

# Carnegie Initiative on the Doctorate

In 2001 The Carnegie Foundation for the Advancement of Teaching launched a multiyear project to examine the doctoral degree in the United States. Entitled the Carnegie Initiative on the Doctorate (CID), the project aims to stimulate rethinking and renewal of doctoral programs in six disciplines, one of which is mathematics. During 2003 the CID will publish a set of twelve essays, two in each discipline, about doctoral education. And earlier this year, thirty-two “partner departments”, including eight mathematics departments, were chosen as participants in the initiative.

Founded by Andrew Carnegie in 1905, the Carnegie Foundation has a long tradition of carrying out research and policy studies in education. One of its most famous and influential projects was the 1910 “Flexner report”, a tough indictment of medical schools in the United States that led to widespread reform. It was partly because of his fame as author of that report that Abraham Flexner became the founding director of the Institute for Advanced Study. Although the Flexner report is sometimes mentioned in connection with the CID, the similarity is not strong. “Of course we would like [the CID] to be influential,” remarked Chris Golde, research director for the CID. The difference is that Flexner clearly had an agenda in mind when he wrote his report, while the CID does not. “We are committed to that [agenda] needing to arise from the disciplines,” Golde said.

In fact, the CID does not even take it for granted that doctoral education needs a huge overhaul. “I don’t see [the CID] as necessarily dramatically changing what we do,” said Kevin Corlette, chair of

the University of Chicago mathematics department, one of the CID participating departments. “The idea is to go back to basic questions about what we are trying to accomplish in doctoral education and to think about what we could do differently or better.” A sign of the excellence of U.S. doctoral programs is that they attract students from all over the globe. Still, evolution in the societal and academic contexts in which these programs exist has sometimes caused mismatches between the goals of doctoral programs and what is expected of the programs’ graduates. The idea of the CID is to ask anew the question, What is the purpose of doctoral education today? George Walker, a theoretical physicist at Indiana University who serves as the CID project director, said the main goal is to “convince people to think carefully and deeply about PhD programs, and then to act on their thoughts, just as they do in their disciplinary research.”

An organizing notion for the initiative is that doctoral programs should produce “stewards of the discipline”. In addition to having made an original contribution to research in the discipline, a steward possesses perspective on the history of the discipline, on the “big questions” and ideas that drive the field, and on its relations to other areas. A steward should also be a communicator in the broadest sense: someone who not only can teach students effectively but also can communicate in such a way that the tools and ideas of the discipline are available to those outside it. The notion of a steward of the discipline “calls in an ethical dimension,” Golde remarked. “It’s about integrity.

It's about, What are your responsibilities to the discipline?"

The CID is "conceptually based," Golde explained. "Its heart is in ideas, not in very specific practices." The purpose is not, say, to promote the use of interdisciplinary team projects in doctoral programs. Rather, the goal would be to get departments to think carefully about the communication skills that stewards of the discipline should possess. Departments would then consider what kinds of experiences—team projects may be one of them—would lead to the development of those skills. As Walker put it, "What experiences should future stewards of the field have in graduate school to allow them to evolve and be effective in a future we can't imagine, a future thirty or fifty years from now?"

Six fields were chosen for the CID: chemistry, education, English, history, mathematics, and neuroscience. There were several reasons for choosing these particular disciplines. One was the aim of including disciplines that span a wide area of academe. Carnegie also looked for central, fundamental fields where there are a large number of doctoral programs and students. The inclusion of neuroscience reflected the desire to bring in a multidisciplinary field.

In addition, Carnegie sought areas in which discussions of the doctorate were already taking place, and in that regard mathematics was a natural choice. Over the past decade or so the mathematical community has engaged in intensive discussions about the doctoral program. Among the major stimulants of these discussions were the reports *Educating Mathematical Scientists: Doctoral Study and the Postdoctoral Experience in the United States* (National Academy Press, 1992) and *Towards Excellence: Leading a Doctoral Mathematics Department in the 21st Century* (AMS, 1999). These discussions influenced the establishment of the VIGRE (Vertical Integration of Research and Education in the Mathematical Sciences) program of the National Science Foundation, which has stimulated much innovation and change in doctoral programs.

To begin the CID, Carnegie commissioned the writing of twelve essays, two in each of the six disciplines, that explore the purpose of doctoral education and the notion of "stewards" in the context of each discipline. The essays are not "how-to" manuals for structuring doctoral programs; their purpose is not to tell departments what to do but rather to provoke discussions within disciplines and across academe. The essays in mathematics were written by Hyman Bass of the University of Michigan, who is now past president of the AMS, and Tony Chan of the University of California, Los Angeles (the essays by Bass and Chan will be published in future issues of the *Notices*). All of the essays are scheduled to be

## CID Participating Mathematics Departments

### Partner Departments

Duke University  
Ohio State University  
State University of New York, Stony Brook  
University of Chicago  
University of Illinois, Urbana-Champaign  
University of Michigan, Ann Arbor  
University of Nebraska, Lincoln  
University of Southern California

### Allied Departments

Howard University  
Kent State University  
University of North Carolina, Chapel Hill  
University of Utah

completed in spring 2003 and will eventually be published together as a book.

The second part of the CID began in early 2003 with the selection of thirty-two "partner departments". These departments have made a commitment to undertake a thorough examination of their doctoral programs. The intention is that the commissioned essays will stimulate the departments' discussions. CID staff will visit the partner departments, not for the purpose of evaluating them, but rather to encourage discussions and bring in new ideas. There will also be periodic meetings of partner department representatives, the first one taking place in July 2003 at the Carnegie headquarters on the campus of Stanford University. After the initial conceptual phase, the departments will experiment with new ways of designing doctoral programs. In the "research and dissemination" stage, departments will evaluate the outcomes of their experiments and share them with colleagues at other institutions; the Carnegie Foundation will also help to publicize ideas and results growing out of the CID.

The departments were chosen after a call for applications was issued last fall. Because there were more worthy applications than it could accommodate, Carnegie also selected some "allied departments" that can participate in discussions and receive materials but which will not have site visits or support for attending CID meetings. (See the sidebar for a listing of partner and allied mathematics departments.)

The VIGRE program has had an enormous effect on mathematics departments across the country, spawning innovations in education at the undergraduate and graduate levels. One reason for the large impact is that the goals of VIGRE are backed by grant dollars. By contrast, the CID provides essentially no funding to its partner departments

(staffing for the CID is funded jointly by the Carnegie Foundation and Atlantic Philanthropies). So what do departments get out of the CID? "It seems to be a very serious look at the doctorate and an opportunity to be there at the table when a lot of people are putting thought into the nature of the doctorate and how it might be protected and changed and improved," explained Jim Lewis, chair of the mathematics department at the University of Nebraska. "I believe this is likely to be an effort that has an impact on the profession," he added. Also, there has been great pressure on mathematics departments to get and keep VIGRE grants, and the competition for money has been fierce. By contrast, the focus of the CID is entirely on enduring ideals and values, which is "refreshing," Corlette remarked.

The now-famous crisis at the University of Rochester in the mid-1990s, in which the university administration planned to close down the mathematics doctoral program, was a wake-up call for many departments that had become insular. Breaking out of that insularity is another motivation for departments to participate in the CID. "We are a typical department," said Francis Bonahon, chair of the mathematics department at the University of Southern California. "For many years we were living in our little corner, complaining that we were not funded at the right level and not given positions. But we were not doing much about it. Now we want to reach out." The department has introduced some new features in its doctoral program in recent years, such as a seminar in which faculty talk about their research areas as a way of helping students choose an advisor. The students also work on problems that are devised by the faculty to relate to the research.

Indeed, one of the criteria Carnegie used in choosing the partner departments was evidence that the departments had already begun to examine seriously their doctoral programs. Some of the departments have VIGRE grants and others are planning to apply for them, but all have made innovations in their doctoral programs. For example, at the University of Chicago the mathematics department has begun offering three-to-five week modules to introduce students to basic tools used in mathematical research. In contrast to regular courses, which usually begin with foundations and work up to big results, these modules provide a "user's guide to ideas", so that students can begin to use the tools without having to work through all the prerequisites. A few years ago the University of Illinois at Urbana-Champaign revamped its comprehensive examinations, which are taken during the first two years of doctoral study. Originally there were two exams, one in algebra and one in analysis. Now there is a more flexible system in which students choose four out of

thirteen exams covering a much wider variety of areas. At the University of Nebraska the mathematics department has given a high priority to educating women in its doctoral program. In February 2003 the department held its fifth annual conference for women in mathematics, which drew 175 women students from eighty colleges and universities. The goal of the conference is to encourage women to pursue graduate education in mathematics.

The list of CID partner and allied mathematics departments is not dominated by the elite doctoral programs, which have historically been seen as the leaders in doctoral education in the U.S. Is this a problem? Not necessarily. For one thing, the CID list is not lacking in representation of the very best doctoral programs in the nation. Also, the diversity among the CID departments may mean that the ideas and experiences that come out of the project will be useful to a wide variety of departments. The received wisdom that all mathematics departments should strive to be like the elite departments has been questioned in recent years. One of the main conclusions of the *Towards Excellence* report was that it is better for most departments to create their own niches and build on their individual strengths rather than pursue an unreachable goal of being an elite department.

The purpose of the CID is not to define, once and forever, what a doctoral program should be. "It's not something you do once and never again, because you have it right for all time," Walker remarked. Rather, the purpose is to foster a culture of continual discussion and renewal, so that improving doctoral education becomes an ongoing mission. This is a worthwhile endeavor for even the best doctoral programs. Phillip Griffith, the director of graduate studies in the mathematics department at the University of Illinois and a CID departmental representative, put it this way: "If you are complacent, you will go backwards."

—Allyn Jackson