assume that the agouti was once a trivial dispersal agent and figured primarily as a seed predator. With the removal of the Pleistocene megafauna, the agouti suddenly has the opportunity for a variety of evolved and coevolved interactions. However, it may well not have yet exploited the opportunity (*11*). It may shift its day-to-day activities in ways that serendipitously serve the dispersal needs of certain species of tree moderately well, even though no evolution has taken place in plant or animal.

Our discussion has focused on neotropical plants and animals, but it can be generalized to the sweet-fleshed large fruits of the Kentucky coffee bean *Gymnocladus dioica* and honey locust *Gleditsia triacanthos* (Leguminosae), osage orange *Maclura* (Moraceae), pawpaw *Asimina* (Annonaceae), and persimmon *Diospyros* (Ebenaceae). When there was a megafauna available to disperse their seeds, such genera may have been denser and had much wider ranges. The extreme spininess of various New World extra-tropical shrubs that are found in moist as well as arid regions has not been well explained. The vesicatory ripe fruits and weak-walled nuts of *Gingko biloba* might even have been evolved in association with a tough-mouthed herbivorous dinosaur that did not chew its food well.

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Reporting of Faculty Time: An Accounting Perspective

Arthur L. Thomas

The Office of Management and Budget's requirements for 100 percent reporting of faculty time on federally sponsored research, set out in circular A-21 (*1*), are provoking controversy (*2, 3*). A much broader reporting dilemma, of which 100 percent reporting is a special case, is rooted in a theoretical difficulty so radical that there is nothing comparable to it in our ordinary experience. Yet, accountants in the business world must prepare similar reports under like difficulties and have learned to live with such requirements. Their experience, and comprehension of the real nature of the theoretical difficulty, may assist government agencies, universities, and investigators. First, I will briefly describe the federal reporting requirements, their context, the uses made of the figures, and reasons advanced for objecting to such reports.

Terminology, Requirements, and Controversies

For many years, our federal government has supported basic research in the sciences through grants and contracts. To simplify a bit, these have reimbursed universities for two things: "direct costs" and, symmetrically, "indirect costs." The distinction between the two may be explained by an example. Let us suppose that the government is sponsor-

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ing Professor X's research on "Altered nesting behavior in rats exposed to severe, random jet aircraft noise." All costs that are easily and obviously traceable to this project would be deemed to be direct costs: salaries of assistants who work on nothing else, costs of buying the rats, and so forth.

In contrast, other costs either are joint (common) costs of two or more functions or are inconvenient to trace to individual projects. Accountants usually deem these to be indirect costs though, as Brown (*4*) indicates, this distinction between direct and indirect is blurred in practice. (Otherwise, one could follow a rule of thumb that direct costs are ones that should be included in grant proposals, and indirect costs are ones that should not.)

Summary. Controversial federal regulations requiring universities to report 100 percent of the activities performed by faculty members encounter severe theoretical difficulties of allocation that pervade accounting and that at present are insoluble. Yet it is only natural for universities and government agencies to desire that such allocations be made. Accounting practitioners have faced such reporting dilemmas for generations; their experiences suggest ways of palliating the federal requirements.

For instance, the building in which Professor X's rats are caged houses many other activities. It was built in the early 1960's at a cost of several million dollars. The university wishes to spread this sum, by a procedure called "depreciation," first to the individual years of the building's life and then, within these years, to the individual functions or activities for which the building is used. The university charges depreciation costs to Professor X's grant because the experiment benefits from being free of the disruptions that might be caused by, say, wind and rain. At the same time, the university wishes to charge to this grant part of the costs of heating and cooling the building, part of the costs of administering the university as a whole, and so forth. Suffice it to say for present purposes that all such indirect costs share the property that a naïve observer could easily be puzzled about how to divide them among different grants and contracts and might see several different, plausible-seeming ways to do so.

The process of dividing up costs is called allocation, of which there are two kinds. Often allocation is thought of as a physical division of resources: so many cubic centimeters of glucose solution to rat 1, so many to rat 2, so much travel money to department A, so much laboratory space to department B. But allocations of indirect costs are less tangible than this. Building depreciation does not divide the building itself; it merely involves transfers of electric charges somewhere within a computer's files. Of course, such allocations of indirect costs may be consequences of physical allocations; for instance, depreciation charges for Professor X's project may depend in part on the physical allocation of laboratory space. But the physical and indirect cost allocations are distinct. The distinction is important because allocations of indirect costs can be much more ambiguous than physical allocations.

Besides various untraceable costs, indirect costs often include numerous costs that, in theory, are directly traceable to individual projects but which, as practical matters, are merely lumped together and charged to different activities by overall, basket allocations. For example, in theory it would be possible to meter the water that the rats drink, but doing so is probably not worth the trouble. Similarly, in theory much of the costs of filling out government forms is traceable to individual grants and contracts, but often such costs are not traced. Indirect costs, then, are a mixture of untraceable costs and costs that are expediently (*4*) treated as untraceable, all allocated to individual grants and contracts.

To conclude this simplified exposition of university accounting, we should note that, until recently, indirect costs were mostly allocated to projects in proportion to the salaries charged to these projects. Thus, if Professor X's project on rat behavior employed twice as many people as her other project involving mice, one would expect roughly twice as much in indirect costs to be charged to the rats as to the mice. Even under the new rules promulgated by the latest version of circular A-21, salary costs have great impact on allocations of indirect costs (*5*).

At this point, I hope that the reader has stirrings of doubt. Surely, it will be difficult to allocate indirect costs in terms of Professor X's salary if that salary is itself an indirect cost. Yet it is far from obvious that Professor X's salary is a traceable, direct cost of either of her projects.

Suppose that it is determined that Professor X spent 30 percent of her working hours teaching classes or holding office hours, 33 percent in committee meetings, 7 percent assisting colleagues, and 30 percent in the laboratory—20 percent on her project on rats and 10 percent on the project with mice. Would this really justify charging 20 percent of her salary to the one grant and 10 percent to the other? After all, in both projects she employs graduate and postgraduate students whom she is simultaneously training as they work. Should not some of the 20 percent and 10 percent be charged to instruction? Also, as principal investigator, part of her time spent with these assistants is devoted to administration. Should not some of the 20 percent and 10 percent be charged to that? Finally, while in the laboratory working on one project she may be thinking about the other project, and while teaching a graduate seminar she may gain insights that profoundly affect her laboratory experiments (*2*).

In short, faculty salaries are often partly untraceable to individual projects. This makes it potentially difficult to use them as a basis for allocating indirect costs. Universities try to escape these perplexities by making rough-and-ready estimates of the percentages of faculty time that are devoted to sponsored projects and then treat the resulting allocations of faculty salaries (really indirect costs) as though they were direct costs of these projects (*6*). It is typical of accounting that one may do such things because accounting's allocations are not physical divisions of tangible resources but merely transfers of electric charges within a computer's files. Indeed, if one wishes to charge 80 percent of Professor X's salary to the project that used rats and 40 percent to the one with mice there would not necessarily be anything in accounting per se to prevent this either, although the bookkeeping complications that doing so would introduce are beyond the scope of this simplified exposition.

Nonetheless, the possibility of allocating 120 percent of Professor X's salary is not a whimsical one. Over the years, both sponsoring government agencies and Congress have noted occasions in which more than 100 percent of faculty members' salaries were charged to different sponsored projects. Mac Lane (*2*) lists this among such other accounting mistakes and abuses as inadequate records, unauthorized transfers of funds among projects, charges of equipment and salaries to wrong projects, misuses of travel funds, and salary charges for an investigator not actually working.

The irritations that these discoveries may have caused have been exacerbated by the dramatic increases in both the

absolute and relative amounts of indirect costs that universities have billed to government grants and contracts during recent years. Brown (*4*) discusses why these increases have been so extreme. Indeed, indirect costs increased so rapidly that federal agencies and Congress finally grew suspicious that taxpayers' money was being diverted from research support to support of nonsponsored activities (*4, 7*). Such suspicions, coupled with knowledge of errors and abuses, led to a general tightening of accounting rules for government research grants and contracts, of which the latest revision of circular A-21 is the most conspicuous result. Also, because of the especially strong impact of faculty salaries on both direct costs and consequent allocations of indirect costs, this revision and related pronouncements required universities to account for 100 percent of faculty members' time.

Since such requirements have inspired widespread, fervent protest, one might wonder what could have motivated them. Here is an example. Years ago the university at which I then taught hired a promising young accountant as an assistant professor. Since he had not completed his doctorate, for 2 years our school lightened his teaching load, protected him from major committee responsibilities and, if memory serves, got him summer salary support so that he could complete his dissertation. Eventually we learned that during much of this period the fellow had also been teaching nearly full time at a neighboring university, without telling us.

At least in the short run, the only way to detect this duplicity would have required knowledge of what he was doing with all his time, not just the portions of it that he spent on our campus. Parallel problems arise in less dramatic situations, as when a faculty member spends excessive time in consulting or recreation. Circular A-21 requires universities to report what investigators do with all of their time, not just those portions of it spent on government-sponsored work. A naïve observer might be excused for believing that such a requirement to report 100 percent of time would be no more inflammatory than, say, a requirement that travel funds not be squandered on trips to ski resorts. Instead, though, this reporting requirement has provoked such responses as: ". . . never have I seen the lash of federal regulation applied to a crucial area of the nation's intellectual life with such seeming indifference to financial and human consequences. . . . It has been a long and deeply disheartening series of events, wasteful of energy and faith and time. . . . [W]hat is at stake is the quality of American science and, therefore, of a free, stable, productive nation" (*3*). Whatever, the observer wonders, can possibly be going on?

Several things are going on, of course. First, there is concern that any requirements to report faculty activities (other than those supported by government funds) are invasions of privacy, gross violations of the very spirit of a university, and could be first steps toward eventual limitations on academic freedom. Some of us remember the McCarthy era. Others are dismayed by the anti-intellectual bullying of Senator Proxmire and, perhaps even more, by the responsive chord that his Golden Fleece awards have struck in some of the media. Still others worry that government functionaries are insensitive enough to the needs and purposes of universities that they could destroy academic freedom and hinder research through well-intentioned zeal (*7*), much as some business executives say that benevolent government regulation has destroyed freedom, sapped productivity, and weakened the entrepreneurial spirit in industry. Second, 100 percent time reporting is apt to be expensive. Again, business has been making similar complaints about regulations for years.

Fork-Shaped Allocations

There is a third reason for objecting to 100 percent time reporting that is so powerful that it and it alone would suffice to damn the entire idea: such reports would be meaningless—not just a bit arbitrary, but as filled with nonsense as a Swiss cheese is with holes. According to circular A-21 (*8*), 100 percent of faculty time is to be allocated among the following five categories: organized research, instruction, indirect cost activities, other sponsored activities, and other institutional activities. For brevity, we must again simplify. Organized research is primarily sponsored research conducted under a grant or contract, whether the sponsor be government, industry, or whatever. Instruction includes much of what one ordinarily means by teaching, plus all other faculty research. The remaining three categories are essentially self-explanatory. Finally, within organized and other sponsored research, faculty time is to be subdivided among projects.

We have already seen the crucial difficulty here: there is no clear-cut way to differentiate faculty activities among these categories and projects. Thus, Professor X's research, teaching, and administration are as impossible to decouple (*2, 3, 9*) as, say, cooking, teaching, and planning when a parent and child work together to prepare an elaborate meal. My only complaint with such objections is that they do not go far enough. However, to appreciate the deeper problem, of which 100 percent time reporting is but one aspect, we must ask a further question. On what basis or rationale does circular A-21 wish universities to allocate costs among its five categories, and among projects?

Circular A-21 offers several answers, some of which are excessively general, at least when considered in isolation. For instance, allocations should be "equitable" (*10*). This is much like saying that allocations should be nice. Equity is not an operational concept until it is interpreted. I am equitable. You have a lot of funny prejudices and tend to kid yourself into justifying your self-aggrandizing behavior. Equitable allocations of faculty time could charge time to categories and projects according to any of the following: (i) the incremental effects on faculty work load of successively relieving the faculty member of duties in some predetermined order; (ii) the generalized, averaged-out, probabilistic versions of relieving the faculty member of duties that comprise the various Shapley allocation approaches (*11*); (iii) a Rawlsian notion of equity, under which one should maximize the well-offness of the least well-off category, project, or colleague; (iv) a democratic or Bernoullian splitting of faculty time equally among activities; or (v) a norm of social responsibility designed to favor "progressive" projects (or any of various other criteria based on politics or religion). Circular A-21 also speaks of allocating costs in terms of "logic and reason" (*12*), reasonableness (*13*), and appropriateness (*14*). Again, these are ideals with which one would not care to quarrel but which are not helpful in isolation.

The only relatively specific allocation criteria to be found in circular A-21 are that costs should be allocated to projects in terms of traceable cause and effect relationships (*12*) or in accordance with relative benefits received or provided (*15*). Significantly, such traceability and benefits rationales are also the only halfway solid-seeming criteria behind traditional allocations in commercial accounting. For instance, commercial accounting's depreciation allocates the cost of a factory building to the functions that it houses in proportion to the services that it is deemed to provide to each. Therefore, we cannot obtain some better rationale for allocation from commercial accounting practices.

Now traceable costs, such as the purchase cost of Professor X's rats, need offer no theoretical problems. But, the precise difficulty with faculty time is that it is not traceable to individual categories and projects. Although it might sound superficially plausible to speak of allocating the time in proportion to relative benefits provided or received, doing so drops one into a theoretical abyss.

An example will show why. [To simplify, I will use incremental analysis where marginal analysis would be more appropriate, but marginal analysis reaches parallel conclusions (*16*).] Essential inputs to this article include paper, ink, labor, and some sort of program; the article is the result of the synergy, or interaction, of these four inputs. I shall refer to such synergies as interaction effects.

Instead of allocating one of circular A-21's costs, let us suppose that we wish to allocate, or attribute, this article to the four inputs that helped generate it. We could plausibly allocate the entire output to the labor, on the reasoning that, without labor, there could be no physical output whatever. But we could equally well allocate the entire output to the ink, since without ink there would be only blank pages. Or to the paper since, lacking paper, there would be no article but only a smudge. Or to the program, since with a different program in my gray matter you might instead be reading computer code. Moreover, since the entire output may be allocated to each essential input, any intermediate allocation is equally legitimate: perhaps half to the labor and one-sixth each to the other three inputs.

The point is that the whole exercise is silly. By definition, an interaction effect is the joint consequence of whatever interacts to produce it; attempts to allocate such joint consequences to individual causal factors are meaningless. I ask you now to visualize the logical structure of this meaningless exercise. It is rather like a fork with four tines: the article is the handle, and each of the tines represents a different essential input. I attempted a one-to-many allocation from the handle to the tines. Such allocations might have 2, 10, or 10,000 tines, depending upon to how many objects one wished to allocate a single subject.

Such one-to-many allocations crop up in many guises. They are the sorts of joint-cost allocations that almost any economist will tell you are meaningless—for instance, attempts to divide the total cost of a steer among its meat, hide, and offal. Commercial accounting is full of them. One example that I have already noted is the allocation of the cost of a factory building to individual years; another is the allocation of the resulting annual charge to the various functions that take place in the building.

Circular A-21's indirect depreciation costs are the same kind of one-to-many allocations. For it can be shown that accounting's only theoretical basis for defending a pattern of depreciation charges (or for allocating the cost of any input) involves dividing such costs among years and functions in proportion to the relative benefits that each input provides to each year and function. Such benefits must inherently be outputs, and these outputs do not bear labels identifying the inputs that generated them. Since years and functions always have more than one input, determination of relative benefits implies allocation of outputs to inputs in exactly the sense that was depicted when I used this article as an example.

As an accounting theorist, I spent almost two decades worrying about such one-to-many allocations (*16–19*). All of them, all allocations with a fork-shaped logical structure, can be shown to suffer from the same difficulty: any allocation that you care to choose is just as defensible (or indefensible), or just as true, as any of an unbounded number of conflicting alternatives. In particular, this applies to allocations of untraceable indirect costs to different research projects and of allocations of faculty time to interacting activity categories and projects. We are faced here with a degree of arbitrariness the like of which we rarely if ever experience in ordinary life. In the four-input example, the ambiguity in the attempted allocations was total; 100 percent of the output (the article) could be allocated to any input. Similarly, insofar as Professor X's projects interact, or her research, teaching, and administration interact, the ambiguity is also total.

The underlying difficulty is that significant portions of what we would like to allocate are interaction effects. For instance, the total hours that Professor X works are not merely an additive consequence of her research, teaching, administrative, and other duties. Yet, though demonstration of this is necessarily complex, there exists no uniquely defensible way to allocate interaction effects (*16–19*). The problem is that of, say, allocating the effect of a piano sonata individually to each of the 88 keys.

Be warned that such conclusions are controversial. Although most accountants admit that one-to-many allocations are inevitably somewhat arbitrary, they either do not yet appreciate, or do not yet admit, the severity of the problem that I have just described—the radicalness of the arbitrariness. At least in part, this reluctance stems from the fact that commercial accounting practice is based on notions of offsetting costs and revenues in order to calculate profit and a recognition that the criticism of one-to-many allocations is simultaneously an argument that such offsetting is meaningless.

It should also be evident that any attempts to allocate costs to interacting faculty activities are inevitably productive of nonsense. Moreover, such attempts lead to paradox. To transpose a proof attributed to Bertrand Russell, if it is simultaneously true that all and half of this article may be allocated to the labor, then one can prove anything—for instance, that a proton is a photon. If all and half are both true, then 1 equals 1/2. Multiplying both sides by 2, we get 2 equals 1. A proton and a photon are two; therefore, a proton and a photon are one. Like possibilities of paradox are another good reason why universities and the government should shun 100 percent reporting of faculty time. One can only agree with those critics who see it as dangerously productive of confusion and unnecessary disputes (*2, 3*).

However, in fairness to fellow accountants, I conclude this section by pointing out that the ambiguities just described are not so much defects in accounting as consequences of our asking it to do things that no accounting system can possibly do. It is not a criticism of engineering to say that it cannot build perpetual motion machines. A quotation from Douglas Hofstadter (*20*) is pertinent.

Achilles: . . . I see the dilemma now. If any record player—say Record Player X—is sufficiently high-fidelity, then when it attempts to play the song "I Cannot Be Played on Record Player X", it will create just those vibrations which will cause it to break . . . So it fails to be Perfect. And yet, the only way to get around that trickery, namely for Record Player X to be of lower fidelity, even more directly ensures that it is not Perfect. It seems that every record player is vulnerable to one or the other of these frailties, and hence all record players are defective.

Tortoise: I don't see why you call them "defective". It is simply an inherent fact about record players that they can't do all that you might wish them to be able to do. But if there is a defect anywhere, it is not in THEM, but in your expectations of what they should be able to do!

What to Do?

The government and the universities share expectations for accounting's record player. Both believe that it is possible and necessary to determine what individual research projects cost. Yet it is implicit in the reasoning just summarized that the cost of an individual research project is a mental construct akin to that of a perpetual motion machine: Not only doesn't such a thing exist outside our minds, but it cannot exist. Therefore, both the government and the universities expect accounting to play the song, "I Cannot Be Played By Accounting." This is unrealistic of them. However, I cannot imagine any demonstration of this lack of realism persuading either to change its tune. For instance, I cannot imagine universities settling for reimbursement of traceable costs only. What then can be done?

One thing that probably we should not do is contend that universities are so very different from other recipients of government contracts that they should not have to respect the same general principles of accountability. Even were this true, its assertion would be indiscreet. Students are part of our community of scholars, but we still must have controls over cheating on exams. Similarly, investigator performances on government grants and contracts must be verified. Mac Lane (*2*) correctly observes that ". . . peer review, at the time of grant renewal, is a form of scientific accountability." But it is not a kind of accountability that is sufficient to satisfy all the needs of agencies that support research. Once again, we might consider my former colleague who was working almost full time at another university. In the long run, peer awareness that he had not completed his doctorate by the time that tenure and promotion decisions were being made would have constituted a form of accountability. But it would have been an accountability that did nothing to protect those faculty members who supported him by assuming heavier teaching and committee loads while he supposedly was writing his dissertation. Government agencies also need ongoing assurance that investigators are doing what they agreed to do.

Yet, if 100 percent reporting of faculty time results in meaningless reports, then 100 percent reporting cannot long provide the needed assurance. The very fact that the underlying allocation difficulties are logical ones ensures that we never will be able to solve them in an entirely satisfactory way. But there are partial remedies that could palliate the discomforts that accounting dilemmas cause.

First, agencies that support research should explicitly acknowledge that they are simultaneously supporting the sorts of administration and assistant-training interactions that are integral to research and then stipulate that the costs of these activities are to be included in research costs. There is a well-accepted parallel to this in elementary commercial accounting. Raw material costs of a product may be too great for two very general reasons: the company used too much, or the cost per unit used was too much. But how should one classify the excess cost of the excess usage—the interaction of the two explanations? Accountants routinely and expediently include this interaction in excess cost per unit, rather than in excess units used, and do not worry about the allocation problem. I propose that the government make the concession of treating all ordinary interactions with research as part of research.

For their part, universities should agree that ordinarily an investigator's time should be assigned to individual activities by such naïve, rebuttable presumptions as that when Professor X is in the classroom she is teaching, when she is in a particular laboratory area she is working on the related grant, and the like. Minor exceptions should be disregarded. When there are major exceptions, interaction effects should be split evenly among interacting activities: 50-50 if there are only two such activities, and so forth.

There are several reasons for using such even splits. First, they parallel default allocation methods already stipulated by circular A-21 (*21*). Second, such even splits are apt to sound fair to Congress, taxpayers, and other external observers. Third, since our allocations must be arbitrary, the least we can do is keep them simple. Fourth, it happens that such even allocations can sometimes be defended by an application of mathematical game theory that has become prominent in recent accounting literature (*11, 19, 22*).

These proposals might be coupled with a concession that the Office of Management and Budget made late in 1980: "The new method provides for a three-stage 'multiple certification' to document faculty salary costs. The individual faculty member would certify only the time he spends on 'direct activity' related to a research grant. A department chairman would certify percentages of activity relevant to indirect cost categories. The university president would, in effect, certify that faculty were not being compensated with federal funds for activities not specified under grants" (*23*). This concession does not solve the allocation problems. Professor X is still making allocations that, as far as they involve interaction effects, are totally ambiguous; only now she is actually reporting only some of them. The rest are still reported at one or two administrative levels removed.

In any event, these proposals for changes in the reporting of faculty time would not require any radical departures from contemporary accounting practices. And the government and universities might often still use the resulting allocations of faculty salaries in determining reimbursements of indirect costs. But since such allocations are inevitably arbitrary, universities and agencies might want to experiment with decoupling reimbursement of indirect costs from salaries. Since the reimbursements inevitably will be arbitrary, too, the experiments and consequent alternatives should not be elaborate.

At present, perhaps the leading proposal for reform of circular A-21's indirect cost reimbursement procedures is to accomplish some of the reporting requirements by means of statistical sampling (*3*). This may well be a fine idea on other grounds, but statistical sampling cannot resolve the logical difficulties that I have described. The domain of statistics is probability, not impossibility; when we are asked to allocate the unallocable, we are being asked to do the impossible.

Fortunately, the business world offers a parallel to problems of indirect cost reimbursement. Often, when a company is organized into separate divisions, these divisions buy and sell from each other. If profits are to be calculated for each division, someone must set prices for these transfer goods. Some of my own research (*18*) has been devoted to such transfer prices. Once again, space limitations dictate drastic simplification, but this business experience suggests a few possible guidelines for indirect cost reimbursement.

First, whenever the services that are to be reimbursed are available commercially, reimbursement at commercial rates will avoid almost all of the allocation problems that we have considered. For instance, many universities sell computer services to business users. They should charge such services to government grants and contracts at the same rates.

Difficulties of transfer pricing arise when there is no external market price for transfer goods. Academic researchers have proposed numerous intellec-

tually sophisticated responses. However, though this is a highly controversial point, research and actual business practices both suggest that sophistication is inappropriate. Instead, if the buying and selling divisions have approximately equal bargaining strengths, everyone is apt to be best off (in the sense of making the best of a bad situation) if the divisions negotiate transfer prices in the same ways that independent buyers and sellers negotiate prices of specialized products.

In the government-university context, there are two obvious difficulties with such negotiation. First, the government is apt to be in a stronger bargaining position than the university. One way to make things more equal might be for the negotiating rules to specify that if an agency and a university are unable to come to agreement in fairly short order they must submit to binding arbitration, with the arbitrator required to accept whichever of the two opposed positions seems the more reasonable and not to split differences. In addition, if need be, agency negotiators could be made aware that having more than a specified percentage of cases go to arbitration would reflect unfavorably on their careers.

The other difficulty is that negotiations could be quite time consuming. Partial remedies would be to encourage negotiators to make extensive use of precedents and to enforce time limits. But one still anticipates that both agencies and universities might often prefer to base reimbursement of indirect costs on direct costs of projects, however arbitrary this might be, rather than to negotiate them. Mac Lane (*2*) mentions one possibility that was also recommended by the National Commission on Research: ". . . government agencies and universities [should] construct an option, analogous to the 'standard deduction' in income tax calculation, to charge activity which is treated as indirect costs under sponsored agreements. The fixed percentage would be negotiated." Elaborating on this suggestion, the analysis summarized in this article gives strong support, on independent grounds, for Brown's (*4*) proposal that " uniform indirect cost rates should be reestablished; each rate should be a percentage of the total direct costs, applied uniformly to all universities, and subject to alteration only under exceptionally compelling circumstances."

As suggested earlier, if accounting must be arbitrary, at least we can make it simple and, as far as possible, neutral. Such neutrality would, of course, require considerable uniformity in defining direct costs.

Meanwhile, some faculty members should reconsider their attitudes toward such things as time reporting. Accounting controls are not a personal insult but merely a necessary response to a careless, wicked world. Professors do not insult students by proctoring exams. Some reactions to 100 percent time reporting have displayed a rectitude that would be admirable in reporting about real-world events, but which is wasted on totally ambiguous allocations. For example (*24*):

> [Professor Y] said he thought the regulations forced people to lie by consciously guessing about how members of the faculty spent their time.
>
> "They're a lie," he said. "When you're putting it down, you knowingly say that you're not telling the truth."
>
> [Professor Z] agreed with [Professor Y].
>
> "It's forcing people to be liars," he said.

With all sympathy and respect, such assertions miss the main point. Where allocations are totally ambiguous, where there are no limits to the ways that one can allocate, and where there is no decisive way to choose one allocation method over another, as long as faculty members confine the distribution of untraceable portions of their time to interacting activities in which they actually engaged, *there is no way that they can lie*. More generally, absent uniform indirect cost rates, whenever allocations of untraceable costs are required, universities should feel no qualms about seeking their own advantages. If there is no truth and one must be arbitrary, one is under no obligation to cut one's throat.

Conclusion

Universities legitimately seek at least partial (*4*) reimbursement of costs of projects sponsored by the government, and government agencies legitimately seek to pay for only those costs that they have agreed to support. However, the cost of an individual sponsored project is usually partly undefinable because projects and other university activities interact. This means that no reimbursement procedure can ever escape partial, yet radical, arbitrariness.

All that we can do is learn to live with this arbitrariness, as one learns to live with other uncomfortable aspects of life. Doing so requires the government, the universities, and individual faculty members to make a few concessions. Perhaps the most important concession is for all parties to recognize and acknowledge the underlying problem candidly: the precise information about project costs that both the government and universities desire simply does not, and cannot, exist.

References and Notes

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6. Compare sections D1, D2, and E1 in (*1*).
7. H. S. Gutowsky, *Science* **212**, 636 (1981).
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25. I am grateful to C. Emmanuel, J. Michal, L. Sherr, and two anonymous reviewers for suggestions.