ise—time is money. Faculty members at 14 medical schools, selected because they were judged to be representative of the 93 fully operational medical schools in the United States, were asked to keep detailed logs of their activities for 1 week, recording the amount of time they spent teaching, the amount doing research, and the amount taking care of patients. It then became necessary to decide how much research and how much patient care can be called *essential* to medical education and how much must stand on its own. Time logs could not provide answers to that question, which required as much judgment as hard data. So, the institute convened a "constructed cost seminar" of medical educators, administrators, and other knowledgeable persons to arrive at the answer.

Meeting at Airlie House, a retreat in the Virginia countryside, seminar members were asked to "construct" a medical school on paper. They devised a curriculum for the imaginary school of about 200 students and provided it with a faculty, research laboratories, hospital beds for patients, an administration, and other necessities.

Their plan was to create a school that would be good for students and faculty alike. Their consensus was that, in the basic sciences, faculty members should spend two-thirds as much time in research as in teaching. A man who spends 30 hours a week in the classroom should spend 20 hours in his laboratory. In the clinical sciences, they judged necessary proportions of time to be somewhat different. To keep abreast of his field and conduct research while teaching, the clinical investigator should spend about one-third as much of his time in research as he does in instructing students.

Armed with this information, the cost study staff determined the average annual "net education" cost of putting a student through medical school, the $9700 price tag. They said that medical institutions receive revenues to support research and to pay for patient care and that some of these revenues should be subtracted from the amount that can be billed to education alone. What they call "offsetting research revenues" come to an average of $2100. "Offsetting patient care revenues" amount to $1300. Therefore, the institution must come up with $9700 a year from other sources—tuition, fees, federal and state subsidies, and so forth—in order to meet the cost of educating a doctor. The institute recommends that the federal government pick up somewhere between 25 and 40 percent of this $9700 bill, which is approximately what it is supposed to be doing now through capitation grants.

Whatever happens to federal financing of education for health professionals the institute pegs as the primary problem the absolute lack of any coordination in federal policies in this area. "In health professional education, the federal shifts of emphasis among research, education, and patient care have usually been made without sufficient consideration of the fact that all three programs contribute to the educational environment of most health students. The support of that environment requires a balance among its programs and a stability of financing that have not been manifest in federal policy thus far." Therefore, the study group recommends that "whatever financing method eventually emerges for health professional education, it should be accompanied by a mechanism for review and coordination in the legislative and executive branches of the federal government."

—BARBARA J. CULLITON

Journals: Photocopying Is Not the Only Problem

The effort to revise the copyright law has kept Congress in one of its longest running quandaries. At one point during a day's hearing on library photocopying last summer, Senator John L. McClellan (D–Ark.) commented testily, "Well, I am not going to get into that business. I am just puzzled and perplexed and I guess confused like most everybody in trying to resolve this problem. I think I have a full measure of sympathy for all interests; I mean, I would like to see the publisher and author and so forth compensated, and at the same time, I don't know how you could base it on this 5 percent rate paid by whoever gets a copy, and make this thing work. I don't know how it is going to be practical."

McClellan's comments were prompted specifically by a publisher's proposal to levy a licensing fee on library photocopying, but perplexity has been the dominant congressional reaction to the copyright problem. For more than a decade, Congress has sought to carry out a major revision of the copyright law to deal with the changes in technology, in the habits of users, and in the economics of publishing since the present law was enacted in 1909.

It appears that Congress may at last be about to emerge from the maze. Sources close to the Senate Judiciary Committee's subcommittee on patents, trademarks, and copyrights, of which McClellan is chairman, expect that a copyright revision bill will be reported out in the reasonably near future.

For scientists and engineers the matter of photocopying journal articles has been the liveliest issue in the debate over revision. As it stands at the moment, the draft bill is said to give legislative support to current photocopying practices.

Attention has been focused on the photocopying issue by a suit brought by the Baltimore publisher of scientific and medical journals, Williams & Wilkins, charging the National Library of Medicine and the library of the National Institutes of Health with copyright infringement via photocopying. The most recent round of court action favored the defendants, permitting them to continue photocopying. The court decision, in effect, however, put pressure on Congress to resolve the issue legislatively.

Reduced to its essentials, the dispute over photocopying casts scientific publishers and research libraries as the major antagonists. The libraries want the right to continue to provide a single photocopy for a reader who requests it.

The limit on material is generally accepted to be a single article from a journal. The publishers argue that the mass, mail-order photocopying by major research libraries deprives the journals of the revenue necessary to cover editorial and printing costs and, in the case of commercial publishers, return on investment. They contend that if things go on this way there will be no journals to copy.

Inevitably, the photocopying debate has generated tensions between the libraries and the publishers, with each side feeling it is being exploited by the other and that the only one doing well in the present situation is the Xerox Corporation.

Ironically, on the central issue of royalties for journal publishers, many librarians would be amenable to paying them if a practical way to handle the bookkeeping could be found. It is not the royalty itself which the libraries find unacceptable (this could be borne by the reader requesting the photocopy), but the accounting. As expressed in an often-used phrase, "It would cost dimes to collect pennies," and neither publishers nor libraries are willing to bear the collection charges; so far nobody has come up with an economical answer to the problem.

The draft law, which the Senate subcommittee has been working on, would apparently allow libraries to make a single copy of material from a journal up to the length of a single article, but would prohibit bulk copying, as, for example, for class use in a university course. Another provision of the draft law would create a commission to look at the future impact of new technology which could quite easily make the photocopying issue seem a minor irritation. The commission would recommend further modification of the law.

If the copyright problem has drawn the most attention, it is by no means the only one afflicting scientific publishing. Journals are vulnerable not only to the generic pressures on periodicals —rising costs of printing, paper, postage, and editorial operations—but also to very special market conditions.

Growing specialization in the sciences has been reflected in the proliferation of specialized journals. The more specialized the journal, the smaller the number of potential subscribers and, because of the economics of the game, the more expensive the journal. (As the old journals have grown larger in size and the number of new journals has increased, the so-called secondary journals—indexes and abstract series—grow larger and more expensive and, in turn, spin off new, more specialized indexes and abstracts.)

Particularly in the case of the specialized journals, as prices have gone up, individual subscribers have dropped out, leaving research libraries as the major source of subscription revenue. Most scientific publishers have by now developed a dual price system with institutions (libraries) paying much higher rates than individuals (on the grounds that libraries photocopy).

Libraries, for their part, are experiencing severe strains on their general budgets from inflation and are beginning to rebel at soaring journal costs. Some libraries have cut purchases of scientific books and monographs in order to keep up periodical purchases. Others have conducted "use surveys" on technical periodicals and dropped the subscriptions on the least used. Even larger and more affluent research libraries—mostly university and large metropolitan libraries—are finding ways to share the burden imposed by increasing costs and greater numbers of scientific journals (one thing this means is a bigger photocopying network).

Documenting the Trend

Data indicating the general dimensions of the problem are not hard to find. Figures in the 1973 *Bowker Annual* used by librarians indicated that the average annual price of periodicals in a sample of 2537 titles in various fields had risen from $8.66 in the period 1967–1969 to $13.23 in 1972. For chemistry and physics journals the comparable figures were $24.48 and $45.46. The price for the chemistry and physics journals showed the biggest percentage rise in all the 24 subject areas included—85.7 percent against the average of 52.8 percent for all periodicals.

Some figures cited by Williams & Wilkins indicated that the market position of that publisher's scientific periodicals has not improved dazzlingly in recent years. At the McClellan hearings in August a company spokesman said that in 1971 the firm's scientific and medical journals had a circulation of 24,217, in 1972 of 24,502, and in 1973 of 23,300. The total number of libraries buying the company's journals rose by 300 to 5800 during the period, so in 1973 more libraries were buying fewer journals. Like other journal publishers, Williams & Wilkins raised their prices during the years covered, so the figures do not reflect income or profits.

Williams & Wilkins, champion of the "pro-owner" cause, is a commercial publisher, but many nonprofit publishers endorse the Williams & Wilkins view. The American Chemical Society and the American Institute of Physics, both major scientific publishers, filed *amicus curiae* briefs in support of the Williams & Wilkins position. (The Baltimore publishing company is now appealing the Court of Claims decision which upheld the libraries' right to photocopy. Williams & Wilkins has paid the high costs of litigation so far and now are asking for help to finance the appeal to the Supreme Court. It remains to be seen how many publishers will ante up.)

The situations of commercial and nonprofit publishers differ because many nonprofit journal publishers depend on page charges underwritten by the government for a substantial part of their income. However, observers say that a growing trend among both commercial and nonprofit publishers is toward obtaining an increasing portion of income from subscription rates levied on libraries.

Alarm over these trends in journal publishing are expressed fairly freely by librarians and some academics. A recent public example was provided by a letter signed by 11 university chemists from six countries (the problem is international) published in the 10 December 1973 *Chemical and Engineering News* under the headline "Too many chemistry journals," and elsewhere. The letter writers said they were concerned with the "quality of the literature, its cost to the libraries of our institutions, and how publication is organized." Particular criticism was aimed at commercial publishers who were accused of taking advantage of the fact that libraries are a "captive audience" by setting high subscription prices on new journals. "Lax refereeing standards" were imputed to some of these new journals and chemists were chided for succumbing to "publisher's enticements" to serve on editorial boards of new and possibly unnecessary journals.

Whether the commercial publishers are mainly responsible for the excesses has not really been documented, but there is growing sentiment for effective regulation or at least stronger self-discipline in the field. The chemists

who wrote the letter, for example, prescribe the following fairly strong medicine:

> Ideally, some international agency ought to be constructed for examining and assessing the foundation of new journals. At the present time this is probably an unrealistic thought. National chemical societies are not perfect, and indeed have sometimes resisted the formation of badly needed supranational journals. They should, however, be urged to set up an impartial mechanism for evaluating the need for a new journal and require that criteria for assuring the level of quality are met. A set of criteria for refereeing practice, statistics concerning rejection rates, criteria for terminating a journal, restrictions on language or national origin of work, page charges, etc., would be the proper concern of any committee.

As the letter suggests, journal publishing does not provide a model of logic or efficiency. The years after World War II were a period of unprecedented growth for science and consequently for scientific journals. This growth, of course, has been largely fueled by federal funding. In the case of journals, the government not only underwrites page charges in nonprofit journals but has also subsidized journal income by, for example, making subscriptions chargeable to research grants. Perhaps even more important, funding agencies have found many direct and indirect ways to subsidize the creation of new journals.

There is no question of the importance of the role of the federal agencies in the expansionary period of journal publishing, and cutbacks in federal science funding in recent years have clearly added to the pressures on journals.

Many journals now find it difficult to react to these pressures.* During the salad days of science in the 1960's, they were able to give top priority to professional concerns or to protecting organizational interests. The reaction of scientific publishers as a group to increasing costs has been to raise prices at a rate that puts them at the top of all the charts plotting inflation in the periodical field.

Federal agencies for their part have done little to analyze or revise the random policies which have so drastically influenced journal publishing. However, there are signs of changing attitudes. One potentially significant effort has been launched at the initiative of NLM director Martin Cummings. A small committee is preparing the way for a meeting of a fairly large and high-powered group representing both commercial and nonprofit publishers. The idea is to have a hard look at all major aspects of journal problems and to recommend, among other things, how federal policies may be altered to improve the situation.

In view of the importance of journals to the scientific enterprise, it is surprising that the cost crisis affecting journals and libraries has not prompted more efforts at corrective action. The photocopying issue has claimed primary attention but other journal problems are enforcing the need for new answers to the old questions of who pays and how much.—JOHN WALSH

* One of the few useful general discussions available of the problems of journal publishing is to be found in the proceedings of a workshop sponsored by the Council of Biology Editors in May 1973. Titled *Economics of Scientific Publications*, a limited number of copies are available from the publications office of the American Institute of Biological Sciences, 3900 Wisconsin Avenue, NW, Washington, D.C. 20016.

House Science Committee: Staking Out a Broader Claim

The House Committee on Science and Astronautics is industriously seeking to consolidate (or, as some say, groping toward) a new, powerful, and expanded role as overviewer of all government scientific research and development activities.

The image of the committee as "the space committee" has been hard to shake, despite the fact that most of the important legislation originated there in recent years has not been space-related. In fact, the committee has recently been the font of four major bills: a 5-year, $50-million solar energy demonstration bill that swept the House on 13 February; a 6-year, $80-million geothermal demonstration bill due to be reported out of committee soon; a measure to establish a national fire program within the Department of Commerce; and the metric conversion bill.

The fire bill would set up a new research program and data collection system as well as a training academy, all of which would eventually require an annual budget of about $20.5 million (*Science*, 24 August 1973). This is a relatively noncontroversial and, many say, long overdue measure, which is scheduled for House vote this month and is expected to pass with little difficulty.

Passage of the metric conversion bill, which may hit the House floor this month, is more uncertain. Modeled after recommendations of a National Bureau of Standards report completed in 1971, it calls for a 10-year, voluntary effort to go metric nationwide. (The Senate passed a metric bill in the last Congress; a new one is now awaiting action by the Senate Commerce Committee.) The House bill adopts the report's approach, which is to let the costs of conversion fall where they may. A small board set up in the Commerce Department would coordinate public and private efforts. Passage of the bill in this Congress is not at all certain, because some craft unions, representing people who own their tools, will oppose it unless it is amended to reimburse them for the costs of metric instruments.

The committee is by no means abandoning space, as chairman Olin E. ("Tiger") Teague (D–Tex.) would be the first to affirm. But it is according other fields, particularly energy, the kind of scrutiny that was once reserved for space.

The character of leadership in the committee has changed markedly in the past few years. The mild-mannered and elder statesmanly George P. Miller (D–Calif.) was replaced in 1973 by Teague, a shrewd politician with close ties to the Texas power structure and an ardent devotee of the National Aeronautics and Space Administration (NASA). Emilio Q. Daddario, a Connecticut lawyer who moved with ease among the upper echelons of the scientific community, was replaced in 1971 as chairman of the science research and development subcommittee by John W.