



## Roy Doi, PhD (1933-Present)

Professor of Molecular Biology  
University of California-Davis

---

*"Do internships, volunteer, whatever you can to find out what you want to do." Roy Doi, 2006.*

---

### Overview

Dr. Roy Doi is a professor of Microbiology in the College of Biological Sciences at University of California-Davis. Dr. Doi has used his interest and passion in biological sciences conduct research across the entire globe. An abbreviate list of his body of work includes the following:

- Arai, T., Matsuoka, S., Cho, H.-Y., Yukawa, H., Inui, M., Wong, S.-L., and Doi, R.H. Synthesis of Clostridium cellulovorans minicellulosomes by intercellular complementation. Proc. Natl. Acad. Sci. USA 104:1456-1460 (2007).
- Arai, T., Kosugi, A., Chan, H., Koukiekolo, R., Yukawa, H., Inui, M. and Doi, R.H. Properties of cellulosomal family 9 cellulases from Clostridium cellulovorans. Appl. Microbiol Biotechnol. 71: 654-660 (2006).
- Kosugi, A., Arai, T. and Doi, R.H. Degradation of cellulosome-produced cello- oligosaccharides by an extracellular non-cellulosomal  $\beta$ -glucan glucohydrolase, BglA, from Clostridium cellulovorans. Biochem. Biophys. Res. Commun. 349: 20-23 (2006).
- Murashima, K., Kosugi, A., and Doi, R.H. Site-directed mutagenesis and expression of the soluble form of the family IIIa cellulose binding domain from the cellulosomal scaffolding protein of Clostridium cellulovorans. J. Bacteriol. 187:7146-7149 (2005).
- Han, S.-O., Yukawa, H., Inui, M. and Doi, R.H. Molecular cloning, transcriptional and expression analysis of engO, encoding a non noncellulosomal family 9 enzyme from Clostridium cellulovorans. J. Bacteriol. 187:4884-4889 (2005).

*This interview was conducted in 2015.*

## Early Life and Career

Roy Doi was born in the small rural community of Loomis, California, to farm laborer parents. Though his mother and father had only a sixth- and third-grade education, respectively, they encouraged him to go to college and become a doctor. His interest in molecular biology, biochemistry, and genetics led him to his current career in the environmental field.

Doi was forced to put his college plans on hold when he was drafted into the U.S. army during the Korean War. While serving in Japan, Doi participated in a research group which piqued his interest in becoming a research scientist rather than going into medicine. Doi returned to the United States and earned two bachelor's degrees from the University of California-Berkeley—the first in physiology, the second in bacteriology. Upon the advice of a mentor, he went on to graduate school at the University of Wisconsin-Madison, where he earned his Ph.D. in bacteriology in 1960. He then did a post-doctoral fellowship at the University of Illinois. After briefly studying gene expression in bacteria at Syracuse University's Department of Microbiology, Doi moved on to a faculty position at the University of California-Davis, where he has had an accomplished career as a scientist and teacher spanning four decades.

Since joining the UC-Davis faculty in 1965, Doi has been promoted to full professor, tenured, and has chaired the department and several committees. Doi's move into explicitly environmental work came in the late 1980s, when the Dean of Davis' College of Agricultural and Environmental Science asked him to chair a committee assessing the advancement and possible applications of biotechnology on campus. The initiative coincided with the California State Legislature prohibiting the burning of rice stalk by 2006 due to pollution concerns. Doi came up with the idea of using enzymes to degrade the rice stalk, producing sugars and mitigating pollution.

Since then, Doi has been fascinated with enzymes, particularly the cellulosome - an enzyme complex with the ability to degrade plant cell walls. He is still working on potential environmental applications for enzymes, including the possibility of using the sugar produced from degraded plant cells to make ethanol, an alternative to gasoline. Doi notes that if such a process were employed on a broader scale, it would have dramatic environmental implications: "If we could convert all the corn stalk we harvested to sugar and then to ethanol, we could reduce oil imports by thirty percent."

## Important to Mentoring to Career

Mentors played an important role in guiding Doi along his career path and offering support. Dr. Clinton Ballou, a professor at UC-Berkeley, encouraged him to pursue graduate school, and also pushed him to go to the University of Wisconsin. At Wisconsin, Harvey Halvorson, his major professor, was also very encouraging. "I was very naïve and unsophisticated coming out of undergrad," Doi remembers, "and Dr. Halvorson urged me to consider an academic career because at that time the only choice other than academia was industry." Doi was a post-doc fellow at the University of Illinois under Dr. Sol Spiegelman, who was "a genius. "He taught me how to be a real scientist," Doi says. Doi also mentions Drs. Arthur Phillips, Paul Stumpf, and Arnold Demain as great supporters of him as he evolved as a scientist and researcher.

In his more than 40-year career at UC-Davis, Doi has acted as advisor to over 1000 students, and has mentored and worked with students and post-docs from countries all over the world, including Mexico,

Japan, China, Korea, Taiwan, Malaysia, Germany, Israel, and Egypt. He also initiated and coordinated a program called the Summer Undergraduate Affirmative Action Research, which provided funds to attract minority undergraduate students to the Davis campus for research. “I coordinated the entire project—the correspondence, the summer housing for the students, the research programs, finding mentors, all of it,” Doi says. When Affirmative Action was banned in California universities, the project was re-named the Summer Undergraduate Research Project, and it continues today. In addition to these responsibilities, Doi was part of the Ethnic Studies Program Committee at Davis, concentrating primarily on Asian American Studies.

## **Contributions and Highlights**

Doi has become a highly prolific and successful scientist. He has earned numerous grants and awards, but the pinnacle of his career came in April of 2006, when he was elected to the National Academy of Sciences. Despite his success, Doi has faced occasional stumbling blocks, the most notable being his struggle with depression; the summer after he was promoted to associate professor, Doi felt inexplicably depressed. “I went to the Pasteur Institute in Paris and toured Europe, I bought a new car and house, I had everything, but I was still down,” he says. “I sought psychiatric help.” Doi struggled to recover while still managing his professional life, and was able to regain the joy he found in research and teaching. He acknowledges that climbing the professional and academic ladder has made it easier for him to enjoy his success. However, “Every progression, every step I’ve made from one phase of life to another has been a struggle,” he says.

## **Advice to Young Professionals**

Doi’s advice for minority students thinking about environmental careers is straightforward: get sound basic training while an undergraduate, pick a graduate school strong in your area of interest, and develop relationships and networks with faculty and fellow students. Perhaps most importantly, says Doi, students should do as much as they can to find out what they excel at: “Do internships, volunteer work, whatever you can do to find out what really interests you. If you are passionately interested in what you are doing, it is fun and not work.”

## **For More Information**

**Phone:** 520-752-3191

**Email:** [rldoi@ucdavis.edu](mailto:rldoi@ucdavis.edu)