

Project Summary

“Undergraduate Diversity at the Society for the Study of Evolution and the Society for Systematic Biologists”

Intellectual Merit: We are requesting funds from the Undergraduate Research and Mentoring (URM) program to bring 15-20 undergraduates from a diversity of backgrounds to four upcoming annual joint meetings for the Society for the Study of Evolution (SSE) and the Society for Systematic Biology (SSB). Richard Kliman and the PI have run this program for the last four years, with great success and much enthusiasm from the community. As in past years, the goal of the program will be to help increase the cultural diversity of the undergraduates attending SSE meetings, and the pool of promising young evolutionary biologists nationally, by bringing mentored students to the annual meeting. The distinguishing ingredient for this program will be the mentoring of undergraduates by faculty and graduate students during the meeting. Each undergraduate will be assigned two mentors. Mentors will each be expected to mentor undergraduates for a minimum of one day during the meeting, thus guaranteeing a minimum of 2 days of mentoring for the 4-day meeting. Mentoring will require attending sessions with the students, demystifying talks for the students, interacting with the students during meals, introducing the students to other faculty, graduate students and postdocs in the field, etc. In particular, it will be crucial that the mentors explain details of talks attended by the students so that the students can understand the talks and walk away with an appreciation for the positive and negative aspects of the talks they attend. These mentors will ease the transition of attending a meeting for the students and, ideally, convey the excitement of evolutionary biology and a career in evolution.

In addition to the mentoring, program participants will present posters of their research and enjoy a “pep talk” near the end of the meeting in which an invited practicing evolutionary biologist will present ideas/perspectives on issues relating to career success in evolutionary biology. Such speakers will have expertise or experience in particular areas, such as admissions to graduate school, non-academic jobs in e.g., museums and public policy institutions that use evolutionary biology, or health and environmental aspects of evolutionary biology, and in general will seek to inspire the participants to take a career in evolutionary biology seriously.

We also propose an informal partnership with NESCent, wherein NESCent assists with a number of logistical and recruiting functions, as well supports a small number of additional undergraduates for the program.

Broader Impact: Societies such as SSE and SSB provide an excellent means of increasing the cultural diversity of environmental biology nationally. The activities described in this proposal will help achieve the UMEB goals of increasing the number of students in underrepresented group exploring careers in environmental biology by providing participating undergraduates with a broad exposure to evolutionary research as well as to graduate schools and other career paths in evolutionary and systematic biology. The incentives for graduate students and postdocs to serve as mentors to these undergraduates should also serve to instill recognition of diversity recruitment as an important element of their future independent research careers.

“Undergraduate Diversity at the Society for the Study of Evolution/Society of Systematic Biologists”

Professor Richard Kliman (Cedar Crest College, PA) and I are requesting funds from the Undergraduate Research and Mentoring (URM) program to bring approximately 14 undergraduates from underrepresented groups to four upcoming annual meetings for the Society for the Study of Evolution (SSE) and Society of Systematic Biologists (SSB). This proposal represents a request for a renewal of grant # 0431754. The SSE is the major international society for the study of organic evolution, and publishes a major journal, *Evolution*. The SSB is the major international society for systematic biology and publishes the journal *Systematic Biology*. Edwards has served on the Councils and Editorial Boards of both Societies and Kliman has been a guest Editor for *Evolution*. Both individuals have wide experience in undergraduate mentoring. In particular Kliman has assisted with the implementation of our program for the past three years, effectively replacing our original co-PI, Elizabeth Zimmer. We propose that Kliman and Edwards act as co-Directors of this project for the next four years, working together to recruit appropriate students and organize the annual program. Nonetheless, receipt and handling of all funds will go through Harvard, Edwards' home institution.

Overall the program has been very successful over the last four years. We have brought students to the last four domestic locations (SUNY Stonybrook; U. Alaska, Fairbanks; Fort Collins, CO; and Chico State, CA) as well as two students to the first international SSE/SSB meeting in Christchurch, New Zealand. In 2001 a pilot program, funded through the UMEB program, was conducted (supplement to NSF DEB 9815800). The program brought 16 undergraduates from diverse backgrounds to the 2001 SSE meeting in Knoxville, TN. The students hailed from all over the U.S., including Puerto Rico, and all presented posters from their own research, interacted with established scientists, were mentored in pairs by graduate students, and attended a mentoring discussion on graduate school. A 'diversity social' (although not funded through the program) was held and attended by about 100 scientists and students, nearly one-tenth of all meeting attendees. By all accounts the program was very successful, and soon after the meeting the results and content of the program were published on the web (<http://www.oeb.harvard.edu/faculty/edwards/community/peptalk/index.htm>).

In this first season we learned much about ways to improve the program and the programs in the subsequent four years went relatively smoothly. Most importantly, a number of students received critical exposure and mentoring in evolutionary research and have progressed onto graduate programs, often in evolutionary biology. All of the students in previous years' programs are listed in the final report for grant 0431754 on fastlane. A recent comment received by email in January 2007 from Jeanine Abrams, now of the University of Texas at Austin, had the subject line, "Diversity at SSE--It Works!" Jeanine wrote (quoted with permission):

“After taking two-years off to teach, I decided to pursue this degree [at UT Austin] and my experiences at the 2001 and 2002 Evolution meetings were key to my decision. Having the opportunity to present my research and to learn what was going on in the field meant a lot to me. However, the support and encouragement that I received from you and your staff was the most

valuable resource. Not only did you encourage me, but you also informed me of the importance of diversity within this field. Being the sole African-American in the entire Integrative Biology department has further opened my eyes to the need for greater diversity in evolutionary biology. If there is any way that I can be involved in the mentoring, planning, etc. for the Diversity at SSE program at future conferences, please let me know. Thank you..."

Jeanine's e-mail also alludes to the self-sustaining nature of the program – former student participants may go on to mentor the next cohort of students.

Another example of our success comes from Ms. Aida Miro, who is now a graduate student in the Genetics and Genomics Graduate Program at the University of Florida. On 9 February 2008, Aida wrote (again quoted with permission):

"I'm compelled to give you an update and restate my appreciation for that opportunity [of the UMEB program], because it was truly one of the most important moments of my academic/professional career. It was at this conference that I discovered the field that could encompass all my interests: molecular anthropology, and where I came in contact with a professor that would guide me as I learned about the field and decided where I would continue graduate school. Currently, I'm a first year student of the new Genetics and Genomics PhD program at the University of Florida working with Dr. Connie Mulligan and recipient of an NSF Graduate Research Fellowship. I'm really happy with what I'm doing, and it might not have happened had I not gone to that [SSE/SSB] conference. So thank you, for my experience and for giving undergraduate students the opportunity to experience the world of academic research."

Wow. It doesn't get much better than that.

We also had a lot of enthusiastic endorsements from mentors of the programs. These were usually postdocs or Assistant Professors, or graduate students in evolution programs. We frequently had repeat participants in the mentorship program, which eased the strain of finding enough individuals. Former mentors would frequently contact us months in advance to learn about the possibility of mentoring again the next year.

Overall structure of the program

As in previous years, the goal of the program will be to help increase the cultural diversity of the undergraduates attending SSE meetings, and the pool of promising young evolutionary biologists nationally, by bringing mentored students to the annual meeting. The distinguishing ingredient for this program will be the mentoring of undergraduates by faculty and graduate students during the meeting. Each undergraduate will be assigned two mentors. Mentors will each be expected to mentor undergraduates for a minimum of one day during the meeting, thus guaranteeing a minimum of 2 days of mentoring for the 4-day meeting. Mentoring will require attending sessions with the students, demystifying talks for the students, interacting with the students during meals, introducing the students to other faculty, graduate students and postdocs in the field, etc. In particular, it will be crucial that the mentors explain details of talks attended by the students so that the students can understand the talks and walk away with an appreciation for the

positive and negative aspects of the talks they attend. These mentors will ease the transition of attending a meeting for the students and, ideally, convey the excitement of evolutionary biology and a career in evolution.

Selecting Undergraduate Attendees and Mentors

Selection criteria – Students will be selected so that:

- a) All students must be US citizens.
- b) As a group, attending students must increase cultural diversity among undergraduates at Evolution meetings.
- c) Students demonstrating a need for funds to attend SSE will be given preference. Those students without access to travel funds from their institutions or their research advisor's research budget will be chosen over those that have significant support.
- d) Students must be registered undergraduates or very recent graduates (i.e., having finished classes during the winter or spring quarters (semesters) before the meeting).
- e) All students will be encouraged to attend the entire meeting to maximize their participation and to minimize travel costs by spanning a Saturday overnight stay.
- f) At least 75% of the students supported would be scheduled to present research plans and/or results, but up to 25% could be at an earlier stage of their training.

Complete application materials, and an overview of the program, are on Edwards' web site:

<http://www.oeb.harvard.edu/faculty/edwards/community/application.html>

The undergraduates will be selected from e-mail nominations made by faculty. Nominations will consist of a brief letter of recommendation from sponsoring faculty. The letter will address the financial need of the student(s), how participation by the student(s) will improve diversity at SSE, the student's registration status at the academic institution, and the length of the student's stay at the meeting. Ideally, students will be nominated in pairs from any institution. This will be done to minimize the awkwardness and shyness that can often accompany an undergraduate's first attendance at a meeting.

Faculty subscribing to various evolution e-lists, such as EVOLDIR and TAXACOM, will be notified electronically of the availability of the funds for students. An email solicitation may also be sent to past UMEB awardees gleaned from the NSF web site. Faculty on campuses with a high percentage of underrepresented groups, such as the Historically Black Colleges and Universities, New Mexico State U., Arizona State U., and the California State campuses will be notified as well.

Identifying mentors -- The Program Committee, consisting of Richard Kliman and myself, will

be responsible for identifying faculty and graduate student mentors for each undergraduate applicant. In most cases, the student's actual faculty advisor can serve as one of the mentors. Ideally, the other mentor, particularly the graduate student mentor, will be from an institution different from those of the undergraduates they will mentor. This may be difficult to implement but will be a great way to spread the word throughout the community of evolutionists nationally and to facilitate interaction among folks who would not normally interact on a day-to-day basis. If the undergraduate's normal faculty advisor cannot serve as mentor, another faculty from the home or other institution, particularly one who already knows the undergraduate or pair, can serve as a surrogate mentor.

Details of Events at the Meeting

Poster session -- The undergraduates will be expected to present a poster of their work or work-in-progress. We will request from the local organizing committee to have a special session of the normally scheduled poster session devoted to these undergraduates. Alternatively we may try to secure a separate room for these activities. At a minimum, however, the special poster session devoted to these activities will be mentioned in the program. In some years we were able to secure the last row of posters for the UMEB undergraduates, and flagged the area with a large “Diversity at SSE” poster – this worked quite well. In addition, refreshments may be provided during this undergraduate poster session, although NSF support is not requested for these refreshments. Approximately 14 undergraduates will be identified to attend the meeting and present posters at a special session of the meetings. The precise number will be determined based on local and transportation costs at different venues each year.

Undergraduate ‘Pep Talk’ – An organized presentation/discussion will take place near the end of the meeting. This session will be primarily open to the undergraduates and graduate and faculty mentors in the program, but other undergraduates, graduate students, faculty and NSF program officers will be encouraged to attend. The discussion will focus on ways to maximize success in a career in evolutionary biology, and the diversity of training modes and careers that can feed into and be fed by evolutionary biology. The contents of last year’s presentation by me can be seen on the web. We will also solicit a presentations from practicing evolutionary biologist with expertise or experience in particular areas, such as admissions to graduate school, non-academic jobs in e.g., museums and public policy institutions which use evolutionary biology, or health and environmental aspects of evolutionary biology. The presentations will end with a discussion among all attendees. In various years we have had myself, Kliman, Elizabeth Zimmer, or another attending faculty (e.g., Mohamed Noor of Duke and Lacey Knowles of U. Michigan) give this Pep talk.

Social Event -- A “Diversity Social” will also be organized, which will bring together meeting attendees with a common interest of increasing cultural diversity at SSE/SSB meetings and in the field generally. This social is expected to attract ~100 persons; attendance by the participating undergraduates and their mentors will be required, and refreshments will be supplied, although we understand that funds from this supplement will not be directed toward social activities. Nonetheless, the social will serve an important function of the overall goal of the program, namely fostering interaction and awareness of the need for enhanced diversity at SSE/SSB. NSF funds will not be used for this event.

Logistics

Preparation for the meeting -- Several months prior to each meeting, the Presidents and Councils for SSE and SSB will be consulted to confirm approval for the program. We will solicit waivers for registration for graduate mentors, and will secure permission to pay the advanced registration student rate for all undergraduates. In addition, we will contact the conference organizers to include in the conference program a flyer advertising the program and the associated social event for the meeting attendees. SSE and SSB web sites will also be used to advertise both the undergraduate fellowship opportunities and a call for graduate student mentors.

Meeting registration and housing -- We will secure permission to have the undergraduates attend the meeting at the reduced student registration fee that they would have paid had they registered prior to the deadline. Ideally in most years they will register prior to this deadline, but this alternative course may have to be taken for 2008. This will simply require that they register by fax or regular mail. Last year the conference organizers requested that they be sent a single check covering registration costs of all the students, and this will likely happen in subsequent years. In addition, we will make the local organizing committee aware of the need for housing for these students. Students will be encouraged to use the shared rooms in the dormitories. Presumably faculty serving as mentors will have already registered for the meeting and arranged for their own housing, and so we do not anticipate using any program funds to facilitate attendance of the meeting by mentors.

Travel Arrangements -- Students or their normal faculty advisors will arrange travel through Harvard University. The assistant to the Department of Organismic and Evolutionary Biology, Katie Parodi, will arrange for travel through Harvard's Corporate Expedia web site. Students will be notified of their itinerary once it is finalized. We anticipate and have budgeted for the average travel cost being approximately \$600. In addition, housing arrangements will be made with each local organizing committee. We can usually secure budget accommodations in dorm rooms. Students will be allowed to charge incidental travel fees, such as cabs or trains, as well as some meals during travel days.

Administration -- As mentioned above, Katie Parodi of Harvard has agreed to facilitate organization of travel. In addition, Alison Pirie, faculty assistant in the Department of Ornithology, Museum of Comparative Zoology, often helped with various aspects of program organization each year. In addition we would like to request temporary staff to assist with keeping prospective participants apprised of upcoming details and generally helping to organize each cohort. This additional assistance could be in the form of a graduate student or an advanced undergraduate. In addition we request funds to send this assistant to the each meeting to help implement the program on site. The need for on-site assistance cannot be overstated -- both Directors in past years have spent most of the meeting besieged by organizational duties, with little time to enjoy the meetings themselves. In addition, it considerably adds to the student's enjoyment of the program if the organizing assistant -- with whom they have been communicating by email and phone for several weeks prior to the meeting -- was able to attend and meet the students face to face. An assistant with lots of charisma can do wonders for the

success of the program, and having him/her attend the meeting will increase the impact even further.

Program partners - We have had informal discussions with other groups, in particular NESCent and a program run through BYU by Keith Crandall, of linking with those groups. Recently the PI was in contact with two NESCent staff, including Professor Todd Vision (Director of Bioinformatics) and Brian M. Wiegmann, Director of Education and Outreach. Both Dr. Vision and Dr. Wiegmann indicated strong enthusiasm for the program and the ability to help locate and fund prospective candidates. In particular Dr. Wiegmann suggested a number of areas in which NESCent could support the program activities (some of the following text is borrowed from their letter of agreement in the Supplementary Documentation):

- Funds - NESCent will agree to support five students, at a cost of approximately \$4000. Funds will come either from the Education and Outreach budget or from the Director's discretionary fund.
- Recruitment and Logistical Support Prior to the Meeting - Jory Weintraub, Program Manager (EOG) has considerable experience organizing and facilitating meeting-related activities. In particular, NESCENT EOG can help with the recruitment, advertising and selection process, if necessary. NESCent has a listserve of faculty who teach and conduct research in evolution at MSIs and HBCUs and this would be an excellent way to help advertise the program and solicit nominations. In addition, NESCent contacts from past work at HBCUs and Jory's involvement with NESCent's EEHMU group and AIBS' DIBS diversity group can help contribute to recruiting.
- Logistical Support at the Meeting – NESCent personnel can help organize and facilitate events and activities at the meeting.
- Recruiting of Mentors NESCent can facilitate recruitment of NESCent postdocs as mentors when needed.
- Leading/Facilitating Professional Development Activities at the meeting - In addition to the existing activities (poster session, social activity, pep talk) we think it would be valuable to organize some "hands on" workshops on things like "Identifying, Applying and Interviewing for Graduate Programs in Evolution", "How to Write a Personal Statement", "Networking", etc. Jory has developed and delivered many of these types of workshops for underrepresented minority undergrads in the past and would be happy to do something similar at SSE/SSB

Although we have not put together specific plans as yet, we will work with Dr. Wiegmann annually to identify a strong applicant pool, one larger than can be supported solely by this program. The result will be a concerted effort and a deeper search for deserving talent, and increased opportunities for a diverse group of undergraduates. It will also be important to coordinate with the growing number of PIs conducting outreach activities for these meetings. For example, Dr. Daniel Promislow (U. Georgia) has been organizing workshops for graduate students about how to prepare for the job market in the evolutionary sciences, and it may be

possible to work with him on some sort of joint event.

Follow up/Evaluation

To monitor the impact of this experience for the students and to solicit suggestions for future events such as this, I will produce a survey form to enable students (both undergraduates and the graduate student and faculty mentors) to provide constructive criticism of this program. This form will be invaluable for honing the program, for improving its execution in future years, and for comparison with other programs such as the one begun by Alan Berkowitz for the Ecological Society of America, or by Emelia Martins for the Animal Behavior Society. The form will be brought to the meeting and distributed to the students for collection at the meeting. We will collect the forms before students leave the meetings, and will only reimburse students after they have submitted their evaluation forms. We hope to have results and summary of the program activities on the web within ten days of the end of each SSE/SSB meeting.

Evaluation of Diversity at SSE/SSB 2002-2007

In the past four years the number of students participating in the program varied from 15 to 20. In general students appreciate being met at a central location near the beginning of the meeting so they can be oriented, meet the program organizers, and meet one another. This is generally accomplished by constructing a large banner with the program name and displaying this prominently in a central meeting area, such as the opening reception, which they are all encouraged to attend. The positive aspects of the program will remain unchanged. These include the overall goals of the program, poster session, mentoring by graduate students, attendance of the meeting by pairs of undergraduates rather than singles, the closing 'pep-talk', and social event. The students very much appreciated not having to pay for travel out of pocket, and we propose to continue our protocol for charging travel. Some of the continuing problems of the program include a lack of funds to support travel of some highly appropriate student mentors; inability of the assistant organizer to attend the meetings; and unnecessary failure of some students to attend the banquet. For this reason we request travel funds for our undergraduate or graduate assistant to attend the meetings as well. To keep things organized and so as not to favor one sector of students over others, we will charge as much of the student costs directly to the budget as possible so that students do not have to pay out of pocket.

There were several instances in which highly qualified mentors, in some cases the postdoctoral or faculty advisors of the undergraduates at their home institutions, were unable to attend the meeting and act as mentors because of lack of funds. Unfortunately we see no way out of this dilemma, except to pay for travel in exceptional cases where funds are available. This is an unfortunate aspect of a program targeting undergraduates, but, since the goal is to maximize undergraduate participation, it is one that will have to persist until further funds are available.

Some undergraduate participants elected not to attend the banquet because they felt there were more enjoyable things to do with that time. While we don't want to force students to attend, we feel it is important to encourage them to attend, since mixing with other conference attendees is an important aspect of life as a practicing, professional biologist.

In summary, I consider our past years' efforts an overall a great success. We feel that most of the major pitfalls of last year's program were do to the pilot nature of the program and can be easily remedied given sufficient time to plan.

Significance and Justification

The enthusiasm for this program among SSE and SSB Council members has been outstanding, both this year and last. In addition, informal queries of faculty at several institutions over the past year about the future of the program suggests that such enthusiasm is likely to continue. I was greatly heartened to have received an email from Fred Janzen (Associate Professor, Zoology and Genetics, Iowa State U.) praising a previous year's effort:

“Last year Scott Edwards (and others) did a great job in attracting, and obtaining NSF support for, undergraduates from underrepresented groups to attend the Evolution meetingsWe'd like this year's workshop/symposium to continue positive momentum and engage more evolutionary biologists in these very important issues. After all, mentoring and diversity, in particular, are essential elements of science.”

The program that year was one inspiration for Dr. Janzen to organize a workshop on the subject of minority diversity in evolutionary biology at the next year's meetings. Clearly the enthusiasm is contagious!

In addition, the ability for several students from the Universidad de Puerto Rico to attend the meeting as part of the program ignited an idea in them to hold a future meeting at their home institution. Now that Dr. Owen MacMillan has moved away from U. Puerto Rico to North Carolina, that conduit will be harder to maintain, since he was our main contact from Puerto Rico who attended the meetings regularly. Still there are many additional faculty contacts that can fuel the often-unforeseen consequences of bringing these students in contact with other scientists, so that everyone benefits. In fact, I can easily imagine that the number of students brought to subsequent SSE meetings could be increased several-fold over the scale of this initial pilot program. Nationally recognized Societies such as SSE and SSB provide an excellent means of increasing the cultural diversity of environmental biology nationally. This activity will help achieve the URM goals of increasing the number of students in underrepresented group exploring careers in environmental biology by providing participating undergraduates with a broad exposure to evolutionary research as well as to graduate schools and other career paths in evolutionary and systematic biology. The incentives for graduate students to serve as mentors to these undergraduates (registration fee subsidy and access to a variety of SSE and SSB faculty and P.I.'s) should also serve to instill recognition of diversity recruitment as an important element of their future independent research careers.