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Liberal Arts Colleges and Universities: Incubators for Scientists

Why is Howard Hughes Medical Institute inviting 226 colleges and master's universities to compete for \$60 million in science education grants?

Preparing Tomorrow's Scientists Liberal arts colleges and master's colleges and universities play a unique role in educating the scientific leaders of the future. These institutions awarded 44 percent of all bachelor's degrees in the natural sciences, according to a 2004 enrollment and completion survey conducted by the U.S. Department of Education, despite awarding a small percentage of the bachelor's degrees overall. The survey also found that almost one-third of all students earning doctorates in the natural sciences were graduates of liberal arts or master's institutions.

Expanding the Ranks of Groups Underrepresented in Science These institutions serve substantial numbers of women and minorities underrepresented in the sciences.

A 2004 National Science Foundation (NSF) report entitled *Women, Minorities, and Persons with Disabilities in Science and Engineering* noted that 42 percent of African Americans and 19 percent of Hispanics and Native Americans who earn Ph.D.s in science or engineering earned their undergraduate degrees at baccalaureate and master's-level colleges and universities. More than half of the women earning doctorates in the biological sciences attended liberal arts colleges or master's-level universities.

Historically black colleges and universities, which generally are baccalaureate and master's degree-granting institutions, account for more than 29 percent of all bachelor's degrees in science and engineering awarded to African Americans.

Sixteen historically black colleges and universities and one tribal college have been invited to compete in the new HHMI undergraduate science education initiative for baccalaureate and master's colleges and universities.

Special Strengths of Colleges What is it about these small colleges and universities that makes them so successful at training future scientists? Some of their special strengths include:

- Small class size
- Low ratio of students to faculty, which facilitates one-on-one mentoring
- Opportunities for earlier hands-on research experiences
- Faculty who are focused on teaching undergraduates
- A nurturing environment
- Cross-training in the humanities and arts
- Science for nonscience majors

Challenges Ahead Although bachelor's and master's degree-granting colleges and universities have a tradition of producing successful scientists, they face some serious challenges.

Funding A 2002 NSF report indicates that liberal arts colleges and master's degree-granting universities receive less than 20 percent of all federal dollars for support of science and engineering education and less than 5 percent of federal research dollars. This scarcity of funding puts an enormous strain on the ability of faculty to be actively engaged in research, which is integral to good teaching.

Reaching diverse populations Colleges and universities still have a long way to go in their efforts to attract and retain significant numbers of students from minorities underrepresented in the sciences. The NSF report, *Women, Minorities, and Persons with Disabilities in Science and Engineering*, states that in 2004, the percentage of African Americans, Hispanics, Native Americans, and Native Alaskans earning science degrees was one-third or less of their percentage in the overall population.

By including institutions that serve large numbers of underrepresented minority students, such as historically black colleges and universities, HHMI's new competition for grants to bachelor's and master's degree-granting institutions can help those institutions recruit and retain those students in the sciences. HHMI funds can also be used to improve recruitment and retention of underrepresented minority students in science at institutions where the numbers of these students are small.

Developing educational and human resources Liberal arts colleges and master's-level universities tend to have small faculties who teach and conduct research without the assistance of graduate students or postdoctoral fellows available to faculty at larger universities. The lack of research funding also means lower access to technical assistance. These factors can limit the kind

and scope of science they can do.

HHMI grants from the new competition can support postdoctoral fellows who want to learn to teach, collaborations between colleges or between colleges and research universities, technical support for interdisciplinary research, and new faculty appointments in emerging or cross-disciplinary fields.