

FROM SMOKE-FILLED ROOM
TO IVORY TOWER---

DICK SEAGRAVE, THE COMPLEAT MAN

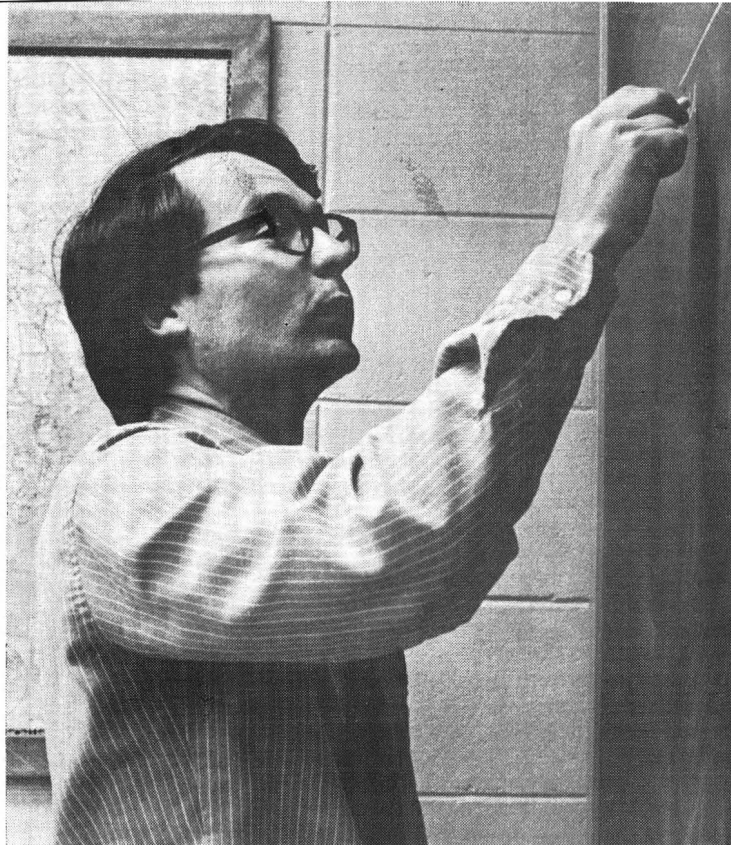
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"Dr. Seagrave is one of the few instructors who can constantly reach into his bag of tricks, period after period, to keep tired students on the edge of their seats. He succeeds in relating technical principles to everyday occurrences. For instance, in his momentum transfer course, typical questions are, 'prove or disprove the old-timers' baseball adage that a hit baseball goes less distance on a hot muggy day' or 'show why the knuckleball flutters when Hoyt Wilhelm lets one go at 60 mph on a cool day in Candlestick Park.'" — Jerry Schnoor.

"Christmas crowds at the supermarket will always symbolize diffusion of mass for me. Our Thanksgiving turkey is no longer a feast bird; it's purely heat transfer. Gas movements were exemplified by Dr. Seagrave himself, charging around the classroom at top speed, hands flying." — Parviz Salehi.

Student remarks such as these show why Dick Seagrave is a very popular teacher and help explain why Dick received one of the Outstanding Teacher Awards at Iowa State University this year. Dick's interest in transport operations runs deep among the streamlines and eddies of this subject but making abstract concepts meaningful to students is a challenge he meets with uninhibited joy and enthusiasm. Unconventional but fresh and illuminating analogies have become a Seagrave hallmark. Moreover, a 'gee-whiz' enthusiasm about his subject easily infects those within range.

Dick joined the Iowa State faculty in 1966 after spending several years at Cal Tech where, in addition to teaching, he worked on oscillatory



combustion under B. H. Sage. Before that he taught for one year at the University of Connecticut.

Dick's interest in a teaching career sprang largely from his association with Ray Fahien at Iowa State. Dick began his graduate studies at this school in 1957 after receiving his BS degree from the University of Rhode Island. Ray not only guided him through the rigors of turbulent flow phenomena but showed him that scholarly work could be enjoyable. Thus inspired, Dick was ready to cast himself in the academic scene upon receiving his PhD in 1961.

At Iowa State, Dick is associated with Chemical Engineering, Biomedical Engineering, and the Engineering Research Institute. He has played a key role in curriculum development and has seen to the integration of subject matter which was formerly presented in separate courses on unit operations and transport phenomena. He has developed several new courses including, "Biomedical Applications of Heat and Mass Transfer." This course led to his writing a text bearing the same title which was published recently.

Dick has attracted an outstanding group of graduate students who are working on various problems of transport phenomena in flow systems, some of course being physiological. This group is accomplishing some interesting research. For example, one of Dick's recent PhD students, M. S.

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Selim, developed a general method for solving moving-boundary transport problems in finite media by integral transforms.

During the past academic year Dick has served as acting chairman of the Biomedical Engineering Department while Neal Cholvin, the regular chairman, is on leave. Although this has been a heavy load on him, Dick plans to be rejuvenated at the Institute of Medical Physics in Utrecht (the Netherlands), not as a patient, but as a scholar on sabbatical starting next September. Here he plans to work with Dr. Jan Beneken on the development of an automatic control system for the administration of anesthesia and to write a textbook on physiological simulation.

Being an American history buff, it was natural for Dick to become engrossed in politics and thereby become chairman of the Democratic Party in Story county. July will see Dick at the National Convention in Miami Beach championing favorite issues and candidates. This plus other summer activities will keep Dick moving at his usual energetic pace. In August he and Giles Cokelet from Montana State will be leading a workshop on Integration of Biomedical and Environmental Applications of Chemical Engineering into Undergraduate Courses at the ASEE sponsored Summer School for Chemical Engineering Faculty in Boulder, Colorado. Between various professional activities, Dick hopes to have a vacation with his wife, Jan, and children, John and Katherine. Since the Rocky Mountains are a favorite vacationing spot for the Seagrave family, the Boulder assignment is a fortuitous one.

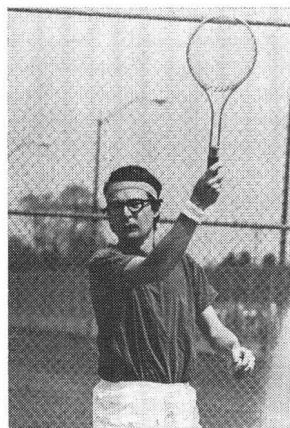
Work-filled days and politics-filled evenings are hardly sufficient to consume the Seagrave energy, so extra steam has to be discharged in "tennis, basketball, and running around in cir-

cles." Then, of course, when there is nothing else to do, the neighbors can be organized for a game of touch-football. Naturally, the major professional and intercollegiate sports must be attended to and football, basketball and baseball pools organized to add zest.

Since no writer could do justice to the Seagrave personality, we taped an interview with Dick and have included some of his remarks below.

Q. Dick, why did you ever decide to become a chemical engineer?

A. I was always interested in designing and building things. In fact at one point in high school I can remember I had just about decided to become an architect, and really I guess the turning point was high school chemistry. I think that my chemistry teacher, a lady who had taught in our high school quite a while, was a very influential person in that regard. I really enjoyed (learning about chemistry) as much as anything I ever did in high



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school. That was kind of coupled with a very strong interest, if you can believe it, in mechanical drawing, and I used to spend all of my spare time in high school down in the mechanical drawing shop making sketches and drawing pictures and I guess a lot of that was from my previous desire to be an architect.



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Q. You are noted for maintaining student interest in the classroom. How do you manage to do this?

A. If there's anything I consciously do, which I think is fun for everybody to do, it is to look for application of the principles that we're talking about in what you might call unusual areas. I mean, when we talk about thermodynamics, it's just as easy to talk about the thermodynamics of people or cities as it is to talk about the thermodynamic system in a cylinder. I think that I try to find 'down to earth' or maybe 'far-out' from earth examples to illustrate a lot of these principals. When we talk about heat transfer, again it's just as easy to talk about new-born infants as it is to talk about a cast iron sphere. And, ever since I started teaching, I've tried to find what you might call homely examples. Cooking time of turkeys, a problem from Bird, Stewart and Lightfoot, is a good example. Almost everybody can stay interested in that for a half an hour and it's just as good an example of how to do heat transfer calculations as a melting block of ice.

Q. What are some of the satisfactions that you get from teaching?

A. I think the main satisfaction is helping people to become independent thinkers and teaching young people to have confidence in their ability to do things. It's particularly fun to see the transition that occurs between about the junior year of college and the second and third year of graduate school. To watch the ability to handle problems and self-confidence develop in students is enormously satisfying.

Q. When do you think you first started seriously thinking about becoming a teacher?

A. I had some twinklings about that in my third or fourth year of college as I began to near the end. I don't know, that was a very uncertain time. You know we were in high school during the Korean War and the universal military training act had just been passed and it seemed then that most of us were going to have to serve in the military service, and I don't know, I can't remember thinking a whole lot about what I was going to be doing after graduating from college. I was in advanced ROTC in college and it was assumed that I'd graduate with a commission in ROTC and serve two years in the Army, but during my senior year they had a cut-down in the level of ROTC, and it was at that point that I made a definite decision to go on to graduate school and begin thinking about what it might be like to teach. The faculty at the University of Rhode Island was really good. We had very small classes and a lot of interaction.

Q. Did your graduate advisor, Ray Fahien, influence you in such a way that you wanted to become a teacher?

A. Yes, there's absolutely no question about that. I think Ray Fahien was one of two or three most influential people that I had encountered during my life up to that time. I think that by example, he really stimulated me and many people who were in graduate school at my

time. I think there were maybe ten or twelve of us during the period that I was a graduate student, who left Iowa State and went into teaching and I think all of us point to Ray as being a very influential person. It was not that he urged people to consider teaching as a career, but I think he showed us how much fun it was to be learning about new things. It was an exciting time in chemical engineering anyway because the nature of graduate work was changing. Bird, Stewart and Lightfoot's book, for example, appeared halfway through the time I was in graduate school and I look back with great pleasure to the group of us who went through that for the first time with Ray in 1960 and 1961. I think out of that class of about fifteen, six or eight of us alone are now in universities somewhere. Yes, Ray was a definite influence on me as a teacher and probably as a person.

Q. What do you feel sparked your interest in Biomedical Engineering?

A. At Cal Tech I was stimulated by Giles Cokelet, a good friend of mine, who is at Montana State University. He had done his PhD at MIT working on blood flow, rheology of blood, and he and I had some very enjoyable sessions as we began to what you might call stretch out, and think about how principles of chemical engineering could be applied to medical problems. And so I began to develop an interest in medicine and there had been times before in my post PhD period when I had seriously considered going back to school again and studying medicine. *But I felt that my expertise could be put to better use by thinking of ways that engineering could be applied to solve medical problems*, and so when the chance came to come back to Iowa State to work in the biomedical engineering area and to be a chemical engineering faculty member in a very well established graduate school, it was an easy thing for me to do.

Q. Have you found it very difficult to make the transition from chemical engineering to biomedical engineering?

A. No. I think it's been very easy, because it's so much fun and because a chemical engineer is probably better prepared to do this than any other person I can think of. A chemical engineer has all the necessary ingredients; it's a matter of putting them together and changing your vector, so to speak, heading off in a new direction. But it's been very easy and in the particular kind of atmosphere we have here at Iowa State, and the relationships we have with the Veterinary College for example have made it quite easy. There has been lots of time spent in learning new things but, you know, you're doing that anyway.

Q. What caused you to write your new book entitled "Biomedical Applications of Heat and Mass Transfer?"

A. Well, let me say that I felt that it might be fun to write down, in some formal fashion, some of the things that I had found interesting in applying chemical engineering to the study of physiology. The purpose of the book really is to sell chemical engineering more than it is biomedical engineering. Biomedical engineering is more

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mechanism than it is a profession and I think that it was a lot of fun to develop some of these ideas, and to write them down was an easy part of the job.

Q. What are your plans for next year?

A. When I first started at Iowa State, I never understood why people would ever want to go away for a year, why people needed sabbaticals. But, in the last year or two I have felt the need to make a fresh start on many things and I think a sabbatical year away like this can provide an opportunity to do that. Next year we are going to be at the Institute of Medical Physics in Utrecht and I want to work on a problem there. Actually, the Institute is similar in size and activity and almost in function to the biomedical engineering department here at Iowa State. In fact, there's a very strong comparison between the kind of research projects they have and what we're doing here. The difference of course is that it's purely a research type atmosphere.

Q. What problems do you think chemical engineers should turn their minds to in the future?

A. No. 1, of course, is the problem of energy sources and delivery, and I think that every chemical engineering department ought to have something going in this area. No. 2, which I feel is going to be a very big problem, and this is a lot of my biomedical engineering interest, is delivery of health care. If you live in a big city or in a rural area right now in the United States, the health care delivery is a national scandal. It is a massive engineering problem, and I think that every area of engineering, chemical engineering, biomedical engineering and all the others, must participate in working out schemes to deliver health care to all the citizens. No. 3, of course, is food. We all know about the projections which show that using current methods of technology the capacity of the earth to produce food is not sufficient to take us through another hundred years. So we have to look for new ways to develop and process food and, of course, new ways to distribute food. And I think the conversion of things that are on the earth's surface, for example algae, into edible, palatable food is going to be important. No. 4, of course, is what's the relationship of the earth going to be to the rest of the solar system. Chemical engineers have a lot of interesting problems that can be worked out in space travel and in design and operation and exploitation of space stations.

Q. How can we improve the education of chemical engineers?

A. Well, one of the things we've talked about at great length this year at Iowa State is the changing needs of the engineering profession. I'm beginning to think, although I wasn't sold on this concept two years ago, that the engineering profession is going to need two kinds of people in large numbers. It's going to need what you might call 'the technologist,' a person with a basic education in chemical engineering who can perform the support functions of engineering and who can go out and be a manufacturer or work in some of the more routine design areas. To produce this person, I think we really need a streamlined curriculum and teachers who have experience in these areas and we've got to think about

economic production of large numbers of these people. But I think the engineering profession also is going to need fairly large numbers of people who are trained to solve the problems that haven't come up yet, people who are going to solve some of the more exotic problems that I was referring to earlier in health care delivery or space travel. So we're going to need people that have a bit more advanced training, but within the confines of an undergraduate program.

Q. You've been pretty active in the Democratic Party the last few years. What do you hope to accomplish by working in organized politics?

A. I might say at the outset that it's an educational venture. I feel that what I can learn from doing that is useful, but I also feel that people like us have something we can contribute to the political party system and to government in general. *It can provide an outlet for the strong feelings you may have on issues you think are important for your city and your state and your country.* It's a way to make your voice a little bit louder than it would be if all you did was vote on election day. It's a wonderful experience for people who normally lead a very sheltered life, in that we can come into contact with people from all different levels of society, people of different backgrounds and views. It's really a lot of fun, I think, is the main thing to say.

Q. Would you ever consider running for public office?

A. No. That's the subject that comes up all the time, I think, because people don't realize that political parties need two kinds of people to operate. They need the kind of people who are willing to make the enormous sacrifice to be candidates, and hold these positions of responsibility, but parties also need people who like to do the organizational tasks, which you might call the administrative tasks of the party, and that are willing to stuff envelopes and ring doorbells and raise money. I really enjoy those parts of the system. I have never even thought about trying to run for an office.

Q. What sort of kicks do you get from sports?

A. It's been pointed out by doctors and others that there's a certain amount of euphoria associated with all kinds of physical activity. *The good feeling that you have after a hard hour of basketball over the noon hour, or after running on the golf course in the Fall and the Spring when it's particularly pretty there, is probably perhaps psychological as well as physiological.* I guess I just feel relaxed, cleaned-out and stimulated as a result of physical activity. I don't have enough self-discipline to lift weights or to do calisthenics and I like basketball and tennis because they're just kind of fun to do.

Q. How do you explain your work to your children?

A. That's a problem I haven't solved yet. I'm not sure they think I work. They probably think, if someone would ask them, that I was probably earning my living working for the Democratic Party. From the part of my life that they see, I think that's probably a good conclusion for them to make.

Q. Do you have any hobbies we haven't discussed yet?

A. Well, I spend an awful lot of time reading. You might say I'm an American history buff and I enjoy keeping up with American fiction. *I manage to read most of the things that make their way to the top of the best seller lists.* I probably enjoy that most of all, although it gets increasingly harder to find time to get everything read I'd like to. □