SESSION IN HONOR OF PROFESSOR ROGER SARGENT
Sponsored by Process Systems Enterprise, Ltd.
Chair: Ignacio Grossmann, Carnegie Mellon University

8:00 a.m. to 8:05 a.m. Session Introduction

8:05 a.m. to 8:30 a.m. Roger Sargent: Intellectual Leader and Pioneer of Process Systems Engineering
Ignacio Grossmann, Carnegie Mellon University

8:30 a.m. to 9:15 a.m. Process Modeling: From Sargent’s Vision to its Current Directions
Costas Pantelides, Imperial College London

9:15 a.m. to 9:40 a.m. Major Contributions by Roger Sargent in Nonlinear Optimization
Ignacio Grossmann, Carnegie Mellon University

9:40 a.m. to 10:05 a.m. Refreshment Break

10:05 a.m. to 10:30 a.m. Distillation & Hybrid Separation: Modelling, Synthesis, Design & Operation
Rafiqul Gani, PSE for SPEED

10:30 a.m. to 10:55 a.m. Scheduling in PSE: Before and After the State-Task Network
Pedro Castro, University of Lisbon

10:55 a.m. to 11:20 a.m. Impact on Optimization, Control, and MPC
Larry Biegler, Carnegie Mellon University

11:20 a.m. to 11:45 a.m. The Centre for Process Systems Engineering: Interactions and Integration
Eva Sorensen, University College London
Major Losses for Process Systems Engineering

Dale F. Rudd (1935-2018)

Roger W.H. Sargent (1926-2018)
Dale F. Rudd
March 2, 1935, Minneapolis, Minn.
B.S. Chem. Eng. University Minnesota 1956
Ph.D. Chem. Eng. University Minnesota 1960
University of Michigan 1960-1962
University of Wisconsin, Madison 1962-
Slichter Professor Chemical Engineering

First textbook on PSE (1968)

PART I. THE CREATION AND ASSESSMENT OF ALTERNATIVES
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### 28 Ph.D. students supervised by Prof. Dale Rudd

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
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<td>Lee, Woo-Young</td>
<td>1966</td>
<td>Kelly, Lloyd Ray</td>
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<td>Christensen, James Henry</td>
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<td>King, Carl Fred</td>
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<td>Fathi-Afshar, Saeed</td>
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<td>Rudd, Powers, Sirola,</td>
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<td>Rudd, Fathi-Afshar, Treviño, Stadtherr</td>
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<td>“Process Synthesis”</td>
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<td>“Petrochemical Technology Assessment”</td>
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<td>(1973)</td>
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61 publications, 2,042 citations h-index=22 (Web Science)
Intellectual Leader and Pioneer of Process Systems Engineering

Roger W.H. Sargent (1926-2018)
Roger W.H. Sargent
October 14, 1926, Bedford, England.

B.Sc. Chem. Eng. Imperial College, 1947
Ph.D. Chem. Eng. Imperial College, 1950

Air Liquide, Paris, 1951-58

Imperial College, 1958
Courtaulds Professor Chemical Engineering, 1962

President of the Institution of Chemical Engineers, 1973

Dean of the City and Guilds College, 1973-76
Head Department Chemical Engineering, 1975-88

Founding Fellow Royal Academy of Engineering, 1976

Founder and Director of the Centre for PSE (CPSE), 1989

Promoted creation of Process Systems Enterprise (PSE)
Roger W.H. Sargent
October 14, 1926, Bedford, England.

B.Sc. Chem. Eng. Imperial College, 1947
Ph.D. Chem. Eng. Imperial College, 1950

1931 - Roger 6 Years Old
1946 – B.S. graduation
1950 – PhD degree
THE DESIGN AND TESTING OF A FRACTIONATING COLUMN FOR THE SEPARATION OF AIR.

A Thesis presented for the Degree of

Doctor of Philosophy

of the University of London

by

R.W.H. Sargent, B.Sc., A.C.G.I.

Advisor: Prof. Newitt

Pilot Plant Cryogenic Separation

Not a single equation!
Roger W.H. Sargent
October 14, 1926, Bedford, England.

B.Sc. Chem. Eng. Imperial College, 1947
Ph.D. Chem. Eng. Imperial College, 1950

1946 – B.S. graduation
1950 – PhD degree
Wife: Shirley 1951-58– Air Liquide, Paris
Philip and Tony

1956 Sketch of Roger W.H. Sargent at Air Liquide, Paris

1957 - Roger with Sons
Philip and Tony
Roger W.H. Sargent
October 14, 1926, Bedford, England.

B.Sc. Chem. Eng. Imperial College, 1947
Ph.D. Chem. Eng. Imperial College, 1950

1951-58 – Air Liquide, Paris
1958 – Senior Lecturer
1962 – Courtaulds Professor

Wife: Shirley
General purpose simulation program for chemical processes

Finding optimal sequence of computation of units to achieve fast convergence
Integrated Design and Optimization of Processes

Although we are in sight of a truly integrated approach to the design of complete processes, a great deal of work remains to be done. With the need for more sophisticated analysis of larger complexes, it is more than ever necessary to join hands with those working in the fields of control engineering, operational research, numerical analysis, and computer science.

R. W. H. Sargent
Imperial College of Science and Technology, University of London, London, England

Visionary paper in 1967 on:
- Process design and integration with control, reliability
- Process models: steady state, dynamics
- Strategy of process calculations
- Computational methods for optimization

The PSE Faculty at Imperial College in 1974

Roger Sargent  Lester Kershonbaum  John Perkins
Roger W.H. Sargent
October 14, 1926, Bedford, England.

B.Sc. Chem. Eng. Imperial College, 1947
Ph.D. Chem. Eng. Imperial College, 1950

1951-58 – Air Liquide, Paris
1958 – Senior Lecturer
1962 – Courtaulds Professor
1975 – Department Head
1973 – President of IChemE
1990 – Director CPSE
2008 – Sargent Lecture

Wife: Shirley 1951-58 – Air Liquide, Paris

1931 - Roger 6 Years Old
1946 – B.S. graduation
1950 – PhD degree
Sargent’s major contributions to PSE:

- Process modeling
  *Equation oriented flowsheeting, DAEs dynamics*
- Optimization, distillation, control and scheduling
  *Nonlinear programming, optimal control*
  *Design, distillation columns, uncertainty*
  *Batch design and scheduling*


67 publications, 2,958 citations h-index=20 (Web Science)

**A GENERAL ALGORITHM FOR SHORT-TERM SCHEDULING OF BATCH OPERATIONS . 1. MILP FORMULATION**
*Kondili, E; Pantelides, CC; Sargent, RWH*
*COMPUTERS & CHEMICAL ENGINEERING 17, 211-227 (1993) 695 citations*

**COMPUTATIONAL EXPERIENCE WITH QUADRATICALLY CONVERGENT MINIMISATION METHODS**
*Murtagh, BA; Sargent, RWH*
*COMPUTER JOURNAL 13, 185 (1970) 335 citations*
### 48 Ph.D. students supervised by Professor Roger Sargent

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<th>Name</th>
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<td>R. S. H. Mah</td>
<td>S. F. Goldmann</td>
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<td>W. P. Macmillan</td>
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<td>K. Chandrasekharan</td>
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<td>L. O. Dworjaryn</td>
<td>M. J. Leigh</td>
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<td>R. Vasquez-Roman</td>
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<td>D. J. G. Sebastian</td>
<td>S. Gomez-Gomez</td>
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<td>G. P. Pollard</td>
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<td>X. Zhang</td>
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<td>C. J. Withford</td>
<td>G. R. Sullivan</td>
<td>Costas C. Pantelides</td>
<td>J. A. Barber</td>
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**Academic Tree: over 2000 names!**

For complete academic tree see:

http://titan.engr.tamu.edu/Sargent_tree/

**Awards**

- **Fellow Royal Academy of Engineering (1976)**
- **Silver Medal of the “Ville de Paris” (1986)**
- **Doctor honoris causa Institut National Polytechnique de Lorraine (1987)**
- **Doctor honoris causa of the University of Liège (1995)**
- **Fellow of the Royal Society of Arts**
- **Computing in Chemical Engineering Award of AIChE (1990)**
- **Nordic Process Control Award (2003)**
- **MM Sharma medal by IChemE (2015)**
- **Sir Frank Whittle Medal, Royal Academy of Engineering (2016)**
1990 Computing in Chemical Engineering Award
CAST Division of AIChE, Miami, USA
Longest applause ever after Sargent's speech (3 min)
Founders Tribute Issue: September 2016

Roger Sargent’s Family

Wife: Shirley
Sons: Philip, Tony
Reflections by Roger Sargent on PSE

Sargent, R.W.H..
“Special Issue on Process Systems Engineering-Critique”
Computers & Chemical Engineering 12, R7-R11 (1988)

Sargent, RWH
“Introduction: 25 years of progress in process systems engineering”

Sargent, R.W.H.

Sargent, R.W.H.
“My Contribution to Broadening the Base of Chemical Engineering,”
Annual Review of Chemical and Biomolecular Engineering, 2, 1-7 (2011)
Roger W.H. Sargent (1926-2018)

Founder and pioneer of Process Systems Engineering

Brilliant researcher who had a tremendous impact in the field

He was a true inspiration to his students, a visionary scholar with very high standards who believed in the power of mathematical optimization.

He was a true gentleman, and above all, a very kind human being.