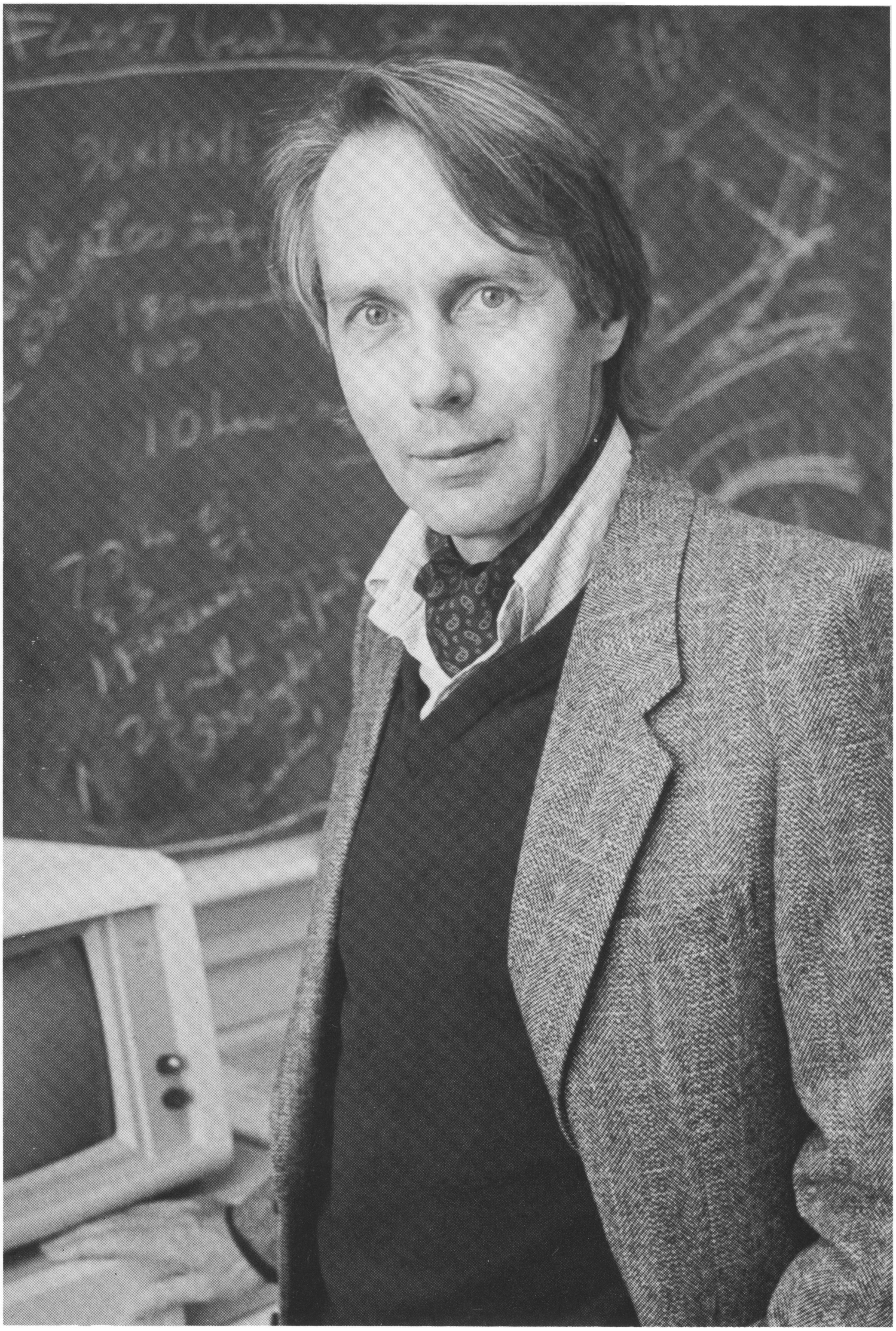
The James S. McDonnell Distinguished University Professorship of Aerospace Engineering

Princeton University



Antony Jameson

JAMES S. MCDONNELL DISTINGUISHED UNIVERSITY PROFESSOR OF AEROSPACE ENGINEERING

"Traditionally, we've designed airplanes a bit like we did cathedrals hundreds of years ago," observes Antony Jameson, James S. McDonnell Distinguished University Professor of Aerospace Engineering.

"Back then, if you wanted to build a bigger dome on a cathedral, you had no way of precisely calculating what the load forces were going to be, so you did it by experiment—essentially, by building the bigger dome and seeing how it performed under the stresses of wind and weight."

Until recently, Dr. Jameson explains, aircraft, too, were designed almost entirely by experiment rather than calculation. It has long been possible, he adds, to use fairly simple equations to answer basic questions about a plane's structure—how much wing surface is needed to lift a given load, for example. But calculating how a particular wing shape performs near sonic speeds remained beyond the reach of conventional mathematics. When designing an airliner or other highly sophisticated airplane, engineers relied on the time-honored—as well as time-consuming and expensive—practice of wind tunnel testing.

This began to change in the late 1960s with the advent of high-speed computers. Tony Jameson, who was an engineer at the Grumman Aerospace Corporation at the time, has been in on this development since its beginning. Today he is widely recognized for his pioneering advances in creating computer models that simulate the highly complex aerodynamics of an aircraft as it approaches the speed of sound.

In 1986 he and Princeton colleague Timothy Parker unveiled a program allowing aircraft designers, for the first time, to create accurate computer models for simulating transonic flow across an entire airplane. In terms of both time and money, the program promises significant savings by enabling engineers to substitute computer models for wind tunnel tests, particularly in the early and middle phases of design.

The modeler's art is to bring aerodynamic experiments within the range of a computer's capacity by reducing them to what Dr. Jameson calls "mathematical approximations" of their essential features. While making the model simple enough for the computer to handle, however, the designer must keep it sufficiently complex to produce meaningful answers. "It's actually a quite deep intellectual question," says Dr. Jameson.

Born and raised in England, he received his B.A. and Ph.D. from Cambridge and worked six years at Grumman before accepting, in 1972, a joint appointment at the Courant Institute of Mathematical Sciences and New York University. He came to Princeton in 1980 and two years later was named one of the four original incumbents of the newly created McDonnell Professorships.

Dr. Jameson enjoys academic life because it allows him to pursue some of the more theoretical aspects of computational aerodynamics. At the same time, he feels it is important to stay in touch with the practical problems faced by aerospace engineers.

"I have very close ties with industry, in part because I worked there for a number of years," says Dr. Jameson, who would like to see more opportunities for exchange between industry and academia. "Unfortunately, once you're in industry it's very hard to get back into university life. Universities are places where you establish your intellectual competence and where you're judged by what you publish. In industry, on the other hand, engineers concern themselves with solving practical problems, and they usually don't publish—the results of their research are treated as trade secrets.

"This is a definite paradox," he adds, "and it concerns me seriously. I believe strongly that experience in industry makes one a more effective teacher, while industrial engineers could benefit from the kind of organized intellectual analysis that's characteristic of the best university research."

Six Distinguished University Professorships were established
at Princeton by gifts from the James S. McDonnell Foundation of St. Louis.
They honor the late James S. McDonnell, a pioneering aircraft designer
and founder of the company that became McDonnell Douglas Corporation.
Mr. McDonnell received his bachelor's degree in physics from Princeton in 1921.
The six professorships—in computer science, economics, engineering,
physics, politics, and psychology—reflect the breadth of both
his professional interests and intellectual curiosity.

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