. . . a "vorton" arriving at glancing incidence at a fluid interface is "scattered" . . . the toroidal eddy arrives . . . pushes along the surface briefly as it tips forward and then, parting company from the "ripplons" it has raised, it descends somewhat less energetically back into the bulk phase.

hydrodynamics. The lesson here is that such crude concepts as eddy diffusivity are poor substitutes nowadays for experimental and theoretical fluid mechanics together with the instantaneous and time-average convective diffusion equations. Nevertheless it does happen that an eddy diffusivity that increased as the *square* of distance from the interface would come very close to producing the same concentration field and mass transfer coefficient as a certain stagnation flow (Figure 21). And a *negative* eddy diffusivity that decreased in the same way would nearly match the corresponding reverse stagnation flow in its effect!

IN OUR ONGOING PROGRAM at Minnesota for understanding flow and transfer at fluid interfaces the question of greatest current interest is how periodic motions, such as accompany progressive and standing surface waves, affect diffusion. While we have some partial answers the state of the results is still such that they are more easily sketched in lecture than in writing. They and the further questions they raise do not point toward an eventually comprehensive theory of convective diffusion fields.

Vortex rings are the simplest experimental models of the "eddies" that according to surface renewal, surface replacement, or surface rejuvenation notions are responsible for interrupting quiescent interludes of diffusion at interfaces. In a preliminary to observing turbulent interfaces carefully, we have watched the encounters of dye-marked vortex rings with water-air and water-benzene interfaces. That this is edifying is plain from the motion-picture record, but it is difficult to summarize all of the wonderful things one sees. It will have to suffice here to report that under certain circumstances a "vorton" arriving at glancing incidence at a fluid interface is "scattered"; in other words the toroidal eddy arrives from the bulk phase, pushes along the surface briefly as it tips forward and then, parting company from the "ripplons" it has raised, it descends somewhat less energetically back into the bulk phase. Vortons arriving at rigid surfaces are invariably annihilated, incidentally—another contrast between the boundary conditions at rigid walls and fluid interfaces.

Beyond these sorts of studies, what I think is needed is research on the mechanics of fluid interfaces under turbulent bombardment, research designed to shed light on such matters as when populations of microflow elements are appropriate and how to relate the parameters of the elements and of their distribution functions to fundamental parameters of the turbulence — which is to say, to parameters in a turbulence theory that is not yet well in hand.

Not everyone would agree. In closing let me call your attention to the viewpoint of someone in closer touch with the practical problem past and present. P. V. Danckwerts evidently never returned to the hydrodynamic issues that he acknowledged but left unexplored in his well-known 1951 paper. At the Twentieth Congress on Theoretical and Applied Chemistry in Moscow fourteen years later, according to the twice-translated version in the first issue of *Theoretical Foundations of Chemical Engineering,* he said,

> "The problem of the absorption of gases, from the industrial aspect, has an essentially practical character and our approach to it must be pragmatic. This does not mean the negation of the role which the scientific understanding of the phenomenon plays but it must be understood that the contemporary state of applied sciences at times makes us overemphasize the value of analytical methods and that, in the case of too great expenditures of time in clarifying the mechanism of processes, the substance of the practical problem may fall from view."

ChE news

OPPORTUNITIES FOR DISADVANTAGED YOUTH AT BERKELEY

The Chemical Engineering Department of the University of California at Berkeley has obtained funds to support a limited number of minority-group students in both its undergraduate and graduate programs. At the graduate level a student without formal training in chemical engi-

neering may apply if he has a degree in chemistry or another related field.

Although several black students have received degrees in chemical engineering at Berkeley in recent years the vast majority of them have been from foreign countries. The desire to see them take advantage of the excellent opportunities offered by the chemical engineering profession has led the faculty at Berkeley to start campaigning actively to recruit students from among the minority groups in this country. While some waiver of normal entrance requirements is being made to get this program started, the degree requirements will be unchanged.

Students and faculty from other schools who wish to receive additional information about this program may write to Scott Lynn, in care of the Department at Berkeley, California, 94720.

EDUCATIONAL FILMS

Two films on phase behavior have been produced by the University of Utah and the Chevron Oilfield Research Co., with the financial support of the National Science Foundation. Part 1 shows the phase changes in a single component system and Part 2 shows the phase changes in binary and multicomponent systems. The films were produced, written, and narrated by Noel de Nevers, ChE Department, University of Utah. Copies of the films may be purchased ($250 each) or rented ($5 each) from Educational Media Center, University of Utah, Salt Lake City, Utah 84110.

PRAIRIE VIEW — IOWA STATE PROGRAM

A group of administrators from Iowa State University including George Burnet, professor and head of chemical engineering, are continuing work on a cooperative program between Iowa State and Prairie View to develop a record-keeping data processing service and to establish a program in chemical engineering there. George Burnet explained that the first goal has been realized and it is hoped that the proposal for the chemical engineering program will be approved by the Texas Board of Regents in time for the 1969-1970 academic year.

Prairie View A and M, a predominantly Negro college, was established as a land-grant college in 1876. The college is located 46 miles NW of Houston and provides its 4,000-plus enrollment with training in agriculture, arts and sciences, engineering, home economics, industrial education, and nursing. The School of Engineering, established in 1952, has departments of architecture, mechanical, civil, and electrical engineering.

This continuing cooperative program is one of five programs begun in 1966 under the auspices of the ASEE to develop five predominantly Negro institutions in the South. ASEE and a number of industrial firms are providing funds to support the five programs. The other programs are: Virginia Polytechnic Institute and University of Wisconsin are aiding A and T of North Carolina; University of Illinois and Tulane are aiding Southern University; Vanderbilt is aiding Tennessee A and I; and University of Michigan and Auburn are aiding Tuskegee.

OUTSTANDING TEACHER AWARD

Dr. John D. Stevens, professor of chemical engineering, recently received an "Outstanding Teacher Award" along with three other members of the Iowa State University faculty. Each award consists of a plaque and $500 made possible by a grant from the Standard Oil Foundation to recognize superior teachers. In 1966, Stevens received the first annual H. A. Webber Teaching Award in the chemical engineering department at Iowa State.

ENGINEER OF THE YEAR

In recognition of outstanding contributions to engineering, Dr. Albert L .Babb, chairman of the Department of Nuclear Engineering at the University of Washington, has been named "Engineer of the Year" by the Washington Society of Professional Engineers.

He received a plaque and citation at a recent meeting of the association from Rolf Lux, president of the Seattle chapter. Dr. Babb was cited for "his untiring efforts on behalf of the engineering profession and for his unselfish services for the good of humanity."

Dr. Babb has conducted significant research on the processing of irradiated nuclear fuel elements. Working with members of the medical profession, he also has helped to develop a new technique for the early detection of cystic fibrosis and was a member of a bioengineering team that designed improvements for components for the artificial kidney.

In 1968, he received a citation from the Washington State Legislative Joint Committee on Nuclear Energy for his contributions to the peaceful use of nuclear energy in medicine.