Teaching Administrative Law: The Wonder of the Unknown

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Teaching Administrative Law: The Wonder of the Unknown

Peter L. Strauss

Sunday, March 7, 1982

Dear Roger:

You would have enjoyed being among the hundred-odd administrative law teachers and hangers-on who met this past weekend for the AALS Workshop on Administrative Law, organized by Ernest Gellhorn of Virginia, [now dean at Case Western]. Perhaps it was the plane ride home, when I had a chance to read Frank Easterbrook's short but very elegant use of Arrow's Theorem in a recent Harvard Law Review; or perhaps it is just a good night's sleep, home away from the sybaritic pleasures of New Orleans, and knowing my dean will want a justification in terms other than crawfish or oysters; this morning, in memory, the workshop has begun to assume some intriguing shapes I'd like to share with you here. "Each generation," Jerome Bruner once wrote, "must define afresh the nature, direction and aims of education to assure such freedom and rationality as can be attained for a future generation";¹ it was to that task, more than the technique of day-to-day teaching, that the workshop set its course.

You know how threatening administrative law can be as a subject, for teacher and student alike. Seen as knowledge to be acquired, the subject is overwhelming; the national agencies may be grinding out less law in this administration, yet they are still in large supply; and beyond them are the state and local agencies we casebook writers tend to ignore. How are we to manage all this information, either in keeping abreast in our scholarship or in our teaching—and how are we to do it in the three semester-hours the curriculum ordinarily allots us? Does it help if we limit ourselves to concerns of process rather than substance? That may not be defensible, intellectually

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or pedagogically (of which more anon); but even then, three hours must encompass for the agencies what the curriculum does for courts and legislatures in Civil Procedure, Evidence, Federal Courts, Trial Practice, Legislation, Legal Method, and a substantial piece of Constitutional Law. And we have not yet accounted for consideration of the informal processes by which the vast bulk of administrative business is dispatched. Nor do I have the comfort of believing my students have some particular focus to their interest. It may be—I believe it will be—that dealing with some administrative agency or another will mark a central part of their professional existence; the trick is that one cannot know in what agency, or at what level, the encounter will come.

Administrative law teachers, at least this one, live nose barely above water, with a constant four-foot shelf of materials to read, with the constant question, what can I pare? Court opinions seem primary; yet a diet of them threatens a diversion from the agencies themselves to the subsidiary issues of judicial control—subsidiary because they contribute least to both scholarship and student understanding about administrative government and its functioning, and because (as Peter Hutt reminded us over lunch) they reflect so small a part of the real world of administrative law practice. Is there a particular agency or small number of agencies I might follow, to have a sense of current themes? Should I be following the Congressional Record or scanning current oversight hearings? Reading, heaven forefend, the Federal Register? Or might some combination of the Washington Post, the New York Times, the Wall Street Journal, and the Legal Times suffice? Similar problems arise with the scholarship: beyond choosing among law professionals' accounts—hard enough a task—how much of political science, economics, history, and their combinations must I try to comprehend? Administrative law's identity crisis is unending. "Simplify, simplify!" might seem the right response were it not so contrary to our instincts as pedagogues and to the realities we seek to tame. Nor could one view the workshop in those terms; while it reframed each of the classic dilemmas of our pedagogy, it did not purport to suggest resolutions.

Appropriately enough for a field characterized by so much uncertainty about subject matter and perspective, the workshop opened with a discussion, "What Are We Trying to Do," presented by Paul Verkuil of Tulane, Richard Stewart of Harvard, and Robert Rabin of Stanford. That question is a large one. The answers given were along traditional and well-defined lines, emphasizing subject matter and teacher perspectives more than classroom process or student needs. What, the three speakers inquired, ought be the focus or perspective of administrative law? Verkuil took the traditional stance, that the course is primarily a procedural subject and that its principal aim must be the formulation of general rules about procedure.² He invoked in the service of this analysis the observation (of which I am immodestly fond) that "if general rules applicable to the behavior of the thousands of diverse instruments of government did not exist, surely judges and lawyers

Teaching Administrative Law

would be obliged to invent them, to assure the possibility of control and avoid unsustainable specialization. Just as the course in civil procedure focuses on the Federal Rules of Civil Procedure, Verkuil urged, a course in administrative process—process, not law,—properly focuses on the Administrative Procedure Act and, overarching that, the constitutional concept of due process and the values underlying it. Rabin, at the other extreme, thought it imperative that the course focus on issues of institutional capacity, the competence of agencies rather than the constraints placed upon them by the courts (primarily) and others; and he believes that an organization around concrete functions requires close study of the work of particular regulators. How do OSHA and EPA develop and select priorities and strategies? What does that tell about the processes they employ, or about their mandates? How do these agencies relate to their various constituencies? Agencies involved in management or in grant administration can be analyzed in the same way as those which regulate. Rabin believes students can only learn if they have a sense of the substance of agency mission as well as information about the procedures they employ and the context in which decisions are taken. Stewart, reflecting his teaching materials, took a middle view. Yes, students—like the judges and lawyers they will become—must approach procedural issues from the possibility of a general perspective; yet we know that, in life, administrative law is inextricable from the particular agencies that act on it, and that judges shape their controls over administrative practice to the particular agencies they confront. To convey this reality requires that we convey something about the agencies as well as about the generality of procedures employed. Stewart's technique is to organize the course around general procedural issues but to present those issues in a setting that conveys sufficient detail about particular agencies to permit students to understand the context. Not all substantive policy questions can be solved in other courses, and unless the student understands the interplay of substantive policy and procedure, he will not see that those problems cannot be solved (as we sometimes seek to do) by procedures.

Wouldn't one like to do all of these things! As Roy Schotland of George-town remarked from the audience and as was subsequently developed in at least one of the ensuing workshops, a difficulty with the presentations was that they tended to lose sight of the students—of the limited time that each has; of the very diverse nature of their wishes concerning the course; of the highly varying character of the background they bring to it; of what it is we wish each to remember. The tension between generality and particularity, between concern with procedures employed and concern with ends sought, the basic inseparability of the two—all this is long enduring. In fact, no one

position denies the others: Rabin assumes that those who teach single-
agency courses will continue to be generalists in administrative law, and in
that way general values will continue to be reflected; Verkuil believes that
those who teach a general course will know something about particular
areas and so bring individual agency perspectives to bear. The more striking
fact, as was pointed out from the floor, is how student concerns tend to be
lost under any of these approaches and how impoverished each approach is
by the constraints of time and demand for breadth. How the teacher, much
less the student, is to manage all the data—where some economies could be
effected or whether indeed the course could be taught so as to avoid the
Sisyphean task of mastery—is much the more difficult question.

The second session, “Teaching Rule Making and Review,” asked ques-
tions about the content of the course in a slightly different way. Whether one
is going to approach the teaching of administrative law from the perspective
of procedure or substance or some mixture, time constrains the number of
topics one can consider. The suggestion implicit in the choice of this topic
seemed to be that rule making and its review is, or ought to be, the central
focus of the teaching of administrative law. Whatever we may have thought
in the past about the importance of acquainting students with the threshold
issues of judicial review, trial-type agency process, or informal agency
processes (little as we get to know about them), today’s Administrative Law
course should concentrate on the formulation of policy and on substantive
judicial review of the outcome of the proceedings in which it occurs. Whether this view will survive the depredations of the Reagan Administra-
tion remains to be seen.

Each of the four speakers here, Glen Robinson of Virginia, Thomas
McGarity of Texas, Antonin Scalia of Chicago [now a judge of the D.C.
Circuit], and Arthur Bonfield of Iowa, addressed particular substantive
aspects of agency rule-making and its review that might be treated in the
classroom. Robinson, for example, raised a number of questions about the
procedures proper to be employed for setting policy. Historically, he
asserted, agencies were reluctant to use any but adjudicatory forms. Their
increasing use of rule-making has provoked the courts and congress into
questioning how appropriate a legislative model is for agency behavior.7 No
head would turn if Senator Kennedy made speeches on the floor of the Senate
suggesting that he had strong views about an issue under legislative consid-
eration, that he had met with private individuals interested in the outcome of
that issue, or that he would act on the basis of factual assumptions without
having a very precise notion of how sound they were. Observably, courts are
nervous about according agencies the same freedom of action, and Robinson
thinks an important task for today’s Administrative Law course is to investi-
gate why. Thomas McGarity’s emphasis was on the need to study the allocation of the fact-finding function in rule making—how courts respond, in
situations of great technical complexity and high public consequence, to

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7. See Ernest Gellhorn & Glen O. Robinson, Rulemaking “Due Process”: An Inconclusive
agency conclusions respecting legislative fact.8 Once past the point of finding procedural regularity in agency action (a finding very much encouraged by the Supreme Court's holding in the Vermont Yankee case),9 a court will find it hard to separate fact from law. Deciding what factors are important for an agency to consider, what weight to give them, what intellectual approaches to take to the matters before them, what findings of a threshold character to make, what regulatory options to choose—all these are not readily distinguishable from consideration whether the agency reached the right conclusion; and this makes the allocation of authority between agency and court in rule making a central and difficult issue. Scalia, in turn, stressed the importance of leading students to understand rule making as political action.10 To be sure, the statutory procedures and judicial review cases must be taught, and a real sense of the diversity of rule making as it occurs among different agencies must be conveyed. But what most attracts Scalia is considering the roles of president, congress, press, and interest groups in much if not all rule making, and the implications of those roles, if any, for the procedures to be required and the judicial review to be employed. How can one teach 250-page opinions, in the first instance? If, indeed, White House phone calls do, and properly do, play so large a role in the formulation of policy, is such elaborate review more than a sham?11 Finally, Bonfield asserted the importance—and particularly in this political area—of examining state administrative law materials. Legislative veto and executive review may be new issues at the federal level, but they have been alive in the states for decades; and Bonfield gave a series of examples of innovative solutions to the political and procedural problems involved in these sorts of controls.12 Treating the states as though they really were laboratories, as they have been, can enrich both teacher and student understanding of what, from a federal perspective, may seem unique legal issues.

What might one glean from presentations such as these? At the level of information and teacher perspective the harvest was rich enough. All four speakers offered valuable insights into aspects of rule-making procedure and its review for pursuit in class or in scholarship. From the perspectives suggested in the first session, all four seemed satisfied to treat the issues discussed as issues of general procedure. However, at least the first three speakers seemed likely to require students to consider a particular instance of rule-making in some detail, in order to understand how a rule-making is carried out and what issues it presents, both within the agency and to subse-
quent reviewing courts. Unquestionably, important issues of the substance of rule-making had been raised, and fresh perspectives suggested.

If one looked instead at issues of course structure and student involvement, the returns were much leaner. Overall, the suggestions seemed likely to add bulk more than new direction to a bag already overstuffed and arguably misdirected. The one exception may have been Scalia, whose presentation, more than any of the others, suggested a series of ways to foster student interest and involvement, a concern for student needs and classroom process, rather than a prescriptive series of “oughts” about the appropriate content of Administrative Law. Using the newspapers’ front pages in selecting topics for discussion, requiring that students play roles of counseling and planning that will confront them directly with our ignorance and its implications, evoking the subject by highlighting the interplay of a series of themes, with shifting outcomes, over time—these techniques suggest attention to the whole of the classroom setting, not merely to the teacher and his explicit subject. Such methods, like the problems some of us employ13 or the simulations others have suggested,14 may offer some hope of bridging the gap between instructor interest and student response that was so universally reported, and so unaddressed, a feature of administrative law teaching among the attendees.

Indeed, one might believe that only by considering such issues as how and for whom teaching is to occur can the subject matter being taught be seen in less than overwhelming dimensions. At one level, as a newcomer to the field wrote afterwards to a friend, “it was reassuring that my frustration (at the gap between my interest and student response) was so widespread.” Discomfort is less bothersome when shared, and some discomfort is inevitable in the face of so demanding a craft. At another level, the frustration is a striking indictment of current teaching and suggests the need for fresh perspectives. Communicating what it is that excites me or what I know about a subject is not the same as communicating excitement or knowledge. Rather than focus attention on the explosive growth of information in our field or the necessary informational content of our course,15 perhaps we ought to look more closely at the persons receiving education and the processes by which learning occurs. Framing our teaching in terms of student interests, concerns, and attitudes, considering classroom events can evoke student response, may point the way to engaging students in the “deep mysteries and profound paradoxes”16 that engage us. It may free both us and them from boundless information and open the possibilities of wonder.

The third session, styled “Teaching Due Process,” turned from issues of content to issues of teaching strategy. The common subject of the talks was

16. See text accompanying note 24 infra.
the Supreme Court's procedural due process decisions, in particular the
due process explosion of the last decade; but the focus was less how to
interpret those cases than what intellectual operations the teacher might seek
to promote in the classroom. As in the first session, the speakers—Clark Byse,
of Harvard, Henry Monaghan of Boston University, and Jerry Mashaw of
Yale—made suggestions that fell across a well-established range. Byse, at one
end, presents the cases essentially in chronological order and rejects building
conceptual or theoretical frameworks for analysis in favor of helping
students think for themselves in analyzing a series of cases that need have no
rational consistency or end. "Observing, analyzing, and vicariously participat-
ing in the launching and voyage of [the various judicial efforts at orga-
nizing due process analysis] should alert students to the problems of such
endeavors and perhaps result in a certain skeptical or show-me attitude when
it is proposed that some new model of due process decision-making should
be adopted. . . . The endeavor is always to stress the student's responsibility
for independent analysis and judgment. . . . If such an approach at times
results in student unease, so be it. I never promised them a rose garden." 
Mashaw, at the other end, sees great value in the use of models in teaching.
The area is one that has long held deep interest for him, and he thinks it has
inherent appeal and practicality for students. He finds that students are not
as good as he is at model building; unchallenged by their theories, he gives
them his own and encourages them to apply to his theory the same skeptical
acid Byse dispenses in his classroom to student (and court) efforts at
modeling. He described, at some length and with elegance, three models he
employs and which he has discussed with enviable sophistication and
persuasiveness in the literature. The net effect was to make a strong case for
a view of the due process clause that moved from utilitarian assessments of
efficiency and accuracy to a concern as well for the "person" who is protected
by its operation. Monaghan's presentation was to a different theme; as a
constitutional lawyer, he wondered how the question of due process could be
taught without focusing squarely on the issue that so bedevils the practi-
tioners of his craft, the legitimacy of judicial review.

Is not due process
analysis, even procedural due process analysis, intimately tied to the ques-
tion of substantive due process, of somehow reading value judgments into
the Constitution? Can one appropriately teach the subject without having
limned those who have so well exposed the difficulties in the judicial task of
constitutional interpretation?

The battle between realists and nominalists—between those who view the
pedagogic function as bringing students to doubt, question, or challenge all
generalizations whatever their source, and those who view it as the creation
of apt generalizations—is not a new one. (To be sure, Mashaw stated that he
preserved the element of doubt by encouraging students to challenge his
models. Yet the professional activity he displayed to his students, what they
would learn by watching and emulating him, was model building and

17. E.g., Jerry L. Mashaw, Administrative Law: The Quest for a Dignitary Theory, 61 B.U. L. 
model defense. One easily imagines that the same imbalance of authority, maturity, and knowledge that led him to prefer his to student models will almost inevitably make his defense appear successful—at least as an activity type—to most students.) The battle was not resolved, although it was enlightening and entertaining to have it so well carried forth. Neither Mashaw nor Byse, however, doubted the validity of the subject matter as one appropriate for the Administrative Law course; Monaghan struck more deeply. Neither approach is competent, he appeared to be saying, because neither asks the proper question. If the validity of administrative law as a discipline independently concerned with this issue is not put seriously into doubt, administrative lawyers must at least accept the constitutionalist's framing of the question.

At lunch we heard more broadly that we were teaching the wrong subject. Peter Hutt, a distinguished Washington lawyer, was clear that either we are not teaching administrative law or he is not practicing it: there is little correlation between what goes on in administrative law classrooms and administrative law practice, and students are greatly confused about what the area is or ought to be. The course must, he believes, build from the ground up. In part that means the adoption of Rabin's view, proceeding in the perspective of a particular agency; most emphatically, it means de-emphasizing courts and litigation. Over 90 percent of his practice, he asserts, is entirely informal, occurring outside hearings of any character. Litigation is avoided where it can be, and what the administrative law teacher must do is bring students to understand the variety of ways in which this can be done. The ideal course, working from the bottom up rather than from the top down, would begin with a sense of the history and mission of the agency with which one is concerned, a history which often predetermines both procedure and substance. A look at the statute will provide a sense of how to use it, of what procedures and what choices it opens. Much the larger proportion of the impact of any given statute can be inferred from the regulatory mechanism it establishes. Then one may consider what the style of given regulation is (hard-line enforcement or softer); what the agency's budget is and how the agency is treated by its appropriation committee; what the political atmosphere is and the attitude of important congressmen; what relationships exist between the agency and other federal agencies; what procedures it employs; who its personnel are and what their attitudes are; how competitors use or manipulate the statute for their own purposes; what the role of chance is in shaping the agency's agenda; what the general competence is of the staff being dealt with. One must know not only how to get meetings with agency officials but also what the publicity consequences are going to be of meeting with officials at varying levels; one must know what policy is likely to be driving the agency, for that will drive the procedures the agency chooses. And then there is the need to become thoroughly familiar with the mass of detail that bears on the particular issues to be presented for decision. Only then does one come to the point of exposure to public materials or public processes.

Again, the perception was possible, if not demanded, that our plate was being piled higher with necessary comestibles than any professor—much less
Teaching Administrative Law

student—could possibly digest. Here, as in the morning's discussion, one might have discerned the question, what is the role of theory in law teaching, particularly in teaching administrative law? If we are to focus on student interests, concerns, and attitudes, surely it is relevant that theory and its close relative, "black-letter law," rank high among their wants. A workable theory, like the assertion that there exists a general administrative law, permits a sense of mastery, an order, a structure from which ventures into the chaos of the real world can perhaps more safely be made. One might believe that only if one has a perspective from which to understand the world, simplified though it might be, can the effort at digestion of the world's rich body of data even begin.¹⁹

That leaves, of course, the question of what theory or theories best promote understanding; and the final session, "Lessons from the Social Sciences," provided a variety of nonlegal responses to that question. Peter Schuck and Susan Rose-Ackerman of Yale and Martin Shapiro of Berkeley presented perspectives from organization theory, social choice theory, and political science.

Organization theory, we learned from Schuck, can help generate insights about how agencies might behave if left to their own devices outside the matrix of legal and political controls within which they function; how legal rules about appropriate administrative behavior may have to contend with ideologies or political imperatives not readily overcome; and how the relationships between courts and their environments may impede the efficacy of some types of judicial remedy. Organization theory may help one perceive the interactions within agencies (between subordinate units) and between agencies and their outside contacts that often drive practical outcomes. Seeing how low-level officials tend to exert influence upward through the agency structure, rather than assuming that agencies respond to instructions from the top, or how negotiation rather than rationality drives administrative results, can be revealing for one's analysis of administrative function. Rose-Ackerman was similarly hopeful about the insights that could be brought to bear by public choice theory, which, she thought, might help us overcome a vague commitment to majority rule and lead us to think specifically about what might be accomplished by political or administrative

¹⁹ I do not intend to reject theory. Indeed I attempt to show that it is probably the most important thing about any human institution, and without it the institution loses its morale. People have got to believe before they will follow and in a rational climate of opinion they will inevitably give good livings to people who prove to them that their beliefs are rational. I lean neither for nor against this phenomenon; it is simply the way group mind operates and I see no reason to believe it will operate differently in the future. . . . I do not think that a purely objective point of view is pragmatically useful in operating a human institution. Its use is limited to the person who finds out about an institution. There is no necessary connection in knowing how an institution works and actually operating it any more than there is in knowing how football is played and getting out and playing the game. I therefore do not attempt to justify my work on the ground that it will have any particular pragmatic usefulness to persons in positions of governmental power. I have, however, the vague faith that in the course of time the more we find out about any institution the better it will be operated according to humanitarian standards. [Thurman Arnold to Jerome Hall, April 11, 1935, in Gene M. Gressley, Voltaire and the Cowboy: The Letters of Thurman Arnold 206 (Boulder, Co.: Colorado Associated Univ. Press, 1977)]
bodies. She reviewed briefly the work of a number of recent writers who might help one understand how fairness can be viewed as a product of opportunity costs and trade-offs; how bureaucratic controls over the flow of information to Congress influence bureaucratic relationships with the Congress; how legislators' own priorities (notably about reelection) may influence them in selecting the legal mechanisms they employ, so as to increase their exposure to constituents; and the like. Shapiro then spoke from the perspective of political science, seeking to demonstrate in very brief compass how the reigning political theories of one generation create the judicial/administrative theories of the next. Classic liberalism and notions of the separation of powers, he suggested, generated the nineteenth century's refusal to recognize administrative law; suits were brought against individual government officials and no special interest of the state was recognized. When, recently, group interactions rather than individual interactions came to be seen as the key to understanding our political institutions, access to government became the central issue of political theory and broadly expansive standing notions and diminution-of-ripeness concerns followed naturally in their wake; rule making then came into vogue as an important procedure. Today, the group theory of politics is being challenged because, while the theory treats all groups as equal, all groups plainly are not equal, and also because group theory is a form of positivism. Shapiro sees us returning to a sense that some ideas or ethics are better than others. Concommittantly, he expects to see a reassertion of demand for rationality, for reaching not merely responsive but also best outcomes, and a resulting return of control from the courts to the technocrats in the agencies. Courts will simply be unable to penetrate the analyses the agencies provide them, and the public will want more assurance that an outcome is correct or not than whether proper procedures were employed.

From one perspective, the afternoon's session underscored the continuing problems of definition and focus in our field. The speakers created a multiplying complexity of insights. No doubt it is my own failing, yet a strong sense of vertigo attacks me whenever I see that to understand well what is being argued to me I shall have to master two or three disciplines other than my own. One has here a basis for profound empathy with our students: how can I ever bring even a small fraction of this within my grasp? The speakers from outside administrative law might be seen to have questioned whether we can exist as a meaningful discipline within law. Those from within struck old themes, never yet resolved. My initial reaction was one of resignation; it remains our quixotic dilemma to respond to the terrible restraints on what we can do as teachers and as scholars by stuffing more content into


what we must teach or into what we must learn, at the risk of appearing irrelevant to the profession for which we train and unappealing to the students we serve. It seemed fitting, in a way, that no one tried to sum up the conference and we drifted away into the foggy damp of the New Orleans afternoon.

Yet the flight home produced a different feeling. There in a few pages of a recent *Harvard Law Review*, was Frank Easterbrook using Arrow’s Theorem—the basic tool, as I understand it, of social choice or public choice theory—to demonstrate a striking proposition about court behavior. It is impossible, Easterbrook asserts, to produce consistency from the judgments of nine justices about issues influenced by a multiplicity of values. If, then, Mashaw is building his models as if the Court were to use them, as if they would subdue the universe, he is wrong and Byse is right; we can only expect inconsistency to continue, and we can only train our students, who will be lawyers, to deal with that as best they can. But, Easterbrook also explains, the impossibility is present only for the collective nine; consistency can be demanded of any individual justice, and from that perspective Mashaw’s work—it is, at root, for his own understanding that he works—has high value. One may oneself strive for a model, for a valid structure of decision, without having to believe that it will provide the measure by which the real world’s results can or will be organized or judged. The multiplicity of experience is not so readily subdued. And that suggests, in turn, viewing the workshop itself not as an occasion for answers but as a source of suggestions and the creative sharing of collective ignorance.

Our concern must be not only for ourselves and our subject matter but also for our students and the process by which they learn. The latter are too often hidden from view, as I think they were at New Orleans. Keeping them in view could help avoid what might be described as the Strasbourg-goose theory of education, in which passive students are forcefed whatever it is an adequate education demands. Of course, viewing the proceedings as a tempting buffet rather than mandatory alimentation—with a sense of adventure substituted for one of obligation—produces responsibility as well as stimulation. Yes, we have been shown new directions to pursue; none need accept that any of the routes suggested is the one that must be taken. There is no Grail—“Lighthouse No Good,” as Dean Prosser once wrote—and there may be sources of renewed wonder.

That leaves each of us with the responsibility of working out for ourselves and our students an approach that will permit a different chemistry. Here I think one would have to consider elements the workshop conveners worked hard to exclude—the process and ambience of the classroom, the position, expectations, and contributions of the students. Perhaps if one starts with the questions how to organize the student sense of what is not known and how to induce a thirst for finding, one will be more successful than in attempting to convey the evanescent known. Reassessing what is fundamental, and beginning with what students are likely to perceive or undere-

stand as fundamental, as worthy of the intellectual chase, may suggest means both to pare away at what is currently taught and to select among the variety of new and developing perspectives that may aid the pursuit. Lewis Thomas, writing recently about the art of teaching science, penned the following words, words which with little alteration seem to speak as loudly to us:

Everyone seems to agree that there is something wrong with the way science is being taught these days. But no one is at all clear when it went wrong or what is to be done about it. . . .

I suggest that the introductory courses in science, at all levels from grade school through college, be radically revised. Leave the fundamentals, the so-called basics, aside for a while, and concentrate the attention of all students on the things that are not known. . . .

Science, especially 20th Century science, has provided us with a glimpse of something we never really knew before, the revelation of human ignorance. . . . Let it be known, early on, that there are deep mysteries and profound paradoxes revealed [only] in distant outline by modern physics. . . . Part of the intellectual equipment of an educated person . . . ought to be a feel for the queerness of nature, the inexplicable thing, the side of life for which informed bewilderment will be the best way of getting through the day.

. . . Biologists, caught up by the enchantment of their new power, armed with flawless instruments to tell the nucleotide sequences of the entire human genome, nearly matching the physicists in the precision of their measurements of living processes, will resist the prospect of broad survey courses; each biology professor will demand that any student in his path master every fine detail within that professor's research program. . . .

But maybe, just maybe, a new set of courses dealing systematically with ignorance in science will take hold. The scientists might discover in it a new and subversive technique for catching the attention of students driven by curiosity, delighted and surprised to learn that science is exactly as the American scientist and educator Vannevar Bush described it: an "endless frontier." The humanists, for their part, might take considerable satisfaction in watching their scientific colleagues confess openly to not knowing everything about everything. And the poets, on whose shoulders the future rests, might, late nights, thinking things over, begin to see some meanings that elude the rest of us. It is worth a try. . . .

"How, at the outset, do we organize our ignorance to inspire students to defeat it?" may be a better question for us, also, than "How shall we organize what we know?"

24. Thomas, supra note 1.