ChE department

RENSSELAER POLYTECHNIC INSTITU

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Rensselaer Polytechnic Institute was founded as the Rensselaer School in 1824, "for the purpose of instructing persons who may choose to apply themselves in the application of science to the common purposes of life." It has evolved into a university comprising five schools, 400 faculty and full-time researchers, and 6400 students. Of the latter, approximately 1900 are graduate students.

Chemical engineering at Rensselaer began seventy years ago as a program in the Department of Chemistry. In 1943, it became a separate academic unit, with Lewis S. Coonley as its first head. It is now one of the eight departments and five centers which compose the School of Engineering. Chemical engineering has eighteen active faculty members; another three from other departments hold joint appointments with us. Undergraduate enrollment is approximately 175, and graduate students number about 60, with 75% pursuing the PhD.

We have a building largely to ourselves. Separated by a comfortable 100 yards of football field from the Engineering-School administration, the Ricketts Building is our home. Ricketts contains offices, classrooms, a unit-operations laboratory, and about 14,000 square feet of research laboratories. An in-house electronics/machine shop is available for use by students and staff.

The perceived heart of a contemporary engineering department is the range and strength of its research interests. In that respect, chemical engineering at Rensselaer is fortunate to have coverage in many areas . . .

Our research labs are relatively new, the result of an extensive renovation undertaken in 1978. Since then, a central graduate-student office/study area has been constructed and furnished. Most recently, through the generosity of Howard Isermann (a Rensselaer chemical engineering alumnus), we have been able to renovate and outfit 3000 square feet of new laboratory space for our biochemical engineers. This facility will help us to compete successfully with other first-class programs in biochemical engineering.

BREADTH AND DEPTH

The perceived heart of a contemporary engineering department is the range and strength of its research interests. In this respect, chemical engineering at Rensselaer is fortunate to have coverage in many areas: air resources, advanced materials, biochemical engineering, control and design, fluid-particle systems, interfacial phenomena, kinetics and reactor design, polymer engineering, separation processes, thermodynamics, and transport processes. A special pride is our biochemical engineering group, with a critical mass of three (approaching four) specialists.

Interdisciplinary interactions are currently encouraged at Rensselaer, and chemical engineering benefits from numerous collaborations. Belfort works with Don Drew from mathematics, Gill with Marty Glicksman from materials engineering, and Nauman with various polymeric enthusiasts from chemistry and materials engineering. Rensselaer's Center for Integrated Electronics provides one of several foci for those (*e.g.*, Gill, Wayner) with interests in advanced materials. Belfort,

Home Sweet Home: The Ricketts Building. Local legend has it that Palmer C. Ricketts (a former Rensselaer president) is interred behind his memorial plaque in the foyer. On moonless nights, his shade perturbs unattended experiments.

Littman, Morgan, and Wayner are members of the Center for Multiphase Flow; Belfort, Bungay, Cramer, Gill, Morgan, and Nauman, of the Bioseparations Research Center; and Cramer, of the Biophysics Research Center. And the Department of Electrical, Computer, and Systems Engineering harbors like-minded souls with whom Bequette exchanges ideas on process dynamics and control.

What makes academic research "go"? Money, of course, and a dedicated and energetic faculty. We, like others in this business, must scramble for the former. The latter, fortunately, is a given. Our research environment is healthy; we are better than competitive, and yearly attract a strong group of graduate students. Problems of student support are mitigated by fifteen new Isermann Graduate Fellowships which are endowed in perpetuity.

FACULTY SNAPSHOTS

R. H. Wentorf is Distinguished Research Professor of Chemical Engineering. Bob is inventor or coinventor of techniques for commercial production of very hard materials (Borazon, diamond). He has many technical interests, ranging from polymer-fiber fabrication to semiconductor processing. After-hours, Bob is a farmer and a glider pilot. **P. C. Wayner, Jr.** studies transport phenomena in evaporating menisci and in ultra-thin films. His arsenal of experimental techniques includes scanning microphotometry and photoscanning ellipsometry. For analysis, he uses capillarity concepts and London/van der Waals theory. Pete enjoys tennis and skiing. **H. C. Van Ness** is Institute Professor of Chemical Engineering. He specializes in the measurement, reduction, and correlation of thermodynamic properties of liquid mixtures. Hank's equipment designs have been widely adopted, and are the source of many of the world's heat-of-mixing and VLE data. Hank golfs and plays the piano.

J. L. Plawsky works with optical substances. He seeks to understand how the various transport phenomena affect the processing of wave-guide devices. Related interests include developing novel materials based upon inorganic/organic copolymer systems and investigating complex mixing effects in flowing glasses. Joel plays rock guitar and swims. **E. B. Nauman** is director of the Industrial Liason Program for chemical engineering. His principal research interests are in polymer processing and polymer-reaction engineering. Much of his current work relates to the compositional-quenching process, which he invented. Bruce characterizes his hobby as "pure and applied flamboyance"; he is the only R.P.I. prof whose winter car is a Jag XJS. **C. Muckenfuss** shepherds our seniors through the final year of chemical engineering; he is responsible for their advising and eventual clearance. His research centers on first-principle studies of trans-

Bruce Hook adjusts a data point. Behind him: Littman's cat combustor, a.k.a. High-Temperature Gas-Phase Spouted-Bed Catalytic Reactor.

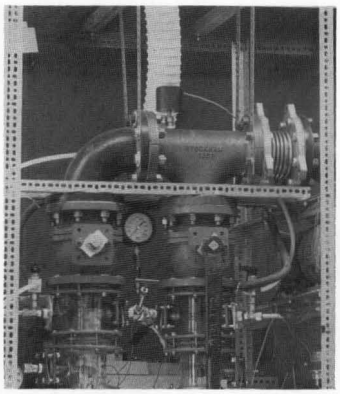
port phenomena, *i.e.*, on the application of kinetic theory and irreversible thermodynamics to multicomponent, reacting systems. Charlie is an avid bicyclist/traveler.

M. H. Morgan III works with fluid/particle systems. His current research focuses on the development of reactor theories and of fluid-mechanical models for spouted beds with draft tubes. Experimental and theoretical studies abound. Morris is a serious competitive runner: in 1988 he took a Submaster's gold medal with a 2:03 half-mile in New York's Empire State Games. **H. Littman** conducts basic research on gas/liquid and fluid/particle systems. Ongoing efforts include studies on the dynamics and control of spouted-bed reactors, pneumatic transport of fine particles, and jet stability and the transition to bubbling. Howard is a 1988 recipient of Rensselaer's Distinguished Faculty Award. He hikes and runs for fun.

P. K. Lashmet is Executive Officer of chemical engineering. His research concentrates on process engineering and on the improvement of basic design procedures. Currently, he explores the effects of parameter uncertainties and process variations on non-dynamic equipment performance, employing Monte Carlo simulation techniques. P.K. enjoys his family and power-boating (in that order).

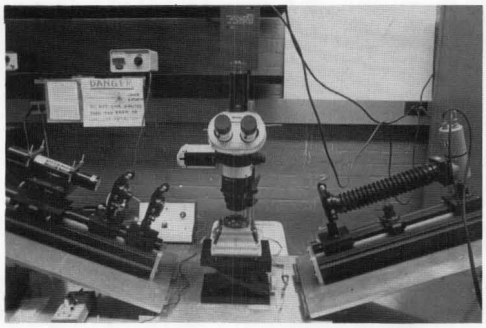
W. N. Gill is Head of chemical engineering; his research is in the applied transport areas. Current efforts include studies in membrane separation techniques and the design and modeling of chemical vapor deposition reactors. Of special interest are experimental and theoretical investigations of dendritic growth of ice and of succinonitrile, and the non-linear dynamics of pattern formation in crystal-growth systems. Bill likes films (classic and foreign), music, plays, running, and martinis. **A. Fontijn** studies combustion. The major efforts of his group concern the high-temperature reaction kinetics of combustion intermediates. For the experimental studies, Fontijn has developed special fast-flow and pseudostatic thermal reactors. Arthur hikes and travels for relaxation. **S. M. Cramer** specializes in biochemical engineering. His interests

"As soon seek ice in June": Bill Gill does. This dendrite began life as a smooth disk. Bill studies its evolution with digital image analysis, and predicts its development with theory.



Nauman's compositional quencher. Bruce probes the depths of the spinodal region, seeking to produce rubber-modified polymers with controlled particle-size distributions.

"Fringe benefits": Wayner's scanning ellipsometer with interferometer and laser light source. Mounted on a vibration-proof table, it is immune to the shocks of Ricketts's frequent renovations.



An unattended experiment? Not to worry. This machine (Cramer's new Delta Prep chromatographic unit) practically runs itself.

center on the synthesis and separation of biomolecules. Research efforts include experimental and theoretical studies of preparative chromatographic techniques (especially displacement chromatography), and enzymatic organic synthesis. Steve is an accomplished jazz pianist who performs regularly with High Society, a group of professional musicians.

H. R. Bungay III conducts research into microbial growth and biomass refining. Capillary microelectrodes with tips a few microns in diameter are used to study oxygen transfer in various microbial systems. Intensive efforts are geared toward eventual commercialization of processes for conversion of wood chips to salable chemicals. Harry is a licensed pilot and a bridge Life Master. **W. D. Bradley** is an essential contributor to our undergraduate instructional program. He brings to us forty years of experience as a practicing chemical engineer. Bill's technical interests span the spectrum of design topics and focus on the ultimate questions: Will it work? Will it make money? His hobbies include beekeeping and herb-gardening. **B. W. Bequette** seeks to integrate the traditionally separate issues of modeling, design, optimization, and control into a consistent methodology. Emphasis is on applications to the manufacture of semiconductor devices. Nonlinear control theory is a special enthusiasm. Wayne's outside interests include collision theory and trajectory analysis (softball) and high altitude inefficient conversion of potential to kinetic energy (skiing with reckless abandon).

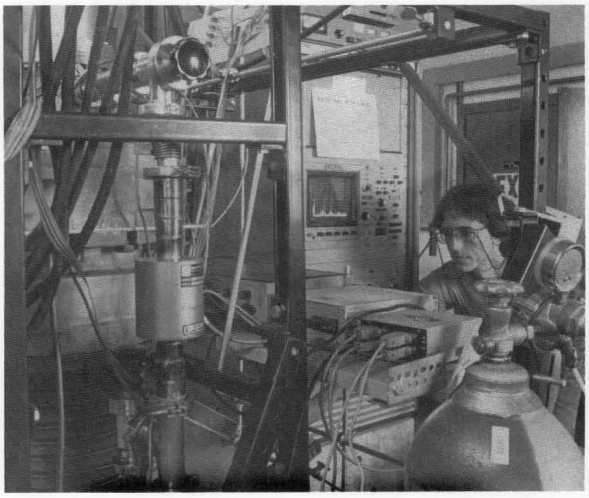
G. Belfort studies the fundamentals of synthetic membrane processes and applications of these processes to biotechnology. Fluid-mechanical concepts are used to analyze membrane particulate fouling and to develop rational design procedures. Flow cytometry and NMR imaging are among the experimental techniques employed in Belfort's work. Georges coaches soccer and plays squash. **E. R. Altwicker** works in selected areas of air pollution control and atmospheric chemistry. Current efforts include studies of S(IV) oxidation and of the heterogeneous combustion of waste fuels. A falling-drop reactor allows controlled investigation of scavenging and scrubbing operations, and complements theoretical studies of mass transfer with chemical reaction. Elmar skis and plays tennis and the violin. **M. M. Abbott** does thermodynamics. Technical interests include phase equilibria, solution thermodynamics, and the PVTx equation of state. His professional passion is the classroom. Mike reads history, poetry, and music.

DISTINGUISHED COLLEAGUES

Outside recognition by one's peers is an indicator of the strength of a department, and we enjoy a share of such honors. In 1985, Fontijn received the ACS Award for Creative Advances in Environmental Science and Technology. Bill Shuster (just retired from Rensselaer) was a 1987 recipient of AIChE's Award for Service to Society. And 1988 has been an especially happy year for us, with Bungay obtaining the ACS Marvin J. Johnson Award in Microbial and Biochemical Technology and Van Ness receiving AIChE's Warren K. Lewis Award.

Four Rensselaer faculty (Bungay, Nauman, Van Ness, and Wayner) are AIChE Fellows. Wentorf is a member of the National Academy of Engineering. Gill, Littman, and Van Ness have done Fulbrights. Gill was the first Glenn Murphy Distinguished Professor at Iowa State University. In 1988, Belfort was Flint Scholar at Yale University, and Van Ness was Phillips Petroleum Company Lecturer at Oklahoma State University. And so it goes: we enjoy our share.

Is there professional life beyond the laboratory? We hope so. Education is still our major business, and service to the profession is a close second. Van Ness, Cramer, Bungay, and Abbott have all won major teaching awards: . . .



Fontijn's HTFFR (pronounced "aitch-tuffer"), with Clyde Stanton at the controls. With this and other devices, Arthur studies gas-phase kinetics over humongous temperature ranges.

LAST, BUT NOT LAST

Is there professional life beyond the laboratory? We hope so. Education is still our major business, and service to the profession is a close second. Van Ness, Cramer, Bungay, and Abbott have all won major teach-

ing awards; Abbott has just finished a two-year stint as a Rensselaer Distinguished Teaching Fellow. We currently have in print ten textbooks and monographs: *Basic Engineering Thermodynamics*, 2nd Ed. (Zemansky, Abbott, and Van Ness); *BASIC Environmental Engineering* (Bungay); *Chemical Reactor Design* (Nauman); *Classical Thermodynamics of Nonelectrolyte Solutions* (Van Ness and Abbott); *Computer Games and Simulation for Biochemical Engineering* (Bungay); *Energy: The Biomass Option* (Bungay); *Introduction to Chemical Engineering Thermodynamics*, 4th Ed. (Smith and Van Ness); *Mixing in Continuous Flow Systems* (Nauman and Buffham); *Schaum's Outline of Theory and Problems of Thermodynamics* (Abbott and Van Ness); and *Understanding Thermodynamics* (Van Ness).

Several of us serve on AIChE technical programming committees. Most of us are members of one or more editorial boards. And, of course, Rensselaer is the home of *Chemical Engineering Communications*, edited by Bill Gill. CEC receives about 400 manuscripts each year, thus providing valuable interaction between Rensselaer and the international chemical engineering community.

Douglas R. Hofstadter asks if the soul of a collection of individuals can be greater than the hum of its parts. We believe so. With strong commitments to education, to professional service, and to research and scholarship, chemical engineering at Rensselaer is certainly a humming place. A diversity of styles and interests, a healthy dedication to the principle of lese majesty, and a sense of collegiality combine to provide our department with a lively atmosphere in which to pursue one's professional goals. It's a great place to work and study. □

ChE letters

LEVENSPIEL CLAIM DISPUTED

To the Editor:

We wish to reply to Dr. Octave Levenspiel's letter published in your Summer 1988 issue which erroneously compares *Chemical Engineering Science* with *Chemical Engineering Communications* as to both cost and price.

Doctor Levenspiel's analysis is incorrect in just about every respect imaginable. Unfortunately, the sorry business could have been avoided had Dr. Levenspiel verified his information with us prior to publication. I hope that in view of the facts as outlined below, he will retract his letter and save further embarrassment.

1. The subscription prices quoted by Dr. Levenspiel for the present calendar year in his letter article are false. He quotes a price of $296 for a volume. In fact the academic library rate is $184, substantially less that [*sic*] the figure quoted in his letter. Furthermore, there is an individual subscription rate at 50% of the library rate, or $92 per volume.

2. In a comparison, these rates are further reduced by the fact that our rates include airmail postage and handling charges all over the world, while in other publications, these costs may be added separately. So a comparable library subscription rate with a publisher who charged separately for these services, would be about $25 lower or about $169.

3. We did study a recent front matter of an issue chosen at random of *Chemical Engineering Science*. It was volume 43, number 7 of that publication. In that issue the 1988 institutional subscription rate for a single year is listed at 1400 DM. We telephoned a major subscription agent who today [August 24, 1988] advised us that the present price in dollars of an academic subscription was $862.50, about twice as expensive as the rate of $435 quoted in Dr. Levenspiel's letter. Incidentally, having chosen this particular article quite by chance, we were surprised that the lead article was the Third P. V. Danckwerts Memorial Lecture by O. Levenspiel and that the front matter included a photograph taken in May 1988 showing Dr. Levenspiel together with the Editorial Director of Pergamon Press as well as the Executive Editor of *Chemical Engineering Science*. We did not verify the other columns of pages and words per page as in Dr. Levenspiel's article but in view of the fact of the other distortions of price and size, we have no reason to accept these as being any less biased.

4. As to the change in format, there was a change in format of *Chemical Engineering Communications* but the amount of material offered subscribers per volume has always been adjusted and remained the same. The number of pages per volume was increased to compensate for the decreased amount of material per page for the change from a double-column to a single-column format. Dr. Levenspiel suggests that the change in format was made to deceive readers; this is simply untrue.

We have always published on a flow basis in that we estimate the number of pages and/or volumes for publication in the upcoming 12-month period. Rather than delay publication of articles to conform to a fixed number of pages, articles are published as ready for most rapid publication. In prior years, as the number of pages billed was reached earlier or later than anticipated renewals were either advanced or delayed accordingly. In the last two years, we have changed this policy so that issues are published on a calendar-year basis. The number of pages for the coming year is estimated and this determines the subscription price for that year. Should the number of pages be over or underestimated, the price is adjusted accordingly in the subsequent renewal period. In the year 1987, we overestimated the number of pages which would be supplied. Accordingly the subscription price for