



C R I T I C A L F O C U S

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50 Years in Microscopy

There's a private lunch in Monaco this week to mark 50 years since I was elected a Fellow of the Royal Microscopical Society. That was when my life as a professional microscopist officially began. Candidates for the Fellowship were scrutinized in detail in those far-off days, like being assessed by an external examiner. Somehow I squeezed in under the bar, and the direction of my adult life was set from that moment on.

When I was 12, I first turned my gaze onto the blue cheese that my father had set out for the holiday season. Under the microscope we saw mites, spiky and secretive, as they scurried around (the gray dust that covers the rind of these cheeses is mite droppings). My father looked and his jaw dropped open. "What on earth are those?" he demanded, so I told him they were *Tyrophagus casei*. My friends knew dinosaur names like *Tyrannosaurus rex*, whereas I was far more interested in the microscopical world. Father was stunned. "They are everywhere!" he exclaimed. He uttered not another word, but slowly stood and picked up the magnificent Stilton cheese that had graced our side table. He walked steadily out across the terrace and down over the manicured lawn, dumping the remains of the cheese next to the bird bath in our quintessential English garden. Within minutes, sparrows were hopping around it and starlings were grabbing at morsels of this costly, delicious cheese, like mice in a bakery.

Father never allowed any Stilton into the house

The direction of my adult life was set from the moment I was elected a Fellow of the Royal Microscopical Society.

after that day. Instead, he turned to Roquefort. I never told him that this fine cheese had mites, too; I enjoy blue cheeses so much, and it would have tempted fate to mention the fact. It's all good protein. Mites must be rich in trace elements, and anyway, the mold

that makes the cheese blue is *Penicillium*, so he could have known that would soon heal him.

School science confused me. Why was a peacock butterfly adorned with eye markings? My primary school teacher in North London was adamant — it ensured that the butterfly survived. Predatory birds would aim for the eye markings on the wings, rather than the body, and the butterfly would escape being eaten. That made no sense to me, and I said so. "I have seen dozens of peacock butterflies," I protested. "None of them has beak marks from birds on their wings! And if a bird did attack the wings of a butterfly it would be doomed anyway, because it would be unbalanced and couldn't fly." The teacher was unimpressed and told me to learn what the book said. Since it was in the book, she explained, it must be right.

Next it was the survival strategies adopted by plants. "Thistles have prickles so that they are not eaten by grazing animals. They would otherwise become extinct," said the teacher. I insisted this was wrong. "On my uncle's farm, lots of animals eat thistles. Donkeys and goats love them! And there are plenty of buttercups and daisies, which don't have prickles. If what



This portrait with my parents and baby sister was taken when I was 7 years old in the drive of the house where we lived in Potters Bar, North London. My father William was a noted engineer like his father Jack, who always said the family was descended from Sir James Watt, the steam engine pioneer.

you said was true, then they'd have become extinct millions of years ago." The teacher shook her head and explained that it said so in the book, and the book must be correct. "When you are older you will understand not to keep asking these questions," she said. The lesson was sinking in — many of the scientific facts we take for granted were suspect.

I was always intrigued by optical instruments. At school I became an expert with a spectrometer, and at age 16, my parents gave me a microscope when I graduated from high school. The first lectures I ever gave on microscopes were as a schoolboy. I was soon experimenting with homemade cameras for photomicrography, constructing them from wood, card and light-proof paper, and culturing bacteria on agar plates.

Some of the first pictures I took were eventually published in reference books and nobody suspected they had been taken by a teenaged rock-and-roll fan with jeans and acne.

The principle problem for any youngster is finding a mentor who can build on one's enthusiasms. At school I was fortunate enough to have spare-time tuition from Dr. A.G. Lowndes. He had once taught that great scientist Sir Peter Medawar, who became Director of the National Institute for Medical Research and President of the British Association for the Advancement of Science. Medawar, wrote *New Scientist*, found Lowndes to be an inspiring teacher — I thought so, too. He was also uncouth and a rebel.

In those days, people didn't take a year out before going to college. I did. A junior place came up with the Medical Research Council (MRC), working under Prof. Scott Thompson. His chief technician was a rotund, bristly character named John Smith who erupted clouds of cigarette smoke around him as he spoke and spat crumbs of tobacco to punctuate each sentence as other people used commas. He was "Mr. Smith" to everyone, and he had a deep knowledge of microscopical research. He had me draw up the purchase list for the coming year's research budget, and I pared it down to essentials.

"We only need 12 of these and we can still manage with those . . ." I began, whereupon he boomed at me: "Just look at these costs. This is less than half of what we spent last year!"

"Yes," I simpered, naively. "Just think what we could save."

He looked at me as if I'd lost my grasp of reality which, by this time, I was already beginning to suspect. "If we only ask for half the grant, then they'll never give us the full amount again," he said. "Not only that, but they'd be wondering what we had been doing with all the extra money, if we hadn't needed it."

I was already nervous, and out of my depth. "But can't we just save it for the future?" I suggested, dodging clouds of ash.

"Look, lad," puffed Mr. Smith. "The point about grants is spending money, not saving it. If we had £50,000 last year, we need £60,000 this time." I still didn't understand, and said: "But we could probably manage with £30,000 — even less," I insisted.

"You never need less in science," he explained. "You always need more. And if you haven't spent it all, then that's your failure to capitalize on the situation. If it hasn't been spent, then find a way to spend it. Research laboratories are not in the business of being economical."

You may wonder why I was at the MRC and not in university by this time. Truth be told, I was not impressed by the way universities worked. A brilliant research biologist named Ted Hill had already become influential in my life. At the university he pioneered research on the microorganisms that degrade fuel oil. He was spritely, irreverent and crisp in his manner — the archetypal English gentleman. Hill spent much time helping me with microbiology, providing me with culture media and Petri dishes. He also gave me worksheets prepared for senior university students. But the other scientists weren't like him.

SCIENCE FOR THE MASSES

Academics seemed comfortable within their disciplines, but I wanted a different kind of science, without the conformity. I also thought science should be explained to a wider audience, which is why, when I was 20, I wrote to the editor of the local newspaper, offering to write a regular column on science. To my astonishment the editor agreed, but the academics did not approve. You were either a popularizer, in which case you were a full-time media personality, or you were a committed academic, in which case you didn't lower yourself to speak to the press. To the university community, my weekly column was an anachronism.

I thought that, if you were engaged in science, you were best placed to explain it all to the public. You should do it because the public provided the funds for science and endured its vicissitudes. Furthermore, I thought that the tradition of disciplines was restrictive. I wanted to work within disciplines and between them. Academia was concerned with teaching students the current state of knowledge, and I wanted to be one of the people who created the knowledge in the first place. With the encouragement of the staff, I enrolled at Cardiff University in Wales at the last minute, in defiance of all the regular rules and conventions. My department heads were Prof. Mary Percival and Prof. James Brough. I learned so much from both of them. Brough was an admirer of microscopy, and Percival was a botanist with seemingly boundless knowledge.

They were great teachers, but it was not enough. I had a tutorial session with Brough one day and put it to him straight. "It seems to me," I began, "that you study a certain thing for a Ph.D., and eventually — when you're 80 — you end up as the world's greatest certain-thing-ologist." He nodded, content that I had at last grasped the situation.

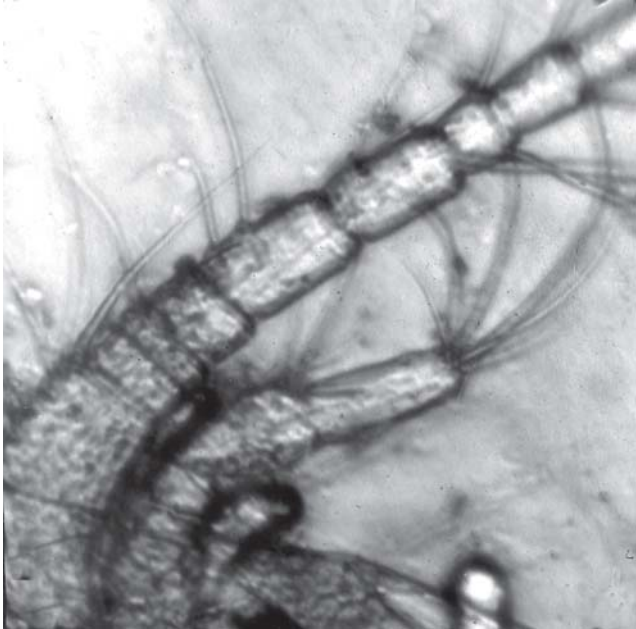
I said: "That's not what I want to do! Science needs a fresh start. It needs original ideas, not those that de-



Here I am in a rowboat showing my enthusiasm for a traditional brass telescope at the Isle of Wight off the south coast of England. I later photographed a solar eclipse with a pinhole camera. Striking an image through lenses was always a fascination.



As a teenager, I was intrigued by the spectroscope. The insights offered by optical instruments were always so revealing and helped explain the real world. Physics was popular at the time, but seemed remote from the microscopic world that I found so compelling.



Using a wooden camera made lightproof with black paper, I began to take micrographs as a teenager. My first efforts were taken using bromide paper to capture the negative, instead of film. This early micrograph of the water flea *Daphnia* was contact printed on photographic paper and was later published.



The first cine films I made with the microscope used a former military camera that I fitted with a beam splitter. My lacquered brass Leitz microscope was a gift from my parents when I graduated from high school. In a reckless moment they had promised me a motorbike but decided that a microscope was a safer option.

rive from convention. I want to work in different fields, sometimes at the same time. We need bridges between the disciplines, and I want to build them.”

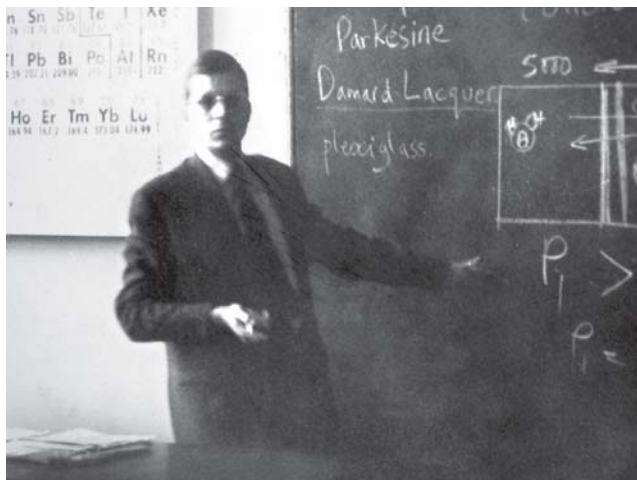
He was not convinced, and neither was the university. I was not persuaded by them, either.

One of the reasons youngsters become students is to escape from home and find a new social life of their own, but I already had an active professional career that brought me many scientist friends. I was making twice-weekly appearances playing piano blues and boogie in a nightclub, which embraced a different social circle, and my weekly newspaper column “Science and You” had taken me into the world of young writers. The disparate social groups in which I was moving provided such an active life that retreating into the role of student during the day became less and less easy. I wanted to be doing science, not passively hearing about it, so in my second year I left to set up my own independent laboratory.

This was fundamentally irresponsible, I concede, but there seemed no alternative: Science was concentrating on elaborate and expensive equipment, and biologists were obsessed with reductionism. Science was headlining astronomy and space travel, nuclear physics, electron microscopes and computers. Data was flooding in on all sides, though little attempt was being made to rationalize it. We were in an information age, right enough, and there was too much information, all of it in specified sectors. Cells were everywhere envisaged as tiny transistors that switched on and off like equipment. I knew that they were sentient and subtle, and it was the light microscope that could let me probe these unexplored truths.

IS BIGGER BETTER?

Modern physics worships at the Large Hadron Collider, a 17-mile circular tunnel built with the collaboration of over 10,000 scientists from 100 countries and costing nearly \$10 million. Even then, all you get is a fleeting spike that may (or may not) correspond to a particle that has been postulated, only because conventional math doesn’t add up and nobody can work out how to balance the equation. Living cells, by contrast, reveal new insights about life from an inexpensive instrument that lives in a box. We have become so obsessed with large and better hardware as a status symbol that it dominates our thinking. Little wonder (as Dr. Gary Laughlin said in a recent editorial in this journal) that people think the light microscope is dead. It isn’t, of course; it has just gone to sleep because it’s being ignored.



An early lecture at Cardiff University around the time I began giving presentations. The immediacy and interactive nature of a live audience gives lectures a special appeal. Although a television audience is larger, the people are remote and there is no sense of connection that a live presentation provides.

Working outside the academic framework was the only way ahead. Nonetheless, I retain close contact with Cardiff University, and my fellow students are friends to this day. The university elected me a Fellow and a Member of Court, I became President of the Association of Past Students, and Cardiff is still the university where I have my academic e-mail address. In recent years they have at last appointed senior staff to work with the media, and to carry out interdisciplinary research — the two areas where I was told there was no future. So I won both points eventually.

My early interests in microscopy took me into unexpected territory. One of my medical friends brought vaginal samples for me to examine, because he'd discovered what he thought were small parasites. They proved to be round objects with thickened sculptured cell walls and tripartite markings, typical of cells produced in tetrads. They turned out to be spores of *Lycopodium*, used as the solid phase of a lubricant for condoms. It was a surprise to him!

Another friend came with what he claimed were active protozoa in a sputum sample. I soon showed that they were ciliated cells from the lining of the bronchi, coughed up in a bout of bronchitis, and not an infection after all. Hemostasis was a continuing research interest when I was young (see Critical Focus, *The Microscope*, 59:4, p 165, 2011) and so were the trypanosomes of freshwater fish (*The Microscope*, 38:1, p 15, 1990).

Meanwhile, I was campaigning for a better deal for science. Among my first books were *Microbiology*



In my early twenties I lived in a rented house near Cardiff city center and the university. Just about everyone smoked in those days. I preferred a pipe because it did not drop ash onto the microscope stage as cigarettes did. Working all night was easier at home than in a college laboratory.



My first television appearance was also 50 years ago, in 1962. I discussed so many topical science subjects, but when I had regular slots on a TV program, I was free to prioritize microscopical subjects — the latest outbreak, a new disease, pollution — even though microscopy has been rarely featured on news programs.

and *Food* (1970) and my satire on science *Nonscience, or How to Rule the World* (1971). The success of *Microbiology and Food* probably stemmed from the unifying theme. Trying to change how microbiology was taught at the university, I looked at the different aspects of food from the standpoint of the single cell. There was more microscopy in *Nonscience*, where I also satirized the problems with grants that I had learned



At 26, I bought a substantial property facing park land and established a laboratory in the rear of the house. From my study, I could wave to my children as they walked in the school gate. When they returned home, I took a break from work to spend time with them. Cardiff University was also within walking distance.



The State Microscopical Society of Illinois awarded me their inaugural Köhler Medal in 1997. Two years later, it was presented to Saville Bradbury (far left), my respected colleague from Oxford University, joined here with award recipient Anna Teetsov and SMSI President Bill Mikuska.

from Mr. Smith a decade earlier.

When the Inter/Micro conference came to Cambridge University in England during 1973, I was invited to give two presentations, and that same year saw the publication of my two new books, *The Revealing Lens* and the *Optical Microscope Manual*. My concern that the public remained unfamiliar with microscopes became a leading article entitled “Microscopic Blind

Spots” that I wrote for *Nature* (258, p 469) in 1975, and the subject was subsequently raised in *The Microscope* 24:4 p 295, 1976.

My discovery of the original specimens from Antony van Leeuwenhoek, the microscope pioneer, made international headlines. They had lain hidden in the Royal Society’s cellars for three centuries. It was an extraordinary revelation and the research was first published by the Royal Society in 1981, after which it appeared widely around the world (see Critical Focus, *The Microscope*, 59:1, p 11, 2011). This was the subject of my banquet speech at Inter/Micro 84 and those attending were captivated — not by my presentation, but by Leeuwenhoek’s wonderful work.

EVENINGS WITH BRIAN

The success of the lecture brought a return invitation from Dr. Walter C. McCrone, and the presentations became an annual feature of the Chicago conference. Once my talks had hit their stride, McCrone decided to call them “An Evening with Brian.” When I first saw the announcement, I said to him that I thought that — even for America — this was carrying informality too far. He smiled and said: “When people take you to their hearts, in any field of endeavor, it’s the first name that they recognize. It’s like Leonardo. Or Marilyn.” I think that was a compliment. In any event, my annual Inter/Micro presentation has endearingly been called “An Evening with Brian” ever since.

So far, I have given more than 80 scientific lectures at those conferences. Many of them have led to enduring projects, and several have gone on to become books. The proposal for this column came out of the blue, when Gary Laughlin approached me about it in January 2010. “Might you be interested in writing a regular section in *The Microscope*?” he wrote. I have written columns before — remember that my very first, the weekly newspaper column “Science and You” had started before I was even a university student. I have written regularly for *The Guardian* in London and had my own column for publications, including *The Listener* magazine, *Boz* in London and *Mensa Magazine*. Before Gary had written, I was musing on writing a regular column once more, so his invitation was perfectly timed.

At first I was concerned to find enough topics to keep going. That didn’t last long. Once I had started I was nominating subjects for future columns, and there are already 20 topics jostling for position. Were they all to appear in print, they would last until 2016 (assuming that no more are added to the list). New microscopical mysteries keep arising on all sides. *Nature* pub-

lished what seemed like a microscopic crossword, leading to speculation that this was some creation by alien life forms, until I was able to show that it was actually a portion of a pennate diatom (*Nature*, 323, p 675, 1986). A colleague at a laboratory in London was perplexed by floaters in samples of virus-contaminated tap water, and it proved possible to categorize them and then find items from each category in impure domestic outfalls upstream of the supply, thus confirming the source. The research was published in *Microscopy* (36:1, p 56, 1988), and I spoke on it at Inter/Micro 1989.

I studied leaf histology as I worked on a theory that leaf fall was the plant's major excretory mechanism. The "Evening With Brian" for 1986, where I described this research, is remembered by many. The subject was new, the talk was extemporized, and my descriptions of trees standing with their roots crossed (desperately waiting for autumnal relief) seems to have created a lasting impression. I published the concept in *Nature* (323, p 763, 1986) and other papers on the subject followed. The research has recently been broadcast on television in the U.K. and has been widely discussed elsewhere.

CHANCE ENCOUNTERS

Curious coincidences continued to crop up through my life — meeting Roger Loveland is a good example. In 1970, I wrote a book review of his masterwork, *Photomicrography*, for *New Scientist*, and I thought how good it would be to meet him. Not long afterwards I had landed at Pittsburgh and saw the last cab disappear as I reached the taxi stand. One other person arrived, and we waited together, each absorbed in reading newspapers. It was late, and taxis seemed to have vanished. Suddenly, one appeared, and we looked urgently at each other. "I am going downtown — well, that's where I live," he said to me. "And I am staying in the center too," I replied, so we agreed to share.

Within minutes we were talking, and he mentioned that he had a book recently published. I hoped it had been widely reviewed, which is an important birth rite for any book that's likely to be successful. He nodded, pleased, and said it had been reviewed in *New Scientist*. "It was a book about taking photographs through a microscope," he explained. I asked him: "Are you Roger Loveland?" and he looked shocked to the core. "I reviewed the book, and I was so hoping to meet you some day," I told him. Roger blanched, and shook my hand warmly. "You're Brian J. Ford!" he exclaimed with a smile. "I was hoping our paths would cross." So there you go — of all places, in a taxi in Pittsburgh.

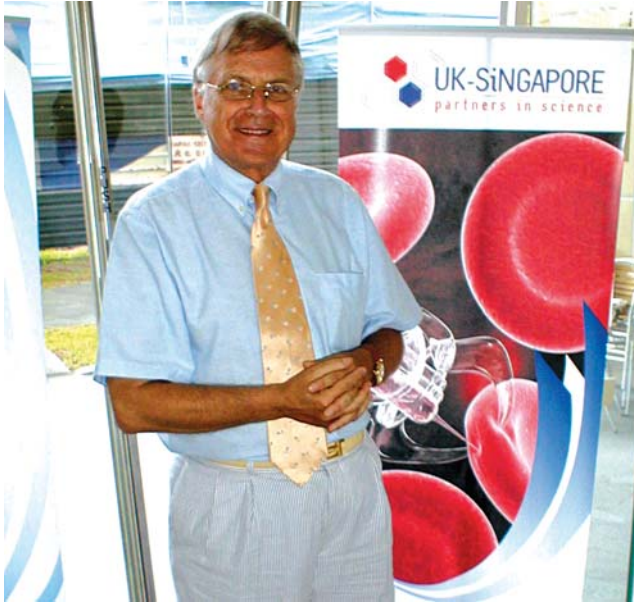


Living in rural Cambridgeshire presented an opportunity to invite fellow microscopists to my home. A frequent guest was John McArthur, whose portable microscope revolutionized diagnosis in remote areas. McArthur was a remarkable friend, clear-sighted and knowledgeable.



I have spoken frequently to smaller microscopy clubs, including the Microscopical Society of Southern California. Seated at this dinner after a talk is (from left) Prof. Stuart Warter, MSSC President Jim Solliday, the author, Leonie and John Fedel, Dr. Joseph Arditti and Pierrino Mascarino.

Here's another: After I had finished my initial studies of neurons communicating with each other, I was in California to lecture. At the weekend I stayed with my cousin at the beach in Aptos, and I thought I'd take off a few hours to wander deep in thought. I strolled the four miles to Capitola (near Santa Cruz) and took lunch by the shore. Later I had an ice cream and settled onto a bench under sun-dappled trees. A couple came



I was photographed in Biopolis, Singapore, at one of the largest international research centers by Brian Ferrar, First Secretary for Science and Technology at the British High Commission. Sir David Lane, Chief Scientist at Cancer Research U.K., introduced my lecture on the ingenuity of the single cell.

by; she headed off for the shops, and he, after a gesture of polite inquiry, seated himself beside me to wait. I mentioned something about the dazzling sunlight; he replied with a comment about image formation. I mentioned the processing of data within the retinal cells; he said he, too, was fascinated by the phenomenon, and then introduced himself as Dr. Dorian Aur. He is the only other person in the world who had paralleled my studies of neurons. We had a marvelous conversation and have remained in close contact ever since. My investigations have benefited so much from his studies of the nature of spike signals sent between neurons. I only hope that he has benefited from what I have said in return. As I write, I have been compiling a reference for him to join the faculty at the University of California-Davis.

One more? I was visiting Joan Powling, a microscopist in Melbourne, Australia. We spoke about my interest in the ingenuity of the living cell, and she asked if I'd like to meet Jeremy Pickett-Heaps. "He is keen to meet you," said Joan. I was just as interested, for Jeremy had written a book on the algae back in the 1970s, and I had learned much from his writings. We met and picnicked near a seaside headland, while I spoke to Jeremy about the repair mechanisms in algae that were of such interest to me. I had made prepa-

rations of some rhodophytes.

Jeremy announced: "I have studied these too — in fact we have taken time-lapse film of the same phenomena." This was astonishing news. I was not aware that anybody had done this, and it was the answer I sought. Jeremy's sequence is the most important and relevant to my work that I have ever seen, because it completely corresponds to my theories. He captured cells restoring to full function a dead and empty cell, which is exactly what I had read about, and the perfect case for me to cite.

What a uniquely gifted microscopist Jeremy is. He came to Inter/Micro where the State Microscopical Society of Illinois presented him with an award, and we jointly presented a microscopy course at the McCrone Research Institute: I demonstrated aquatic microorganisms while he explained what they were doing, live on the screen. Later, I showed how a bead-lens microscope could be made and had students create their own and observe specimens with what they produced. The results were surprisingly good and helped to inspire the residential courses that I now teach at Madingley Hall, Cambridge University.

One of my greatest pleasures is demonstrating my work with microorganisms to the public. This was supported by the fellowship I was awarded in London by the National Endowment for Science, Technology and the Arts (NESTA), the British equivalent of the MacArthur Foundation fellowships. I was often asked why I had not been on the list for a MacArthur award, and the answer — apart from the likelihood of being assessed as too dumb to qualify — is that eligible candidates must be citizens of the United States. NESTA provided the same support in Britain, though the fellowships have since been stopped and the money now seems to go to commercial companies instead (I am not sure that was the original intention when the British government set up the scheme).

Apart from the NESTA fellowship, I was also awarded a three-year research fellowship at the Open University by the Royal Literary Fund and have been awarded grants by the Royal Society, and by major trusts in London such as the Wellcome and Leverhulme. I've also received small awards from the Botanical Research Fund and the Appleyard Fund at the Linnean Society. I was awarded the Kodak Bursary in the early days of my investigations into the origins of the microscope with support from the Spencer-Tolles fund of the American Microscopical Society. It has all been crucial, though much of the research work has to be supported by personal income strands from book royalties, lecture fees and television rights.

TURNED OFF BY TV

Nobody does microscopy because it pays well. We do it because it is our way of revealing the truth about the world. Over the last 50 years, I have had unique experiences in broadcasting. I have often turned up on news programs to talk about the latest microbe or a current outbreak, have had several series of my own, and even hosted a television game-show for the BBC. I once took over as an announcer, substituting for the real one who was stuck in traffic, and I've appeared on programs broadcast in countries from Japan to Germany and from India to Ireland.

Lecturing is better. Television programs are made with a tiny team of technicians, with none of the thrill of an audience or the immediacy of interaction, which is what I prefer. Give me a living, responsive, skeptical audience anytime. That is what transcends the clinical detachment of TV shows. In the lecture theater, things so often go wrong. The computer won't work or the sound will remain stubbornly mute or the projector will stop responding to the laptop I'm using that day (which occurred recently during a Cambridge lecture). The result? The audience gets to see you as you are — they have come for the presentation, and that is what they'll have no matter what goes wrong. I have lost count of the number of times I've given fully illustrated presentations without the illustrations.

Invitations come to speak from all over the world, and for the last decade, I have also been showing people what the microscope reveals through my presentations aboard cruise ships. The audiences are always bubbling with enthusiasm and eager with endless questions afterwards. That's the problem with a TV program: once it's off, it's ended. On a cruise ship or at a conference, the audience remains with you and can discuss details days later if they wish. Yes, I much prefer a live lecture to television. Contact with people is the only way to reveal the microscopic world in all its vividness — and answering their questions offers the unique path to enlightenment for us all.

HEROES AND FRIENDS

Working between the conventional disciplines provides so many new insights. People sometimes report that I work independently, but that is not the case. It is *interdependence* that has underpinned my research. I have been so fortunate in having my heroes as friends. Learning about the McArthur microscope is fascinating enough, though discussing details with John

McArthur here at my home laboratory was far better. Training in Hoffman Modulation Contrast is an accomplishment, but being personally taught by Bob Hoffman at the McCrone Research Institute is unforgettable. Studying the reflecting microscope is interesting, but learning it all from its inventor, C.R. Burch, at the University of Bristol is unmatched. I have had so many influential heroes. In British microscopy? Sir Andrew Huxley, Dame Miriam Rothschild, Prof. Denis Bellamy, Mr. Spike Walker, Mr. Es Reid, Prof. Brian Ralph, Prof. Brad Amos, Mr. Horace Dall, Dr. Peter Evennett, Prof. Ellis Cosslett, Dr. Archie Howie and so many more. The people one has been fortunate enough to meet range from Her Majesty the Queen to the pop singer Lulu; from film star Victor Spinetti to the emperor of Japan (himself a noted zoologist). In America? My good friends in the States are far too many to list here, though you could check my paper in *The Microscope* (56:2, pp 67-85, 2008). You know who you are, and I am indebted to you all.

The institutes that have welcomed me range from the Cavendish Laboratory in Cambridge to the Deutsches Museum in Munich; from Biopolis in Singapore to the American Museum of Natural History in New York; from the Jawaharlal Nehru University in Delhi to the Johnson Space Center at Houston (which is celebrating its own 50th anniversary). Apart from my connections with the University of Kent at Canterbury and my fellowship at Cardiff University, being a member of the Senior Common Room at Caius College at Cambridge University brings leisurely nights of intense discussion. I have traveled from Reykjavik, Iceland, to Hobart, Tasmania; from Verdansky Base in Antarctica to Eric the Red's territory on Greenland via trips up the Amazon and through the African bush, and have circled the globe several times. I have spoken to huge audiences in great lecture theaters and small groups in private clubs. I have come to know premiers, prime ministers and presidents, along with the leaders of AIDS-ridden communities in African shanty settlements, Australian aborigines, stilt villagers across the tropics, the families of cannibals in Papua New Guinea, and headhunters in Borneo.

These people all know so much, and can teach us how to improve our understanding of the world. For me, the microscope has been the key to revelation, and I remain bemused that the public is never given the chance it needs to find out what we, as microscopists, know. We are here only to make life better for our fellows. *Antithamnion*, that diminutive alga, can work out how to heal its neighbor. Small organism, large lesson. It is one that I hope I have learned.