Hale, director of the Carnegie Institution of Washington's Mount Wilson Observatory, on plans for a 200-inch telescope, and soon after with Francis G. Pease and John A. Anderson of the Mount Wilson staff (who were not, as Willard suggests, Caltech astronomers). Through the agreement, by which the Rockefeller Foundation gave the initial $6,000,000 for the 200-inch project, the planning, construction, and operation were to be carried out jointly by the Carnegie Institution of Washington and the California Institute of Technology. (The observatories on Mount Wilson and Palomar Mountain have now been named the Hale Observatories.) Porter's connection with the project, originally expected to last a few months, lasted more than 20 years. His contribution as "Associate in Optics and Instrument Design" is graphically illustrated by his skillful "cut-away" drawings for the various instruments and buildings, including the 200-inch dome. The telescope was dedicated on 3 June 1948. Porter was ill and could not be there. He died on 22 February 1949.

Willard includes a bibliography but, unfortunately, no index. In general the details are accurate. This biography can be recommended to any reader who is interested, as Porter was, in the exploration of remote regions of the earth and distant regions of the sky.

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Tumors and Embryogenesis

Teratomas and Differentiation. Proceedings of a symposium, Nutley, N.J., May 1975. MICHAEL I. SHERMAN and DAVOR SOLTER, Eds. Academic Press, New York, 1975. xviii, 324 pp., illus. $16.50.

Nothing matches the development of an embryo for complexity, beauty, and elegance. Each cell of a very early embryo is like a ball rolling down a mountainside, with time taking the place of gravity. The descendants of each cell end up at the base as one or another irreversibly differentiated part of the organism. A teratoma is a tumor made up of levitating cells, poised at the top of the mountain, sending progeny down without losing the ability to send off more: the totipotent cell forever. Thus the teratoma is not only a tumor, but also a marvelously manipulatable travesty of normal embryogenesis. As such, it has been discovered by many different sorts of developmental and molecular biologists in the last few years. There are not many groups in modern biology who can summarize their work in less than 300 pages, as the teratoma workers have done in this book. I suspect this was their last chance to do so.

The book comprises the papers presented at a meeting at the Roche Institute. There is an introduction and a paper on terminology. The rest of the papers are assembled by topic: Embryo-Teratoma Relationships, Surface Antigens on Embryos and Teratomas, Teratoma-Host Interactions, Control of Differentiation of Embryonal Carcinoma Cells, Properties of Embryonal Carcinoma Cells, and Properties of Teratomas *in Vitro*. Both in vitro and in vivo studies are represented.

The laboratories of Boon, Sherman, Martin, Levine, and Ephrussi report on their success in harnessing the process of differentiation of the tumor cells in vitro. It has apparently become routine to select cloned teratoma cell lines showing various differentiated states. The biochemical characterization of these cultured descendants of the embryoid body is well under way. Interestingly, most, if not all, cultured differentiated lines of teratoma origin are unable to make tumors when they are injected into susceptible host mice.

Work in vivo has been concentrated on the antigenic and morphological similarities between normal early embryos and embryoid bodies. Although there are many such similarities, a major difference between these two cell masses remains: only embryoid bodies have the capacity to form tumors. Therefore the most surprising and novel contributions in the book must be those from Philadelphia. In separate studies, Mintz, Illmensee, and Gearhart, of the Institute for Cancer Research, and Brinster, of the University of Pennsylvania, have apparently shown that a normal embryo can normalize tumorigenic teratoma cells. That is, they have used Stevens's teratoma embryoid body cell populations to demonstrate that a teratoma is a form of cancer that has a totally reversible loss of growth control.

Mintz *et al.* and Brinster dissected embryoid bodies into their core cells and their rind of differentiated endothelial cells. The core cells are the germ cells that give rise to all differentiated types. By mating C57 white mice, they obtained blastocysts, into which they injected clumps of core cells from teratomas from black mice of strain 129. The hybrid embryos were then reimplanted in the uteruses of foster mothers (also white), and the pregnancies were permitted to go to term. Normal mice were born that were mosaic in coat color. Furthermore, the male mice born of these constructed hybrid embryos were fertile, that is, they made normal sperm and produced some F_1 black mice when mated to female hybrids. Since the mice were normal in every way, we must conclude that these descendants of tumor cells were normalized by the environment of the normal mouse embryo.

Beautiful as these results are, their potential importance lies in the possibility of combining them with the sort of studies that fill the rest of the book, those on the culture in vitro of the differentiated descendants of teratomas. If the implantation results are confirmed and other studies are carried out with cultured teratoma cells, one would expect future implantations to be carried out with cultured diploid cells that have received DNA sequences obtained by cloning in prokaryotic organisms. That would, it seems to me, be the technology for carrying a known DNA sequence directly through a prokaryote vector for amplification, then through a mammalian cultured cell for integration into the mammalian genome, and then through blastocyst injection and reimplantation of an embryo for stabilization in a whole mammalian organism. Although this bypass of evolution has not yet been accomplished, the book provides an experimental context for carrying out such work. I suspect that this context will become increasingly important to all biologists.

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State University of New York,
Stony Brook

Statistical Induction

Perspectives in Probability and Statistics. Papers in Honour of M. S. Bartlett on the Occasion of His Sixty-Fifth Birthday. J. GANI, Ed. Applied Probability Trust, Sheffield, England, 1976 (U.S. distributor, Academic Press, New York). viii, 424 pp. $21.

The first half of this century witnessed the major developments in the theory and methods of statistical induction. The pioneering contributions made in England by Karl Pearson, Ronald Fisher, Jerzy Neyman, and Egon Pearson are widely recognized and revered. One

LETTERS

A Bank of Mammalian DNA Fragments

On 16 June 1976, the National Institutes of Health published guidelines for recombinant DNA research. The guidelines were adopted after much discussion and debate within both the scientific and the lay communities. They are intended to facilitate the pursuit of research while at the same time minimizing the risk to the public. Certain types of experiments, particularly those involving the creation of DNA chimeras between bacterial and mammalian genes, can only be performed under the most restrictive conditions. Despite these concerns, there are likely to be very significant uses of such materials for biomedical research and diagnostic purposes.

Since the complex large genomes of man and other mammals are now amenable to more detailed study as a consequence of advances in recombinant DNA technology, it is important that a safe, uniform, and reproducible method be developed for replicating and storing their fragments. It has been suggested to the National Institute of General Medical Sciences (NIGMS) by members of the scientific community that a repository or bank of mammalian DNA fragments might provide a useful means for achieving these objectives. A bank of DNA fragments, containing reference portions of the human and other mammalian genomes, could help keep order in this rapidly growing field and provide an invaluable national resource for investigators. Use of this bank to replicate the reference material for distribution in a safe form would foster full utilization of this new technology while maintaining compliance with the guidelines, and minimizing risk.

The NIGMS is therefore specifically interested in receiving comments on the desirability of establishing a repository of mammalian DNA fragments. Suggestions as to its operation and maintenance will also be welcome. For example, such a repository might solicit and accept defined fragments of DNA in an appropriate form. It is conceivable that the bank might also produce DNA fragments de novo, if this proved desirable. These fragments would then be stored, replicated, characterized, and distributed with strict attention to safety.

Although interested in the possibility of establishing a repository for mammalian DNA fragments, the NIGMS has come to no conclusion as to its advisability. A decision to proceed will, in part, be based on an evaluation of responses to this letter.

Comments should be sent to the undersigned within 6 weeks of the date of publication of this letter.

FRED H. BERGMANN

Genetics Program, National Institute of General Medical Sciences, Bethesda, Maryland 20014

Utility Accounting and Energy Policy

Luther J. Carter, in his article "Nuclear initiatives: Two sides disagree on meaning of defeat" (News and Comment, 19 Nov., p. 811), discusses the Missouri utility rate reform referendum and says, "This initiative, which was approved by a 62 percent majority, makes it impossible for the Union Electric Company to bill ratepayers for the interest it owes on construction work in progress."

Since the construction work in progress (CWIP) issue is an important one for both energy policy and utility financing, it would be worth getting straight the concept and the terminology.

The Missouri electorate voted to exclude CWIP from the rate base. What does this mean? In many jurisdictions, CWIP is excluded from the rate base, the rationale being that a plant not completed is not serving the public, and therefore the public should not pay a return on it. This is the "used and useful" concept. The utility, though, is incurring costs to support the construction work (that is, interest on borrowed funds, dividends on preferred stock, and return on common stock sold to finance the work). These costs are capitalized, which means that they are added to the final cost of the power plant. If, for instance, the utility had to invest $100 in a construction project for a year, and the cost of that money was 9 percent, the project would go on the books at $109. The utility would earn a return on $109 and also recover its investment through depreciation on $109, not $100. The extra $9 is referred to as the allowance for funds used during construction. It is a noncash credit that appears in the income statement.

In other jurisdictions, such as Missouri until the referendum, some or all of CWIP is placed in the rate base and customers must pay higher rates to provide that extra $9 cost during the construction period. The choice is between making the customer pay over the life of the plant or while the plant is being built. There is no way of escaping payment.

Tuesday
Feb 1, 1977
7:30
Fantasia

DEPARTMENT OF MICROBIOLOGY AND MOLECULAR GENETICS
HARVARD MEDICAL SCHOOL
25 SHATTUCK STREET
BOSTON, MASSACHUSETTS 02115

28 January 1977

Councillors Barbara Ackermann and David Clem
Cambridge City Council
Cambridge City Hall
Cambridge Massachusetts 02139

Dear Councillors:

Though I think the immediate medical hazards of recombinant DNA are of great concern, I also think the longer range hazard of genetic engineering within the human species -- what we would refer to as an Orwellian world -- should also be considered when dealing with the recombinant DNA problem. This should be important to you because the action of the Experimental Review Board is already being touted as the 'go ahead' vindication signal for the technology of gene manipulation to continue. Likewise, if the city council reaches a similar conclusion as to going ahead with the work, the decision will surely be used in support of this technology which will certainly lead to that Orwellian world. All of you are making history.

That the above concern is fact rather then science fiction can be seen from the enclosed two articles from the December 1976 issue of *Science* magazine. There are many more such articles and I would be glad to send them if requested*.

Sincerely,

Richard Goldstein
Assistant Professor

* several of these articles you already have in the large packet of materials I sent to you two weeks ago, e.g. see articles by Kass, Signer, Lappe, etc. .

P.S. I hope you will give copies of this letter and the enclosed to the other councillors

12. S-73

Comm. from Richard Goldstein, Asst. Professor, Harvard Medical School, re: to DNA experimentation.

In City Council,

Feb. 7, 1977

Placed on file