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# The STEM Graduate School Experience: Reflections from Minority Post Docs[1]

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As part of a larger effort to increase the numbers and percentages of under represented minorities in STEM graduate programs, 17 minority Post Docs attending the Minority Post Doc Summit at the 2004 SACNES meeting completed surveys and participated in a series of focus groups on the graduate school experience. The following themes emerged from the survey and the focus groups:

**Research.** The overall importance of research was the most consistent theme. Research opportunities were seen as the most important factor in participant selection of a graduate school and conducting, presenting and publishing research were rated as the most positive aspects of participant graduate school experiences. Teaching opportunities were seen as the least important influence on selection of a graduate school and no one mentioned teaching as a "most positive" aspect of their graduate school experience.

**Advisor.** There was general agreement that the advisor was the most important academic support a graduate student could have. When the advisor was good, things went well; however when the relationship did not work out, dealing with the problems or even changing advisors was seen as difficult and "carrying a stigma". What was needed, participants felt, were systems in place to motivate faculty to care about student success and to advocate for students.

**Interactions with other minority students.** Participants spoke of the value of interacting with other minority students; however such opportunities were usually not provided by the institutions. To facilitate the interactions, minority students had to form their own formal or informal support groups.

**Money.** While money was an issue throughout the graduate school process; money, participants reported, did not impact participants' desire to continue an academic career. They did however feel that better salaries would encourage more minority students to go into academia.

**Factors seen to encourage minority students to go into academia include:**

- better salaries at the post doc and faculty level
- the introduction of younger students to minority professors so the professorate seems like a viable option
- assurances to minority students that they will get an academic job after graduation
- advisors who help students find jobs and meet people in the field
- university career centers and professional organizations that place more emphasis on academic job opportunities.

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# Appendix: Detailed Results from the Survey and Focus Groups

As part of a larger effort to increase the numbers and percentages of under represented minorities in STEM graduate programs, 17 minority Post Docs attending the Minority Post Doc Summit at the 2004 SACNES meeting completed surveys and participated in a series of focus groups on the graduate school experience.

**A Description of the Participating Post Docs**

Participants were primarily from the biological sciences (7) and physics (4). On average they had taken 5.4 years to get their degree, although the actual number of years each person took ranged from two to nine. Nine had also received Master's degrees, taking from one to three years to do so. Four participants had received their degrees from University of California campuses, three from SUNY campuses and two from the Albert Einstein College of Medicine. Individuals received their doctorates from Harvard, Penn State, Pitt, Rutgers, NJIT and three international universities. Eight of the respondents were women and eight men. They ranged in age from 30 to 45 with an average age of 36. Nine respondents were Hispanic, four African American, two Asian American and one White[2]. Nine were US citizens by birth, two were naturalized citizens and five were permanent residents. None reported having any disabilities.

**Factors Related to Graduate School Selection**

In the survey, participants were asked about the graduate schools they attended and why they chose to that university to attend. Research opportunities and financial packages were the strongest influences on their decisions to attend an institution, followed by the school's and the department's academic reputation.

**Table 1: Factors Influencing Student Selection of a Graduate Program (5=Very important to 1=Not at all important)**

| | Average Rating |
|---|---|
| Research opportunities | 4.35 |
| Financial package | 4.12 |
| School's academic reputation | 3.82 |
| Department's academic reputation | 3.76 |
| The presence of a specific mentor | 3.35 |
| Job opportunities | 2.75 |
| Other graduate students | 2.73 |
| Teaching opportunities | 2.35 |

For most respondents, graduate school selection may have had more to do with decisions about applying rather than enrolling. Three of the 17 respondents applied to only one graduate school and another six were admitted to only one of the schools to which they applied. Those who had a choice of programs to attend rated the importance of research opportunities higher in their

[2] One respondent did not provide any demographic information.

selection of a graduates school than did others (4.9 vs 3.9), while they were less apt to consider job opportunities (2.4 vs 3.1) as a factor.

Academic preparedness also had an impact on graduate school choice. Those who felt they had been prepared or very prepared for graduate school rated the importance of the academic reputation of the school (4.6 vs 3.0) and of their department (4.7 vs 2.8) as more important in their decision to attend their graduate school than did others. They also rated research opportunities (4.9 vs 3.8) and teaching opportunities (3.0 vs 1.6) as more important.

**Academic Preparedness**

Nine (53%) of the participants (9/53%) saw themselves as academically prepared or very prepared for graduate school with the rest (8/47%) seeing themselves as somewhat or a little prepared. Those who saw themselves as academically prepared or very prepared to do graduate work were more apt to have gone straight on toward a PhD rather than stepping out for a while before beginning a PhD program (56%; 5 of 9 vs 38% 3 of 8).

In the survey, seven people, including three who felt they were prepared/very prepared, said their institutions helped them make up academic deficits by providing:

- academic flexibility so remedial courses could be taken or courses could be waived (2)
- recommending specific courses (i.e. ESL, Statistics) (2)
- providing general academic support (2)
- providing tutors and material review (1 each).

Focus group discussions provided more insights into the types of supports students with academic deficits were provided. Some institutions provided special bridge courses for interested students or for students whose diagnostic test scores indicted such courses were needed. Others had graduate students enroll in undergraduate courses in areas of weakness or offered support such as writing programs for all students whenever it was needed. In one institution, all new graduate students in the department had to take the same classes for the first semester and during that semester received a lot of support. However, as one person explained, "after that you are on your own." A second institution had no mechanism in place to help with academic deficiencies, so the students set up their own. "Because a lot of us were failing, we organized study groups where people who passed the courses previously would tutor the others."

**Academic Supports**

**Advisors**

There was consensus among the focus group participants that the most important academic support is the advisor. There are, however, some institutions where graduate students didn't get advisors until after they passed their orals. For these students, the supervisor in the labs in which they are working was very important; "the key, the person who will lead you."

Things can go wrong with the advisor/student relationship but participants felt that could be "fixed" where the department had formal or informal policies in place. One participant explained, "before you were allowed to join a research group, you were encouraged to go to open houses for each of the groups; to get to know the students and the professors and what their research was. Even if you came into the institution saying this is the person with whom I wanted

to work, [attending an open house] could open up your horizons, which would be helpful if things go wrong." Additionally, if it were "a good department [a student] can talk with faculty in case they need to move to another advisor." However as another participant explained, although it does happen, there is a stigma involved in talking to another faculty member when there were personal conflicts between the student and the advisor.

The consequences of not having a good advisor/student relationship are severe. "In three cases where the advisor died, the advisees had to be distributed across the department. Those who liked the advisor to whom they were assigned stayed; the rest left or transferred."

**Peers**

Peer support was a second major source of academic support. "Students can tell you which profs are good and can help you get out [your degree] in a timely way and which have students who are around for a long long time." One participant's comments underscored the importance of peer support.

> *I took a year off after my undergraduate program. Entering grad school was hard, as was finding people to study with. I failed my exams the first time. The second year I had more Black students who would work with me and I passed.*

The importance of lab mates was stressed not just because of the importance of the work in the lab but also because students are judged on how well they get along with others in the lab. Friends or "social groups of students" were mentioned as well because they "give you tips, tricks on studying, discussion feedback, different approaches" but also because of the "support they gave when you weren't doing well and when you needed it."

Interactions with other minority students were very important to the participants; but for the most part if participants wanted interaction with other minority students, they had to establish ways to do it for themselves:

- *The grad students formed clubs where you felt like you didn't have to perform and you got good academic advice. It was unofficial and always involved beer—*
- *I formed the minority grad student support group at the school. The dean would fund lunches and we would invite minority faculty to talk about their experiences. Then we invited outside speakers and had a symposium. We had support from the school to do it.*
- *We had our own peer support group [of minority students] and would give people the real deal.*
- *We started a diversity group that became a standing committee .*

However, as participants pointed out, relying on other minority graduate students for support along with everything else they must do is unrealistic. And it is also only possible where there are other minority students in the department. When participants were one of the few or the only minority student they would seek out minority students in other departments or use professional organizations to find minority students in the same field from other institutions.

Two participants mentioned graduate student minority programs, including AGEP, saying "knowing they were there was helpful" and wishing that as a grad student they had access to such AGEP activities as workshops on giving presentations, dealing with advisors and how to

write grants. However, while undergrads were encouraged to be involved in minority programs, participants felt that for grad students, being involved in minority programs was seen as neither a positive nor a negative and for post docs it was seen as a negative

**Advocates**

It is not easy for minority grad students to find advocates, particularly with the very small number of minority professors. Students, the focus group members felt, needed to have access to faculty who were "volunteers; people who want minority students to survive." There needs, they felt, "to be a way to educate faculty as to why having minority students is good" and to not penalize professors who do help minority students. At this point, as one person explained, "there is nothing to motivate faculty to care for students."

**Progress toward the Degree**

There was, not surprisingly, a tendency for those who took longer to get their degrees to be less satisfied with the timeliness of their progress. Those who were satisfied or very satisfied with the timeliness of their progress toward the PhD finished in between 2 and 5 years, while those who were less satisfied took between six and nine years to finish their degree. Somewhat surprisingly, those who saw themselves as academically prepared or very prepared to do graduate work took the same amount of time to get their degree as did others (5.4 years). Nor were there major differences in their satisfaction with their progress toward the degree (3.6 vs 3.25).

Focus group participants explained there are a wide number of things that contribute to minority student progress, or lack of progress, toward their PhDs. Certainly the major professor is a significant influence on the process and participants were in agreement that one needs to be aware of which professors' graduate students got their degrees and work with those professors as much as possible.

The academic discipline, it was felt, can make a difference in terms of progress to a degree. For example, in physics, one participant felt, "if you are working in theory, you can graduate in four years, if you are doing experimental work, it is six and a half years." The attitudes of the PIs of participant research projects can make a difference as well. Indeed, one participant felt that in their discipline if the PI had an outline of what the student was doing, the student tended to finish in four years, whereas with PIs who left students alone and didn't push them, it took twice as long.

More officially, participants said, many universities have policies and deadlines to help move students on to their degrees, but those policies need to be applied. As one participant explained, "there were rules; but before [the arrival of a new graduate director] the rules weren't being followed." Now committees now have to meet with students at least annually and students have to take their orals in the first two years. In a second institution, a new dean made a difference. The dean met with everyone, established deadline dates and said "these are the rules and we are going to follow them."

A third institution also enforces the annual committee meetings requirement but adds a further twist. Students are required to present their work to the department annually which puts pressure

on the advisor because if the student's work isn't progressing, the advisor doesn't look good. Institutional pressure can make a difference:

> *It took me 8 years to get my PhD. I had delayed it for a year and they said you had to submit the dissertation; they said you HAD to graduate. I think if they hadn't done that I would have delayed it for another year.*

Without enforced rules that cover the entire PhD process there can be "gaps." One participant spoke of not having any committee meetings for the last six months "before the very end" while another said that there were policies that covered the first few years but "then it is up to you to finish. At my university there was no final push. I know some who spend many years [trying to finish]." Another participant summed it up this way: "You are required to manage your own graduate education. If you miss the deadlines it is your fault."

**The Graduate School Experience**

On the survey, participants were quite positive about their graduate school experience. They rated most positively opportunities to present posters at professional meetings, followed by research opportunities, opportunities to make contacts with professionals in the field, coaching for professional presentations and opportunities to present papers at professional meetings. The only experience rated below neutral was opportunities to learn about science policy. Four participants each indicated that teaching opportunities and opportunities to set up a lab were not available to them.

**Table 2: Post Docs' Ratings for Various Factors of their Graduate School Experience (5=Very positive to 1=Very negative)**

| | Average Rating | Support not available |
|---|---|---|
| Opportunities to present posters at professional meetings | 4.5 | 1/6% |
| Research opportunities | 4.2 | 0 |
| Coaching for professional presentations | 4.1 | 0 |
| Opportunities to make contacts with professionals in the field | 4.1 | 0 |
| Opportunities to present papers at professional meetings | 4 | 0 |
| Opportunities to write for scientific publications | 3.8 | 0 |
| Teaching opportunities | 3.6 | 4/24% |
| Faculty mentoring | 3.5 | 0 |
| Support for writing grants | 3.4 | 0 |
| Opportunities to learn about the logistics of setting up a lab | 3.2 | 4/24% |
| Exposure to career opportunities in different sectors | 3.1 | 0 |
| Opportunities to learn about science policy | 2.9 | 0 |

Research was also the most frequently listed positive aspect of their graduate experience, including conducting research (7), presenting research (3) and publishing it (1). Fellow students were listed by eight participants including four who listed minority student organizations or peers. Seven also listed mentors and advisors.

In the focus groups, participants spoke movingly about the important support their fellow students, especially minority students, provided:

- *Great friends. We did things socially and academically, took classes, talked theory, reading each other's work and now that we are colleagues— as professionals, we still help each other out. Most of my graduate school friends have been minorities which was not the case as an undergraduate.*
- *Fellow minority students. We all had our tough days and exams. We all studied together and the older students quizzed us. If one of us did poorly, they tutored us until we passed it.*

Other personal "high points" included:

- *The team sprit in the lab… Getting support from undergraduates as well as getting help from supervisors is very helpful.*
- *Having a good relationship with my mentor. It was good to go in and talk about science.*
- *Everything—social life, difficulties that teach you something, skills and the problem that you learn to solve—learning something new, meeting my mentor and the faculty. It is a combination of everything there was not something in particular.*

Professional "high points" included:

- *When my experiments worked*
- *The joy in learning how to learn on my own—how to solve a problem, even to determine the problem I wanted to work on.*
- *When I was confident enough to write my own papers and getting accepted for publication and to gain the confidence of my advisor.*
- *The liberty to pursue the ideas I wanted to without the constraint of getting something done*

Survey responses about negative experiences centered around a lack of support (7). Writing support (2) was most frequently a negative followed by discrimination (5) including gender discrimination (3) and racial discrimination (2). Lack of mentorship (4) was listed as was a generally negative culture as were a lack of labs and other resources.

Racism was a big part of the negative graduate school experiences brought up in the focus groups, with participants speaking about how it was "always a struggle. I had to work twice as hard to show I earned my spot. They thought I wasn't good enough." They also spoke of having to prove yourself more and having to deal with people who are important to your career who say "minority post docs aren't seen as productive [as other students]." And one participant explained, "people internalize a lot of those criticism[s]. When directed at minority individuals, it becomes something that is bigger than just you. It is you the race rather than you the individual."

The theft of their work by research mentors or other supervisors, was mentioned by two participants and supported by several others who knew of instances where that had happened to students they knew. In one case, when the student confronted the research mentor who had

stolen the work, the student was no longer allowed access to their data and lost two years of work.

Advisors and mentors contributed to graduate students' negative experiences in other ways as well:

- *When you are at the end of your grad studies, you get very independent and face some problems with your supervisor. My professor was happy that I was thinking independently but other senior professors were not so happy about it.*
- *My advisor was not given tenure and he wasn't available the last year. We had good interactions until then but he was "gone" that last year.*
- *Towards the end of my stay; my PI was not able to renew grants so I didn't have money. I had to borrow money, finance trips myself to go to meetings. That was tough not having the finances to do some things that I wanted to.*

**Commitment to an Academic Career**

On the survey 65% (11) of the participants saw themselves as committed or very committed to an academic career. Five decided to pursue an academic career as undergraduates, six as graduate students and three as post docs. The desire to make positive social contributions, college professor mentors and personal interests and personal abilities were rated as the influences that most strongly encouraged them toward academic careers. The only influences rated below as neutral were ability to combine career and family and financial rewards.

**Table 3: Post Docs' Ratings of Influences Toward and Away from an Academic Career (5=Strongly encouraged 3=Neutral 1=Strongly discouraged)**

| | Mean |
|---|---|
| Desire to make positive social contributions | 4.6 |
| College professor mentor(s) | 4.5 |
| Personal interests | 4.5 |
| Personal abilities | 4.5 |
| Other mentors | 4.1 |
| Challenge of profession | 4.1 |
| Other college professors | 3.9 |
| Spouse or partner | 3.7 |
| Fellow graduate students | 3.7 |
| Flexible hours | 3.7 |
| Spouse/partner's career | 3.6 |
| Parents | 3.3 |
| Job image | 3.3 |
| Other relatives | 3.2 |
| Job opportunities | 3 |
| Ability to combine career and family | 2.9 |
| Financial rewards | 2.7 |

Advisors/professors (10) including those at all levels; seventh grade (1), undergraduate (3), graduate (4) and postgraduate (2) were most frequently listed in the survey as inspirations toward an academic career:

- *I still look to a teacher I have known since seventh grade. She is still motivated, enjoys teaching and wants to learn*
- *A faculty in my MS institution was warm, smart, realistic, sympathetic, aware of academic politics but not jaded by them, great teachers, committed to doing the right thing.*
- *The head of the laboratory where I am working now was a brilliant and caring physical-scientist. He inspired me to follow my dreams.*

Others were inspired by the childhood knowledge that if you wanted to do research in Biology you needed to go into academia, the looks on students' faces and Carl Sagan and the TV show Cosmos.

Only four said they were not planning to pursue an academic career, and even one of them is planning to work in academia as well as industry. Long hours, wanting to start a family and a negative post doc experience were the reasons they gave for not going into academia. Debt level, or at least debt level directly related to their education, did not appear to have an impact on their interest in going on to academia. Over half (6/54%) of those who were very interested in an academic career had debt from their undergraduate and/or graduate education including, in three cases, debts of over $30,000. Those less than very interested in academic careers included three with debts and two without. Their graduate education was most often funded through fellowships (13/76%) and research assistantships (10/59%) followed by teaching assistantships (8/47%) and loans (6/35%).

The ambiguities felt by two focus group participants who were not sure if they want to continue on in academia present a vivid picture:

- *I've thought about professorate quite a bit. My options are do I want to go into an academic institution that is one of the top ten. If so who students will I be helping? Is my goal to advance research or to advance learning and education for other minority students? I could go into a smaller university and focus less on research and more on the education. I am balancing that with the sort of salary you will get and the amount of social life you can have being a professor after all the work. It is a tough decision and I'm still battling with it.*
- *Everything is a lot of work, especially in academia. If you want to be tenured in a research oriented institution, you have to bring in the money and do research. You do have academic freedom, but your research has to fit into NSF [and other funder] research interests. The pressure. If I were to go into a small college and focus on teaching… but if you don't do any research then your career is dead, if you ever want to more to a more research institution. I'm tired and I am thinking about national labs because I can do research and publish and leave the door open to go back into academia.*

Most of those who were ambiguous about going into academic careers were women and they were worried about combining academic lives and family; noting that assistant professors with children were men with wives. The need for advice on balancing graduate school and the rest of

your life was brought up by several students, primarily women, both married and single. "It is hard to have a family when you need it. [Family balance] isn't discussed. To have to keep postponing your personal life is uncomfortable."

The reasons for going into academia varied tremendously among focus group participants. Some want to go into academia because they like to do research, but "don't much enjoy teaching"; others enjoy teaching and see research and teaching as very much interrelated, others "love science and enjoy the discovery process." Some want to go into academia because if society doesn't "train new people who can think and solve any problems… it is lost" and others because they "have an obligation to [their] community; can assist others."

They realize how hard it is to get into academia.

- *It is hard to find a tenured position—you have to come in at the right time, like when people are retiring. You are competing with 50 others for the position, even in a small institution."*
- *You have to move where the job is located. If you are married "you have a two body problem."*

As minorities who, for the most part are planning to go into academia, there was consensus that better salaries at the post doc and faculty level would help encourage minorities to go into academia. Additional suggestions included:

- *The best you can do is give them the options – if like it they will take it*
- *You have to make the professorate exciting and attractive. You have to start before graduate school. Talking to my dad, [I heard] the professorate wasn't for minority students. And to some extent it is still that way. You could start in with some sort of program; introducing younger students to minority faculty. If you don't see anyone who looks like you; you won't do it.*
- *You need to assure them that they are going to get a job. It is hard for minorities. I don't know if affirmative action is working. Sometimes has to do with where you graduated; it is hard to compete with people from a known university. Most of the people getting the jobs are those from the top universities; that discourages minorities.*

It is not clear the degree to which career supports are helpful in encouraging post docs to go into academia, but it is clear how important the advisor is to getting, or not getting, academic jobs:

- *You need to develop a good relation with your advisor. It is your advisor that finds you your first job in terms of getting a post doc or a job*
- *People get jobs not just on the abilities/capabilities but on whom you know and who is recommending you.*

Under some advisors, students just don't get introduced to "big names" and don't get invited to conferences. Other advisors insisted "we attend the conferences and present papers. He would make sure we met different people." "You need to have advisors invite people to go see your poster." And especially, if you are shy, to "force you out there" to network.

The support provided by university career centers and professional organizations tended, in the eyes of the focus groups, to focus more on non academic jobs sponsoring seminars to provide

students with “a perspective of what else was out there, beyond the graduate experience,” bringing people from industry, national labs and academia to talk about careers and even talking “to companies and different industry about any possible openings, helping you in your career”.