



HARRY G. FAIR

Each year, a special lecture is given in memory of Harry G. Fair, an outstanding OU alumnus. Harry G. Fair was born in Okmulgee, Oklahoma, on June 3, 1916. He received his B.S. in Chemical Engineering in 1939. He joined Phillips Petroleum Company in 1939 and worked his way up to Vice President for Supply and Transportation, with responsibility for worldwide exchange of crude oil and all transportation facilities. In 1966, he joined the M.W. Kellogg Company as Executive Vice President, in charge of all engineering activities and became Executive Vice President of Coastal States Gas Corporation from 1971 until the time of his death on July 27, 1974. Harry G. Fair was active in service to society and to his alma mater. He was a member of a number of professional societies and was a licensed professional engineer.

This lecture is made possible by the Harry G. Fair Memorial Fund contributed by his widow, Jane Swift Fair. Arrangements are made by the School of Chemical Engineering and Materials Science.

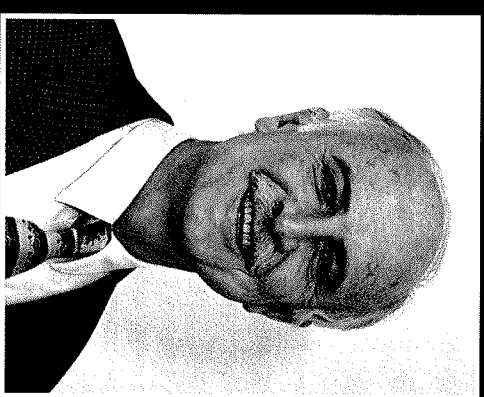
Perspectives on the Synthesis of Plant-Wide Control Structures

by George Stephanopoulos
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The synthesis of plant-wide control structures has resurfaced as the most important design problem in process control. In this lecture we will provide a comparative analysis of various approaches, with an emphasis on how well they address the inherent theoretical and practical issues associated with the design of such control systems. Starting with a formal statement of the problem, which corresponds to a multi-objective optimization problem, we will argue that the central issue to be resolved is the translation of implicit operating objectives to sets of feedback-controlled variables.

The principle of the *Optimizing Feedback Control Structures* is proposed as the formal medium for the identification of controlled variables. Furthermore, it is shown that the selection of the best sets of input (manipulated) and output (measured) variables for the formation of the controllers' structures is governed by classical control-theoretical aspects, such as open-loop gains, model uncertainty, and non-minimum phase process characteristics. *Hierarchical viewing of a plant* is proposed as an effective mechanism to contain the complexities of the problem by streamlining the (i) specification of control objectives at different time-scales, (ii) modeling needs and model uncertainties, (iii) selection of measured and manipulated variables, and (iv) formation of the control structures.

In addition, we will discuss the characteristics of a phenomena-based, computer-aided modeling environment, entitled *MODEL LA*, which is providing the hierarchical representation of the plants for the synthesis of plant-wide control structures. The overall approach will be illustrated on the synthesis of control structures for two continuous chemical plants.



George Stephanopoulos

George Stephanopoulos is the Arthur D. Little Professor of Chemical Engineering at MIT. His research interests include product and process development and design, process operations and control, and integrated computer-aided environments for process systems engineering. His research focuses on development of new problem formulations and formal theoretical frameworks and methodologies for the solution of important process systems engineering problems such as design of products with desired properties; preliminary design of processing systems with environmental constraints; plant-wide control and operability analysis; monitoring, analysis and interpretation of process trends for diagnosis and operators support; and design of model-predictive and adaptive controllers. He received the Diploma of CHE from the Nat. Tech. Univ. of Athens in 1970, an M.E. from McMaster Univ. in 1971, and a Ph.D. from Univ. of Florida in 1974. He received the Camille and Henry Dreyfus Teacher-Scholar Award in 1977, the Alan P. Colburn Award of AIChE in 1982, the Curtis McGraw Award of ASCE in 1986, and the Computing in Chemical Engineering Award of AIChE-CAST Div. in 1993.

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THE 25TH ANNUAL

**Harry G. Fair
Memorial Lecture**

IN CHEMICAL ENGINEERING
AND MATERIALS SCIENCE

**April 15, 1999,
3:30 P.M.**

THE LECTURE WILL BE GIVEN
ON CAMPUS,
IN SARKEYS ENERGY CENTER,
ROOM M-204.

COFFEE AND REFRESHMENTS WILL BE SERVED

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AND MATERIALS SCIENCE
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THE 25TH ANNUAL

**Harry G. Fair
Memorial
Lecture**

in



CHEMICAL ENGINEERING

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