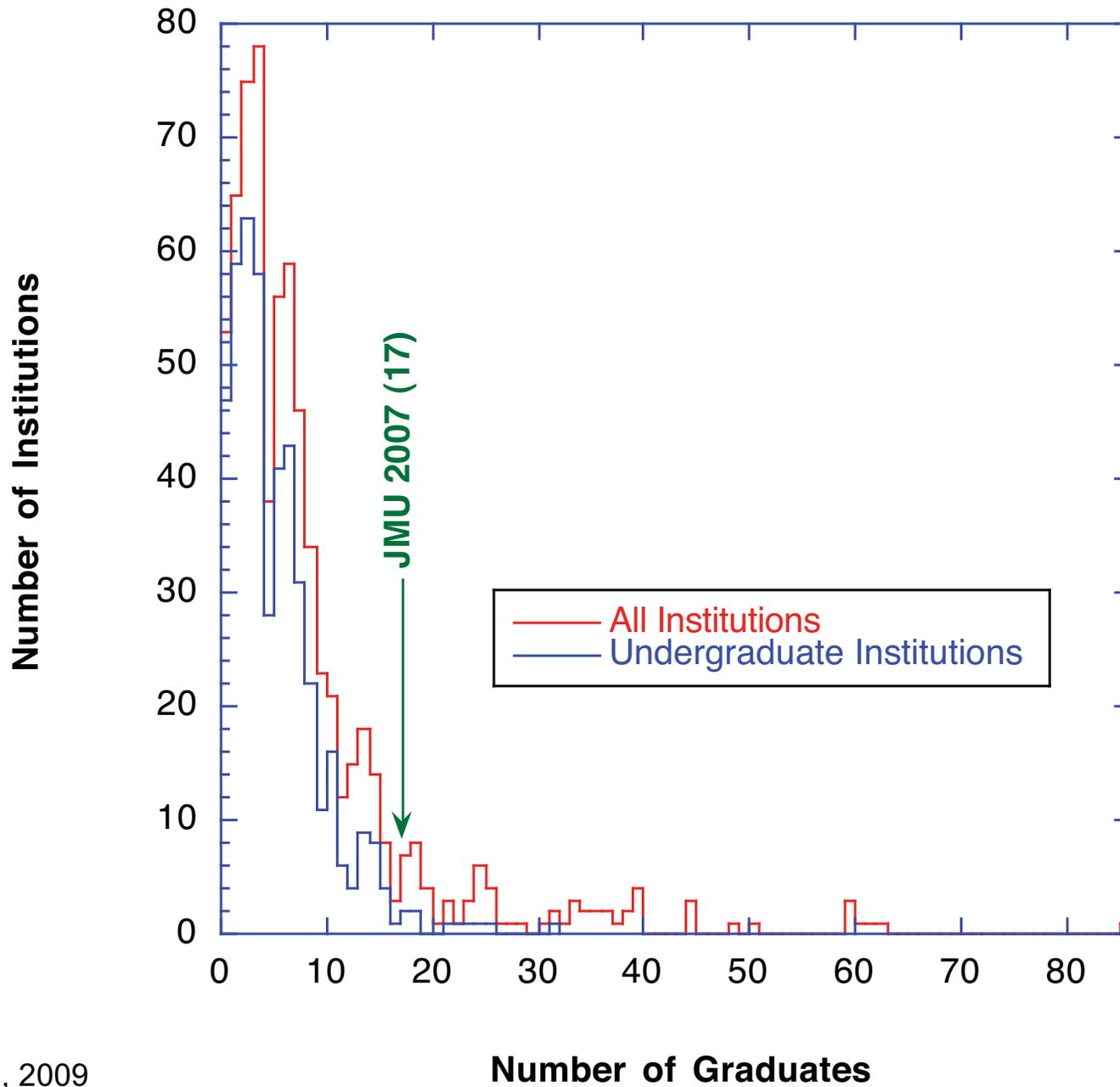
Lessons Learned

- Balance & integrate teaching and research
- Visibility on- and off-campus
- Curriculum reform
- Student recruiting
- Exploit opportunities
- Hire carefully
- Develop a strategic plan

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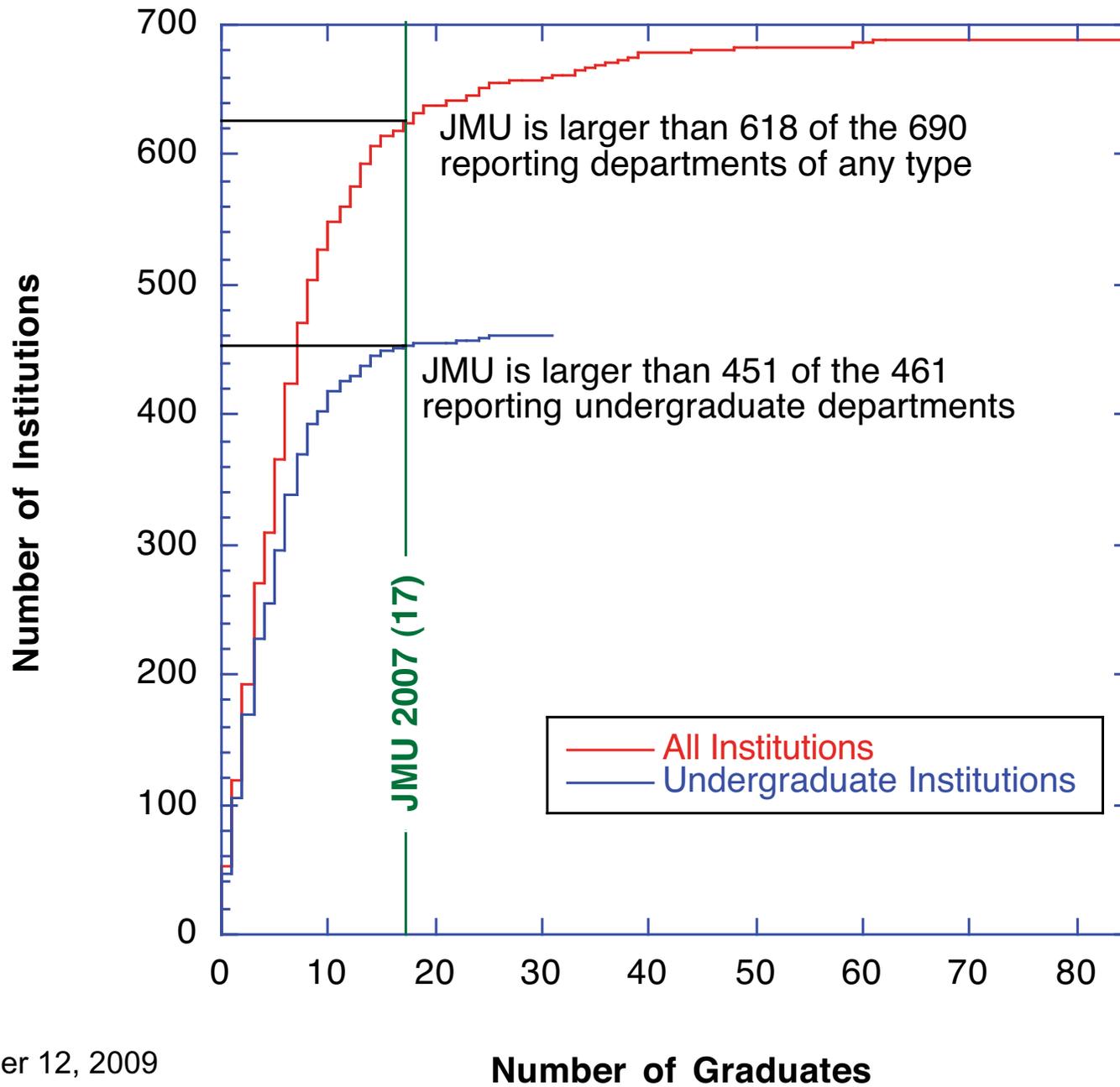
AIP 2007 Data



September 12, 2009



AIP 2007 Data



September 12, 2009

