Tom Edgar: teacher, department chair, research colleague, friend

James B. Rawlings

Department of Chemical Engineering

Tom Edgar's 80th Birthday Celebration
AIChE Annual Meeting
November 4, 2025
Boston, MA

Outline

A selective look at Tom's vita

THOMAS F. EDGAR
Department of Chemical Engineering
University of Texas, Austin, Texas 78712
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September 1, 2020

PERSONAL

Date of birth: April 17, 1945
Place of birth: Bartlesville, Oklahoma

EDUCATION

Princeton University, Ph.D., Chemical Engineering, 1971
Princeton University, M.A., Chemical Engineering, 1968
University of Kansas, B.S., Chemical Engineering, 1967

WTF?
Industrial
Experience?!

EMPLOYMENT

1968-1969	Process Engineer, Continental Oil Company, Baltimore, Maryland
1971-1976	Assistant Professor of Engineering, The University of Texas at Austin, Austin, Texas
1976-1981	Associate Professor of Chemical Engineering
1978 (Spring)	Visiting Professor of Chemical Engineering, University of California at Berkeley, Berkeley, CA
1979-1985	Graduate Advisor
1981-1985	Professor of Chemical Engineering
1983-1991	The Paul D. and Betty Robertson Meek Centennial Professorship
1985-1993	Department Chairman, Chemical Engineering

Tom as an undergraduate instructor

- I took Tom's undergraduate optimization elective class
- Some of the students in the class were having a bad case of senioritis
- They asked if we could have class outdoors
- Tom said, sure!
- So for the next class, Tom moved a portable blackboard outdoors under a live oak tree and gave his lecture
- It was hot. . . the sun was so bright that you couldn't read the board . . . the acoustics were terrible and you couldn't hear the lecture. . .
- Tom carried on in this less than ideal environment and finished his lecture
- And we couldn't wait to get back in the classroom

I joined Tom's group as an undergraduate researcher

Ph.D. Dissertations

[1] V. Krishnamoorthy, 12/76, On Line Identification and Multivariable Control of a Distillation Column.

[2] L. S. Tung, 8/79, Analysis and Control of Large Scale Processes with Limited Measurements.

[3] T. H. Tsang, 5/80, Modeling of Heat and Mass Transfer during Coal Block Gasification.

[4] P. Christman, 12/81, Analysis of Simultaneous Diffusion and Chemical Reaction in the Calcium Oxide-Sulfur Dioxide System.

[5] E. Vogel, 5/82, Adaptive Control of Chemical Processes with Variable Dead Time.

[6] H. P. Tseng, 12/82, Identification of the Combustion Behavior of Coal Char Between 350 C and 900 C.

[7] R. Kochhar, 5/84, Mechanisms of Sulfur Retention by Lignite Ash during Isothermal Sulfation.

[8] K. Park, 12/84, Investigation of Cavity Growth Mechanisms for Underground Gasification of Western Coals.

[9] H. Chang, 12/84, Process Analysis and Simulation of Underground Coal Gasification.

[10] T. Westby, 12/84, Carbon Combustion Efficiency and Sulfur Oxide Emissions during Fluidized Bed Combustion of Texas Lignite.

- These were Tom's PhD students at the time
- They showed me that research was *fun!*
- I decided to go to Wisconsin for graduate school
- I wanted to get a faculty job before people found out about this deal!

As a faculty colleague—My final paper with Tom

[76] R.S.H. Mah, G.V. Reklaitis, D. M. Himmelblau, and T.F. Edgar. Computer Aids in Chemical Education. *ChemTech*, Vol. 18, pp. 277-283, 1988.

[77] A.W. Alsop and T.F. Edgar. Nonlinear Heat Exchange Control Through the Use of Partially Linearized Control Variables. *Chem. Engr. Commun.*, Vol. 75, pp. 155-170, 1989.

[78] B.W. Bequette and T.F. Edgar. Non-interacting Control System Design Methods in Distillation. *Comp. Chem. Engr.*, Vol. 13(6), pp. 641-650, 1989.

[79] T. Setalvad, I. Trachtenberg, B. W. Bequette, and T.F. Edgar. Optimization of a Low Pressure CVD Reactor for the Deposition of Thin Films. *IEC Res.*, Vol. 28, pp. 1162-1170, 1989.

[80] S. Venkatesan, I. Trachtenberg, and T.F. Edgar. On the Dynamics of an Isothermal Radial-Flow Plasma Etcher. *J. Electrochem. Soc.*, Vol. 136(9), pp. 2532-2545, 1989.

[81] A. Patwardhan, J. B. Rawlings, and T.F. Edgar. Nonlinear Model Predictive Control Using Simultaneous Solution and Optimization. *Chem. Engr. Commun.*, Vol. 87, pp. 123-141, 1990.

But wait, what's this other Rawlings paper?

[283] J.D. Hedengren, R.A. Shishavan, K.M. Powell, and T.F. Edgar. (2014). "Nonlinear Modeling, Estimation and Predictive Control in APMonitor." *Computers and Chemical Engineering*, *70*, 133-148. doi:10.1016/j.compchemeng.2014.04.013

[284] D. Castineira, B.C. Rawlings, and T.F. Edgar. (2012). "Multivariate Image Analysis (MIA) for Industrial Flare Combustion Control." *IEC Research, 51*(39), 12642-12652. http://dx.doi.org/10.1021/ie3003039

[285] W.J. Cole, D.P. Morton, and T.F. Edgar. (2014). "Optimal Electricity Rate Structures for Peak Demand Reduction Using Economic Model Predictive Control." *J. Proc. Cont.*, *28*(8), 1311-1317. http://dx.doi.org/10.1016/j.jprocont.2014.04.014

[286] R. Wang, M. Nixon, W. Wojsznis, R. Dunia, T.F. Edgar, and M. Baldea. "A Geometric Framework for Detection and Classification of Abnormal Events and Systemic Faults in Process Systems." *J. Proc. Cont.*. Accepted, 2014.

[287] J.D. Rhodes, W.J. Cole, C.R. Upshaw, T.F. Edgar, and M.E. Webber, (2014). "Clustering Analysis of Residential Electricity Use Data." *Applied Energy*, *135*, 461-471. http://dx.doi.org/10.1016/j.apenergy.2014.08.111

- My son Blake also did research with Tom
- He decided to go to Carnegie Mellon for graduate school
- Tom's influence extends over *generations* in some families

And where does this madness end?

[345] L.Yan, T.F. Edgar, and M. Baldea (2019). "Dynamic Process Intensification of Binary Distillation Based on Output Multiplicity." *AIChE J., 65*(4), 1162-1172.

[346] J. Lee, S.W. Sung, F.Y. Lee, T.F. Edgar, and M. Baldea (2019). "Full Closed-loop Tests for the Relay Feedback Autotuning of Stable, Integrating and Unstable Processes." *ACS Omega*, submitted.

[347] H.S. Ganesh, D.P. Dean, S. Vernuccio, T.F. Edgar, M. Baldea, L.J. Broadbelt, M.A. Stadtherr, and D.T. Allen (2020). "Product Value Modeling for a Natural Gas Liquid to Liquid Transportation Fuel Process." *IEC Research*. https://dx.doi.org/10.1021/acs.iecr.9b06673

[348] T.F. Edgar (2020). "Methods of Weighted Moments for the Relay Feedback Autotuning of Conservative PI Controllers." *Comp. and Chem. Eng.*

[349] J. Lee, M. Baldea, T.F. Edgar (2020). "Shape Factor for the Relay Feedback Autotuning." *Indian Chemical Engineer*, submitted 3.2020.

That's not a typo. . . 349 papers . . . The horror, the horror!

Tom as a department chair

- I returned to UT in 1986 as a new faculty member and Tom was the department chair.
- He nicknamed me "angry young man" during my assistant professor years
  (noun: a young man dissatisfied with and outspoken against existing social and political structures.)
- Later, he summarized my research attitude with the following song . . .

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For what is a man, what has he got?
If not himself, then he has naught
To say the things he truly feels
And not the words of one who kneels
The record shows I took the blows
And did it my way
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My Way, English lyrics by Paul Anka
Performed by Frank Sinatra, 1969

For those of you who don't know the song

Tom as a director of an industrial consortium

Texas Modeling and Control Consortium
(TMCC)
3/5/93

Department of Chemical Engineering
University of Texas at Austin

Principal Investigators

- T.F. Edgar
- D.M. Himmelblau
- J.B. Rawlings
- I. Trachtenberg

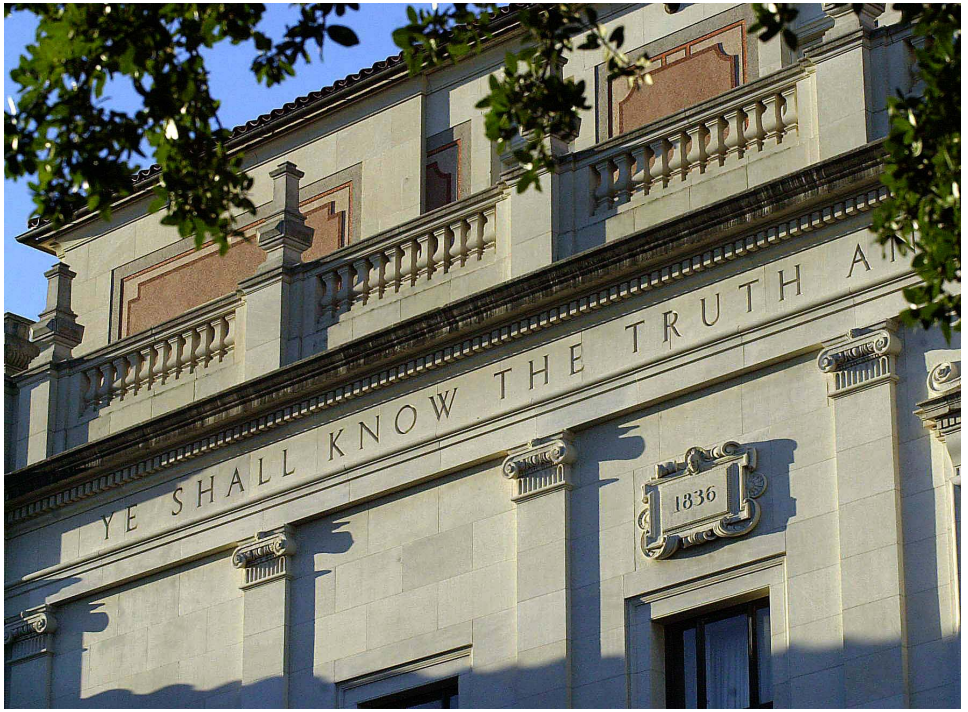
23 graduate students, 2 postdocs

The TFE, JBR, Joe Qin, Michael Baldea chain of PIs

Tom trained all three of us!

The big picture—What did the University of Texas awaken in me

- I was a freshman living in the Jester dormitory in the fall of 1975
- My first time living on my own
- Every morning when I walked to class I saw the following inscription on the main building . . .



My career choice

- I saw the mission of the university, and teaching, and research, as sharing the biggest truth that we can discover. . .
- As a young person, I took this mission very seriously. And I thank Tom for pointing this path out to me.
- But what is *truth*? To flourish, human society needs truth in many forms.
- Scientific truth, so we can understand (and influence) nature.
- Historical truth so that we see clearly where humanity has been and can learn from our mistakes (and successes).
- Legal truth to have a just society.

The Truth

My career choice

- I saw the mission of the university, and teaching, and research, as sharing the biggest truth that we can discover. . .
- As a young person, I took this mission very seriously. And I thank Tom for pointing this path out to me.
- But what is *truth*? To flourish, human society needs truth in many forms.
- Scientific truth, so we can understand (and influence) nature.
- Historical truth so that we see clearly where humanity has been and can learn from our mistakes (and successes).
- Legal truth to have a just society.
- So how *do* we handle the truth?
  We set up *systems* to discover the truth in these different areas.
- And that's not easy. The *scientific method* is our great gift from the *enlightenment*.

And what to conclude about Tom?

- Tom is *perceptive*
- Tom is *thoughtful*
- Tom is a *consensus builder*
- Tom is a *leader*
- Tom has a wicked sense of humor
- And despite outward appearance and behavior, Tom is *sensitive*