

Commencement Remarks – Claremont Graduate University
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President Klitgaard, members of the Board of Trustees, members of the faculty, today's graduates, and families and friends of the graduates. The program of study that these graduates have completed was rigorous, challenging, and at the leading edge of developments in their field. Claremont Graduate University is highly regarded throughout the academic world, both for the excellence of its faculty and the quality and innovativeness of its programs. The graduates and their families can be proud of what they have accomplished at this distinguished university.

I began my academic career as a faculty member at Stanford University in the fall of 1956. So this spring I will complete exactly 50 years as a member of the academic community. Those 50 years have been stunning in terms of the changes that have occurred and the progress that has been made. Looking back over the past 50 years one cannot help but wonder what the future will be like. Will change continue to occur at the remarkable rate of the last 50 years, or will the future be different?

A recent book with the peculiar title "The Singularity is Near" offers an interesting perspective on that question. The author is Ray Kurzweil, a brilliant scientist and innovator who has had a superb track record of anticipating new technologies. Let me explain the term "singularity" in the title of Kurzweil's book. The word has somewhat different meanings in different fields of science, but its core meaning is easily explained in terms of the exponential function. An exponential function is a curve that increases fairly slowly at first, but at a certain point—at the knee of the curve—bursts off at an explosive rate. That explosive change at the knee of the exponential function is called a singularity. Kurzweil argues that the change we have experienced in science and technology during the last 50 years represents the first stage of the exponential function and that we are now near the knee of the curve and about to witness explosive change. In his view "within several decades information-based technologies will encompass all human knowledge and proficiency, ultimately including the pattern-recognition powers, problem-solving skills, and emotional and moral intelligence of the human brain." His book provides a thoughtful analysis of various fields of science and technology and makes a convincing case that indeed "the singularity is near". The increasing interplay between science and technology—science pushing technology and technology pushing science—will move both endeavors forward at an ever accelerating rate. The remarkable changes we have seen over the last 50 years will be overshadowed by what we are about to experience.

The behavioral and social sciences will experience especially explosive change. Just as the biological sciences underwent revolutionary change with the work of Watson and Crick on DNA, so too will research now underway in cognitive science and neuroscience transform the foundations of the behavioral and social sciences. That transformation will be particularly evident in the area of learning and teaching. We will see highly adaptive instructional systems delivered on an internet platform. These systems will optimize student performance based on the student's individual learning history coupled with real-time imaging of the student's brain activity.

A word of caution. Progress in all fields of science, but particularly in the behavioral and social sciences, can be impeded by what I call the Golden Fleece phenomenon. When I was director of the National Science Foundation (NSF) in the 1970s, we funded a research project

entitled “The Sexual Behavior of the Screw-worm Fly”. The project quickly won the Golden Fleece Award. Senator William Proxmire (the long term Democrat from Wisconsin who passed away last December) had established the Golden Fleece Award to expose waste and fraud in publicly funded programs. The news media had a field day ridiculing NSF for what they judged to be silly research.

The screw-worm grant and other NSF projects with provocative titles got tremendous national attention. The National Enquirer was paying a \$500 bounty to freelance reporters who came up with stories like the screw-worm fly. Some reporters simply scanned the list of titles of NSF research projects and free-associated to a title as the basis for a story. On one occasion a reporter found a project titled “A Theory of Necking Behavior.” With great fanfare it too became national news. We tried in vain to find this grant on the NSF list of social science projects. Days later we finally unearthed it among the engineering projects—the necking referred to was of a metal, not a human, variety. But no follow-up news story ever revealed the mistake.

Some years later, Senator Proxmire was very forthright in publicly acknowledging that he was wrong in criticizing NSF projects, and particularly the one dealing with the screw-worm’s sexual habits. It turned out that this study was key to unraveling the reproductive biology of insects and changed agriculture’s approach to pest control. The study led to a multi-million dollar business in biological—as opposed to chemical—methods for pest control yielding major gains in agricultural safety and productivity.

The behavioral and social sciences are especially vulnerable to the Golden Fleece phenomenon. Should the government have supported research on why monkeys clench their jaws? Did we really need a study of why humans smile? On the surface, such projects may appear frivolous. But it turns out that the former study contributed to understanding and coping with aggression, especially in tight quarters like submarines and space stations; and the latter project led to research in facial-recognition techniques with important applications in screening and security.

The simple fact is that many studies do not yield immediately useful findings, regardless of whether they are in the social, physical, biological or medical sciences. One cannot know with certainty which will be winners and losers. Picking winners is especially difficult for the social sciences, which frequently address the most complex, multidimensional, value-laden and vexing problems.

The Golden Fleece phenomenon has resurfaced several times since I left the National Science Foundation and is once again on Congress’ agenda. This year there have been an unusual number of attempts by members of the Congress to bar funding for particular NSF projects, solely because of titles. One project titled “Accuracy in cross-cultural understanding of others’ emotions”, proposed by a psychologist on the faculty of University of California Berkeley school of business, drew particular attention. Unknown to the congressional critics, senior army officials had a high regard for this psychologist’s work because it offered important insights for U.S. troops in Iraq and Afghanistan on how different cultures express their emotions in different ways. And this line of research has also proved valuable for those engaged in international business. But the title of the research project was too easy to mock. This project and several others with titles or abstracts vulnerable to criticism led to a long and testy Congressional debate about slashing federal funds for research in the behavioral and social sciences.

Fortunately, at the end of the debate Congress supported funding these projects. However, the anti-intellectualism represented by the Golden Fleece phenomenon has proved to

be persistent. With the perfect set of circumstances—the perfect storm—it could end up blocking important avenues of research.

On the whole, the evidence is clear that federally funded research in the behavioral and social sciences has paid off. We know much more today—than we did 50 years ago—about poverty and education, and about many other complex problems that bear directly on our economic and social well-being. Today’s knowledge stems from years of research, which could not have been conducted if the federal government had refused to fund a wide range of studies—even those that may have at first sounded strange. Part of the beauty of science—which also makes it a target for Congressional debate—is its uncertainty. Science is about inquiry and discovery, unearthing the unanticipated, spotting surprising relationships in complex systems, confronting and coping with divergent streams of evidence, looking at data skeptically, and allowing knowledge to accumulate over time. We must—whenever possible—encourage friends of science to stay the course and reinforce our nation’s commitment to the scientific analysis of complex behavioral and social systems.

With that exhortation, let me now conclude. Indeed, the singularity is near and will be particularly evident in the behavioral and social sciences. Some will claim that such unprecedented change will have a dehumanizing effect, but in my view it will enrich human consciousness and ennoble the human spirit. The Golden Fleece phenomenon will surely rear its head from time to time, hopefully with less frequency and intensity as the general public gains a better understanding of the uncertainties and complexities of science.

Once again, my congratulations to the graduates. You are well prepared not only to understand the changes that will take place, but also to participate in making change occur.