

The Red Eye Special

Jean-Paul Revel, Caltech

I am a professor at a university, and like most of my colleagues I divide my time between teaching, administration, service work and basic research. Of all these activities it is the research that I and my students have done that has been most important for the advancement of our respective careers. Research is indeed the life blood of science and the meeting of MSA in New Orleans this month, will be an occasion to celebrate this and to show each other what we have been doing since we saw each other in Cincinnati last year.

I am driven to write this column because some nights ago I watched a program on the problems surrounding the delivery of the impending "universal" health care package. On the stage were Senators Dole and Mitchell, along with people representing different opinions about the issues at hand. In the audience, among *hoi polloi*, "the common people", were Mrs. Clinton and ex-Surgeon General Everett Koop. Now this is not the place to discuss health care but I mention it because the program started a train of thought when it was brought home to me that health care at present costs 1 trillion dollars - yes, 1×10^{12} dollars a year. To place this in some sort of perspective the 1994 NIH budget appropriation arrived at by the House and Senate appropriation conferees last fall is \$10.956 billion (or about $\$1.1 \times 10^{10}$) for Fiscal Year 1994. The NSF budget is much smaller than that. NSF and NIH together along with DOE and DOD account for a lot of the research involving microscopy. Now $\$1.1 \times 10^{10}$ looks like a lot of money, but it is sobering to realize that the total National Institute of Health budget will be about 1% of expenditures for health care. For us researchers looking to support our habit it must be made clear that only a small fraction of that will go to basic research. Why get exercised, what's basic research good for anyway? Do we really need intellectual quests at this time? Why support a bunch of researchers to explore esoteric unknown territories when other demands are so great? All that will come out of their work anyway will be arcane treatises that few will understand. Should we not support more directly applicable research instead? *Hoi polloi* and the politicians whose opinion mirror those of the general public find research focused on recognizable problems much easier to understand (although AIDS researchers may dispute this!). Well, the fact is that it usually is the basic stuff that drives the applied research. Only rarely is the converse true, although much of the work of Louis Pasteur, who clearly recognize the importance of basic research, had its origin in his being asked to solve technical problems of the French wine and silk industries.

The explosion of understanding brought on by basic research of the last 20 or so years and the subsequent extension and application of this

knowledge permit spectacular hope for humanity's well being and survival. Much of this bounty has its roots in some esoteric work beginning in the 1930s and carried on by basic research scientists such as Thomas Hunt Morgan, the first chairman of the Biology Division at Caltech and Max Delbruck who also happened to work at Caltech. Max's office, in the basement of the Biology building, was just upstairs from mine, his door decorated by an STP motor oil additive advertisement, and a hand drawn sign announcing that here resided Pontifex Maximus. Morgan had an office on the 3rd floor with windows, and in his day a view now blocked by newer buildings. That's where the basics of modern genetics were worked out on *Drosophila melanogaster*, the black bellied fruit fly!

The advantage of fruit flies is that they can be grown in milk bottles (the old fashioned glass kind), reproduce fast, have easily recognized features under genetic control, such as their eye colors (red, white and also pink!). They have giant chromosomes in their salivary glands and so changes in the genetic material could be detected using an ordinary light microscope. Along with other "mapping" techniques these changes can then be correlated with the changes in eye color and other markers affected by mutations which occur spontaneously or are induced by the experimenter. Thus it became possible to physically map the loci involved in the changes and gain a first understanding of the organization of genes along the chromosome, long before one knew much about DNA and all that. As to Delbruck his work concentrated on bacteriophage, viruses which infect bacteria. They were discovered and named by a researcher named D'Herelle, "while studying, of all things, a diarrhoea of locusts!". Tom Anderson, the pioneer microscopist, took pictures of them in the EM in 1942. One phage worker of the time, Prof. Bronfenbrenner at Washington University, on seeing the pictures clapped the palm of his hand to his forehead and exclaimed "Mein Gott!, they have tails!". Here again the ease with which the organism can be grown and mutations analyzed were most important. "The bacterial viruses make themselves known by the bacteria they destroy, as a small boy announce his presence when a piece of cake disappears" (Max Delbruck in ref.1). Delbruck's work permitted the insights which form the basis of modern molecular biology. He became one of the most influential intellectual leader of the burgeoning field. An exciting and readable account of the life and times of these people and how their interactions with other major actors shaped what Biology is today can be found in Horace Freeland Judson's wonderful book *The Eighth Day of Creation*¹. Working out the interactions of "phage" with its bacterial host did not by itself lead to any cures for anything, nor did peering into flies eyes. Nevertheless the conclusions reached on the basis of these studies formed the intellectual background for the study of more complex systems and are ultimately responsible for our present understanding of Cancer, Cystic Fibrosis, Huntington's disease, etc. Now if anyone would have wanted to eliminate unnecessary research they sure should have eliminated work on the color of flie's eyes color and on diseases of bacteria, both clearly worthy of "Golden Fleece Awards". The sensible research in the

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Don Grimes, Editor

The Red Eye Special - Continued

'30s when Morgan was doing his work and Delbruck beginning his, the research that had a practical and understandable aims should have been the development of iron lungs to support those stricken by the scourge of Polio. The point is that we do not know today what fundamental research will bring tomorrow. Very often it is not a question to make a better, safer, economical, environmentally tame, cheaper to manufacture car, but to invent a technology which will eventually lead to a novel mode of transportation altogether.

No one can guarantee that a particular bit of basic research will provide an ultimately worthwhile "product". But it is a certainty that not doing this research will lead nowhere. Doing basic research is like trying to peek beyond the curtain of the "state of the art". Maybe there is something backstage or maybe there is nothing that we can understand. It is important to peek in spite of this not just for the excitement of the discovery, but also because such work today will pay off, perhaps not tomorrow, but the day after, or 5 or 30 years from now. The sad part is that lack of support for basic research will not affect us in the short term (except for hitting hard the professor types who have spent their lives at it, and find they have to change gears to continue doing the only thing they know how to do well). But not having this knowledge will be a killer in ways that we will never know, because ideas and insights which would have provided the basis for the problems down the road will never have been hatched. So this is a plea to support basic research? Yes it is an exciting intellectual adventure. It is also the source of future fundamental advances. It may be a plain old goose or one that lays golden eggs. It is often cost effective, permitting savings in many ways, and providing employment for many. But that is not really the point. So won't you please write to your representatives and senators, and support basic research in whatever way you can?

It is now two years that I have been writing these pieces for

Microscopy Today. It has been great fun to do so, and has kept me on my toes. However I have just accepted to become the editor of a new Journal for the Microscopy Society of America, to be known as JMSA if you have not guessed, and with that responsibility I'll have to curtail my contributions to this publication. It is now your turn to send me your very best papers. I hope to hear from you and, once in a while when I get really excited about something and need to share it, I hope Don Grimes will let me use his pages again. ■

1. Judson, H.F. *The Eighth Day of Creation*. Simon & Schuster, NY 1979

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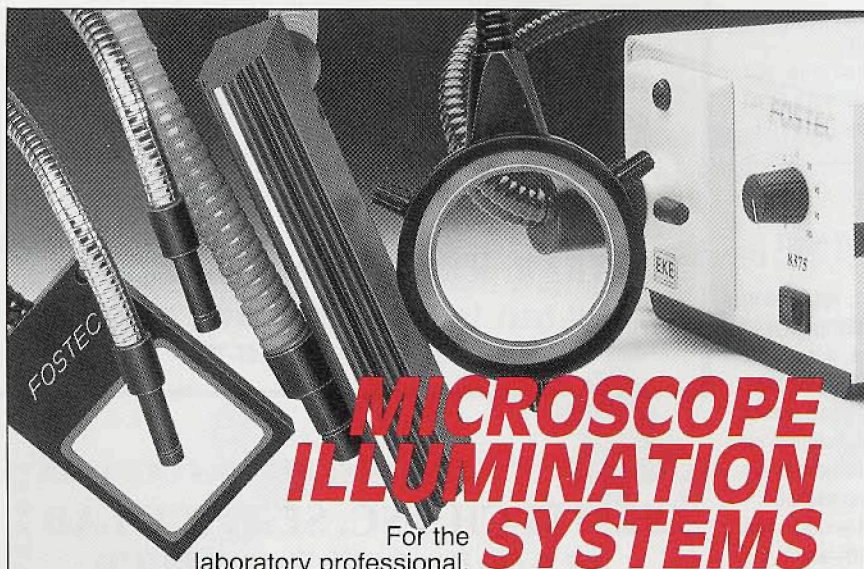
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COMING EVENTS

- ✓ July 11/15 '94: **Freeze Fracture Course.** Colorado State Univ., Fort Collins, CO. Eileen Dieperbrock, (303)491-5847.
- ✓ July 11/15 '94: **41st International Field Emission Symposium (IFE '94).** Rouen, France. Prof. D. Blavette and A. Menand. Tel.: (33) 35 14 66 51, Fax: (33) 35 14 66 52.
- ✓ July 17/22 '94: **13th International Congress on Electron Microscopy.** Paris, France. Secretariat ICEM 13, Case 243 - Université Paris VI, 4 place Jussieu, 75252 Paris Cedex 05, France. Tel.: (33)144272621, Fax: (33)144272622.
- ✓ July 18/21 '94: **INTER/MICRO-94.** McCrone Research Institute. Chicago, IL. Nancy Daerr: (312)842-7100, Fax: (312)842-1078.
- ✓ July 31/Aug 5 '94: **MSA/MAS Conference.** New Orleans LA. (800)538-3672, Fax (508)548-9053.
- ✓ August 15/17 '94: **Site-Specific Cross-Section.** Arizona State Univ. Short Course. Tempe, AZ. Sharon Willson (602)965-4544.
- ✓ August 18/19 '94: **Materials Ultramicrotomy.** Arizona State Univ. Short Course. Tempe, AZ. Sharon Willson (602)965-4544.
- ✓ August 18/20 '94: **Stereology Course.** Yale Univ. School of Medicine, New Haven CT. Paul Webster: (203)785-5072, Fax (203)785-7226.
- ✓ August 22/26 '94: **Microspec Training School.** Fremont, CA. Lois Donnelly: (510)656-8820, Fax: (510)656-8944.
- ✓ August 22/26 '94: **Immunocytochemistry and Cryosections Practical Course.** Yale Univ. School of Medicine, New Haven CT. Paul Webster: (203)785-5072, Fax (203)785-7226.
- ✓ Sept 8 '94: **High Resolution Transmission Electron Microscopy.** London, U.K. (***)
- ✓ Sept 8/9 '94: **ImmunGold Wet Workshop.** Univ of Bristol. (31)-8370-97676 or Fax: (31)8370-15955.
- ✓ Sept 11/12 '93: **Advanced School on Microstructural Analysis.** Univ. of Birmingham, U.K. (***)
- ✓ Sept 12/15 '94: **MICRO 94 - International Microscopy and Image Analysis.** London, UK. RMS (U.K.): (0865)248768 Fax: (0865)791237
- ✓ Sept 13/15 '94: **EMAG '95.** The Univ. of Birmingham, U.K. (***)
- ✓ Sept 21/23 '94: **Microscopy/Photomicrography Workshop.** American Type Culture Collection. Rockville, MD. (301)231-5566.
- ✓ Oct. 24/28 '94: **41st American Vacuum Society National Symposium.** Denver, CO. Angela Mulligan: (212)248-0200.
- ✓ March 5/10 '95: **PITTCON '95.** New Orleans, LA. (412)825-3220, Fax: (412)825-3224.
- ✓ March 28/31 '95: **SCANNING '95.** Monterey, CA. Mary K. Sullivan: (201)818-1010, Fax: (201)818-0086.

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