

CHEMICAL HERITAGE FOUNDATION

ENRIQUE IGLESIA

Transcript of an Interview
Conducted by

Hilary Domush

at

University of California, Berkeley
Berkeley, California

on

27 and 28 January 2014

(With Subsequent Corrections and Additions)

CHEMICAL HERITAGE FOUNDATION
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ENRIQUE IGLESIA

1954 Born in Havana, Cuba, on 27 August

Education

1977 BS, Princeton University, Chemical Engineering, *summa cum laude*
1979 MS, Stanford University, Chemical Engineering
1982 PhD, Stanford University, Chemical Engineering

Professional Experience

1982-1993 Exxon Research and Engineering Company
Corporate Research Laboratories Research Associate, Section
Head, Catalysis Science

1988-1993 Stanford University
Consulting Professor of Chemical Engineering

1993-present E.O. Lawrence Berkeley National Laboratory
Faculty Senior Scientist, Chemical Sciences Division

1993-present University of California at Berkeley, College of Chemistry
Professor of Chemical Engineering
1999-present Director, Berkeley Catalysis Center
2006-2009 Chancellor Professor of Chemical Engineering
2009-present Theodore Vermeulen Chair in Chemical Engineering

Honors

1976 Tau Beta Pi, Princeton Chapter President, 1976-77
1977 Silver Medal of the Royal Society of Arts, Princeton University (highest-
standing graduating senior in Schools of Engineering and
Architecture)
1977 Phi Beta Kappa
1992 Golden Tiger Award, Annual Exxon Award for: "Inspirational
Leadership and Outstanding Contributions in Catalytic Science and
Technology"
1995-1996 American Institute of Chemical Engineers Award for Chemical
Engineering Excellence in Academic Teaching, California Chapter

- 1997 Paul H. Emmett Award in Fundamental Catalysis; North American Catalysis Society
- 1998 Award for Excellence in Catalysis and Eminent Visitor Award, Chemical Society of South Africa
- 1999 Best Teacher Award, Berkeley Chapter, American Institute of Chemical Engineers
- 2003 Richard H. Wilhelm Award in Chemical Reaction Engineering, American Institute of Chemical Engineers
- 2004 Award for Excellence in Natural Gas Conversion
- 2005 George A. Olah Award in Hydrocarbon Chemistry, American Chemical Society
- 2005 Donald Sterling Noyce Prize for Excellence in Undergraduate Teaching, University of California (highest teaching award in the physical sciences at the University of California at Berkeley)
- 2006 Robert Burwell Lectureship Award, North American Catalysis Society
- 2007 Humboldt Senior Scientist Research Award, Alexander von Humboldt Foundation
- 2007 Doctor Honoris Causa, Universidad Politecnica de Valencia, Chile
- 2008 National Academy of Engineering
- 2009 Tanabe Prize in Acid-Base Catalysis
- 2010 Fellow, American Chemical Society
- 2010 Best Teacher Award, College of Chemistry, University of California at Berkeley
- 2011 Francois Gault Lectureship Award, European Federation of Catalysis Societies
- 2011 Alpha Chi Sigma Institute Award, American Institute of Chemical Engineers
- 2011 Cross Canada Lecturer, Chemical Institute of Canada
- 2012 ENI Prize, New Frontiers in Hydrocarbons
- 2012 Gabor Somorjai Award for Creative Research in Catalysis, American Chemical Society
- 2013 Fellow, Japan Society for the Promotion of Science
- 2013 Honorary Fellow, Chinese Chemical Society
- 2014 Fellow, American Institute of Chemical Engineers

ABSTRACT

Enrique Iglesia was born in Havana, Cuba, one of two children. The family lived in Havana until Enrique was about fourteen years old; he was then approaching military age, at which time he would not be allowed to leave the country, so they moved to Mexico, where they lived for six months, awaiting papers to enter the United States. In Miami, Florida, Enrique's intellectual abilities were recognized, and he was placed in advanced courses in math and science, and he also took college-level math classes at Florida International University. Iglesia entered Princeton University because of his math teacher's recommendation, intending to major in chemical engineering, and he found the education there excellent. John Weikart of Exxon Corporation began to recruit him. Iglesia had summer internships at Exxon and became interested in catalysis. He entered Stanford for a PhD and began research right away in Michel Boudart's group, working on the applicability of model systems to real-world catalysis. Iglesia married at the end of his first year in graduate school and by the end of his PhD, they were expecting their first child, so Iglesia needed to have a job. He accepted Exxon, expecting to return to academia eventually, and they moved to New Jersey. Iglesia advanced to the position of section head, supervising about fifty scientists and support staff, and found the science to be first rate. He also taught a seminar at Stanford during several summers.

Ready to return to academia he accepted University of California, Berkeley's offer and also became a consultant to Catalytic Associates. He and Fabio Ribeiro worked together at the start and his research on membrane thin films continuing a project of Heinz Heinemann, the "father of organized catalysis." BP organized a collaboration of scientists from Caltech and Berkeley, a small group called Methane Conversion Cooperative, that lasted ten years and worked on gas conversion. Iglesia promoted thinking over excessive use of technology; he wanted to see real-world materials under real conditions, not just in models. He has started a new, smaller, group, the X Conversion Cooperative, which has reached its fifth year and continues beyond. His group has been working on Fischer-Tropsch synthesis again, as well as other reactions of C_1 molecules, such as carbonylation and tripane synthesis. In addition, Chevron Corporation has been funding research into zeolites, which the Cooperative has learned to form around a precursor, and van der Waals interactions, and auto manufacturers have supported research into exhaust problems. He has also been co-editor in chief of the *Journal of Catalysis*.

During his interview, Iglesia mentions many other scientists who have been important in his career and describes some of their work. He talks about liking teaching, though he finds that working with the different personalities of students can be challenging. Iglesia says that academia provides freedom to do what interests him. He analogizes a scientist's students and their students to a family "bloodline." Iglesia says that predicting too far in advance can narrow one's vision. Iglesia is proud of his family, of having close friends, and that he is still learning things.

INTERVIEWER

Hilary Domush was a Program Associate in the Center for Oral History at CHF from 2007-2015. Previously, she earned a BS in chemistry from Bates College in Lewiston, Maine in 2003. She then completed an MS in chemistry and an MA in history of science both from the University of Wisconsin-Madison. Her graduate work in the history of science focused on early nineteenth-century chemistry in the city of Edinburgh, while her work in the chemistry was in a total synthesis laboratory. At CHF, she worked on projects such as the Pew Biomedical Scholars, Women in Chemistry, Atmospheric Science, and Catalysis.

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Biographical Information	1
<p>Born Havana, Cuba. Father came from small village in Galicia; worked in dry cleaning while employed. One younger sister. Communist revolution. First to be educated past junior high school; did well in school. Aunt and uncle encouraged education. Conscripted at age fourteen and a half. Left for Mexico, no guarantee of work or permission to enter United States. Six months of labor; then to Miami, Florida. Advanced math classes at Florida International University. Advanced Placement classes in science and math in high school. Met future wife in high school chemistry class.</p>	
College Years	13
<p>Math teacher recommended Princeton University. Good undergraduate education; worked hard; had highest grade point average in class when he finished. Already being recruited by John Weikart. William Russel from Stanford University. Interested in surface chemistry; wanted catalysis because of two summer internships at Exxon Corporation, one in Baytown, Texas, and other in Baton Rouge, Louisiana.</p>	
Graduate School Years	22
<p>Chose Stanford University. Good graduate education. Drove Dodge to school; broke down in Arizona. Henry Taube. Michel Boudart his advisor let him begin research at once. Paul Emmett and heterocatalysis. Eight or nine in group, all very good. End of first year married; wife a night shift nurse at Stanford Hospital. Worked on applicability of model systems to real-world catalysis; dissertation challenged the role of model systems in realistic catalysis. Finished in less than four years; wife expecting child. Weikart still recruiting.</p>	
Exxon Years	35
<p>Chose industry supposedly for five years; began at Exxon in Linden, then Annandale, New Jersey. First child born shortly after move. Exxon diversifying into electronics as oil supply thought to be depleted. Advancing in administration; section head over fifty scientists and support staff. Exxon Valdez. Fewer publications. Science excellent, but wanted to return to academia. Spent portion of some summers at Stanford, giving seminar. Liked teaching.</p>	
Back to Academia	41
<p>Best offer from University of Delaware; also inquiries and then offers from Stanford and University of California, Berkeley. Boudart retiring from Stanford. Chose Berkeley. Financially difficult for first two years; then joined Catalytica Inc. as consultant. Eleven years' work at Exxon sound and fundamental. Stuart Soled and Sebastian Reyes. Gas conversion using Fischer-Tropsch synthesis. Rostam Madon. Joseph Baumgartner. George Meitzner. Spectroscopy. Zeolites;</p>	

sulfur reduction. Worked on membrane thin films with Heinz Heinemann. Liked teaching, pretty good at it, but challenging to mentor young people. Inherited lab, had to refit it. Heinz Heinemann, father of organized catalysis gave him membrane project. National Science Foundation funding; Department of Energy project. Co-editor-in-chief of *Journal of Catalysis*. Alexis Bell and spectroscopy. Oxygen activation.

Continuing Work 66

BP organized Methane Conversion Cooperative with Berkeley and California Institute of Technology (Caltech). Junmei Wei. Graham Butler, Theo Fleisch. Carbonylation gave unexpected results. Promotes thinking over excessive use of technology. X Conversion Cooperative, for five years; began Fischer-Tropsch work again; triptane. Aldol concentration. Many graduates and postdocs to Chevron Corporation and to academic positions. Zeolites and van der Waals interactions funded by Chevron for eight years. Publishing and patenting. Funding from auto manufacturers for exhaust problems. NO and NO₂. Brian Weiss. Basic research. Molecules. Björn Modén, Bi-Zeng Zhan and auto-oxidation. Building zeolites around precursors.

Some General Thoughts 87

Working with different personalities of students. Academia leaves one free to choose work. Alexander Katz and Justin Notestein. Evolution of his group. Academic progeny analogous to family bloodline. He is now academic grandfather to his students' students. Does not like to predict too far ahead; predictions narrow possibilities. Proudest of his actual family, proud to be married still to same woman. Proud of having long-term, close friends. Proud that he is still learning.

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