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Authors

Salzman, James
Ruhl, J.B.

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Mozart and the Red Queen: The Problem of Regulatory Accretion in the Administrative State

J.B. RUHL* AND JAMES SALZMAN**

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* Matthews & Hawkins Professor of Law, Florida State University College of Law.

** Emalee Godsey Scholar, Professor, Washington College of Law, American University. We are grateful for the encouragement, input, and comments received from William Buzbee, David Driesen, Sandy Gaines, Lewis Grossman, Neil Gunningham, Phillip J. Harter, Dennis Hirsch, Jeff Lubbers, Timothy Malloy, David Markell, Todd Rakoff, Cliff Rechtschaffen, David Spence, Dan Tarlock, and Buzz Thompson, and the participants in law faculty workshops at Stanford University, American University, and Florida State University. We also appreciate the assistance that the American Bar Association's Section on the Environment, Energy, and Resources provided by facilitating our survey of attorney attitudes regarding regulatory compliance, discussed *infra*, and that of the Florida State University College of Law for funding the survey. Please direct comments to jruhl@law.fsu.edu and salzman@wcl.american.edu.

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Having just composed his first opera for Emperor Joseph II, Mozart asks if His Majesty is pleased:

> *Emperor: Well, my dear fellow, there are, in fact, only so many notes the ear can hear in the course of an evening.... Your work is ingenious. It's quality work, and there are simply too many notes. That's all. Just cut a few and it will be perfect.*
> *Mozart: Which few did you have in mind, Majesty?*[1]
>
> * * * * *
>
> *"Well, in our country," said Alice, still panting a little, "you'd generally get to somewhere else—if you ran very fast for a long time as we've been doing."*
> *"A slow sort of country!" said the Queen. "Now, here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that."*[2]

INTRODUCTION

Picture a law professor's wistful dream—to be transported from office hours to a tropical paradise across the sea and crowned the benevolent monarch. This enlightened ruler has the wisdom to craft the perfect rule to fit any social problem. Each rule in the kingdom is cost-efficient, clear, and born only of good

1. This exchange is from a scene in the movie *Amadeus*. AMADEUS (Orion Pictures Corp. 1984).
2. LEWIS CARROLL, *Through the Looking Glass*, *in* THE ANNOTATED ALICE 210 (Martin Gardner ed., 1960).

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intention. All the monarch's subjects work diligently to comply with every rule, which should be easy because, after all, every rule is perfect. But even in this land of worthy sovereign and good-minded subjects, rules multiply as new social problems arise and old ones evolve.

Looking out across the domain one day, the professor-turned-monarch notices the accretion of rules and muses, "Does the number of rules matter?" His seasoned advisors point out the obvious—as the number of rules increases, the effort and information required to comply with them increase as well. But the monarch has something different in mind. Could it also be, he wonders, that as the number of efficient, clear, and institutionally valid rules increases, the collection of laws will not possess these qualities, although they are found in each individual law? Put another way, as rules multiply, does the *quantity* of rules affect the *quality* of the legal system itself? If so, the task of achieving full compliance may become more difficult and costly—not only because of the added effort and information needed to comply with the mounting rules, but also because of the ways in which the rules interrelate. And, if that is so, then the design of any one rule ought to take into account the other rules—each rule must be designed to operate within the *system* of rules.

Our hypothetical sovereign's quest for perfect rules is not new to legal theory. Over the last century, the proper design of rules has firmly rested as a cornerstone of legal scholarship. Duncan Kennedy described the "formal realizability" of regulations.[3] Colin Diver sought to define the "optimal degree of regulatory precision."[4] Carol Rose unearthed the "crystals and mud" of property law.[5] And many other scholars have shed light on the multi-faceted trade-offs between rules and standards.[6] Indeed, the design of rules runs to the very heart of our legal system. If ours is a nation based on the rule of law, then surely we should strive to craft effective rules that citizens can understand, regulators can enforce, and courts can apply.

Much of the scholarship in this field has focused on the administrative state. This emphasis is entirely fitting, for while rules promulgated by agencies have created obvious benefits, they have equally generated economic and liberty costs to regulated parties and society at large.[7] In recent years, these costs have

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3. Duncan Kennedy, *Form and Substance in Private Law Adjudication*, 89 HARV. L. REV. 1685, 1687–89 (1976).

4. Colin S. Diver, *The Optimal Precision of Administrative Rules*, 93 YALE L.J. 65, 71–79 (1983).

5. Carol M. Rose, *Crystals and Mud in Property Law*, 40 STAN. L. REV. 577, 600–01 (1988).

6. *See, e.g.*, P. S. ATIYAH & ROBERT S. SUMMERS, FORM AND SUBSTANCE IN ANGLO-AMERICAN LAW: A COMPARATIVE STUDY OF LEGAL REASONING, LEGAL THEORY, AND LEGAL INSTITUTIONS *passim* (1987); RICHARD A. EPSTEIN, SIMPLE RULES FOR A COMPLEX WORLD *passim* (1995); H. L. A. HART, THE CONCEPT OF LAW 127–32 (1961); Ronald M. Dworkin, *The Model of Rules*, 35 U. CHI. L. REV. 14, 22–29 (1967); Louis Kaplow, *Rules Versus Standards: An Economic Analysis*, 42 DUKE L.J. 557 *passim* (1992); Kennedy, *supra* note 3 *passim*; Roscoe Pound, *Hierarchy of Sources and Forms in Different Systems of Law*, 7 TUL. L. REV. 475, 482–87 (1933); Cass R. Sunstein, *Problems with Rules*, 83 CAL. L. REV. 953 *passim* (1995).

7. Take air pollution regulations, for example:

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been criticized by those marching under the broad banner of regulatory "reform," with its clarion calls for greater deregulation and simplification of rules, and by those who argue in the alternative for increased use of "common sense," "cooperative regulation," and other forms of what is generally referred to as regulatory "reinvention."[8] But if, like Dante, one is foolhardy enough to descend into the lower circles of the regulatory reform and reinvention infernos, even without a guiding Virgil it soon becomes apparent that many of regulation's critics have lumped together distinct concerns that require equally distinct solutions.

In fact, reformers and reinventors alike have bundled together at least three distinct critiques of rulemaking in the administrative state. The most prevalent alleged rule defect is inefficiency. As economists and others have pointed out, rules may prove socially harmful when total costs to society exceed total benefits. Inefficient regulations, they charge, reduce the resources available for socially important needs. This results in higher social costs, such as unemployment, poorer health, and lower standards of living. According to those who condemn the inefficiency of regulation, rules should justify their costs by providing equal or greater benefits.[9] The second criticism of rulemaking in the

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> Regulatory controls have helped to produce substantial decreases in both the levels and emissions of major pollutants, including sulfur dioxide, carbon monoxide, lead, and nitrogen dioxide. Ambient concentrations of lead have decreased especially dramatically, declining eighty-five percent between 1975 and 1988; transportation emissions of lead decreased from 122.6 million metric tons in 1975 to 3.5 in 1986. . . .
>
> . . . .
>
> . . . [But equally,] the United States spent no less than $632 billion for pollution control between 1972 and 1985, and some studies suggest that alternative strategies could have achieved the same gains at less than one-fifth the cost.

Cass R. Sunstein, *Paradoxes of the Regulatory State*, 57 U. CHI. L. REV. 407, 409, 411 (1990).

8. For a discussion of a "common sense" approach, see, for example, PHILIP K. HOWARD, THE DEATH OF COMMON SENSE: HOW LAW IS SUFFOCATING AMERICA *passim* (1994); for cooperative regulation, see, for example, David B. Spence, *Can the Second Generation Learn From the First? Understanding the Politics of Regulatory Reform*, 29 CAP. U. L. REV. 205, 218–20 (2001); for simplification, see, for example, Kendall L. Houghton & Walter Hellerstein, *State Taxation of Electronic Commerce: Perspectives on Proposals for Change and Their Constitutionality*, 2000 BYU L. REV. 9, 50–52; for reinvention, see, for example, Daniel J. Fiorino, *Rethinking Environmental Regulation: Perspectives on Law and Governance*, 23 HARV. ENVTL. L. REV. 441 *passim* (1999); Richard D. Stewart, *A New Generation of Environmental Regulation?*, 29 CAPITAL U. L. REV. 21 (2001).

9. On file with James Gattuso, Research Fellow in Regulatory Policy, Heritage Foundation. As Tom McGarity has described:

> Other critics believed that agency personnel were not sufficiently analytical in thinking about regulation and its social impact. If internal agency decision-making procedures could apply comprehensive analysis to regulatory problems, agencies would reach more reasoned, and perhaps less burdensome, results. Regulatory reform, in this view, consisted of restructuring agency decision-making processes to include rational-thinking policy analysts, preferably with training in economics, to ensure appropriate sensitivity to the economic impact of regulatory efforts.

Thomas O. McGarity, *Regulatory Analysis and Regulatory Reform*, 65 TEX. L. REV. 1243, 1245 (1987); *see also* John Graham, *The Failure of Agency-Forcing: The Regulation of Airborne Carcinogens under*

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administrative state is complexity. One need not toil long in any regulatory field before finding that agencies often produce rules that are complicated, difficult to understand, ambiguous, or contradictory.[10] As a result, it becomes difficult for a regulated party to know whether it is in compliance with a particular law. Those criticizing the complexity of regulation argue that rules should be more clear. The third critique is institutional and concerns the democratic deficit of the administrative state. Institutions creating regulations, critics charge, are not sufficiently accountable to voters and are too vulnerable to rent-seeking by special interests.[11] Rules should be free of these institutional biases. Reformers promise to weed out the defective rules; reinventors promise that a new kind of regulatory state will avoid promulgating them in the first place.

During the past decade, these three critiques have provided a prolific source of legal scholarship. But they omit a fourth concern, which we shall explore in this Article. Our focus is on neither the efficiency of regulation, the complexity and indeterminacy of a particular rule, nor the institutional accountability of agencies. Rather, we are intrigued by the challenges presented by another attribute of the administrative state, one that is widely acknowledged but seldom considered—a problem we call "regulatory accretion."[12]

Section 112 of the Clean Air Act, 1985 DUKE L.J. 100 *passim* (arguing that Clean Air Act provisions allow the EPA to make some decisions without sufficient legislative guidance in the face of scientific uncertainty); Robert W. Hahn & John A. Hird, *The Costs and Benefits of Regulation: Review and Synthesis*, 8 YALE J. ON REG. 233 *passim* (1991) (synthesizing previous works on the costs and benefits of regulation and estimating the general impact of federal government regulations).

10. *See, e.g.*, Richard J. Lazarus, *Meeting the Demands of Integration in the Evolution of Environmental Law: Reforming Environmental Criminal Law*, 83 GEO. L.J. 2407, 2429–38 (1995); Clifford Rechtschaffen, *Deterrence vs. Cooperation and the Evolving Theory of Environmental Enforcement*, 71 S. CAL. L. REV. 1181, 1201–02 (1998); Peter H. Schuck, *Legal Complexity: Some Causes, Consequences and Cures*, 42 DUKE L.J. 1 *passim* (1992).

11. As Tom McGarity has observed:

> Some of these critics argued that bureaucrats made bad decisions and tended to overregulate because they were not sufficiently accountable to the President, to Congress, and ultimately to the voters. Thus, to these critics, regulatory reform meant bureaucratic accountability. Prescriptions for improved accountability included more stringent presidential oversight of administrative rulemaking and broadened public participation in the rule-making process.

McGarity, *supra* note 9, at 1245. Dick Stewart has explained this in historical terms:

> Madison identified the problem of factional domination in territorially limited government. The growth of the national regulatory welfare state, however, has spawned a new form of factional domination. By an irony of inversion, Madison's centralizing solution to the problem of faction has produced Madison's Nightmare: A faction-ridden maze of fragmented and often irresponsible micro-politics within the government. The post-New Deal constitutional jurisprudence of majoritarian politics has helped produce this result, because the demands for national regulatory and spending programs have outstripped the capacity of the national legislative process to make decisions that are accountable and politically responsive to the general interest. This has subverted the very premises of Madisonian politics.

Richard B. Stewart, *Madison's Nightmare*, 57 U. CHI. L. REV. 335, 342 (1990).

12. "Accretion," used frequently in geological contexts, means "an increase by natural growth or by gradual external addition; growth in size or extent." RANDOM HOUSE WEBSTER'S UNABRIDGED DICTIONARY

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Since the New Deal, and even before, regulatory law has grown massive, detailed, and encompassing. The sentiment, "there's too much law," surely rings true to both practitioners and regulated parties, but there is remarkably little scholarship delving into this glib cliché. Scholarly elaborations on "optimal precision" and "mud and crystals" explore the design of individual regulations—and are valuable in that sense—but they do not examine the systemic implications of regulatory accretion. As easy as it is to find quips in the literature decrying the accumulation of "too many rules," one searches in vain for principled analysis of the problem and its solutions.[13]

Perhaps because accretion is so obvious a problem, it does not warrant further consideration. Or does it? Practitioners respond to the question with a resigned shrug of the shoulders and a lifted eyebrow, as if to say, "Sure, it's a problem, but that's the way it is." We argue, instead, that regulatory accretion warrants serious consideration in its own right. Accretion presents a different kind of problem than inefficiency, complexity, or institutional bias. It creates a separate type of challenge that has not, and will not, be addressed adequately by many of the entries in the current parade of proposed reforms and reinventions.

Part I of this Article describes the phenomenon of regulatory accretion from several perspectives. We start by using the hypothetical professor-turned-monarch to isolate regulatory accretion as an independent variable in the operation of regulatory systems, separate from the three conventional topics of administrative law scholarship—efficiency, clarity, and institutional accountabil-

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13 (2d ed. 1997). Previous law review articles have also used accretion, and other geological terms, to describe the growth of environmental law. For example:

> [E]nvironmental law is the result of an additive process where layer upon layer is added to the preexisting strata as if guided by the laws of geology. There are occasional reductions in this cumulative mass (for example, the repealers that are featured in high school civics classes), but they are far outnumbered by the additions, accretions, faults, folds, and fractures that mar the surface and shape the deep content of this legal world.

William H. Rodgers, Jr., *Defeating Environmental Law: The Geology of Legal Advantage*, 15 PACE ENVTL. L. REV. 1, 1–2 (1997). And:

> The field's legal terrain likewise ranges broadly, from common law, constitutional issues, the subtle vagaries of multilayer statutory accretions and administrative quagmires to international and comparative law and contending theories of societal governance.

Zygmunt J.B. Plater, *Environmental Law and Three Economies: Navigating a Sprawling Field of Study, Practice, and Societal Governance in which Everything is Connected to Everything Else*, HARV. ENVTL. L. REV. 359, 360 (1999).

13. As a simple example, a LEXIS search of "too many regulations" turned up more than 300 articles; yet, beyond acknowledging the problem of regulatory growth, none of these articles took the next step and considered the problem in isolation. Articles on regulatory relief, public choice theory, and other topics often identify concerns over accretion, but accretion has yet to be considered on its own terms. We found only one article that considered the issue in depth. Written in 1977 by Bayless Manning, former Dean of Stanford Law School, the article focuses on "hyperlexis," the "pathological condition caused by an overactive law-making gland." Bayless Manning, *Hyperlexis: Our National Disease*, 71 NW. U. L. REV. 767 (1977). A short piece, the article sketches the dimensions of the problem and lays out a range of possible reforms, including greater use of cost-benefit analysis, sunset laws, program evaluation, and simplifying the law.

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ity. To describe regulatory accretion, we then define a range of metrics, showing that over the last fifty years, regulatory growth has been the rule rather than the exception using virtually any measure. We also show why regulatory law theory suggests that we should expect accretion to be the dominant dynamic in regulatory systems, overwhelming any forces of "regulatory erosion." We close Part I with evidence from a variety of sources, including a survey we conducted of attorneys practicing environmental law, that the regulatory community—both regulators and the regulated—perceives regulatory accretion as a significant factor in the prevalence of noncompliance and the thwarting of policy objectives.

Part II lays out our theory of how regulatory accretion, even of rules that are perfectly efficient, clear, and institutionally valid, increases noncompliance by changing the very quality of the operation of the regulatory system. Rules impose what we call information burdens and effort burdens on compliance behavior. These burdens have been the focus of most of the literature on regulatory compliance. The conventional view is that compliance is simply a matter of (1) investing the appropriate level of resources toward gathering the information needed to perform the tasks required to comply (information burden) and (2) performing those tasks (effort burden). However, accretion of rules introduces a third challenge to compliance, however, which we call system burdens.

System burdens arise from the collective operation of rules. Drawing from complex systems theory—the study of large systems of dynamically related agents—we explain how regulatory systems exhibit behaviors such as feedback, emergence, path dependence, and nonlinearity, all of which simultaneously produce overall system resilience and locally unpredictable and unstable outcomes in system behavior. Accretion of a complex system's agents can amplify these system properties, changing the underlying character of the system itself. It is these qualitative effects on system behavior, principally local unpredictability and instability, which we equate with system burdens on compliance with regulatory law. Although overlooked in regulatory law theory, system burdens can confound an organization's ability to comply even when it devotes sufficient resources to meeting all the information and effort burdens.

In Part III, we explore the practical implications of system burdens. There is always bound to be some residual or background noncompliance, what regulatory law theory calls "slippage."[14] Additional investment in enforcement and other means of influencing compliance behavior may chip away at this residual noncompliance, but it will not do so with equal success across the three forms of compliance burdens. Because it is not associated with discrete rules, noncompliance stemming from system burdens will be much harder to resolve than noncompliance related to effort and information. In regulatory fields that experi-

14. *See, e.g.*, Daniel Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 HARV. ENVTL. L. REV. 297, 298 (1999).

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ence high levels of system burdens, such as environmental law, there will be high rates of noncompliance; and, more importantly, compliance itself may be difficult to translate into a tangible policy goal "payoff." This combination can lead the regulated community to value compliance behavior less and to question the legitimacy of the system in general.

In Part IV, we offer observations about how regulatory law can respond to the problem of accretion. We describe the fallacy of rule-specific solutions that dominate conventional regulatory reform proposals, positing instead that any meaningful response must tap into system-level behaviors. Because of the focus in regulatory law and theory on efficiency, clarity, and institutional validity, conventional reform approaches generally describe problems in rule-specific terms; they posit that, by tweaking a few here and removing a few there, it is possible to fine-tune the regulatory system to eradicate undesired burdens on compliance. But like Emperor Joseph's feeble suggestion that Mozart remove a few notes from his opera, it is not so easy to identify which rules to revise or remove so as to eradicate the system burdens that contribute to noncompliance (and other policy failures). Clearly, Mozart thought that every note in his symphony was perfect. Even if one could devise a regulatory system in which every rule in itself is perfect—efficient, clear, and institutionally pure—system burdens would arise, and regulatory reformers would stand in Emperor Joseph's shoes. After all, which perfect rules should be removed?

Of course, no perfect rule should be removed. This is the ultimate paradox our model reveals: Although the number of rules in the administrative state may trigger system burdens that interfere with the very goals of regulation, the solution is not—it cannot be—to reduce the number of rules. Nor can selective tinkering solve the problem. Rather, as we explain in Part IV, the best strategy for managing system burdens is to evolve with them. Like the Red Queen, we can only hope to keep up; yet myopic attention to each rule will soon put us off pace in that race. Instead, the focus should be on building adaptive structures in the administrative system itself so as to take advantage of the system-wide nature of large, rule-based regimes. We show that the emerging body of literature on regulatory reinvention offers a promising foundation for adopting this approach through its focus on market-based, information-based, and performance-based regulatory instruments.

Indeed, regulatory reform and regulatory reinvention are often portrayed as joined at the hip, but we see them as fundamentally distinct. To be sure, both are born of the widespread sentiment that conventional "command-and-control" regulation has run its course in many fields. Professor Arnold Reitze sums up the mood in observing that "we cannot save the environment just by creating more regulations."[15] True enough, but what do we do instead? If the future of environmental law and similar heavily regulated fields is not "more regula-

15. Arnold W. Reitze, *A Century of Air Pollution Control Law: What's Worked; What's Failed; What Might Work*, 21 ENVTL. L. 1549, 1642–43 (1991).

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tions," what is it? Regulatory reform uses instruments such as barriers to regulation and outright repeal to impede or reverse the tide of rule accretion and thereby relieve system burdens. It will not work because that agenda can be implemented only on a rule-specific level that has no hope of capturing and managing system-level effects. Unless we dismantle the regulatory system entirely, it will always exhibit system burdens. Regulatory reinvention, by contrast, holds the promise of changing the kinds of regulations that are promulgated, focusing on regulatory designs that recognize the system-level dynamics of regulation and realize their properties of resilience and sustainability. With that objective in mind, our model of regulatory accretion offers not only original insights into why deregulation and other blunt instruments of regulatory reform offer little promise as a comprehensive strategy, but also, and more importantly, a central principle on which to design the next generation of regulation.

I. UNDERSTANDING REGULATORY ACCRETION

Many cogent policy proposals have been offered to resolve the conventional critiques of rules in the administrative state described above. Proponents of efficiency have argued, most visibly in the Contract with America, that greater attention should be devoted to cost-benefit analysis and risk assessment in screening rules to ensure that our resources flow efficiently to address the greatest risks.[16] Complexity critics call for greater use of plain language and common sense in drafting, as well as information hotlines and other outreach efforts.[17] Concerns over democratic accountability have been addressed through greater use of negotiated regulations and stakeholder engagement.[18] In practice, these cures have proven limited and may even cause their own ills, but they at least hold the potential to cure their respective maladies.

With respect to accretion, however, policy approaches seem to be operating at the level of leeches and bloodletting. The gauntlet of review requirements for major regulations makes it more costly to promulgate rules and therefore should help to curb accretion—but this approach is indirect at best.[19] Direct initiatives to cull regulations have been abject failures.[20] While the road to Washington is littered with campaign pledges to get government off people's backs and reduce the number of rules agencies promulgate, no one has come up with a good way to do this. Why the repeated failures?

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16. The Contract with America was clearly expressed in the regulatory reform bills that passed the House of Representatives in 1995. The measures would have required quantitative risk assessment and cost-benefit analysis. *See* Robert L. Glicksman & Stephen B. Chapman, *Regulatory Reform and (Breach of) The Contract With America: Improving Environmental Policy or Destroying Environmental Protection*, 5 KAN. J. L. & PUB. POL'Y 9 *passim* (1996).

17. *See, e.g.*, Rechtschaffen, *supra* note 10, at 1234–35.

18. *See generally* Jody Freeman, *Collaborative Governance in the Administrative State*, 45 UCLA L. REV. 1 (1997) (reviewing collaborative governance influences on the health and environmental fields).

19. *See infra* text accompanying notes 61–77.

20. *See infra* text accompanying notes 47–60.

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We believe the reason this relentless accretion of rules merits serious consideration is the effect it has on the system of rules. To appreciate why, consider a simple thought experiment of a reinvented administrative state that promulgates only smart rules. Imagine, once again, a hypothetical professor-turned-monarch ruling in a "Regulatory Kingdom"—a ruler whose every decree satisfies the three core concerns described above: inefficiency, complexity and institutional bias. Our Regulatory Kingdom thus has three boundary conditions that apply to each rule considered individually. First, each and every rule is efficient, with a favorable cost-benefit ratio. Second, every rule is clear, with no ambiguity or uncertainty over its requirements. And third, each rule is developed in a transparent process, responding to public concerns rather than reflecting the biases of agency or special interests. As a result of these conditions, inefficient, unclear, or institutionally defective laws are either never promulgated or quickly removed from the statute books.

This may seem an ideal situation, attractive to regulatory reformers of all colors and stripes. But is it possible that our system of efficient, clear, and institutionally valid rules will not possess these same qualities found in each individual law? Put another way, it is reasonable to assume that most actors are subject to more than one law and thus perceive regulatory law as a system of requirements, prohibitions, and allowances. So the real question is not whether the actor believes any *individual* law meets the three conditions, but whether the *system* as a whole meets them.

As the number of rules increases, the effort and information to comply surely increases, but we suggest a qualitative change occurs as well. If the number of laws were to double overnight how much harder would it be to ensure compliance? Would we not expect the addition of new rules to influence existing rules, and how the regulated community responds?

Paradoxically, even in a system comprised of individually perfect rules—rules that satisfy the three qualities of efficiency, clarity, and freedom from institutional bias—accretion can change the very nature of how the overall system of rules operates.[21] In a quantum effect, the sheer number or mass of rules may itself create conditions that, despite good faith efforts, hinder full compliance and impede the ability of government to demonstrate its efficient delivery of regulation's purported benefits.[22] Doubling the number of rules may

21. This paradox is distinct from the problem caused when the desire for specificity and clarity in rules—qualities that ought to assist regulated parties in knowing what is expected of them—leads to rules that become so detailed as to become incapable of being comprehended or administered. Duncan Kennedy has called this the problem of "reverse administrability." Conversation with Duncan Kennedy, Carter Professor of General Jurisprudence, Harvard University Law School (Mar. 12, 2000). Our concern is whether the number of rules in the system affects the operation of the system, independent of the content of the rules.

22. Of course, if we relax the boundary conditions even slightly, any such system-wide failure effect is amplified. If a fair number of individual laws are even slightly unclear, slightly cost inefficient or slightly overbroad, the cumulative system-wide failure effect can be quite significant. We assume for

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more than double the efforts needed to ensure compliance. Taking environmental law as an example, which we shall do throughout this article, the net result of regulatory accretion may be that many regulated entities do not know—and cannot ensure practically—that they are fully in compliance. Nor can such entities easily and directly identify how their compliance serves a particular policy goal. Regulatory law rests on the fundamental premise that enforcement of rules and facilitation of compliance behavior can close this gap; yet noncompliance remains a significant, seemingly intractable residual in many fields of regulation.[23] Importantly, we suspect that regulatory accretion may account for a significant amount of the noncompliance experienced in environmental law, which, as we shall show, is surprisingly prevalent.

If this "good faith noncompliance" does indeed occur (and this certainly

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our purposes that such individual failures can be identified and corrected; again, our interest is in whether the number of rules in the system matters and, if so, what to do about it.

23. For example, a 1996 survey of corporate counsel at major firms found that two-thirds believed their businesses had operated in violation of environmental laws at some time during the prior year. Nearly 70% did not believe absolute compliance was achievable. Rechtschaffen, *supra* note 10, at 1202 (citing Marianne Lavelle, *Environmental Vise: Law, Compliance*, NAT'L L.J., Aug. 30, 1993, at S1). "Among major facilities in five industrial sectors, the rate of noncompliance with Clean Air Act (CAA) requirements is approximately 40%." Joel A. Mintz, *Scrutinizing Environmental Enforcement: A Comment on a Recent Discussion at the AALS*, 30 Envtl. L. Rep. (Envtl. L. Inst.) 10,639, 10,640 (2001). Startlingly:

> Noncompliance has also been a serious problem with respect to water pollution. For example, some twenty years after the passage of the Clean Water Act, roughly 10,000 dischargers still had no permits whatsoever, twelve to thirteen percent of major private and municipal sources were in a "Significant Noncompliance" status during a single three-month period alone, and another five percent of industrial sources avoided that status only because they were already on extended compliance schedules. The situation was even worse for companies discharging into sewage systems rather than waterways: thirty-five percent were in "significant" violation of discharge standards. Even the more optimistic estimates of compliance are in the seventy-five percent range, which is not at all discreditable but does mean that a quarter of sources are noncomplying in some respect.

Farber, *supra* note 14, at 304–05; *see also* Mike Ferullo, *30 Percent of Large Facilities Violated Their Permits in Past 15 Months, Group Says*, 33 Env't Rep. (BNA) 1765 (Aug. 9, 2002) (study of Clean Water Act permit violations based on facility self-reporting records). Similarly, in a controversial report released late in 2002, the U.S. Public Interest Research Group claimed that more than 5000 of the major facilities regulated under the Clean Water Act (81% of the total)—those discharging more than one million gallons of wastewater per day—released more pollutants into water bodies than allowed under their Clean Water Act permits. *See* PUBLIC INTEREST RESEARCH GROUP, *In Gross Violation: How Polluters are Flooding America's Waterways with Toxic Chemicals*, at 3 (Oct. 2002), *available at* http://www.uspirg.org/reports.

Another measure of the prevalence of noncompliance is the staggering level of enforcement activity in which the Environmental Protection Agency engages. In its fiscal year 1999, for example, the EPA initiated a combined 3935 administrative and civil enforcement actions. It obtained $61.5 million in criminal fines, $141.2 million in civil penalties, and $3.4 billion in injunctive relief involving the correction of violations, the highest ever. *See* U.S. EPA, OFFICE OF ENFORCEMENT AND COMPLIANCE ASSURANCE, ANNUAL REPORT ON ENFORCEMENT AND COMPLIANCE ASSURANCE ACCOMPLISHMENTS IN 1999 5–7 (2000). The next year the agency initiated over 6000 enforcement actions and collected $122 million in criminal fines and $102 million in civil fines. *See* Press Release, U.S. EPA, EPA Releases FY 2000 Enforcement and Compliance Assurance Data (Jan. 19, 2001), *available at* http://yosemite.epa.gov/opa/admpress.nsf (last visited May 14, 2003).

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was our personal experience when we worked in the private sector),[24] then the problem of accretion deserves some clear thinking because it presents a *different* type of challenge than inefficiency, complexity, or institutional failure. To date, the conventional approaches to regulatory reform have been regulation-specific. The concerns of efficiency, clarity, and accountability operate on—and can be addressed at—the level of discrete rules. But one cannot predictably influence a system-wide effect by tinkering with individual rules. In our imaginary Regulatory Kingdom, for example, all laws are already "perfect laws."[25] Nonetheless, as we describe herein, the Regulatory Kingdom may yet suffer from too much of a good thing. Without attending to the systemic features that accretion introduces, even a system of individually perfect laws eventually generates imperfections that will defy easy cures.

As a result, our inquiry must turn to addressing the problem of "too much law." Even this deceptively simple description rests atop questions with no obvious answers. What do we mean when we say there is too much law? How do we get too much law? Is accretion inevitable? Why is this is a problem? What are the consequences of this situation for the regulators and the regulated community? And what should be done about it?

In this Article, we explore each of these questions.[26] We begin doing so in this section by examining the problem of "too much law" from three perspectives. First, from the quantitative perspective, we describe metrics to define how much law there is, and we show that regulatory law is growing by leaps and bounds. Second, from a qualitative perspective, we show that regulatory theory predicts the tendency toward accretion of rules rather than stasis or erosion. Finally, from a cognitive perspective, we examine the perceptions of regulators and the regulated community regarding the effects that accretion has on compliance performance and policy performance.

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24. Prior to entering academia, both authors worked extensively with regulated parties. J.B. Ruhl was a partner at Fulbright & Jaworski, LLP., and Jim Salzman was European Environmental Manager at S.C. Johnson Wax.

25. This way of framing the problem demonstrates that Occam's Razor (simply eliminating the most troublesome rules) is not the solution. We would not want to remove a perfect law from the imperfect system. Our three premises imply that Occam's Razor is already satisfied; and, as noted above, the scholarship and proposed reforms (perhaps out of necessity) have been regulation-specific.

26. In previous work, one of us has examined the contribution that a burgeoning number of rules, along with other factors, makes generally to the rise of systemic burdens on the ability of the administrative state to achieve policy goals efficiently. *See* J.B. Ruhl & Harold J. Ruhl, Jr., *The Arrow of the Law in Modern Administrative States: Using Complexity Theory to Reveal the Diminishing Returns and Increasing Risks the Burgeoning of Law Poses to Society*, 30 U.C. DAVIS L. REV. 405 (1997). In this Article we develop a more robust model for describing the accretion of rules as a discrete, independent variable influencing the legitimacy of the administrative state's system of rules, with particular attention to the practical effects on the ability of regulated parties to comply and on the government to demonstrate the policy benefits of compliance. We also show how practical solutions to this problem must rely on system-level institutional reform rather than on the removal or redesign of specific rules.

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A. METRICS

The sentiment that "there's too much law" resonates throughout the popular book, *The Death of Common Sense*, and most other critiques of the administrative state.[27] The meaning of this criticism seems self-evident—for lack of a better phrase, there are simply "too many damn rules." Worse still, their number seems to keep growing. As Robert Kagan colorfully puts it:

> In contemporary democracies positive law, the law on the books, proliferates extremely rapidly—so rapidly that it confounds our attempts to find out, in any systematic way, what is actually going on. Like Lewis Carroll's Red Queen, we seem to run faster and faster only to keep from falling further behind. The ecological outlook in the Amazon may be troubled, but the number of species in the legal rainforest keeps multiplying.[28]

Lawyers who practice in heavily regulated fields express similar frustrations, but what exactly do such critiques mean? How should we unpack the phrase "too much law" to make it a useful description rather than a curse?[29]

Increasing the number of rules[30] can confer important benefits. Moreover, at a certain level, it is consistent with the basic theory behind our governmental system. As Peter Strauss has noted:

> Agency administration is aided when central officials can advise responsible bureaucrats how they should apply agency law. Citizens are better off if they can know about these instructions and rely on agency positions, with the assurance of equal treatment such central advice permits, than if they are remitted to the discretion of local agents and to 'secret law.'[31]

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27. *See generally* PHILIP HOWARD, THE DEATH OF COMMON SENSE: HOW LAW IS SUFFOCATING AMERICA (1994).

28. Robert A. Kagan, *What Socio-Legal Scholars Should Do When There Is Too Much Law to Study*, 22 J. L. & SOC'Y 140, 140 (1995).

29. In this regard, Bayless Manning's incisive description in 1977 bears reading today:

> A fair amount of talk is to be heard these days in many and diverse circles about the need to get rid of "overregulation." Most of this talk assumes, or implies, that "overregulation" is a unitary thing, that it is the nefarious product of ambitious bureaucrats or crypto-socialists, and that it can be cured by a few bold surgical strikes of deregulation. The facts are quite otherwise. Regrettably, hyperlexis is a subtle illness; its forms are many and its causes are multiple.

Manning, *supra* note 13, at 770.

30. For the purposes of this Article, we use the term "rule" broadly to include statutory, promulgated, legislative, and nonlegislative, rules (though not norms).

31. Peter L. Strauss, *Publication Rules in the Rulemaking Spectrum: Assuring Proper Respect for an Essential Element*, 53 ADMIN L. REV. 803, 808 (2001). According to Strauss:

> Both sorts of guidance, understandably, were earnestly sought out by those the Commission regulated and greatly influenced their conduct. From an internal perspective the guidance also contributed to the discipline of staff action, its predictability and regularity. Comparable practices and proportions, in response to similar levels of public demand for guidance and central agency interest in controlling a farflung staff, can be found at many, if not all

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But there can be too much of a good thing. Inherent in the phrase "too much law," are the earlier states of "not enough law" and, to paraphrase Goldilocks, "just the right amount." As with the best temperature for porridge, though, the optimal level of regulation depends on the taster.[32]

But how does one measure the number of rules? As Frederick Schauer once noted, "the question, 'What is one rule?' is often complex, and one reason why the enterprise of *individuating* rules is important."[33] Because our interest is in the effect of rules on compliance, one way to individuate rules would be to consider the degree of specificity with which an enforcement agency would be required to plead its claim before a tribunal against an alleged violator of a rule. For example, the Environmental Protection Agency surely would need to state its case more particularly than, "Party *X* violated the Clean Air Act." In other words, the agency must show that a discrete act or omission failed to meet a discrete regulatory compliance requirement, as in "On April 3, Party *X* emitted into the air *y* pounds of Pollutant from Facility in violation of regulation 321.456(a)(1), which allows only *z* pounds from facilities like Facility under conditions that applied on that day." For Party *X*, the agency, and the tribunal, that is the rule at issue. It is the aggregation of such rules that motivates our interest in the effects of regulatory accretion. Hence, our working definition of regulatory accretion is "the progressive increase in the number of discrete regulatory compliance requirements."

Of course, it is hard to measure the number of rules even with this metric. At any given moment, Party *X* is subject to an array of discrete compliance requirements. In theory, Party *X* should be able to identify and count such requirements. For some companies, the number is very high. For example, the former Vice President for Health and Environmental Issues at Occidental Petroleum stated that at one refining plant at his company there were "several hundred thousand regulatory transactions per year."[34] It is hard to tell whether

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> regulatory agencies. The result is an enormous output of publication rules, far greater than the pages of the *Federal Register*, and (in proportional terms) rarely challenged in litigation.

Id. at 806.

32. James R. Elkins stated:

> There are questions disciplines cannot answer. Regardless of the methodological care and sophistication of the social sciences, regardless of how rigidly economic and scientific we may try to be about pricing costs and benefits, no economic, mathematical, quantitative equation is going to provide good answers about how much law, or what quality environment, we can afford. Do we need less law or more, fewer environmentalists or more? We will need all the stories we can get and more to answer these questions.

James R. Elkins, *Rhetoric, Disciplines, and Stories: How Will We Know When We Have Too Much Law?*, 22 LEGAL STUD. FORUM 519, 524 (1998).

33. FREDERICK SCHAUER, PLAYING BY THE RULES: A PHILOSOPHICAL EXAMINATION OF RULE-BASED DECISION-MAKING IN LAW AND IN LIFE 119 n.9 (1991).

34. Mintz, *supra* note 23, at 10,645 (quoting Ernie Rosenberg, former Vice President for Health and Environmental Issues at Occidental Petroleum). Rosenberg defined regulatory transactions as "any things you would install or do, changes you would make, etc., that have a regulatory consequence." *Id.*

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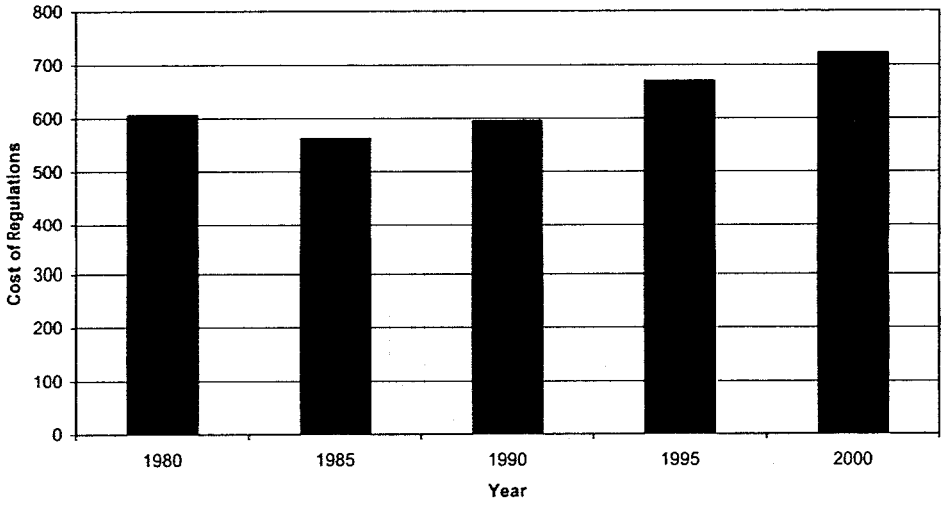
this figure is an exaggeration—or how big an exaggeration—because the number of discrete compliance requirements in his highly regulated industry has not been quantified. If, as with solidified lava flows, one could freeze the accumulation of rules that the administrative state produced at any instant in the past twenty years, the absolute number of discrete compliance requirements would probably be quite large by any standard. However, we know of no attempt actually to count them.

There may be readily available proxies, though. For example, one might use costs of compliance as a proxy. It was estimated that in 2000 the cost of regulatory compliance in the United States would exceed $720 billion.[35] As Chart 1 demonstrates, this figure has increased significantly over time. However, using this figure as the metric of regulatory accretion is problematic because a small number of rules could impose immense compliance costs (thus a cost concern of efficiency rather than accretion) or be so complicated as to require extensive legal advice to understand what they mean (a cost problem of complexity rather than accretion). The cost of compliance, therefore, is too broad and uncorrelated a measure for our purposes.

CHART 1: Estimated Annualized Regulatory Costs (in 1995 inflation adjusted dollars, in billions)



More directly, one could measure the growth of textual representations of rules, such as the number of pages in the *Federal Register*. This publication, however, is a better measure of federal government activity than of the number of rules because it includes more than just proposed and final rules; but the two

35. Notes on file with James Gattuso, Research Fellow in Regulatory Policy, Heritage Foundation (citing Thomas D. Hopkins, *Regulatory Costs in Profile*, 31 J. POL'Y SCI. 301, 304 (1998)).

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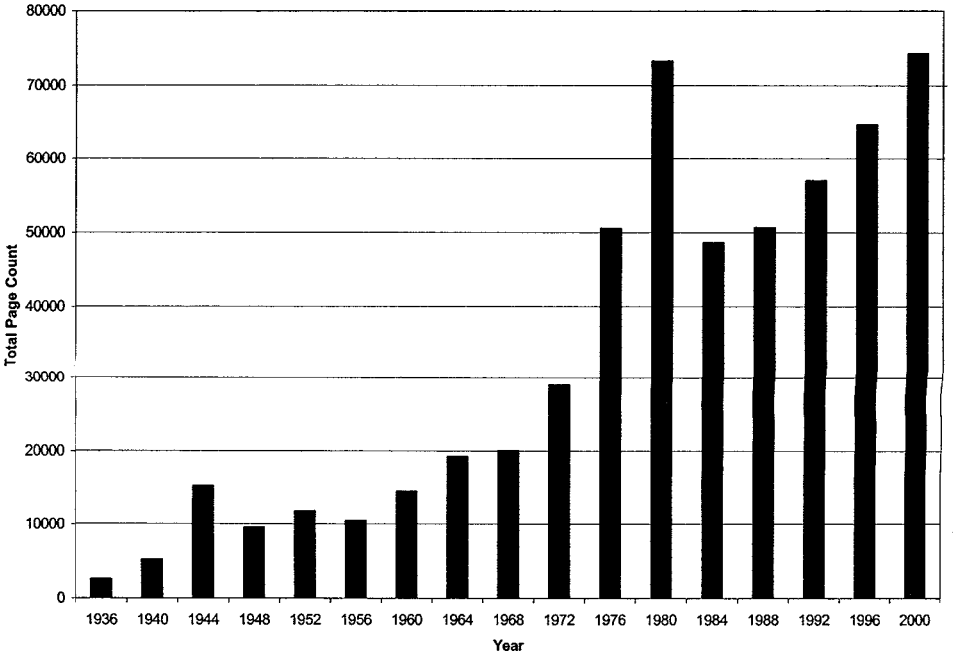
are surely related. In 1998, the *Federal Register* was 68,571 pages long[36] and, given the trend shown in Chart 2, it will likely continue to grow.

CHART 2: Federal Register Pages



One could improve this metric by tracking the annual growth of only those pages in the *Federal Register* that are dedicated to final rules (Chart 3).[37] This, too, is a crude measure because, in an effort to ward off allegations of arbitrary and capricious rulemaking, agencies write detailed Summary and Supplemental Information sections, which are often longer than the rule they accompany.

Another measure of accretion may be found in the *Unified Agenda of Federal Regulations*,[38] the semiannual report of rules under consideration by agencies

36. *See supra* note 35. During Ronald Reagan's eight-year presidency, the number of pages in the *Federal Register* declined by more than 22,642—from an all-time high of 73,258 pages in 1980 (President Jimmy Carter's last year in office) to 50,616 pages in 1988. *Id.* The number of pages printed in the *Federal Register* rose from 2411 in 1936, to 15,000 in 1961, to 67,716 in 1991. Robert C. Ellickson, *Taming Leviathan: Will the Centralizing Tide of the Twentieth Century Continue into the Twenty-First?*, 74 S. CAL. L. REV. 101, 105 (2000) (citing RICHARD A. EPSTEIN, SIMPLE RULES FOR A COMPLEX WORLD 7 (1995) (providing counts for 1936 and 1991)); Peter L. Strauss, *Presidential Rulemaking*, 72 CHI.-KENT L. REV. 965, 969 n.20 (1997) (providing count for 1961).

37. *See supra* note 35.

38. For examples of semiannual agendas see 67 Fed. Reg. 32,981 (May 13, 2002) (Department of Defense); 67 Fed. Reg. 34,253 (May 13, 2002) (Surface Transportation Board). As discussed below, it is worth noting that even if the annual number of proposed rules has increased only slightly over the

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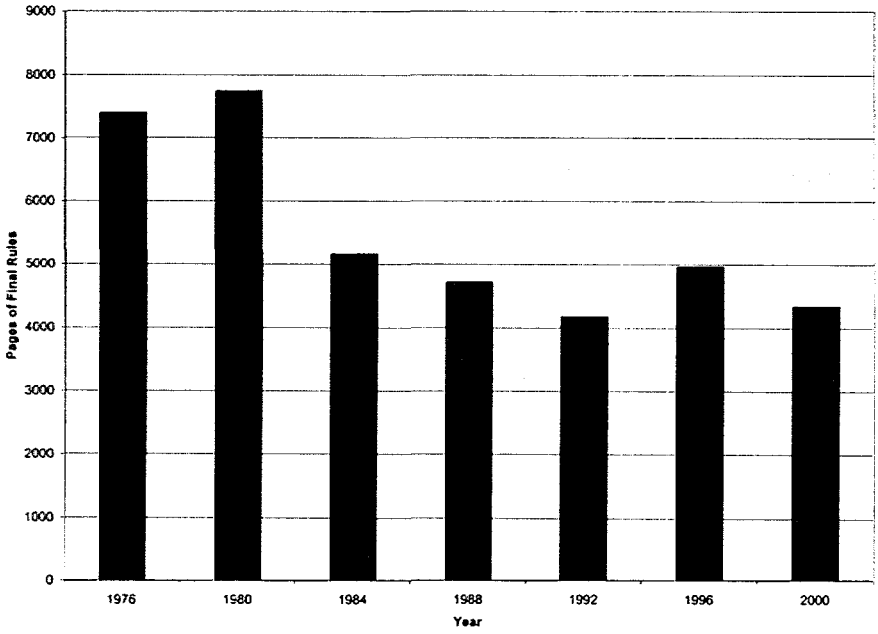
CHART 3: Final Rules in Federal Register



and departments. As Chart 4 demonstrates, since 1984, roughly 8000 to 9000 rules have been considered each year. The chart does not indicate how many rules were ultimately adopted.

A problem common to the foregoing metrics is that they do not directly account for net accretion. Because it takes a new rulemaking to revise or repeal an existing rule, a massive deregulation effort could lead to an upward swing in the number of rules reported in the *Federal Register* or *Unified Agenda*. Of course, that trend could not persist indefinitely because eventually there would be no rules left to repeal. But in any given year what matters for purposes of studying accretion is the number of rules added versus the number of rules removed.

To close this hole in the search for a suitable metric, one can turn to the jaw-dropping evidence from the *Code of Federal Regulations*, the repository of the federal government's agency and department final regulations in place at any given moment (Chart 5). Since 1970, it has more than doubled in size, from just under 60,000 pages to 134,723 pages in 1998, occupying nineteen feet of shelf space.[39] This trend holds true for statutes at the federal and state level, as

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last two decades, the overall number of rules in effect continues to increase since many fewer rules are under consideration for removal. *See infra* text accompanying notes 46–60.

39. *See supra* note 35 (citing data provided by the Office of Federal Register). "In 1900, there was no federal income tax. A century later, this tax has given rise to 684 forms and 17,000 pages of statutes and regulations." Ellickson, *supra* note 36, at 105.

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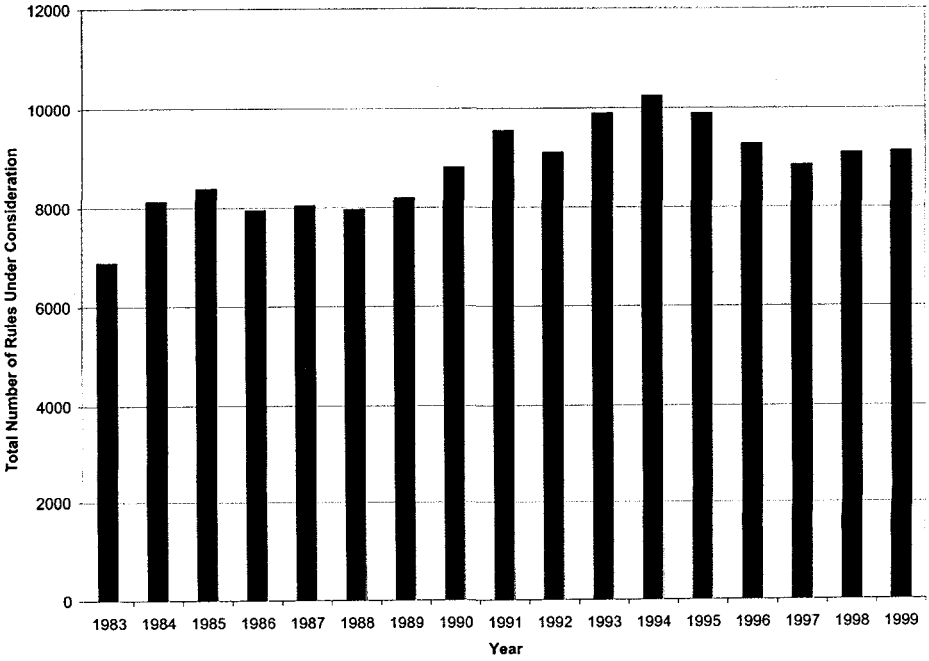
CHART 4: Unified Agenda Rules



well as for nonlegislative rules.[40]

This final measure is also imperfect because the problems associated with "too much law" may not turn simply on the sheer number of rules.[41] Because

40. According to Ellickson, in 1928, the unannotated version of the United States Code appeared in two tall volumes that totaled six inches in width. Ellickson, *supra* note 36, at 105. The 1988 version of the unannotated Code included twenty-nine volumes that spanned six feet, a twelve-fold increase. *Id.* Title 42 of the Code (which at first dealt with Public Health and later also with Welfare) expanded from twelve pages in 1928 to 5227 pages in 1988. *Id.* State and local law also have grown like kudzu. *Id.* According to Fischer, "at the state level, 4443 pieces of legislation were passed by the six New England states *in 1985 alone*; an average of twelve new laws (two per state) *every day of the year*, whether or not their legislatures were in session." Thomas C. Fischer, *Toward Legal Gridlock?*, 24 NEW ENG. L. REV. 697, 701 (1990). The volume of legislation in Rhode Island in 1985 was four times its 1965 level. Vermont's was nearly 2.5 times its 1965 rate. *Id.* With respect to the same phenomenon for non-legislative rules, see Strauss, *supra* note 36, at 969 n.20.

41. *See* Robert W. Hahn, *State and Federal Regulatory Reform: A Comparative Analysis*, 29 J. LEGAL STUD. 873, 883–84 (2000):

> Most states and the federal government document the impact of initiatives by counting the number of rules or pages of regulation the government eliminates. Such a measure is not meaningful because the repeal of a rule may not change the behavior of regulators. The legislature, for example, may repeal a rule, and the agency may consolidate its requirements with existing regulations. Although the state reduces the absolute number of rules, the overall level of regulation remains the same. Florida, for example, defines a rule as a "rule section" of the Florida Administrative Code. Florida could, in theory, reduce the number of regulations by simply merging sections of the Administrative Code. California, New York, and Virginia are

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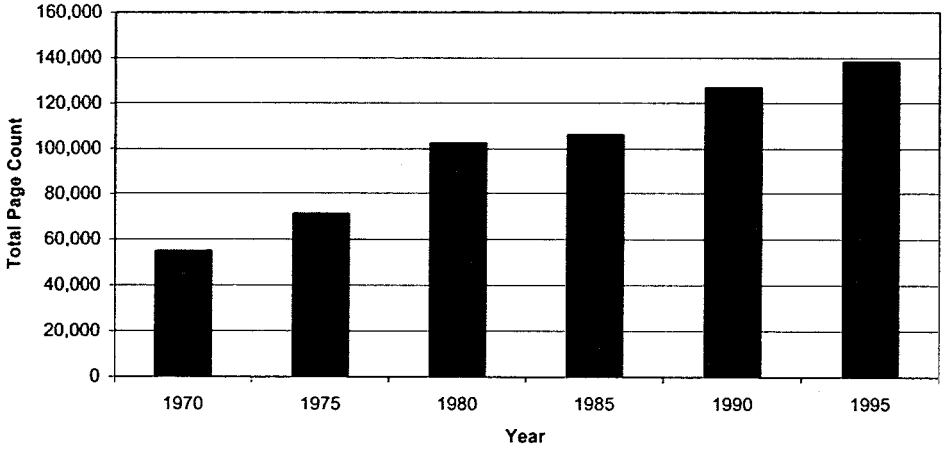
CHART 5: Code of Federal Regulations Pages



rules vary in length depending on their type, any page-counting approach cannot address that point.

Despite their various shortcomings, perhaps it is best to think of these different proxy measures as imperfect views of the same dynamic—a policy wonk's version of Monet's paintings of haystacks or the Rouen Cathedral. By any measure, there are a lot of rules, and their numbers are steadily growing. The important question, then, is why?

B. GEOLOGY

The preceding section provided evidence for the seemingly obvious proposition that regulatory accretion is happening, and furthermore, as an empirical matter, it seems to operate as a one-way ratchet, increasing over time rather than decreasing or remaining in the same position.[42] While perhaps self-evident and consistent with the popular view,[43] the one-way ratchet metaphor is nevertheless problematic. Why should regulatory accretion be uni-directional? Just as with Jared Diamond's seemingly ridiculous question of why the Incas did not invade

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the only states that attempt to accurately document the economic impact of some regulatory changes.

Id.

42. Eugene Bardach and Bob Kagan suggested this analogy in their thorough study of regulation: "[W]e might liken these forces to a toothed ratchet wheel that allows regulation to turn toward greater stringency from time to time, but then locks it in place, preventing any downward movement except for an occasional notch or two when political antiregulation pressures are intense." EUGENE BARDACH & ROBERT A. KAGAN, GOING BY THE BOOK: THE PROBLEM OF REGULATORY UNREASONABLENESS 185–86 (1982).

43. *See, e.g.*, Donald Kennedy, *Legislate in Haste, Repent at Leisure*, 294 SCI. 745, 745 (2001) (expressing the view that "Congress, having taken a particular course, has great difficulty in reversing it").

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Spain instead of the other way around,[44] there are useful insights to be gained by asking why accretion does not reverse or reach equilibrium over time. Surely, there are examples of agencies taking action to decrease the number of rules. In addition, at some point in the future, there must be some type of homeostatic mechanism to protect the legal system from collapsing under its own weight. What is the counter-dynamic at work? Just as the islands of the Outer Banks were crafted by geological accretion and the Grand Canyon was carved by the opposing forces of erosion, so, too, clash the opposing dynamics of regulatory erosion and regulatory accretion.

1. Regulatory Erosion

If we return to our mythical Regulatory Kingdom, recall that it produces laws that individually are optimal in terms of (1) efficiency, (2) clarity, and (3) institutional validity. No matter what foundations this system uses—common law or public law, democratic or totalitarian—it will at various points be necessary to generate new laws to deal with new situations that the existing laws do not handle satisfactorily. But there is no way, a priori, to know whether such a system will grow or shrink in terms of whatever metric of accretion we use.

Systems theory tells us that a complex system will reach a state of dynamic equilibrium over time, in which a balance between agents of change is maintained until perturbed by external events.[45] For example, when sand is added to the top of a sand pile on a tray, the pile does not grow indefinitely. Instead, once the edges of the pile reach the edges of the tray, sand migrates down the sides of the pile, sometimes one grain at a time and sometimes in sloughs, and rolls off the edge of the tray. The pile looks stable but is actually quite dynamic.[46] One can reasonably expect this process to occur in complex regulatory systems as well—as new rules come on line, outdated or inefficient rules are removed, and the overall mass of rules remains constant. The three major forces that might lead to the regulatory erosion necessary to maintain this dynamic equilibrium are culling, deregulation, and ossification.

a. Culling. The first is culling. If the system of laws is like the sand pile, then as new rules are added to the system we should expect the total number of rules eventually to reach some approximately stable number, with new rules entering the system at roughly the same pace that existing rules exit. In practical terms, our lawmaking system must be as efficient at culling outmoded rules as it is at promulgating new rules. It must identify laws that are no longer necessary either because the situations for which they were devised no longer happen, as in

44. JARED DIAMOND, GUNS, GERMS, AND STEEL: THE FATES OF HUMAN SOCIETIES 15 (1998).

45. *See* PER BAK, HOW NATURE WORKS *passim* (1996). For more on complex systems theory, see *infra* notes 156–215 and accompanying text.

46. *See* BAK, *supra* note 45, at 2, 49–64.

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Holmes's description of "survivals,"[47] or because better rules have taken their place. However, as Mozart rashly pointed out to Emperor Joseph II, the challenge lies in determining which rules to remove. In a sand pile, gravity does all the work. But what principles shall we apply to know which rules to cull?

To be sure, there has been no shortage of initiatives to cull regulations.[48] In the Clinton Administration, for example, the Environmental Protection Agency boasted that it was:

> [R]eexamining all environmental regulations and reporting requirements now in place in order to simplify and streamline them, and to reduce the time and costs associated with them, without compromising public health or the environment. For example, last February the President announced that all Federal agencies would conduct a line-by-line review of their regulations and then eliminate those that were obsolete or redundant. EPA is proposing to delete more than a thousand pages from the Code of Federal Regulations or more than 10 percent of the pages currently devoted to EPA regulations.[49]

The first Bush Administration had also asked agencies to review and remove redundant or unnecessary regulations.[50] Governors have asked the same of state

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47. *See* OLIVER WENDELL HOLMES, JR., THE COMMON LAW 35–36 (1881).

48. Culling initiatives have strong historical roots:

> [T]he idea of permanent expert agencies to look after the update of the law had long preceded Weber and Pound. It was present, for example, in the suggestions of codifiers Jean-Marie Portalis in 1804 and Charles Dewey Day in 1866 for the creation of some official institution to keep up with the necessary revisions to the Civil Codes of France and Lower Canada respectively. Indeed, the very idea of commissioning experts to codify the law has close affinities with that of commissioning experts to reform the law. Substantive improvement of the law, or at a minimum, the purging of contradiction, obsolescence, and confusion, is never far from the surface in any codification debate. . . .
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> . . . .
>
> . . . With the proliferation of legislation overturning particular common law doctrines, often at the behest of political progressives, jurists (including many of these same progressives) began to look for new official institutions to redeem law's promise of systemic rationality. Hence the motive for creating free-standing Law Reform Commissions—whether official or, like the American Law Institute, unofficial—comprised of disinterested experts undertaking both doctrinal and empirical studies of large segments of the law of a given political jurisdiction.

Roderick A. Macdonald, *Recommissioning Law Reform*, 35 ALBERTA L. REV. 831, 835–37 (1997) (footnotes omitted). The codification movement in the nineteenth century, for example, sought to synthesize the common law, as well as statutory provisions, into a logically arranged code. One scholar describes the efforts of the most celebrated codifier, David Dudley Field, as "the restatement of the existing law, cutting off its excrescences, [and] amending it to meet modern conditions." Alison Reppy, *The Field Codification Concept*, *in* DAVID DUDLEY FIELD: CENTENARY ESSAYS 30 (Alison Reppy ed., 1949).

49. Unified Agenda: Statement of Regulatory Priorities (EPA), 60 Fed. Reg. 59,658, 59,658–69 (Nov. 28, 1995) (referring to William J. Clinton, Regulatory Reinvention Initiative: Memorandum for Heads of Departments and Agencies (Mar. 4, 1995)).

50. *See* OFFICE OF MANAGEMENT AND BUDGET, REGULATORY PROGRAM OF THE UNITED STATES GOVERNMENT APRIL 1, 1992– MARCH 31, 1993 9–10 (1993).

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agencies as well.[51] Nine states require periodic regulatory review.[52] Three states have also adopted "sunset provisions," requiring the removal of laws after a fixed period of time and forcing reconsideration before they are adopted again.[53] The results of these initiatives, though, have been decidedly mixed.[54]

b. Deregulation. A more direct, though blunt, instrument of regulatory erosion is deregulation—the large-scale removal of rules. Examples include the dismantling of the Interstate Commerce Commission and the Office of Technology Assessment, the deregulation of airlines, and the "simplified" Tax Code of 1986. While deregulatory initiatives are generally based on economic rationales (removal of high-cost, low-impact rules),[55] they also counteract regulatory accretion. Such deregulatory efforts have been the exception, however, rather than the rule. While the Reagan administration had a reputation for deregulation, over two terms it ended only four regulatory programs.[56] Similarly,

> [T]he [first] Bush administration tried to get rid of 246 small items (most of them not full-scale programs but projects and grants and the like) and speared only eight. President Clinton's hard-won 1993 budget deal managed to eliminate only forty-one small programs, worth a total of about $1.3 billion, or less than one-thousandth of the budget—even though Clinton, unlike Bush, was working with a Congress that his party controlled.[57]

The Republican-controlled 105th Congress did not fare much better, terminating about 200 programs and agencies that accounted for only one-quarter of one

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51. In 1995, for example, incoming Florida Governor Lawton Chiles challenged state agencies to eliminate all unnecessary rules. The state's administrative branch responded by repealing more than 5,000 rules, only to begin immediately promulgating hundreds of new regulations to implement new and existing laws. *See* Jim Rossi, *The 1996 Revised Florida Administrative Procedure Act: A Survey of Major Provisions Affecting Florida Agencies*, 24 FLA. ST. U. L. REV. 283, 287 (1997).

52. *See* Hahn, *supra* note 41, at 882.

53. *Id.* at 882.

54. *See id.* at 882–83 (citing Indiana, New Jersey and Tennessee as examples).

> States do not always comply with requirements for review of existing regulations. An Illinois statute, for example, requires agencies to review all rules at least every 5 years. Agencies have not, however, completed a review in over a decade. The legislative committee responsible for enforcement cited a lack of staff and funds as the reason for its negligence. Options to improve compliance include stricter statutory language and the establishment of effective oversight mechanisms.... In Tennessee, the legislature routinely votes to eliminate the expiration date of the sunset provision, defeating its original purpose. New Jersey requires the expiration of all rules within 5 years of adoption. If an agency wishes to continue enforcement of the rule, it can reinstate it by complying with the extensive analysis and review requirements of the Administrative Procedures Act. New Jersey has not, however, assessed whether this requirement has increased the efficiency and efficacy of regulation.

Id. at 882.

55. *See* Robert Rabin, *Federal Regulation in Historical Perspective*, 38 STAN. L. REV. 1189, 1319 (1986).

56. JONATHAN RAUCH, GOVERNMENT'S END: WHY WASHINGTON STOPPED WORKING 180 (1999).

57. *Id.*

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percent of the budget.[58]

It is worth noting, as well, that deregulation may not result in a significant reduction of rules. Indeed, over the longer term, deregulation can actually increase the number of rules. As Susan Rose-Ackerman has observed:

> Deregulation of one area of the economy may itself produce the need for more regulation someplace else. In moving toward a more competitive situation in one dimension, bottlenecks and market imperfections in other dimensions may become newly relevant. . . .
>
> . . . .
>
> . . . In short, deregulation in one area often requires new regulation and oversight someplace else.[59]

Nor, given the Enron, savings and loan, and other scandals in the wake of deregulation, is it clear this is an effective policy.[60]

c. Ossification. The term "ossification" refers to the increasing costs and rigidity of the rulemaking process caused by extensive pre-promulgation requirements for the analysis and justification of individual rules.[61] These restrictions make rulemaking more expensive, and, one would expect, lead to fewer rules.[62]

Ossification evolved through actions by all three branches of government. For instance, the "hard look" doctrine of the D.C. Circuit in the early 1970s

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58. *Id.* The reason for the seeming invulnerability of these programs and agencies lies in the political economy of regulation and is further explored *infra* notes 92–104.

59. Susan Rose-Ackerman, *Defending the State: A Skeptical Look at "Regulatory Reform" in the Eighties*, 61 U. COLO. L. REV. 517, 520–22 (1990) (discussing the airline deregulation efforts).

60. Deregulation can result in what one author has termed a "patch-work world," where:

> [T]here will be some deregulation, some unchanged regulation, and some re-regulation. . . .
> . . . [In this manner,] "the two poles [regulation and deregulation] may, in a perverse way, meet. If, as seems likely, complete deregulation is not politically feasible, and if certain types of regulations—'self-regulation,' for example, or those that serve particularly powerful constituencies—are much more resistant to removal, the net effect of a blind drive to deregulate everything may be a much less conspicuous, and perhaps reduced, level of regulation with substantially more harmful net effects."

Steven G. Wood et al., *Regulation, Deregulation and Re-Regulation: An American Perspective*, 1987 BYU L. REV. 381, 464–65 (quoting R.G. Evans, *Slouching Toward Chicago: Regulatory Reform as Revealed Religion*, 20 OSGOODE HALL L.J. 454, 469 (1982)).

61. *See, e.g.*, William S. Jordan, III, *Ossification Revisited: Does Arbitrary and Capricious Review Significantly Interfere with Agency Ability to Achieve Regulatory Goals Through Informal Rulemaking?*, 94 NW. U. L. REV. 393, 394 (2000); Thomas O. McGarity, *Some Thoughts on "Deossifying" the Rulemaking Process*, 41 DUKE L.J. 1385, 1385–86 (1992); Mark Seidenfeld, *Demystifying Deossification: Rethinking Recent Proposals to Modify Judicial Review of Notice and Comment Rulemaking*, 75 TEX. L. REV. 483, 483–84 (1997).

62. *See* Strauss, *supra* note 31, at 808 ("The notorious ossification of notice-and-comment rulemaking in recent years, a response to the minority of regulations having major economic impact, has greatly increased its cost at the same time as agencies have experienced increasing stringency in the resources available to them. The more costly it becomes to generate regulations, and the fewer resources agencies have available to pay those costs, the greater will be the temptation to find other means to generate policy – shortcutting a desirable, even necessary public process.").

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contributed to much more thorough recordkeeping and justification of agency decisions.[63] While judicial requirements for additional process were rebuked in *Vermont Yankee*,[64] agencies realized that unless their actions were adequately justified in a comprehensive record, these actions might be remanded back to them as arbitrary and capricious.[65]

Congress has also required greater pre-decisional review and justification of agency actions. The best-known example is the National Environmental Policy Act, which requires environmental impact statements for major federal actions that significantly affect the human environment.[66] Similarly, the Regulatory Flexibility Act requires agencies to prepare a regulatory flexibility analysis for any rule that may have an important economic impact on a significant number of small businesses.[67] The Paperwork Reduction Act requires agencies to assess the impacts of their reporting and recordkeeping requirements, while the Unfunded Mandates Reform Act requires analysis if agency rules impose financial obligations on states or local government over $100 million.[68] Thus, rulemaking, which was conceived as a more efficient way of governing than trial-type administrative hearings, has accumulated its own procedural baggage and costs.[69]

Presidents also have imposed pre-promulgation analysis requirements on agencies through executive orders. President Reagan's Executive Order 12,291[70] required cost-benefit analysis for major rules;[71] Executive Order 12,988 requires agencies to review their laws and regulations to ensure they minimize

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63. *See, e.g.*, Citizens to Preserve Overton Park v. Volpe, 401 U.S. 402 (1971) (requiring that agencies provide evidence to the court of their decisionmaking processes).

64. Vermont Yankee Nuclear Power Corp. v. Natural Res. Def. Council, 435 U.S. 519 (1978).

65. RICHARD PIERCE ET. AL., ADMINISTRATIVE LAW AND PROCESS 380–86 (3d ed. 1999).

66. 42 U.S.C. § 4332 (2000).

67. 5 U.S.C. §§ 601–612 (2000). The law was amended by the Small Regulatory Enforcement Fairness Act of 1996, 5 U.S.C. § 611 (2000). For thorough descriptions of this and related pre-promulgation review requirements, see Fred Anderson et al., *Regulatory Improvement Legislation: Risk Assessment, Cost-Benefit Analysis, and Judicial Review*, 11 DUKE ENVTL. L. & POL'Y F. 89, 90–93 (2000); Daniel Cohen, *S.981, the Regulatory Improvement Act of 1998: The Most Recent Attempt to Develop a Solution in Search of a Problem*, 50 ADMIN. L. REV. 699, 706–12 (1998). For a discussion of how EPA in particular implements these requirements, see Melissa Romine, *Politics, the Environment, and Regulatory Reform at the Environmental Protection Agency*, 6 ENVTL. LAW. 1, 11 (1999).

68. Paperwork Reduction Act of 1995, 44 U.S.C. §§ 3501–3521 (2000); Unfunded Mandates Reform Act of 1995, 2 U.S.C. §§ 1501–1571 (2000).

69. *See* William F. Pedersen, *Regulatory Reform Contracts and Regulatory Reform*, 32 Envtl. L. Rep. (Envtl. L. Inst.) 10,589, 10,589 (2002):

> This [rulemaking] process, originally conceived of as a streamlined alternative to the use of trial-like hearings to make policy, has become more complex and resource intensive in recent years, as new analytical requirements have been imposed to assure that major regulations are well-planned and socially beneficial, and as requirements for public participation have increased.

70. Exec. Order No. 12,291, 46 Fed. Reg. 13,193 (Feb. 17, 1981). Executive Order 12,291 was revoked by President Clinton's Executive Order 12,866. 58 Fed. Reg. 51,735 (Sept. 30, 1993).

71. A major rule is defined as one having an annual economic impact of $100 million or more. 5 U.S.C § 804(2) (2000).

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litigation;[72] and Executive Order 12,898 requires agencies to make achieving environmental justice part of their mission and, in particular, "to the greatest extent practicable and permitted by law," identify and address disproportionately high and adverse human health or environmental effects on minority and low-income populations.[73]

These requirements—as well as others too numerous to mention—supplement the notice-and-comment requirements for legislative rulemaking prescribed under the Administrative Procedure Act.[74] Their stated goal is to ensure that the agency fully considers the possible impacts of its rules. This, in itself, surely seems a worthy enterprise.[75] Yet these added costs of analysis unquestionably have resulted in fewer legislative rules than might otherwise have been the case. Indeed, given the system-wide reach this ossification of notice-and-comment rulemaking can have, it is probably the most significant check on regulatory accretion.

It is important, though, to note two points. First, these analytical requirements, at best, slow the rate of growth of rules rather than lead to an absolute decrease in number.[76] Second, increased costs for notice-and-comment rulemaking may not result in fewer rules, but rather rules in different forms. With increasing ossification of notice-and-comment rulemaking, scholars have clearly documented the increasing reliance of agencies on non-legislative rules, such as guidance documents and interpretive rules.[77] The net result, in the eyes of the

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72. Exec. Order No. 12,988, 61 Fed. Reg. 4729 (Feb. 5, 1996).

73. Exec. Order No. 12,898, 59 Fed. Reg. 7629 (Feb. 11, 1994).

74. 5 U.S.C. §553(a)–(e) (2003).

75. *See* McGarity, *supra* note 9, at 1244–45. Some proponents of hybrid rulemaking have sought relief from regulatory burdens, as well. According to McGarity:

> To these critics, regulatory reform meant substantial regulatory relief. Criticism naturally focused on the statutes that empowered the agencies to promulgate burdensome rules, but attempts to persuade Congress to ease the substantive regulatory burden were largely unsuccessful. . . . One of the first and most enduring regulatory reform efforts of the Reagan administration, Executive Order 12,291, attempts to implement all three themes by imposing extensive analytical requirements on agencies, vesting the Office of Management and Budget (OMB) with review powers to ensure political accountability, and imposing substantive criteria on agencies to provide regulatory relief for regulated industries.

Id.

76. *See* BARDACH & KAGAN, *supra* note 42, at 191 ("Most of what the Congress has done in recent years to curb protective regulation has been directed at forestalling prospective regulation rather than cutting back existing regulation.").

77. For a spirited debate on the propriety of the growth of agency guidance, *compare* George B. Wyeth, *The "Regulation by Guidance" Debate: An Agency Perspective*, NAT. RESOURCES & ENV'T, Spring 1995, at 52, *with* F. William Brownell, *"Regulation by Guidance": A Response to EPA*, NAT. RESOURCES & ENV'T, Winter 1996, at 56 (Wyeth argues that guidance is desirable and beneficial from an agency management standpoint. Brownell disagrees, stating that the debate is not about whether guidance is useful but whether guidance should be used as a substitute for regulation.). *See also* Robert A. Anthony, *Interpretive Rules, Policy Statements, Guidances, Manuals, and the Like—Should Federal Agencies Use Them to Bind the Public?*, 41 DUKE L.J. 1311, 1332–40 (1992); James W. Conrad, Jr., *Draft Guidance on the Appropriate Use of Rules vs. Guidance*, 32 Envtl. L. Rep. (Envtl. L. Inst.) 10,721, 10,721–22 (2002); Strauss, *supra* note 31, at 808. Some courts have suggested the need for

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regulated community, can often appear to be the same number of rules, but in a different guise.

2. Regulatory Accretion

Even if the mechanisms of regulatory erosion described above are taking place, the data presented in Part I demonstrates that the forces of erosion have been overwhelmed by the processes of accretion. To be sure, we live in an increasingly complex world, and it is reasonable to assume that this requires ever more rules of conduct.[78] But this point alone neither explains why the older rules do not erode, nor accounts for the overpowering force of accretion. This Section groups the many causes of accretion into three categories: growth of government, the Red Queen effect, and the political economy of regulation.

a. Growth of Government. The simplest explanation for the growth of rules is that everything else in government has been growing as well. As Thomas McGarity has described:

> In the late 1960s and early 1970s, . . . Congress enacted a new generation of regulatory statutes that imposed new social and environmental responsibilities on entire sectors of the economy. These "social regulation" statutes often required federal agencies to govern through informal rulemaking. The shift in the older agencies from the adjudicatory to the rule-making mode and the emergence of the new rule-making agencies combined in the early 1970s to produce a rule-making revolution with a potential to expand greatly the federal government's role in American society.[79]

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limits on the ability of agencies to side-step rule promulgation in this manner and use guidance as a surrogate for regulation. *See* Gen. Elec. Co. v. EPA, 290 F.3d 377, 384–85 (D.C. Cir. 2002); Appalachian Power Co. v. EPA, 208 F.3d 1015, 1020–23 (D.C. Cir. 2000). The phenomenon has also surfaced at the state regulatory level, *see* Michael Asimow, *Guidance Documents in the States: Toward a Safe Harbor*, 54 ADMIN. L. REV. 631, 633–44 (2002), as well as in the phenomenon of informal agency "advice," *see* William R. Andersen, *Informal Agency Advice—Graphing the Critical Analysis*, 54 ADMIN. L. REV. 595, 602–05 (2002).

78. As the Supreme Court observed when confronted with constitutional challenges to the emergence of local zoning regulation in the late 1920s:

> Until recent years, urban life was comparatively simple; but, with the great increase and concentration of population, problems have developed, and constantly are developing, which require, and will continue to require, additional restrictions in respect of the use and occupation of private lands in urban communities. Regulations, the wisdom, necessity, and validity of which, as applied to existing conditions, are so apparent that they are now uniformly sustained, a century ago, or even half a century ago, probably would have been rejected as arbitrary and oppressive.

Village of Euclid v. Ambler Realty Co., 272 U.S. 365, 386–87 (1926).

79. McGarity, *supra* note 9, at 1243–44 (footnotes omitted); *see also* Stewart, *supra* note 11, at 339 ("In the period 1965–1980, Congress adopted sweeping new environmental, health, safety, and antidiscrimination regulatory statutes. There are at present over sixty major federal programs regulating business and non-profit organizations. Congress dramatically increased funding for direct federal social insurance and assistance programs, many of which also apply to state and local governments. Congress also greatly increased federal funding of conditional grant programs to states and localities. They now

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The potential was surely realized. Whether the burgeoning number of laws acted as cause or effect, their proliferation has correlated closely with the rising number of lawyers,[80] bureaucrats,[81] and agencies.[82] Oftentimes, these statutes created legally cognizable rights.[83] Along with these statutes came new agencies with rulemaking authority, which, not surprisingly, promulgated a lot of rules.[84] To be fair, it has often been the regulated community that demanded these rules. In some cases regulated parties seek greater certainty, calling for more specific rules.[85] In some cases, as described below, more rules are sought

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impose over one thousand different sets of conditions and requirements on state and local governments.").

80. "In 1951 (the start of the most reliable statistical series), the ratio of the U.S. population to the number of attorneys was 695:1. By 2000, when the number of attorneys was estimated to have exceeded one million, the ratio had fallen by over half to 267:1." Ellickson, *supra* note 36, at 106 (footnotes omitted).

81. "Over the past 30 years, from FY 1970 to FY 2000, the number of permanent, full-time positions at the more than 54 federal regulatory agencies has grown from 69,946 to an estimated 131,587." *See supra* note 35.

82. "The 'Alphabetical List of Agencies Appearing in the Code of Federal Regulations'—just the names of the federal agencies!—now runs to nine pages of fine print . . . ." Todd D. Rakoff, *The Shape of the Law in the American Administrative State*, 22 TEL AVIV U. STUD. L. 9, 16 (1992).

83. *See* Kagan, *supra* note 28, at 140, 142:

> [L]aw has become far more ambitious. It attempts to regulate or even extirpate scores of behaviours that it virtually ignored twenty-five years ago: sexual harassment in the workplace, leakage from underground fuel storage tanks, medical malpractice . . . .
>
> . . . .
>
> . . . [T]he belief [in popular culture is] that because sophisticated modern societies *can* afford to provide compensation for victims of unfair treatment, personal injury, and sudden economic loss, they *should* enact laws that do so. Because modern governments *can* provide prophylactic regulatory protections against identifiable sources of harm, against economic insecurity, and against unfair treatment, they *should* enact laws that do so.
>
> . . . In all likelihood, therefore, the decades to come will see an accelerated rate of change, disruption, and political demands for more law. New legal rules, institutions, jurisdictions, remedies, and enforcement methods will continue to proliferate, as will political controversy about law.

Id.

84. *See supra* Part I.A.

85. This "guidance problem" is most obvious in the raft of nonlegislative agency interpretations and unpublished decisions that, while not rules, clearly have similar effects as binding laws. As one respondent in our survey of attorneys noted, "It's not the number of regulations that is the problem; it's the inability to understand how they apply to a specific situation that is the problem. In that analysis, more regulations—and more specific examples of how they apply—actually might be a good thing." (Survey responses on file with authors.) As a commentator has noted:

> In a modern society characterized by a thoroughgoing division of labor and widespread social differentiation, the situations which the law must confront and the dynamics which it must regulate, are correspondingly highly differentiated. General rules become ill-fitted for the task, and many different bodies of law, requiring specialists in their application, grow up in correspondence with the already-existing differentiation of society. This legal specialization is most pronounced in those areas of the law adapted to governing the economy which is where the social processes of differentiation have proceeded the furthest . . . .

Rakoff, *supra* note 82, at 19.

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as barriers to entry for potential competitors.[86] In either case, while additional regulation may make compliance easier or solidify market position, over time accretion can become a significant attribute of the administrative state in its own right.

In addition, jurisdictional overlap has led to accretion. As a result of federalism and our media-specific statutory structure, different levels of government often regulate the same activity, particularly in environmental law, leading to repeated regulation of the same pollution source or other social ill.[87] Moreover, the American government has a long tradition of addressing problems at all levels by passing laws.[88]

b. The Red Queen. Evolutionary biologists formulated the Red Queen hypothesis to explain the process of natural selection.[89] To take the example of herbivory, if a certain species of caterpillars feeds on the leaves of a particular plant species at time period zero, eventually some individual plants in that species may randomly develop a defense against the caterpillars, such as poison compounds in their leaves. The survival rate of these better-adapted plants within the total population of plants will likely increase through natural selection. They are more "fit." The race, though, has only begun because natural selection will also favor those individual caterpillars that can more successfully metabolize these poisons. In due course, those plants with poison in their leaves *and* indigestible leaves will now be favored by natural selection, but only until some caterpillars develop a means to digest those leaves and are, in turn, selectively favored. The result is a never-ending competition between plants and caterpillars where, as with the Red Queen, the participants must run just to stay in the same place.[90]

Similarly, there is a constant competition between agencies and the regulated community.[91] Efforts by the regulated community to evade legal requirements

86. *See* Michelle Adams, *Intergroup Rivalry, Anti-Competitive Conduct and Affirmative Action*, 82 *B.U. L. Rev.* 1089, 1117 (2002).

87. For an excellent account of the tension and overlap between federal and state environmental regulatory regimes, see Richard L. Revesz, *Federalism and Environmental Regulation: A Public Choice Analysis*, 115 HARV. L. REV. 555 *passim* (2001). *See also* Fischer, *supra* note 40, at 701 ("America's economic growth has been accompanied by a steady increase in the *number* of statutes (and regulations) governing business and private transactions. State and local governments have entered regulatory fields once chiefly federal."); Rechtschaffen, *supra* note 10, at 1202 ("[E]nvironmental law is considerably differentiated; regulatory authority is fragmented among federal agencies, and between federal and state (and sometimes local) agencies.").

88. Alexis de Tocqueville noted that the American approach to governance is to "[i]dentify a problem, then throw a law at it." Manning, *supra* note 13, at 772.

89. The seminal work is Leigh Van Valen, *A New Evolutionary Law*, 1 EVOLUTIONARY THEORY 1 (1973).

90. For a description of a recently discovered instance of the Red Queen at play in species evolution, in this case involving the evolution in certain snakes of resistance to toxins in the skin of newts, see Raymond B. Huey & William J. Moody, *Snake Sodium Channels Resist TTX Arrest*, 297 SCIENCE 1289 *passim* (2002).

91. *See* Pedersen, *supra* note 69, at 10,590 ("[R]egulation depends for its beneficial results on the reciprocal actions of the regulators, who issue commands designed to achieve some social good, and the regulated, who must act to make those commands reality.").

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necessitate a legal response from the agency, which, in turn, leads to a new strategic response from the regulated community. As the former head of enforcement for EPA observed, "if you write a simple, straightforward regulation, the first time you try to enforce it the industry lawyers will drive a truck through it. So [in drafting regulations] people [in the Agency] try to nail everything down [with specific regulatory language]."[92] By promulgating rules in response to the regulated community's responses to rules, ironically, more rules are needed to ensure compliance with existing rules. Regulations thus breed more regulations in a vicious cycle found not only in environmental law, but also in tax and other heavily regulated fields.[93]

c. Political Economy of Regulation. Economics offers useful insights into both regulatory accretion and, conversely, why regulatory erosion is not more significant. Accretion can be explained as the product of an alignment of both the agencies' and the regulated community's economic interests in promoting more rules. As Bob Ellickson has wondered:

> Why do inefficient government programs persist in a democracy, where political aspirants might be expected to win election[s] by campaigning to eliminate waste? According to public choice theory, the explanation lies in asymmetries in the ability of the gainers and losers from government programs to organize themselves for political action. An inefficient regulatory or spending program can be predicted to emerge and endure when its (relatively concentrated) beneficiaries have more influence than the (relatively diffuse) taxpayers and consumers whose interests are disserved by it.[94]

Just as regulated parties might desire more regulation to clarify required conduct and ensure predictability, they may also want more rules to serve as barriers to entry. In a similar vein, members of a regulated community may be able to extract rents from agency regulations that further their self-interests.[95]

Agencies, one can argue, act in a similarly self-interested way. Because agencies need not pay the costs that their regulations impose and are only remotely accountable at the voting booth, they may have little incentive to

92. Mintz, *supra* note 23, at 10,645 (alteration in original) (quoting Steve Herman, Deterrence vs. Cooperation: The Struggle Over the Future Direction of Environmental Enforcement, Panel Discussion at the Association of American Law Schools Annual Meeting (Jan. 7, 2000)).

93. *See, e.g.*, Steven A. Bank, *Codifying Judicial Doctrines: No Cure for Rules But More Rules?*, 54 SMU L. REV. 37, 44 (2001) ("[T]he real question is whether the avoidance occurring under our current [tax] rules can be prevented by issuing more rules.").

94. Ellickson, *supra* note 36, at 114 (footnotes omitted).

95. *See* RAUCH, *supra* note 56, at 33–34 ("[A]s interest groups and their deals pile up, so do laws and regulations and the like, and so, therefore, do the number of people who work the laws and regulations. 'When these specialists become significant enough,' wrote [Mancur] Olson, 'there is even the possibility that the specialists with a vested interest in the complex regulations will collude or lobby against simplification or elimination of the regulation.'").

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refrain from promulgating more regulations.[96] Moreover, agency authority can be increased by regulatory complexity. If regulated parties never know for certain whether or not they are in compliance, agencies are further empowered by the considerable deference courts pay to their judgments.[97] Jonathan Rauch has gone one step further, arguing that agency behavior tracks that of pathogens:

> Like the virus that mutates to stay ahead of the latest drugs, programs change, but they do so in ways that preserve their existence and keep their clients happy, rather than in ways that solve any particular social problem with any particular degree of effectiveness. If the business of America is business, the business of government programs and their clients is to *stay* in business.[98]

This helps explain why rules accrete, but what of erosion? Surely, some erosion occurs—not all regulations ever promulgated remain on the books. Occasionally, Congress hears the public's cries for deregulation of a sector, or an agency head will respond to the Executive's demand that the number of rules be reduced. Despite these initiatives, however, removing regulations is hard work for three reasons.

First, as described above, parties that benefit from regulations will often be able to form a more concentrated and effective opposition to deregulation than the diffuse public interest harmed by the regulation in question.[99] As Olson observed: "Stable societies with unchanged boundaries tend to accumulate more collusions and organizations for collective action over time."[100] Those who stand to lose from regulatory change will always resist such changes—and they generally will have the advantage of facing fewer transaction costs of collective action and fewer free-rider problems than the general public faces.[101]

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96. For a fuller examination of these sources of regulatory failure, see CASS R. SUNSTEIN, AFTER THE RIGHTS REVOLUTION 74–110 (1990).

97. *See* Heckler v. Chaney, 470 U.S. 821, 831 (1985).

98. RAUCH, *supra* note 56, at 18.

99. *See id.* at 151–52 ("Driven by the demands of a changing world, the government has no choice but to pass new programs. Yet at the same time, driven by the demands of the organized lobbies, the government struggles desperately to keep doing everything it ever tried for every group it ever aided. And so, lacking any better option, Washington just piles new programs on top of old programs. Laws are passed, policies adopted, programs added or expanded—things "get done"; but, as layer is dropped upon layer, the accumulated mass becomes gradually less rational and less flexible.").

100. *Id.* at 28. Rauch is more fatalistic, concluding, "government has become what it is and will remain: a large, incoherent, often incomprehensible mass that is solicitous of its clients but impervious to any broad, coherent program of reform. *And this evolution cannot be reversed.*" *Id.* at 18.

101. *Cf. id.* at 126.

> In an interest-group democracy, all kinds of action are difficult, but they are not *equally* difficult:
>
> . . . .
>
> . . . To create a new subsidy or anticompetitive deal is hard, but to reduce a subsidy that already exists is much harder. And to completely eliminate a subsidy or an anticompetitive arrangement is hardest of all.

Id.

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Second, as between adding or removing rules, expending agency resources on removing rules offers agencies little political benefit.[102] A story from Eugene Bardach and Robert Kagan's comprehensive study of regulatory reform efforts provides a nice example. An official in the California Food and Drug Division described the drain on agency energies that occurred in the course of trying to pare down regulations governing low-acid canning processes, some of which had been on the books since 1925:

> First, the experts and bureaucratic factions took a year to hammer out a new set. Then industry had to fight a while to get changes. Then the legal staff got them and changed them all into legal jargon that no one would accept. Then the [citizen] health groups entered, and so on. This all began three years ago and we're hardly further along than when we started. . . . As a result, we almost try to avoid having to change regs and standards.[103]

Agency heads and politicians rarely brag about the number of rules they have cut or amended so as to reduce regulation.[104] It is the new initiatives that get people's attention.

And finally, regulatory erosion is more resource-intensive than adding new rules or guidance. The courts demand that "an agency changing its course must supply a reasoned analysis."[105] Repealing or amending an existing rule to "streamline" regulation requires an agency to justify its decision. Even if it does so, affected parties are likely to challenge the decision as arbitrary and capricious. Initiating and defending regulatory erosion also diverts agency resources and public attention from new initiatives more likely at any moment to be deemed popular and positive.[106]

Public choice theory thus strongly suggests that, in the end, the combination of concentrated special interests, political costs, and limited resources ensures that accretion beats erosion. In short, "amending an existing rule will generally

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102. BARDACH & KAGAN, *supra* note 42, at 186 ("As one nursing home enforcement official observed, 'Regulation is always additive. New regulations are added to deal with new problems.'").

103. *Id.* at 195 (alteration in original).

104. *See* Manning, *supra* note 13, at 772–73 ("As batting averages are to baseball players, stars to restaurants, ribbons to generals, and stock prices to corporate executives—so new statutes are at the heart of the scorekeeping system by which legislators are measured and measure themselves. No legislator gains recognition as a great non-law giver or as the Great Repealer.").

105. Motor Vehicle Mfrs. Ass'n. v. State Farm Mut. Auto. Ins. Co., 463 U.S. 29, 57 (1983) (quoting Greater Boston Television Corp. v. FCC, 444 F.2d 841, 852 (D.C. Cir. 1970)).

106. *See* Rakoff, *supra* note 82, at 20 ("[O]nce the statute is enacted reformist political energies are diffused and interests in the new status quo develop. Just as it is rare for a regulatory enactment to be abrogated, so is it rare for it to be overhauled to bring it into line with other, later developments, which in turn have been organized around other particular issues."); *see also* BARDACH & KAGAN, *supra* note 42, at 197 ("[M]ore careful analysis of proposed rules does not necessarily imply an equivalent effort to undertake detailed analysis and revision of old ones, and indeed, by making the enactment of new regulations more time consuming and intellectually demanding, it may actually further divert busy regulatory staffs from backward-looking rule-revision projects, even if "sunset" reviews are formally mandated.").

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be less politically and programmatically rewarding to the agency than issuing a new rule."[107] Erosion may slow down the one-way ratchet of accretion, but the direction remains unchanged.

C. PERCEPTION

Confirming the commonsense notion of regulatory accretion serves little purpose if accretion has no appreciable impact on compliance behavior or policy performance. As noted above, the conventional critique of rules in the administrative state is that they are unclear, too expensive, or institutionally defective.[108] But we have conveniently solved all three defects in the Regulatory Kingdom. Compared to those defects, is the ever-increasing number of rules simply too small a concern to deserve our attention? Noncompliance levels suggest the answer is no. In this section we examine empirical evidence demonstrating that the regulatory community—both regulators and the regulated—believes that accretion plays an important role in driving noncompliance.[109] First, we consider the results of a study the Environmental Protection Agency conducted to determine the specific causes of discrete events of noncompliance. On a more system-wide level, we also describe the results of a survey we conducted to determine respondents' perceptions of the causes of noncompliance and the influence of accretion.

1. EPA's *Root Cause* Study

EPA's 1999 *Root Cause* project studied environmental compliance behavior through an unusual alliance.[110] For three years, from 1996 through 1998, the Chemical Manufacturers Association (CMA)[111] and EPA worked together to understand better the underlying causes of noncompliance. Their joint study sought to identify the key factors behind noncompliance, examine how facilities respond to noncompliance events, and assess the value of environmental management systems.[112] Unlike previous compliance studies by academics or government officials interviewing companies, this truly was a partnership between the regulated and the regulator, with CMA encouraging cooperation and frank answers by its member companies. CMA contacted fifty of its members' facilities that had been parties to environmental enforcement actions between 1990 and 1995, explained the *Root Cause* project, and sent them an extensive

107. Pedersen, *supra* note 69, at 10,589.

108. *See supra* notes 9–11.

109. While both federal and state actors can be guilty of noncompliance with environmental law, our focus in this article is on noncompliance by the private sector. For examples of noncompliance by government regulators, see Farber, *supra* note 14, at 301–04.

110. U.S. EPA & CHEMICAL MANUFACTURERS ASS'N, EPA/CMA ROOT CAUSE ANALYSIS PILOT PROJECT: AN INDUSTRY SURVEY (1999) [hereinafter ROOT CAUSE].

111. In June 2000, CMA changed its name to the American Chemistry Council (ACC).

112. *See* ROOT CAUSE, *supra* note 110, at 5–6.

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survey.[113] The identity of the respondents was confidential.[114] Of those contacted, more than half (twenty-seven facilities involved in forty-seven actions) returned the surveys.[115] The survey asked the facilities to categorize each type of noncompliance event.[116] For each event, the facilities were asked to select the main, or "root," causes and the factors contributing to the violation from more than seventy specific causes, ranging from "ambiguity of the regulation" and "inadequate compliance funding" to "insufficient compliance monitoring."[117]

The types of violations that participants identified were not particularly surprising. They included report omissions, permit exceedances, operations and maintenance failures, and recordkeeping mistakes.[118] Any inspector would likely have predicted this result. The *causes* given for the violations, however, were both unexpected and instructive.

Overall, the categories of "Regulations and Permits" and "Human Error" tied as the leading root causes of violations.[119] The "Regulations and Permits" category of root causes aligns more closely with the conventional descriptions of environmental law's complexity; it includes "ambiguous federal regulations," "conflicting permit conditions," and "rule implementation time frames are too short."[120] While these are surely part of the causal chain of noncompliance, they are hardly the *root* causes. The root cause in those cases is whatever makes the regulation ambiguous or conflicting.

And what of "Human Error"? It proved to be a key source of trouble for every type of violation. For the category of report submissions and reporting, human error proved the single most important root cause, accounting for 35% of violations.[121] Human error was the second most important cause of operations and maintenance violations (27%),[122] one of two leading causes for recordkeeping violations (38%),[123] and was responsible for a significant percentage of

113. *Id.* at 5.
114. *Id.* at 4.
115. *Id.* at 5.
116. *Id.*
117. *Id.* at 5–7, app. C at C2–C4. EPA and CMA defined "root cause" as "a primary factor that led to the noncompliance event," and "contributing cause" as "a secondary factor that led to the noncompliance event." *Id.* at 6. Categories of root causes included broad factors such as procedures, management, communications, compliance monitoring, regulations and permits, equipment problems, emergency preparedness, external circumstances, and human error. *Id.* at 11. From these categories, the survey defined 74 specific causes—for example, within the reporting category, one specific cause was "reporting or notification procedures unclear," and within the regulations and permits category, one specific cause was "ambiguous federal regulations." *Id.* app. C at C2–C4. Respondents were limited to choosing only three specific causes to explain each violation. *Id.* at 7.
118. *Id.* at 6.
119. *Id.* at 22.
120. *Id.* app. C at C–4.
121. *Id.* at 14.
122. *Id.* at 18–19.
123. *Id.* at 20–21.

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physical exceedance violations as well.[124] The three main causes for violations in the human error category were "individual responsibility or professional judgment," "fatigue," and "inexperience."[125] Although professional judgment and inexperience are primary causes for some violations, the fact that they account for more than one-quarter of all violations and represent the top causes of non-compliance raises more questions than it answers. No doubt mistakes happen; yet, according to the *Root Cause* results, goofs are one of the most significant causes of noncompliance. This finding does not withstand scrutiny. Consider that the U.S. chemical industry is arguably the most experienced sector in the country in environmental compliance. As an industry, chemical plants are subject to numerous major pollution statutes and have large health, safety and environment departments as well as environmental management systems.[126] The sophisticated nature of these companies makes it hard to believe that the main cause for their violations is simply people making mistakes. Indeed, even when facilities have known they would be inspected by the EPA (as was the case in the EPA's Environmental Leadership Program), there still were numerous violations.[127]

Rather than a meaningful explanation for noncompliance, *Root Cause* seems to treat the human error category as a repository for noncompliance events unexplained by the more tangible causes. The assumption seems to be that, if the regulations were clear and the resources for achieving compliance were

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124. *Id.* at 16–17. Similarly, in a follow up study focused on United Technologies Corporation (UTC) facilities in New England that had implemented rigorous internal environmental management systems, EPA cited human error as the second leading root cause of noncompliance. U.S. ENVIRONMENTAL PROTECTION AGENCY, ENVTL. MGMT. SYS. IMPLEMENTATION STUDY OF UTC FACILITIES, FINAL REPORT OF SURVEY RESULTS vi (Aug. 31, 2000).

125. ROOT CAUSE, *supra* note 110, at 14–23.

126. *See* David B. Spence, *The Shadow of the Rational Polluter: Rethinking the Role of Rational Actor Models in Environmental Law*, 89 CALIF. L. REV. 917, 977 (2001) ("[T]he CMA provided its members with a kind of continuous compliance education, making them uncommonly well-versed in the details and nuances of the regulatory scheme.").

127. *Id.* at 954-55 ("One of the EPA's . . . pilot programs, the now defunct Environmental Leadership Program ('ELP'), [sought to recognize] and learn from 'environmental leaders,' companies whose environmental management and compliance systems were particularly forward thinking and sophisticated. In June 1994, EPA announced the creation of the ELP and invited proposals for pilot projects that would demonstrate state of the art compliance management systems and produce knowledge that could be transferred to other facilities and settings. The program was limited to companies that: (i) had a good compliance history and sophisticated environmental management systems; (ii) regularly used environmental auditing; (iii) were willing to share their expertise with others; and (iv) would involve both employees and the general public in their environmental management systems. The twelve private facilities selected for the first pilot phase of the program were owned by large, sophisticated organizations with substantial environmental compliance experience."); *id.* at 975 ("During the pilot phase of the ELP, audits were carefully planned in advance and designed to allow participating firms to demonstrate their sophisticated environmental management and auditing systems to the EPA. The audits included regulators and representatives of the firms, and each firm knew ahead of time when the audit would take place and had ample time to prepare. Nevertheless, in nearly every environmental audit performed under the ELP, violations were discovered. . . . [E]ven with time to prepare and an incentive to perform well, these sophisticated firms did not achieve perfect compliance.").

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sufficient, somebody simply must have goofed. One might as well call the human error category "hobgoblins" instead.

It hardly seems satisfying to conclude that as much as one-quarter of all regulatory noncompliance is attributable to a "root cause" of human error but then fail to dig deeper into causal explanations. Importantly, no causal category used in *Root Cause* corresponds explicitly with our concept of regulatory accretion, much less the possibility that accretion affects compliance at systemic levels.

2. Perceptions Survey

Although the *Root Cause* study provides an in-depth survey of sources of noncompliance, the study only surveyed a small number of fairly homogeneous facilities. Furthermore, *Root Cause* did not focus specifically on the problem of regulatory accretion. In order to understand better the significance of accretion, we conducted a survey of environmental law attorneys to detect their level of concern about involuntary noncompliance and to identify its possible sources. We sent our survey to 500 randomly-selected members of the American Bar Association's Section of the Environment, Energy, and Resources (SEER). We chose SEER because it is a prominent forum for leading practitioners of environmental law in private practice, government, academic, and other practice settings. Thanks to SEER's affiliation, the participation rate was very high: of the 500 surveys sent, 168 were completed. [128]

We designed our survey to elicit the respondents' perceptions on three topics

128. We grouped this respondent population using several personal characteristics called for in the survey's opening questions. First, because of our interest in determining the influence of government work experience on perceptions of regulatory compliance, we divided respondents into the following three practice setting categories: (1) those who had spent their entire practice careers representing industry in positions such as private law firms, in-house counsel, or trade associations; (2) those who had spent all or a part of their practice careers in a government position, regardless of other experience; and (3) all others, meaning those who had no government work experience, but also had some experiences other than representing industry, such as judicial or academic.

To detect whether the resources of a regulated business affect compliance perceptions, we further subdivided the respondents who currently represent businesses or did so in the past according to the size of client predominantly represented. We based size on Fortune 500 status and number of employees, with categories for large, medium, small, and balanced (no predominant client type). Finally, because the volume and type of environmental regulation may vary across types of industries, we also characterized the respondents' clients according to the following four industry sectors: (1) manufacturing; (2) land and resource development; (3) transportation and utilities; and (4) services, with many respondents spanning more than one sector.

The survey was voluntary and responses were anonymous. We greatly appreciate SEER's cooperation in providing the member names and their contact information (SEER did not commission, direct, or in any other way influence the design or implementation of the survey). All funding for the survey and the data analysis was provided by The Florida State University (FSU) College of Law. We thank FSU Department of Statistics Professor Kai-Sheng Song and graduate student Han Yu for their assistance in compiling and analyzing the survey data. A descriptive report of the complete survey findings can be found at J. B. Ruhl, James Salzman, Kai-Sheng Song & Han Yu, *Environmental Compliance: Another Corporate Integrity Crisis or Too Many Rules?*, 16 NAT. RESOURCES & ENV'T 24 (2002).

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relevant to compliance policy.[129] First, we asked respondents to describe their perceptions of their ability to assess environmental compliance and of their clients' ability to achieve compliance. Second, expecting that at least some respondents would report significant levels of noncompliance, we asked questions that probed their perceptions of the institutional effects noncompliance has on businesses. Third, turning to the heart of the matter, we asked respondents to identify the sources of noncompliance. We closed the survey with questions about the solutions the respondents would recommend for reducing noncompliance, both within businesses and as a matter of policy.

a. Prevalence of Noncompliance. Environmental lawyers representing business clients have the unenviable task, day in and day out, of assessing their clients' level of compliance for past, present, and future activities. We designed a series of questions, directed exclusively at respondents who currently represent or previously represented businesses, to capture what private sector environmental attorneys think about regulation and compliance. With respect to assessing a client's compliance, a significant portion of the respondents said they find the task difficult with respect to paperwork regulations (for example, recordkeeping and reporting) and physical violations (for example, discharge and disposal violations).[130] None described the task as easy: Only 14% found it moderately difficult, whereas 40% said it is a difficult task and 43% found it very difficult.[131] When asked whether they agree with the statement, "I can confidently assess the absolute level of compliance for companies I have counseled," roughly equal numbers agreed and disagreed.

Although respondents generally found it difficult to assess compliance, many respondents also believed that businesses often fail to comply fully.[132] When asked to estimate how consistently their clients achieved full compliance, a startling number of respondents said they believe their clients did so less than two-thirds of the time.[133]

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129. *Id.* We designed our survey questions to obtain respondents' perceptions about a variety of topics that any experienced environmental lawyer could find controversial and aligned with particular political and economic interests. As such, we recognize that responses may be affected by factors such as whether the respondent represents industry or government, believes in strong government or free-market principles, and so on. Lawyers who represent industry might have rushed to condemn regulations in their responses, and lawyers who represent government might have taken every opportunity to defend them. That is the nature of qualitative perceptions surveys. As we explain in Part III of the Article, we believe it is vital to understand perceptions of regulatory accretion— biased as they may be by practice setting, client base, and political predisposition—because of the effect those perceptions will have on the legitimacy of the administrative state. In any event, as reported in this section of the Article, we found no statistically significant differences in response distributions between sets of respondents from different practice backgrounds or with different client bases.

130. *Id.*

131. *Id.*

132. *Id.*

133. One respondent noted, "I believe that an aggressive regulator can find at least one violation at any facility in the United States on any given day, despite the good faith efforts of the company to be in compliance." Another respondent made the following comment:

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Table 1: Responses to whether the lawyers agreed that they could confidently assess compliance (percent of responses)

	strongly agree	agree	indifferent	disagree	strongly disagree
Paperwork Violations	13	36	12	28	11
Physical Violations	9	38	13	31	9

Table 2: Responses to question on estimated rate of full compliance (percent of responses)

	always	90 percent	66 to 25 percent	never	can't estimate
Paperwork Violations	<1	40	34	11	14
Physical Violations	2	46	28	8	16

Response distributions to this series of questions on compliance assessment and compliance rates generally held true regardless of the respondent's practice background, the size of the respondent's clients, or the industry sectors in which the respondent's clients operate.[134] Most significantly,

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> [A] good auditor can always find some non-compliance at any facility. This does not mean that most industries don't try hard to comply with [applicable regulations]. They are just too complex, spread out, and subject to interpretation (in addition to being too voluminous) for any industry to be able to say with any certainty that it is in full compliance will [sic] all applicable environmental laws.

Id.

134. Because the responses called for in our survey are ordinal in nature, we used the logistic regression method of statistical analysis to answer various questions of interest throughout our study. For example, to determine the influence of government work experience on perceptions of regulatory compliance, we treated the three practice setting categories as the explanatory variable X, and the responses to perceptions of regulatory compliance were coded on a scale from 1 to 5; for example, 1–5 corresponded respectively to strongly agree, agree, indifferent, disagree and strongly disagree. The score for each question was treated as the response variable Y and the k possible scores of Y are called the response categories. The principal objective of a statistical analysis is to investigate the relationship between the explanatory variable X and the response variable Y. The ordinal nature of the responses leads naturally to statistical models based on the cumulative response probabilities of observing response categories less than or equal to a given score j, when the covariate is X. More specifically, we are interested in investigating the influence of the explanatory variable X on the cumulative response probability up to and including category j. The logistic regression method of examining such relationships involves modeling the logarithm of the odds of the event of observing response categories up to and including category j as a function of the explanatory variable X through a linear regression equation.

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experience in the government sector did not measurably affect the distribution of responses.

b. Sources of Noncompliance. The respondents generally agreed that noncompliance presents an array of institutional costs for businesses, including harm to corporate public image (85%), increased administrative costs (82%), friction between businesses and government (81%), and demoralized company personnel (74%). But what, other than the deliberate decision not to comply, causes noncompliance? To explore that question more deeply, we culled explanations for involuntary noncompliance found in the compliance behavior literature and asked our survey population to rate each in terms of its importance in contributing to noncompliance.[135] As shown below, the overwhelming majority of our respondents found many of the factors associated with involuntary noncompliance at least relevant; indeed, most were rated important to very important by a majority of respondents.

By far the most important noncompliance factor the respondents identified was the sheer number of regulations. This held true regardless of respondent's practice experience, sector of employment, size of client, or sector of client. As previously noted, most of the literature criticizing regulatory compliance policy focuses on the complexity, ambiguity, inconsistency, and fluidity of regulations.[136] These qualitative factors can operate independent of the quantitative number of regulations. We would not have been surprised to find the number of regulations scoring roughly the same as these other factors, but to have it rated significantly higher suggests that the *quantity* of regulations has a perceived effect on compliance at least partly independent of the *quality* of the regulations.

Another surprise was that "cost of compliance" was ranked least important overall. Given how prominently the cost of compliance figures in environmental policy dialogue generally, the low score that it received in our survey was curious. To be sure, cost of compliance was rated as relevant, important, or very important by three-quarters of the respondents, but almost a quarter of respondents described cost of compliance as of minor or no significance, and its scores for very important and important pale in comparison to the ratings for number of regulations and the factors focusing on qualities of regulation.[137] This was consistent with the results for our survey's questions on compliance strategies,

135. *See, e.g.*, Spence, *supra* note 126.

136. *See id.*

137. A typical response to our survey noted:

> It's not just a question of money. Even with adequate resources, the laws are just too complex and evolve too often for anyone to track accurately in all cases . . . Laws are both too vague and complex and numerous to ensure >90% compliance regardless of the amount of $ thrown at the issue.

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Table 3: Responses to question on importance of sources of noncompliance (percent of responses)

Factors of Noncompliance	Very important	Important	Relevant	Minor	Not significant
Sheer number of regulations	64	27	7	1	1
Complexity of regulations	44	36	19	1	0
Ambiguity of regulations	39	32	21	7	1
Too many different and conflicting requirements	36	40	13	8	3
Keeping track of changes in regulations	32	42	22	4	0
Size of business operation	32	40	21	5	2
Agencies relying on informal guidance	25	28	32	13	1
Unpredictability of inspectors and enforcement	24	21	30	20	5
Too many levels of government authority	16	35	30	16	3
Costs of compliance	13	25	39	21	2

as well.[138]

No survey can perfectly reflect reality. Questions may be unclear or overbroad. Respondents may lie or, despite best intentions, respond in a self-serving

138. A frequently heard theory is that companies simply need to devote more resources to compliance in order to improve compliance performance. Of course, this sweeping generality does not answer how companies should deploy the money. In any event, this view was not widely held among our respondents. When asked whether a two-fold increase in environmental regulation compliance budgets would ensure full compliance at least 90% of the time, only 40% of respondents agreed that it would. Thirty percent disagreed, and 30% were indifferent. In a follow-up question, when asked where respondents would spend the doubled compliance budget, the emphasis was on devoting more dollars to internal compliance resources, followed by physical facility improvements, and then, of least importance, expenditures on external resources such as consultants and legal counsel. The dedication of compliance resources to internal compliance problem-solving is entirely consistent with the finding that the primary sources of noncompliance are the quantity and qualities of environmental regulation. First

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and misleading manner. In our ABA survey, for example, the possibility surely exists that some private sector respondents downplayed the possibility that costs drive compliance decisions to avoid seeming crass or focused on the bottom line. They may have over-emphasized the importance of the number of rules and their complexity, or the aggressiveness of enforcement efforts, so that noncompliance would seem less culpable.[139] On the other hand, respondents in government or who had government practice experience answered no differently on these questions than respondents whose entire practice experience was in the private sector, suggesting that self-serving bias was not a significant factor. For us the important message is that the regulatory community—both regulators and the regulated alike—strongly perceives the sheer number of rules as an impediment to compliance.

II. A THEORY OF REGULATORY ACCRETION AS A MECHANISM OF INVOLUNTARY NONCOMPLIANCE

Using environmental law as the example, Part I of this Article established that full compliance with regulatory mandates is seldom achieved, that accretion of regulatory mandates is seldom abated, and that practitioners representing agencies and regulated parties believe the two trends are related. Now we consider whether this relationship is real or imaginary. The depths of this issue, to our knowledge, have not previously been seriously examined.[140] In shifting our discussion from descriptive to operative, we first develop a model of how accretion of regulations affects compliance.

EPA defines compliance as "achievement of environmental standards set by law or regulations."[141] But we, and many others, are interested in what the EPA calls "environmental behavior"—the behavior that leads to compliance or noncompliance.[142] An increasing universe of data is becoming available about

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and foremost, human resources are needed to confront the challenge of understanding and complying with the vastness and complexity of environmental law. Where greater expertise levels are needed to solve compliance problems or address conflicts with government or citizens, outside technical and legal resources can be employed.

139. *See, e.g.*, *Companies Say EPA Enforcement Policy Collides with Voluntary Audit Programs*, 25 Env't Rep. (BNA) 416 (June 24, 1994) (describing how private attorneys argue that aggressive enforcement can frustrate voluntary compliance initiatives).

140. Several authors have provided compelling descriptions of how the growing number of regulations complicates compliance through what we describe in this section as effort and information burdens. *See, e.g.*, BARDACH & KAGAN, *supra* note 42, at 931–36; Spence, *supra* note 126, at 184–213. These works stop short, however, of examining whether accretion of regulatory law interferes with the ability to comply because of the effects accretion has on the very nature of the regulatory law system. We call these effects "system burdens."

141. U.S. EPA, OFFICE OF RESEARCH AND DEVELOPMENT, NATIONAL CENTER FOR ENVIRONMENTAL RESEARCH, CORPORATE ENVIRONMENTAL PERFORMANCE AND THE EFFECTIVENESS OF GOVERNMENT INTERVENTIONS 2 (Apr. 2000) (request for research funding proposals) [hereinafter CORPORATE ENVIRONMENTAL PERFORMANCE], *available at* http://es.epa.gov/ncer/rfa/archive/grants/00/corpp00.html (last visited May 14, 2003).

142. EPA defines "environmental behavior" as "actions taken by regulated entities to improve or worsen environmental performance or compliance with environmental statutes or regulations." *Id.* at 2.

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"compliance," as EPA defines it, but remarkably little data exists about "environmental behavior."[143] Usually the latter is portrayed as merely the result of a rationally derived decision whether or not to comply—that is, based on the perceived costs of complying versus the risk and costs of being caught, the "good apples" decide it is efficient to comply and the "bad apples" decide it is efficient to violate.[144] While this is practically the sole foundation of traditional environmental law and many other fields of regulation,[145] there is in fact very little empirical data available on which to test this "rational polluter" model.[146] Yet, however untested the model may be, it is clear at least that for the good apple-bad apple distinction to bear any legitimacy in the sociolegal sense, attaining compliance ought to be reasonably within the grasp of regulated entities that strive to be among the good apples.[147] In other words, if, for whatever reason, compliance is unreasonably difficult to attain, then noncompliance is no longer necessarily the mark of only bad apples.

To emphasize this point, let us return to our Regulatory Kingdom and assume additionally that all companies have wholeheartedly adopted compliance as their corporate norm—that is, they will try in earnest to be good

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143. "[S]urprisingly little attention is paid to how businesses make choices in the face of government regulation." Timothy F. Malloy, *Regulating by Incentives: Myths, Models, and Micromarkets*, 80 TEX. L. REV. 531, 532 (2002).

144. *See, e.g.*, BARDACH & KAGAN, *supra* note 42, at 64–65 ("The regulated enterprises in any program will be distributed along a spectrum of dispositions ranging from most to least compliant—from 'good apples' to 'bad apples'"); Malloy, *supra* note 143, at 532–33 (describing and providing a critique of the three components of the "black-box model" on which most regulation is based—firms are monolithic, rational, and profit-maximizing); Spence, *supra* note 126, at 919–21 ("If there is a foundation on which traditional American environmental structure exists, it is the idea of the firm as a rational polluter").

145. The EPA has explained its view that "[i]n any regulatory situation some people will comply voluntarily, some will not comply, and some will comply only if they see that others receive a sanction for noncompliance. This phenomenon—that people will change their behavior to avoid a sanction—is called deterrence." U.S. EPA, PRINCIPLES OF ENVIRONMENTAL ENFORCEMENT 2–1 (July 15, 1992) [hereinafter PRINCIPLES OF ENVIRONMENTAL ENFORCEMENT]. Deterrence is inherently a rule-based undertaking. John T. Scholz, *Cooperation, Deterrence, and the Ecology of Regulatory Enforcement*, 18 L. & SOC'Y REV. 179, 179 (1984) (defining deterrence as a "rule-oriented strategy [that] seeks to coerce compliance through the maximal detection and sanctioning of violations of the legal rules").

146. "Until recently there have been surprisingly few empirical studies of environmental enforcement. Comprehensive data on compliance and enforcement are only beginning to become available to researchers." Mark A. Cohen, *Empirical Research on the Deterrent Effect of Environmental Monitoring and Enforcement*, 30 Envtl. L. Rep. (Envtl. L. Inst.) 10,245, 10,245 (2000). Public access to comprehensive environmental compliance information is increasing. For example, the EPA recently developed and made public access possible to a new website, known as the Enforcement and Compliance History Online (ECHO), which contains searchable, facility-level enforcement and compliance information for over 800,000 regulated facilities. *See* http://www.epa.gov/echo; Notice of Availability of Enforcement and Compliance History Online Web Site for 60-Day Comment Period, 67 Fed. Reg. 70,079 (Nov. 20, 2002). There has been some controversy already over alleged errors in the database. *See* Drew Douglas, *Florida Officials Complain of Errors Posted on Site Listing Facility Compliance Records*, 33 Env't Rep. (BNA) 2700 (Dec. 13, 2002).

147. We defer until later discussion of the legitimacy issue. *See infra* Part III. Our purpose in the intervening material is to demonstrate the different ways in which regulatory accretion can become an obstacle to the ability of regulated parties to comply.

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apples.[148] Each company's compliance performance thus becomes a matter of matching resources to the reasonably ascertainable compliance conditions.[149] Compliance in this sense has moved from a simple binary decision about behavior (that is, whether to be a good apple versus a bad apple) to a problem-solving exercise. Recall also that in the Regulatory Kingdom all rules are efficient, clear, and institutionally valid. All these good apples should be able easily to comply with all the laws under this ideal scenario, but it may not be that simple, once accretion of rules enters the picture.

A. EFFORT BURDENS AND INFORMATION BURDENS

When compliance is viewed as a problem-solving exercise, the accretion of regulations necessarily equates with the accretion of problems to solve. Even when, consistent with the assumptions of the Regulatory Kingdom, each individual problem is relatively easy to solve, accretion of problems, simply by virtue of there being *more* problems, necessarily adds two dimensions of compliance burden for the problem solver. *Effort burden* refers to the additional time and resources that must be "thrown" at problem-solving in order to complete more problems. *Information burden* refers to the increasing demand for reliable information needed to complete the problems successfully. These two effects, which occupy most of the attention of compliance theory,[150] can be illustrated by analogy to math problems.

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148. This, like the other assumptions of the Regulatory Kingdom, is a convenient academic tool we use to isolate our topic of interest; surely, it is not a reasonable description of current conditions. But an increasing number of critics of the rational polluter model contend that a variety of civic and social motives, only some of which are rational and economically motivated, influence corporate behavior in general toward compliance. *See* Rechtschaffen, *supra* note 10, at 1191–92; Spence, *supra* note 126, at 931–60; *see also* Timothy Malloy, *Regulation and the Compliance Norm* (manuscript on file with author) (describing the prevalence of sub-optimal firm compliance routines and operational procedures as factors contributing to noncompliance). For a thorough description of the two models and the empirical evidence supporting them, concluding that neither is decidedly superior as a framework for achieving compliance, see CLIFFORD RECHTSCHAFFEN & DAVID MARKELL, REINVENTING THE STATE/FEDERAL RELATIONSHIP IN ENVIRONMENTAL ENFORCEMENT 213–88 (2003). For our purposes, it is not critical which of these models one assumes or concludes explains corporate environmental compliance behavior. Even assuming that the rational polluter model explains all corporate compliance behavior, there would be some companies seeking to achieve compliance somewhere, sometime, and the question of the effects of regulatory accretion thus would remain in play. Like the other assumptions of the Regulatory Kingdom, we have adopted the assumption that all companies are "good apples" to eliminate the background noise of "rational noncompliance" and thereby isolate the effects of regulatory accretion.

149. Malloy, for example, proposes using this problem-solving model, which he calls the "resource-allocation" model, because it is a more useful foundation for regulatory design than is either the traditional rational-actor model or the more hopeful good apple model. *See* Malloy, *supra* note 143, at 535–36.

150. *See, e.g.*, Malloy, *supra* note 143, at 536. Malloy captures the impact of effort and information burdens through his description of "regulatory investment." Regulatory investment is made if "it successfully navigates the firm's resource-allocation process." *Id.* Effort and information burdens constrain the investment from navigating the process. So do system burdens, but commentators rarely address these.

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When people think of the role accretion plays in noncompliance, most think of effort burden; accretion means there are just too many laws to handle. Similarly, the addition problem *2 + 2* is easy to solve quickly, but considerably more effort is required for a person with pencil and paper to solve, say, 100,000 such problems. Even if each problem is as easy as *2 + 2*, the exercise of solving the aggregate of the problems is a burden. If the person assigning the problems has decided that 100,000 problems is the "right" number of problems to assign, then the only compliance evaluation question is whether the problem-solver expends the effort to solve them all. The assumption that each problem is relatively easy to solve, however, does not necessarily justify the conclusion that the aggregate effort burden demanded is reasonable. Indeed, those are two completely different matters. The question of effort burden boils down mainly to how much effort to expect of the problem-solver.

Information burdens introduce an additional dimension to the effects of accretion. The *2 + 2* problems described above provide all the information the problem-solver requires to answer each problem, making the question of how many can be solved a matter of the problem-solver's skill and effort. But if the problem is stated as "the number of chairs in the room + the number of tiles on the floor," the problem-solver is required to collect data to solve the problem. As problems of this sort aggregate, the effort burden amasses faster than it does in the *2 + 2* problem scenario given the additional data collection demands, but, importantly, the problem-solver also faces externally imposed constraints associated with the quality and flow of the data. The data may be prone to error, or there may be errors in the collection and communication of the data. The data may be subject to time lag fluctuations, bottlenecks, and other costs not associated solely with the problem-solver's effort. Even where no individual problem imposes unreasonable error or cost constraints, the aggregate exercise of collecting data subject to quality problems may expose the problem-solver to significant risk of failure, regardless of effort. Even so, the stoic problem-assigner may decide that the information demanded is necessary and the number of problems is appropriate, so it is up to the problem-solver, if it wishes to be considered a good apple, to "go the extra mile" to find more accurate and efficient ways of gathering the data.

To place this in the environmental regulation context, assume that State has regulated air pollutant emissions from a particular industry for over twenty years. A new regulation requires Company to measure the pollutant levels of its air emissions several times daily and to file reports of its monitoring findings. This is the kind of compliance problem most people imagine when they think of environmental regulation. It presents little more than a question of investment in technology and employee training designed to gather information relevant to evaluating Company's compliance performance.

The marginal effort and information burdens imposed by accretion thus appear fairly easy to identify. This new rule clearly presents an effort burden (training employees and investing in monitoring equipment) and an information

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burden (gathering and collating reliable monitoring data). In simple terms, more time and effort must be spent complying with each additional rule. Given accretion, as the survey responses made clear, over time the necessary effort can become daunting.[151] For the regulated community, these challenges operate both at the "front end" of compliance, requiring that companies monitor all the rules they must follow, and at the "back end," requiring that companies confirm compliance with the rules. For regulators, these challenges raise primarily the question of how much problem-solving effort and information-gathering ingenuity to expect of a regulated party before identifying it as a good apple even when less than full compliance is achieved. Thus, much of the emerging regulatory compliance literature focuses on this optimization problem by exploring ways other than hard-nosed deterrence-based regulation and enforcement to motivate more compliance effort, improve data collection methods, and, in general, turn bad apples into good apples.[152]

B. SYSTEM BURDENS

Effort burdens and information burdens are discrete problems caused by the accretion of rules. Yet, as much as we and others believe these effects operate

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151. This was clear in many of the responses to our survey:

> "Most of my clients had reasonable budgets and staff. I think it's just about humanly impossible to keep up with everything, especially when many agencies use 'informal guidelines,' often unpublished, to spring new requirements or interpretations on companies."
>
> "There is never enough manpower or time to monitor, record-keep, report, and operate all emitting units in compliance. Never ending juggling act which is guaranteed to lead to a ball being dropped once in a while."
>
> "The number of employee hours devoted to environmental compliance is directly related to the number of regulations, so the number of regs directly affects cost of compliance."
>
> "Most medium to small firms (my typical client) are large enough to have 'big time' environmental issues, but are too small to be able to afford a substantial compliance division. Thus, production and general line staffers attempt to handle a large and complex body of law 'on the side.'"
>
> "There are so many different regulations in so many different places, one can never be sure that he or she has found every applicable regulation."

152. *See* Milo C. Mason, *Preventing Accidents and Anarchy: Toward a Science of Compliance*, 14 NAT. RESOURCES & ENV'T 243, 244 (2000) ("State and local agencies have jumped on the 'let's-help-people-comply' bandwagon."); Rechtschaffen, *supra* note 10, at 1234–39 ("One positive element in current reforms has been a push to expand cooperative assistance efforts significantly"); Jon D. Silberman, *Does Environmental Deterrence Work? Evidence and Experience Say Yes, But We Need to Understand How and Why*, 30 Envtl. L. Rep. (Envtl. L. Inst.) 10,523, 10,530 (2000) ("Behavior modification and motivational concepts are highly relevant in the context of deterrence policy and research"). In its recent request for research funding proposals on the question of environmental compliance behavior, EPA's research objectives include: "What motivates companies to monitor, dissuade, and punish poor environmental performance by their own facilities or noncompliant behavior by their employees?" and "What motivates firms to attain environmental performance beyond that required by regulation?" CORPORATE ENVIRONMENTAL PERFORMANCE, *supra* note 141, at 4. None of the research objectives relates to the topic of regulatory accretion. For more on compliance motivation, see *infra* text accompanying notes 255–57.

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significantly in the context of regulatory accretion,[153] it is too often overlooked that they do not account for *all* of the effects of regulatory accretion. While many of our survey respondents identified the increasing number of regulations as a source of increasing effort and information burdens, many comments suggested that the regulated community appreciates that something else is at play—something having to do with how the accumulation of rules begins to act as a system and imposes a third source of compliance burden effect. One respondent succinctly captured all three effects in the observation that "the greater the number of regulations, the more requirements that must be met [effort burden], the more places that must be checked for guidance [information burden], and *the greater the complexity of their interrelationship*."[154]

It is the last of these three effects that interests us. And it is this interrelationship among regulations that also has escaped pointed analysis thus far in the regulatory compliance literature. The number of rules traditionally has been associated only with effort and information burdens. Those effects are obvious—more rules mean more resources needed for more compliance. Yet it is not entirely obvious what the *full* effect of more rules is. In the Regulatory Kingdom, for example, what would happen were the number of laws to double overnight? How much harder would it be to achieve full compliance? Would the

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153. *See, e.g.*, Spence, *supra* note 126, at 931–36, 972 (outlining the "complexity critique" of environmental regulation—that regulatory requirements impose, in our words, too much effort and information burden and may explain involuntary noncompliance). Professor Spence and others developing this critique of regulation use the term "complexity" primarily to describe conditions such as the incoherence of rules, the effort required to keep up with so many changing rules, and the difficulty of finding rules among all the guidance and other informal administrative apparatus. These are conditions we have either assumed not to exist in the Regulatory Kingdom or have identified as part of the effort and information burdens associated with regulatory accretion even in the Regulatory Kingdom.

As described *infra* notes 154–211 and accompanying text, "complexity" as used in complex systems theory—the usage we adopt in this Article—refers to the behavior of large systems of interacting agents, and can exist regardless of how "simple" or "complex" the individual agents may be. The complexity critique of environmental regulation that Spence summarizes does not incorporate complex systems theory. It does, nevertheless, help to explain the immense costs of complying with environmental regulation. The U.S. Census Bureau estimates that the manufacturing, mining, and electric utility industries combined spent nearly $18 billion in pollution abatement capital and operating costs in 1999. U.S. CENSUS BUREAU, POLLUTION ABATEMENT COSTS AND EXPENDITURES:1999 v (2002), *available at* http://www.census.gov/prod/2002pubs/ma200-99.pdf; *see generally Industry's Pollution-Reduction Costs Detailed In Census Bureau Survey Sponsored by EPA*, 33 Env't Rep. (BNA) 2700 (Dec. 13, 2002).

154. (emphasis added). A number of our survey responses made similar points:

> "[Regulations] often overlap, and changes in one have sometimes unintended consequences in others."
>
> "With this many [rules], there are bound to be inconsistencies and ambiguities and uneven interpretation."
>
> "The more regulation, the more likelihood of overlaps, inconsistencies, and conflicts."
>
> "Greater number = greater complexity."

Bardach and Kagan found similar sentiments in their study of health care industry officials. *See* BARDACH & KAGAN, *supra* note 42, at 186 (noting that, as one nursing home enforcement official observed, "no one examines the effect of new regulations on the old ones. Nobody looks at the second-order effect.").

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added compliance burdens be attributable solely to extra effort and information needed to comply? If so, then it should be relatively easy to quantify and add up the effort and information burdens of all the new rules.

Intuitively that does not seem like all we must consider. For example, would we not expect some of the new rules to influence some of the existing rules and the way the regulated community responds to them, and vice versa? What would happen if such interactions occurred? Can their effects be as easily quantified as the effort and information burdens associated with individual rules? These questions carry us beyond the realm of discrete rules and to the very heart of the behavioral qualities of the legal system. To understand the full effects of regulatory accretion, in other words, we must understand the fate of rules in a legal system.

Although legal scholarship and commentary is replete with references to "the legal system," the system component of that term is usually taken for granted, left unexplained.[155] What exactly is it about "the legal system" that makes it a *system*? Stated another way, why not just refer to the "bunch" of laws, the "masses" of lawyers, and the "collection" of agencies and courts? In the loosest sense, "the legal system" may be simply a shorthand way of referring to the assemblage of laws, lawyers, agencies, courts, and other law-related people and institutions, implying nothing more than quantity. If this were all there is to the system component of the legal system, then it would be reasonable to portray the accretion of laws in our Regulatory Kingdom—including something as extreme as the overnight doubling of rules—as having little consequence beyond adding quantitative effort and information burdens. As law accretes, more law-related people and institutions will be needed, they will do more work, more citizens will be subject to more laws, and they will need to do more to comply with those laws; however, no qualitative effects will be felt.

This view hardly seems credible, but why so? We believe the answer lies in the additional effects attributable to system burdens. Accretion of law, in this view, is but one of many agents of qualitative change in a complex adaptive system.[156] Complex systems theory, or complexity theory, is devoted to the study of such systems.[157] As made clear by the recent explosion in scholarship

155. A search for the term "legal system" in Westlaw's TP-ALL database conducted on August 30, 2001, resulted in 43,954 documents. We did not read them all. A quick scan of several hundred revealed the accuracy of the assertion in this text. To be sure, legal scholars through history have produced elegant and deeply theoretical analyses of what makes "the legal system" a system. A good account of that body of literature is found in MICHEL VAN DE KERCHOVE & FRANCOIS OST, LEGAL SYSTEM BETWEEN ORDER AND DISORDER (Iain Stewart trans., 1994). However, we know of no treatment of that question that focuses on the issue we address here—whether accretion of regulatory law in the legal system confounds compliance because of the effects accretion has on the very nature of the system.

156. Complex adaptive systems are "macroscopic collections of [interacting] units that are endowed with the potential to evolve over time." PETER COVENEY & ROGER HIGHFIELD, FRONTIERS OF COMPLEXITY: THE SEARCH FOR ORDER IN A CHAOTIC WORLD 7 (1995).

157. Although the study of such systems can be quite technical in substance, many of the recent and most influential works in the field focus on applications of the technical theory to real world

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employing complex systems theory, the legal system exhibits the basic ingredients of a complex adaptive system.[158] Indeed, much of the effort in legal

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phenomena, such as biological evolution. *See, e.g.*, JOHN L. CASTI, COMPLEXIFICATION: EXPLAINING A PARADOXICAL WORLD THROUGH THE SCIENCE OF SURPRISE *passim* (1994) [hereinafter COMPLEXIFICATION]; JACK COHEN & IAN STEWART, THE COLLAPSE OF CHAOS: DISCOVERING SIMPLICITY IN A COMPLEX WORLD *passim* (1994); MURRAY GELL-MANN, THE QUARK AND THE JAGUAR: ADVENTURES IN THE SIMPLE AND THE COMPLEX *passim* (1994); BRIAN GOODWIN, HOW THE LEOPARD CHANGED ITS SPOTS: THE EVOLUTION OF COMPLEXITY *passim* (1996); JOHN HOLLAND, HIDDEN ORDER: HOW ADAPTATION BUILDS COMPLEXITY *passim* (1995); STEVEN JOHNSON, EMERGENCE: THE CONNECTED LIVES OF ANTS, BRAINS, CITIES, AND SOFTWARE *passim* (2001); STUART KAUFFMAN, AT HOME IN THE UNIVERSE: THE SEARCH FOR LAWS OF SELF-ORGANIZATION AND COMPLEXITY *passim* (1995); RICARD SOLÉ & BRIAN GOODWIN, SIGNS OF LIFE: HOW COMPLEXITY PERVADES BIOLOGY *passim* (2000). Complexity theory and the science of complex adaptive systems have radically altered the way in which scientists study natural systems as mundane as a dripping faucet and as grand as the weather. For centuries, the classical scientific method has approached such behavior in a reductionist manner, intent on studying components of whole complex systems at their most irreducible levels, based on the premise that by understanding how each part works in its simplest form, we can understand how the whole system works. *See* CASTI, *supra*, at 11–13; COHEN & STEWART, *supra*, at 33–34; COVENEY & HIGHFIELD, *supra* note 156, at 432. The advent of high-speed computers that allow system modeling at levels of detail never before imagined opened the door to the alternative view of systems that complexity theory posits. *See generally* JOHN L. CASTI, WOULD-BE WORLDS: HOW SIMULATION IS CHANGING THE FRONTIERS OF SCIENCE (1997). Although it is relatively young as a scientific discipline, complexity theory has already emerged as an important force in virtually every field of the physical sciences as well as in a wide array of the social sciences. For histories of the development of complexity theory, which has been brought about largely through the efforts of the Santa Fe Institute, see generally JAMES GLEICK, CHAOS: MAKING A NEW SCIENCE (1987); ROGER LEWIN, COMPLEXITY: LIFE AT THE EDGE OF CHAOS (1992); M. MITCHELL WALDROP, COMPLEXITY: THE EMERGING SCIENCE AT THE EDGE OF ORDER AND CHAOS (1992). Current information about the field is best obtained from the journal COMPLEXITY, *available at* http://www.academicpress.com/jcomp (last visited May 14, 2003).

158. *See, e.g.*, Hope M. Babcock, *Democracy's Discontent in a Complex World: Can Avalanches, Sandpiles, and Finches Optimize Michael Sandel's Civic Republican Community?*, 85 GEO. L.J. 2085 *passim* (1997) (critiquing civic republican political theory using complex systems principles); Vincent Di Lorenzo, *Complexity and Legislative Signatures: Lending Discrimination Laws as a Test Case*, 12 J.L. & POL. 637, 639 (1996) (using chaos theory to evaluate the legislative response to alleged lending discrimination); Vincent Di Lorenzo, *Legislative Chaos: An Exploratory Study*, 12 YALE L. & POL'Y REV. 425, 432–35 (1994) (developing a model for legislative decisionmaking based on chaos theory); Gerald Andrews Emison, *The Potential for Unconventional Progress: Complex Adaptive Systems and Environmental Quality Policy*, 7 DUKE ENVTL. L. & POL'Y F. 167, 192 (1996) (applying complex adaptive systems theory to ecological protection issues); Thomas Earl Geu, *Chaos, Complexity, and Coevolution: The Web of Law, Management Theory, and Law Related Services at the Millennium*, 65 TENN. L. REV. 925, 926 (1998) (discussing complexity theory in the context of corporate structure, management, and law); Thomas Earl Geu, *The Tao of Jurisprudence: Chaos, Brain Science, Synchronicity, and the Law*, 61 TENN. L. REV. 933, 934–35 (1994) (discussing the potential significance of chaos and emergence to legal theory); Andrew W. Hayes, *An Introduction to Chaos and Law*, 60 UMKC L. REV. 751, 764–73 (1992) (containing a general discussion of chaos theory and its application to judicial decision making); Jeff L. Lewin, *The Genesis and Evolution of Legal Uncertainty About "Reasonable Medical Certainty,"* 57 MD. L. REV. 380, 389–93 (1998) (describing the evolution of the tort doctrine of "reasonable medical certainty" using complex systems principles); Mark J. Roe, *Chaos and Evolution in Law and Economics*, 109 HARV. L. REV. 641, 643–65 (1996) (describing legal evolution according to path dependence theory and chaotic systems theory); J.B. Ruhl, *Thinking of Environmental Law as a Complex Adaptive System*, 34 HOU. L. REV. 933, 943 (1997) (describing environmental law as a complex system); J.B. Ruhl, *The Fitness of Law: Using Complexity Theory to Describe the Evolution of Law and Society and its Practical Meaning for Democracy*, 49 VAND. L. REV. 1407 *passim* (1996) (using complexity theory to develop a general evolutionary model of the legal system); J.B. Ruhl, *Complexity Theory as a Paradigm for the Dynamical Law-and-Society System: A Wake-Up Call for*

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scholarship to describe the operation of our legal system has focused on understanding how and why it changes qualitatively—its evolutionary qualities.[159] The relationship between accretion of regulatory law and the ability of regulated parties to comply with that body of law falls within this domain of investigation.

Our hypothesis, in short, is that the quantity of rules may affect the quality of the legal system itself, and thus the ability to comply. In other words, continuing to add efficient, clear, institutionally valid laws will at some level change not only how much compliance effort must be expended and how much reliable information must be gathered, but also the way in which the legal system operates, thus potentially altering the compliance potential of regulated parties *regardless* of effort and quality of information. System burdens arise when the various rules are interrelated or have relations to indirect or exogenous variables. As the third dimension of accretion, systems burdens both magnify the

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Legal Reductionism and the Modern Administrative State, 45 DUKE L.J. 849 *passim* (1996) (using complexity theory to develop a general behavioral model of legal system); J.B. Ruhl & Harold J. Ruhl, Jr., *The Arrow of the Law in Complex Administrative States: Using Complexity Theory to Reveal the Diminishing Returns and Increased Risk the Burgeoning of Law Poses to Modern Society*, 30 U.C. DAVIS L. REV. 407 *passim* (1997) (using complexity theory to describe the direction in which the behavioral and evolutionary mechanics are leading the sociolegal system given its current transient state); Robert E. Scott, *Chaos Theory and the Justice Paradox*, 35 WM. & MARY L. REV. 329, 329–31 (1993) (applying chaos theory to questions of justice); Kenton K. Yee, *Coevolution of Law and Culture: A Coevolutionary Games Approach*, COMPLEXITY, Jan. 1997, at 4 (describing attempts to model mathematically the evolution of common law according to complex adaptive systems dynamics). Several other works discuss complexity theory or its branches, such as chaos theory, in specific legal settings, albeit sometimes very briefly. *See* Lawrence A. Cunningham, *Capital Market Theory, Mandatory Disclosure, and Price Discovery*, 51 WASH. & LEE L. REV. 843, 854–59 (1994) (applying chaos theory to capital market regulation); Lawrence A. Cunningham, *From Random Walks to Chaotic Crashes: The Linear Genealogy of the Efficient Capital Market Hypothesis*, 62 GEO. WASH. L. REV. 546, 581–92 (1994) (discussing the application of chaos theory to capital market regulation); Michael J. Gerhardt, *The Role of Precedent in Constitutional Decision Making and Theory*, 60 GEO. WASH. L. REV. 68, 114–15 (1991) (explaining Supreme Court constitutional jurisprudence using, among other mediums, a discussion of chaos theory); Alistair M. Hanna, *The Land Use System*, 13 PACE ENVTL. L. REV. 531, 538 (1996) (discussing application of chaos and self-organization theory to land use regulation system); Glenn Harlan Reynolds, *Is Democracy Like Sex*, 48 VAND. L. REV. 1635, 1639–40 (1995) (discussing the antiparasitic effect of evolutionary processes as an analogy to democratic processes); Glenn Harlan Reynolds, *Chaos and the Court*, 91 COLUM. L. REV. 110, 112–15 (1991) (explaining Supreme Court constitutional jurisprudence using chaos theory); William H. Rodgers, Jr., *Where Environmental Law and Biology Meet: Of Pandas' Thumbs, Statutory Sleepers, and Effective Law*, 65 U. COLO. L. REV. 25, 46–48 (1993) (portraying evolutionary biology as a historical science that studies complex systems); *see also* Eric Kades, *The Laws of Complexity and the Complexity of Laws: The Implications of Computational Complexity Theory for the Law*, 49 RUTGERS L. REV. 403, 452–54, 476 (1997) (focusing on mathematically complex issues as they arise in law, such as cyclical priority issues in liens and property titles); Lynn M. LoPucki, *The Systems Approach to Law*, 82 CORNELL L. REV. 479, 480–82 (1997) (advocating an empiricist "systems approach" to legal analysis); Randal C. Picker, *Simple Games in a Complex World: A Generative Approach to the Adoption of Norms*, 64 U. CHI. L. REV. 1225, 1227 (1997) (using computational theories to examine norm competition).

159. *See* E. Donald Elliott, *The Evolutionary Tradition in Jurisprudence*, 85 COLUM. L. REV. 38 *passim* (1985); Herbert Hovenkamp, *Evolutionary Models in Jurisprudence*, 64 TEX. L. REV. 645, 649 (1985); Ruhl, *The Fitness of Law*, *supra* note 158 *passim*; M.B.W. Sinclair, *The Use of Evolution Theory in Law*, 64 U. DETROIT L. REV. 451 *passim* (1987).

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effort and information burdens as well as sub-optimize overall compliance performance.

By way of illustration, turning back to the example of math problems, until now it has been possible for our problem-solver to confront each math problem on its own as a single, independent problem-solving event. The burden of accretion has been having more problems to solve and data to gather and verify before the day is done, but the effects of success or failure on a particular problem remained confined to that problem. Now consider a problem stated as "the answer to Problem 106 + the answer to Problem 912." Because this style of problem introduces interrelations between problems, a mistake on one can lead to a mistake on another. Other problems may add conditions that are internal to the problem-solving exercise, such as "get five wrong answers and receive ten more questions," or external to the exercise, such as "get five wrong answers and the compliance group loses half of its budget." Worse still, a problem might alter the correct answer to another problem, as in, "now that you've answered question 107, go back to question 33, which has changed as follows."

With the accretion of such interrelations between problems, the problem-solver can no longer consider each problem discretely or limit the consequences of mistakes to single problems. A mistake on one problem could lead to mistakes on dozens more, result in dozens more problems being assigned, and impose effects having nothing to do with the problem-solving task at hand. Even correct answers can have consequences elsewhere. Moreover, after solving many problems, the problem-solver has become "locked in" to certain solutions of earlier problems, sub-optimizing solutions of future problems. Indeed, as interrelations increase, at some point it will become difficult for the problem-solver to untangle the mistakes.

System burdens also complicate matters for regulators. Where only effort and information burdens operate, it is perhaps reasonable for the problem-assigner to consider completion and success rates as indicia of compliance ethic and chalk up unexplained events to human error. But when the set of problems exhibits system properties, the identification of good and bad apples becomes far more complicated. For example, the order in which problems are attempted can affect completion rates; a mistake on one problem can cascade through additional problems, and thereby affect success rates, often without regard to the problem-solver's work effort or data collection ingenuity. The problem-solver's completion and success rates, while still indicia of actual performance, thus no longer provide direct and complete evidence of a good apple or bad apple ethic. Both the problem-solver and the problem-assigner thus are challenged when accretion introduces system burdens to the problem-solving exercise.

This effect is what makes system burdens so different from effort and information burdens and, therefore, important to explore further. No longer is the charge of "too many rules" simply a "straw that broke the camel's back"

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problem. Were effort and information burdens the only consequences of rule accretion, we might be able to "draw the line" on total compliance burdens at some point and refrain from adding new rules on the ground that their increment of compliance burden would make the total burden unreasonable. Or, in the Regulatory Kingdom where all rules are "perfect," we could assign a total compliance burden and rank rules according to criteria such as cost-benefit payoff, accepting only as many rules from best to worst as fell within the total allowed burden. In other words, where only effort and information burdens exist, it remains possible to quantify the burden associated with each rule and cull out discrete rules based on objective criteria in order to adjust total compliance burdens. But system burdens present a "sum is greater than the parts" problem, complicating the decision as to which rules to remove, or to refrain from adding, to meet the assigned total compliance burden. No longer is it as simple as finding the last rule that broke the camel's back.

To appreciate more fully how system burdens in this manner complicate the challenge of managing rule accretion, the following sections explore what complex systems theory reveals about the effects of system burdens on compliance; describe the central principles of complexity theory; and then ground them in examples of regulatory compliance.[160]

1. The Problem of Conflicting Constraints

The diversity of the components that form the "macroscopic collection" of a system is the backbone of complex system behavior. A single tree in a tropical rainforest ecosystem can harbor over 10,000 distinct species of insects, and it is possible to walk long distances in the rainforest without twice encountering the same species of tree.[161] Diversity of such magnitude is the signature of complex adaptive systems.[162] Because the system as a whole depends on no single component for its long-term operation, difficult trade-offs exist as to the overall structure of the system—that is, one is forced to ask whether enhancing one component will diminish another, and if so, what is the overall effect on the system?

Complexity theory research suggests that within any complex adaptive system there exist "conflicting constraints" between the different possible combina-

160. We have suggested previously the utility of applying complex systems theory to problems of regulatory compliance, using the metaphor of a traffic jam to illustrate that, like driving too slow, some noncompliance may be an involuntary response to external conditions beyond the agent's control and operating independent of the agent's proclivity to act consistent with the rational polluter model or the compliance norm model. *See* James Salzman, J.B. Ruhl, & Kai-Sheng Song, *Regulatory Traffic Jams*, 2 WYO. L. REV. 253 *passim* (2002). Accepting our own invitation to study the question further, in this Article we develop a more robust and explanatory model of what we believe is the primary agent of involuntary noncompliance—that is, regulatory accretion.

161. *See* HOLLAND, *supra* note 157, at 27; SOLÉ & GOODWIN, *supra* note 157, at 194–95.

162. *See* Ricard V. Solé et al., *Phase Transitions and Complex Systems*, COMPLEXITY, 1995–1996 No. 4, at 13, 23 ("complex systems find one of their brightest examples in the tropical rainforest").

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tions of components' structural traits.[163] These constraints limit the degree to which any single trait can be adjusted without influencing, positively or negatively, another trait.[164] The upshot is that improving one trait for the sake of improving that particular trait's status in the system can degrade the overall system. When considering how a system should be structured, therefore, the system designer has to evaluate the effects of changing one trait based on the overall effects on the system, taking all other traits into consideration.

The phenomenon of conflicting constraints, familiar to the legal system, is described in legal literature as the "tradeoffs" problem.[165] For example, measures designed to protect imperiled species, have increasingly been identified as threats to private property rights.[166] Measures to increase public access to government records may stifle reporting and jeopardize security.[167] Efforts to streamline one field of regulation through "deregulation" may lead to the need to boost regulation in another field.[168] Legislatures, administrative agencies, and courts routinely must attempt to balance such potentially conflicting policy objectives as they shape rules of law. Complex systems theory shows why, as policies and the number of rules designed to implement them increase in number and diversify in objectives, it becomes more difficult to strengthen rules related to any single policy objective without consequences, positive or negative, to the effectiveness of rules serving other policy objectives.

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163. *See* KAUFFMAN, *supra* note 157, at 169–73 (discussing conflicting constraints as applied to genetics).

164. The exoskeleton of an ant, for example, presents tremendous advantages at the size of an ant, but if ant size were to increase eventually the proportional weight of the exoskeleton would produce the ant's demise. As Kauffman explains:

> Here is the problem: in a fixed environment, the contribution of one trait—say, short versus long nose—to the organism's fitness might depend on other traits—for example, bowed versus straight legs. Perhaps having a short nose is very useful if one is also bowlegged, but a short nose is harmful if one is straight legged . . . In short, the contribution to overall fitness of the organism of one state of one trait may depend in very complex ways on the states of many other traits.

KAUFFMAN, *supra* note 157, at 170.

165. *See, e.g.*, John D. Graham & Jonathan Baert Wiener, *Confronting Risk Tradeoffs*, *in* RISK VERSUS RISK: TRADEOFFS IN PROTECTING HEALTH AND THE ENVIRONMENT 1–42 (John D. Graham & Jonathan Baert Wiener eds., 1995); Lisa Heinzerling, *Reductionist Regulatory Reform*, 8 FORDHAM ENVTL. L.J. 459, 461 (1997); Richard L. Revesz, *Federalism and Interstate Environmental Externalities*, 144 U. PA. L. REV. 2341, 2355–56 (1996); Richard B. Stewart, *Regulatory Compliance Preclusion of Tort Liability: Limiting the Dual-Track System*, 88 GEO. L.J. 2167 *passim* (2000); Cass R. Sunstein, *Health-Health Tradeoffs*, 63 U. CHI. L. REV. 1533 *passim* (1996); Kip Viscusi, *Corporate Risk Analysis: A Reckless Act?*, 52 STAN. L. REV. 547, 548 (2000); Stephen F. Williams, *The Era of Risk-Risk and the Problem of Keeping the APA Up to Date*, 63 U. CHI. L. REV. 1375 *passim* (1996).

166. A classic statement of such a conflicting constraint pitting one legal structure against another is the so-called "regulatory takings" doctrine under the Fifth Amendment's requirement that private property not be taken for public use without just compensation—that is, "if [governmental] regulation [of private property] goes too far it will be recognized as a taking." Pa. Coal Co. v. Mahon, 260 U.S. 393, 415 (1922).

167. *See* BARDACH & KAGAN, *supra* note 42, at 110.

168. *See* Susan Rose-Ackerman's observation, *supra* note 59.

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The conflicting constraints effect is compounded by positive and negative feedback and feedforward response loops. Generally speaking, the force of interaction in complex adaptive systems—which makes these systems dynamic—involves a flow of some medium between components, such as energy or information.[169] When such flows take place in the context of complex adaptive systems, the flows themselves exhibit complex, circuitous paths known as feedback and feedforward loops.[170] In an economy, for example, money and the factors of production move throughout the system from component to component. The response of one component to a particular stimulus can trigger responses from one or several other components (feedforward), which in turn may trigger responses in the original component (feedback) or from yet additional components (more feedforward). The multiplier effect in economic theory, for example, explains how money transferred at one stage of a series of transactions moves from stage to stage and amplifies the effect of the initial transfer.[171]

Indeed, in the conventional view, the very point of having legal rules is to take advantage of the anticipated feedback and feedforward between the rules and their targeted social problems. Feedback and feedforward in the form of deterrent or incentive effects, for example, is the intended result of legal initiatives designed to prompt responses from the regulated community.[172] Such

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169. *See* HOLLAND, *supra* note 157, at 23; JOHNSON, *supra* note 157, at 130–62.

170. Adaptation in complex systems is associated with the feedback and feedforward loops made possible by multiple paths of interactions between system components and thus "is an emergent property which spontaneously arises through the interaction of simple components." GLEICK, *supra* note 157, at 339 n.314 (quoting J. Doyne Farmer & Norman Packard, *Evolution, Games, and Learning: Models for Adaptation in Machines and Nature*, Introduction to Conference Proceedings, Center for Nonlinear Studies, Los Alamos National Laboratory (May 1985). Adaptation allows the system to "restructure, or at least modify, the interaction pattern." CASTI, COMPLEXIFICATION, *supra* note 157, at 271.

171. *See* HOLLAND, *supra* note 157, at 23–25, 84–87.

172. EPA has explained that "[o]ne of the primary goals of an environmental enforcement program is to change human behavior so that environmental requirements are complied with." PRINCIPLES OF ENVIRONMENTAL ENFORCEMENT, *supra* note 145, at 2-1. Malloy goes so far as to say that "environmental regulation is all about using incentives to control behavior," whether those incentives are negative or positive. Malloy, *supra* note 143, at 531. This premise, of course, underlies the rational polluter model and that model's justification of deterrence-based environmental regulation policy. *See* James A. Lofton, *Environmental Enforcement: The Impact of Cultural Values and Attitudes on Social Regulation*, 31 Envtl. L. Rep. (Envtl. L. Inst.) 10,906, 10,906–07 (2001); David L. Markell, *The Role of Deterrence-Based Enforcement in a "Reinvented" State/Federal Relationship: The Divide Between Theory and Reality*, 24 HARV. ENVTL. L. REV. 1, 7–14 (2000); Rechtschaffen, *supra* note 10, at 1186–87; Spence, *supra* note 126, at 937. EPA, for example, defines "deterrence" as "the motivation of regulated entities to comply with environmental laws and regulations through consideration of the government-induced consequences of violating these laws or regulations." CORPORATE ENVIRONMENTAL PERFORMANCE, *supra* note 141, at 2. While virtually every EPA enforcement policy rests on the efficacy of deterrence-inducing response loops, *see* Silberman, *supra* note 152, at 10,523, EPA continues through efforts like the *Corporate Environmental Performance* project to search for evidence of the strength and operative behavioral mechanics of these response loops. Of course, advocates of environmental policy reform incorporating incentive-based rather than deterrence-based measures also rely on different response loops whose strength and operation are not fully understood. EPA defines "compliance incentives" as

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response loops can become exponential in effect and thus dominate the system in which they operate.[173] This is why, as discussed previously, some regulatory feedback and feedforward effects create unanticipated, even undesired, behavior. In other words, the conflicting trade-off constraints of policy choices are not static; the response loops of rule interactions keep them dynamic.[174]

How do these principles affect noncompliance? Assume that a company in our Regulatory Kingdom cares so deeply about compliance that it pairs each regulatory requirement to which it is subject to its own full-time, fully dedicated compliance employee. Because its operations are subject to 1,000 regulations, it hires 1,000 compliance personnel and assigns each person to his or her own rule. The company's management should, naturally, expect such an investment of personnel to result in perfect compliance. However, because of the properties of diversity and response loops, not only is perfect compliance unlikely, but the final result will almost surely be sub-optimal.

Consider, for example, the case in which Bob's job is to comply with a water conservation rule applicable to a property that Company manages. One way of complying with the rule is to remove particularly thirsty vegetation of low commercial value. But what if Sally's job is to comply with an endangered species protection rule applicable to the same property, and the species happens to thrive on the same vegetation that Bob is hoping to remove? As Sally is ordering more plants, Bob is hiring work crews to remove them! Each employ-

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"policies that provide incentives to regulated entities to voluntarily discover, disclose and correct violations or clean up contaminated sites before they are identified by the government for enforcement investigation or response. Compliance incentives may also promote superior environmental performance." CORPORATE ENVIRONMENTAL PERFORMANCE, *supra* note 141, at 2. The degree to which these positive response incentives work also is a subject of EPA's *Corporate Environmental Performance* research effort. There is, in other words, tremendous faith that these positive and negative response loops exist, but little empirical understanding of how strong they are, where and when they work most effectively, how they change over time, and other rather basic issues.

173. *See* Douglas S. Robertson & Michael C. Grant, *Feedback and Chaos in Darwinian Evolution: Part I. Theoretical Considerations*, COMPLEXITY, Sept.–Oct. 1996, at 10, 12. However, as Ronald Coase observed in his classic, *The Problem of Social Cost*, feedback and feedforward cannot easily be confined to the targeted social behavior. Promulgation of Rule *A* may influence not only the targeted behavior, but also behavior in a realm not governed by Rule *A*. But the problem goes beyond even that which Coase envisioned: The collateral behavior Rule *A* affects may be within a realm governed by Rule *B*. As the influence of Rule *A* plays out, the effectiveness of Rule *B* in governing *its* targeted behavior may be compromised. Regulators might be prompted to change Rule *B*, and indeed may do so in a way that affects the behavior that was the target of Rule *A*, leading to changes in Rule *A*. Or the effects of changes in Rule *B* may include behavior governed by Rule *C*, and so on. The promulgation of a rule, in other words, may set into motion events that "bounce back" at the rule and cause it to change yet again, or "bounce forward" toward other rules. *See* R.H. Coase, *The Problem of Social Cost*, 3 J. L. & ECON. 1, 2 (1960); *see also* Pierre Schlag, *An Appreciative Comment on Coase's* The Problem of Social Cost*: A View from the Left*, 1986 WIS. L. REV. 919, 926; Pierre Schlag, *The Problem of Transaction Cost*, 62 S. CAL. L. REV. 1661, 1666–68 (1989).

174. For example, one of the major conclusions Peter Yeager reached after his years-long study of the EPA and corporate compliance with environmental regulation was that there are "systemically embedded constraints in our political economy" and that "the operation of [such] constraints on law is a dynamic process." PETER CLEARY YEAGER, THE LIMITS OF LAW: THE PUBLIC REGULATION OF PRIVATE POLLUTION 30 (1991).

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ee's single-minded focus to ensure compliance with his or her single rule can set in motion events that undercut compliance ability elsewhere.

Of course, one might reasonably expect Sally and Bob to find each other, identify their conflicting goals, and coordinate a solution. Alternatively, Company may capitalize on a cost-cutting opportunity by firing Bob and consolidating both functions into Sally's job description. Sally can then balance the two conflicting constraints internally. Coordination and consolidation thus are two appropriate responses to the problem of conflicting constraints.[175]

But now add Sam into the mix. His job is to reduce the firm's greenhouse gas emissions. His efforts to increase carbon sequestration through increased biomass will support the species protection effort and frustrate the water conservation effort (or frustrate both, if Sam selects a fast-growing, water-hungry, invasive exotic such as a eucalyptus).[176] Coordination and consolidation become incrementally more difficult with each new rule. Indeed, in a typical refinery or chemical plant, as thousands of rules and thousands of employees begin to enter the mix it will become increasingly difficult to trace the paths of cause and effect. The accretion of rules and different types of requirements thus only increases the likelihood of conflicting constraints. Increasing compliance efforts to meet the incremental regulation through coordination and consolidation will, in a number of cases at least, undermine compliance with yet another existing or future rule.[177] The problem of conflicting constraints, a function of

175. This is predicted in fields of study as diverse as game theory, organization theory, and biology. *See generally* ROBERT AXELROD, THE EVOLUTION OF COOPERATION (1984). In complex systems theory terms, coordination and consolidation responses are manifestations of co-evolution between the interacting agents—that is, the Red Queen Hypothesis. *See* SOLÉ & GOODWIN, *supra* note 157, at 253–63.

176. As this example demonstrates, it is important to note that accretion can have positive as well as negative system effects once we introduce a normative criterion, such as compliance with rules. In other words, there may be system efficiencies that occur in compliance possibilities because of accretion, such as breakthroughs in monitoring and compiling of information that are motivated by the need to handle more compliance decisions. In general, however, as most conventional deterrence-based regulations add compliance costs (effort burdens) and increase the need for information (information burdens), it is unlikely that the net system effect would be to reduce total compliance costs. Moreover, the system effects discussed in this section unquestionably complicate any regulated party's understanding of how to optimize compliance behavior, suggesting that it will be more difficult to know what to do. Indeed, the ultimate effect of system behavior on compliance is to make the consequences of different compliance options more unpredictable. *See infra* notes 214–15 and accompanying text. In any event, even if total system effects balance out evenly between normatively positive and negative effects, it is highly unlikely they would balance out evenly for every firm. Some firms, in other words, will suffer disproportionately from the effects of regulatory accretion.

177. Indeed, complex systems theorists studying hierarchical human organizations such as corporations posit that their inherent characteristics lead them to managerial "sticking points" that produce sub-optimal firm-wide behavior. *See* Jan W. Rivkin & Nicolaj Siggelkow, *Organizational Sticking Points on NK Landscapes*, COMPLEXITY, May–June 2002, at 31, 41. Managers have cognitive limits, but must deal with interacting managerial decisions and potentially divergent personal, group-wide, and firm-wide interests. Individuals and groups within the firm develop routines and other coping mechanisms that are efficient for their purposes, but can produce inefficient firm-wide behavior. For example, the flow of information from lower to higher levels of the firm hierarchy must reflect the cognitive limits of the managers involved, who will shape the information to best serve their individual and group needs, which in turn influences the ability of senior managers to act optimally for the firm. *Id.* In a

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the feedback and feedforward response loops associated with the need to comply with diverse regulations, will therefore increase along with accretion and will thereby increase the possibilities that compliance with one requirement will work at cross-purposes with compliance with another.[178]

It is important to note that this is different from the more commonly understood problem associated with accretion of competing resource demands. To be sure, compliance with any new regulation creates problems of opportunity costs that may have effects elsewhere in Company. Money diverted to specific environmental compliance problems may come at the expense of Company's investment in employee training, or the quality of food served in the boardroom. As regulatory demands increase, opportunity costs increase as well, and that may have a significant effect on some aspects of Company's behavior, perhaps even compliance behavior. Those are not system effects, however, but rather just the result of a limited budget.

Some regulations, though, present more than mere cost concerns because of the way they affect or are affected by the application of other regulations. Compliance may not be simply a matter of distributing resources, but truly a problem of understanding complex interactions between responses to one standard and their effect on the options presented under another. In effect, an act designed to comply under one rule may limit the options available to comply elsewhere beyond the limitations arising from the scarcity of financial resources, and vice versa. In this setting, throwing more money and people at compliance may not help. In other words, the compliance problem has moved beyond one of merely effort and information burdens. For example, in our Bob and Sally scenario, increasing their respective budgets would not have solved their respective compliance problems—Sally simply would have bought more plants and Bob would have hired more workers to whack away at them.

The properties of dynamic conflicting constraints also demonstrate the shortcomings of regulatory economic analysis. One might well think the problem of conflicting constraints would be avoided if rigorous cost-benefit analysis were carried out prior to the promulgation of such rules in order to identify their added costs. But this is not the case in practice. Consider, for example, that an

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forthcoming work. Tim Malloy canvasses the literature on such managerial constraints and explores how they lead to "routine noncompliance" with regulatory law—that is, noncompliance resulting from sub-optimal individual and group-wide routines for coping within the firm. *See* Timothy Malloy, *Regulation and the Compliance Norm* (manuscript on file with the author).

178. Another example is the contribution land development regulation can make, ironically, to accelerating land development. Professor David Dana describes the "race to develop" that occurs when environmental preservation regulations impose nonretroactive land development restrictions without hope of compensation for the landowner. Landowners respond by seeking to develop before additional restrictions are imposed, which in turn prompts more regulation, which in turn prompts more development, and so on. The system-wide effect of not compensating landowners for the effects of environmental regulation, therefore, is to risk promoting the very behavior we intend to restrict, perhaps imposing social costs in the form of diminished resources that are far in excess of the costs of providing landowner compensation. *See* David A. Dana, *Natural Preservation and the Race to Develop*, 143 U. PA. L. REV. 655, 656, 677–95 (1995).

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economic analysis reveals the net direct cost of compliance with Rule X to be $\$Y_x$. Traditional cost-benefit analysis would identify this as the cost of the rule. Because of conflicting constraints, however, compliance with Rule X now makes it harder to comply with Rule Z, say by a net cost of $\$\Delta Y_z$.[179] Therefore, the true cost associated with compliance with Rule X is $\$Y_x + \$\Delta Y_z$.

As the number of rules in the system increases, the feedforward potential for these cost variations spreads to more rules (that is, $\$\Delta Y_z + \$\Delta Y_{zz} + \ldots \$\Delta Y_n$), and, eventually, the cost of complying even with Rule X may change as feedback effects emanate from those responses (that is, the new component $\$\Delta Y_{x\text{-}feedback}$). Therefore, the total compliance costs Rule X adds to the system of compliance costs is $\$Y_x + (\$\Delta Y_z + \$\Delta Y_{zz} + \ldots \$\Delta Y_n) + \$\Delta Y_{x\text{-}feedback}$.[180] These numerous marginal cost shifts provide the answer to the question posed in the Introduction: must a system of efficient, clear, institutionally valid laws possess the same qualities found in each individual law?[181] The answer is no, once the level of regulation triggers system burdens. As a result of accretion, even though each rule in our ideal Regulatory Kingdom passed its own cost-benefit test, the system as a whole will not pass the test once the aggregate net cost of system burdens from conflicting constraints becomes significant.

Moreover, the aggregate system costs (or savings) from conflicting constraint effects are not (and, in practical terms, likely cannot be) captured by ex ante economic analysis. While this is roughly analogous to the problem of risk-risk tradeoffs,[182] the likely compliance tradeoffs are far harder to identify so long as rules increase in number and diversify in objectives. Put another way: if, as the number of rules increases, the diversity of rules also increases, then the potential for system feedback and feedforward also rises, and the ability to predict the consequences (and thus the net cost) of any one new rule diminishes.

2. Emergence of System-Dominated Behavior

Understanding the role of conflicting constraints in complex systems sets the stage for recognizing emergence-behavioral characteristics that occur only be-

179. We acknowledge again that systems theory does not require that the effect be negative. However, it is far more likely that, in a system of rules, each of which imposes compliance costs through effort and information burdens, the total system effect of significant accretion of such rules will produce net marginal costs rather than savings, or will make overall compliance more difficult rather than easier. As reported previously, the empirical record gives no reason to argue to the contrary. Our systems model suggests why not.

180. Indeed, we really cannot stop even at this point because the feedback response on Rule X can in turn trigger new feedforward responses. But we believe the point is adequately made that any new rule has the potential to impose cost reverberations throughout the regulatory system.

181. *See supra* INTRODUCTION.

182. Much of the tradeoffs literature posits that by using more rigorous risk tradeoff analysis, legal institutions can predict and control for the effects of conflicting constraints. *See generally* Graham & Wiener, *supra* note 165 (advocating a comprehensive risk tradeoff analysis program for public health and environmental protection laws). Some authors, however, are less sanguine that tradeoff analysis can avoid becoming biased by the way regulation is framed. *See, e.g.*, Heinzerling, *supra* note 165, at 460–61.

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cause of the presence of the system itself. For example, by limiting observation to an individual ant—its foraging, building, defending, and so on—it is highly unlikely that an observer could accurately predict the behavior of the ant colony.[183] The ant colony, unlike an individual ant, is highly adaptive, surviving over time periods far in excess of individual ant lives and in the face of a variety of environmental hazards that pose certain death to individual ants.[184] This emergent adaptive behavior arises when a "system . . . use[s] local rules between interacting agents to create higher-level behavior well suited to its environment."[185]

Even when the individual parts of a system are unaware of or indifferent to their mutual effects—or are even working against each other—emergent system behavior may become highly adaptive. Research has suggested that the magnitude and direction of this effect depend on the number of decisionmaking components, or "patches" as they are known in the complex adaptive systems literature,[186] and how tightly intertwined, or "coupled," are their decisionmaking processes.[187] The problem is that for a multi-patch, coupled decisionmaking system there is no reliable way to predict, simply on the basis of observing any of the system's individual patches, what form the system's emergent behaviors might take and to what end.[188] One has to let the whole system run to see what happens.[189]

The presence of unanticipated emergent behavior in law has not gone unnoticed; it is usually described as the phenomenon of "unanticipated conse-

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183. *See* HOLLAND, *supra* note 157, at 11; SOLÉ & GOODWIN, *supra* note 157, at 147 ("[s]ocial insects display some of the best examples of what we call emergent behavior").

184. *See* JOHNSON, *supra* note 157, at 73–82; SOLÉ & GOODWIN, *supra* note 157, at 147 ("while colonies of social insects behave in complex ways, the capacities of individuals are relatively limited").

185. JOHNSON, *supra* note 157, at 20. Emergence is "a process that leads to the appearance of structure not directly described by the defining constraints and instantaneous forces that control a system." James P. Crutchenfield, *Is Anything Ever New?: Considering Emergence*, *in* COMPLEXITY: METAPHORS, MODELS, AND REALITY 515, 516 (George A. Cowan et al. eds., 1994). Peter A. Corning, Director of the Institute for the Study of Complex Systems, offers the most complete and thoughtful summary of the concept of emergence, tracing its theoretical roots from Aristotle to modern complex system theorists. *See* Peter A. Corning, *The Re-emergence of "Emergence": A Venerable Concept in Search of a Theory*, COMPLEXITY, July–Aug. 2002, at 18.

186. *See* KAUFFMAN, *supra* note 157, at 247–71.

187. *See id.* The study of interconnected systems is a major research focus of complexity systems research. The general model is of so-called *NK* systems, where *N* is the number of system components (patches) and *K* is the number of inputs from other components each component needs in order to know what to do next in the system (coupling). By constructing computer models of *NK* systems, complexity theory researchers can study the effects of altering *N* and *K* in different combinations. *Id.* at 173; *see also* Jeffrey Johnson, *A Language of Structure in the Science of Connectivity*, COMPLEXITY, 1995 No. 3, at 22, 22 (discussing connectivity indexes in social and physical systems).

188. This problem follows from the presence of emergent properties in complex systems. "The ascending levels of hierarchy of complexity demonstrate emergent properties at each level which appear to be nonpredictable from the properties of the component parts. Thus the commonly held expectation that we should be able to derive macroeconomics from microeconomics is probably unrealistic." George A. Cowan, *Opening Remarks*, *in* COMPLEXITY: METAPHORS, MODELS, AND REALITY 4 (George A. Cowan et al. eds., 1994).

189. *See* KAUFFMAN, *supra* note 157, at 288–89.

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quences."[190] For example, Professor William H. Rodgers has written extensively about what he calls statutory "sleepers (provisions with consequences not anticipated at the time of enactment)," which he observes "have played an important role in the history of environmental law."[191] And Professor Cass Sunstein has examined the unintended consequences that result when regulations are based on "partial perspectives that emerge from close attention to mere pieces of complex problems."[192] A classic example from environmental law is media-shifting—the effect that pollution-control laws protecting one environmental medium (for example, air, water, or land) have had on the generation of pollution in alternative media. As Professor Rodgers has observed, "[t]he history of environmental law is filled with examples of air pollution being 'solved' by dumping the residue into the water, water pollution 'eliminated' by diverting the residues to the land, and land pollution 'cleaned up' by incineration or underground injection."[193]

The unintended consequences of a rule thus emerge from the complex interactions between the full set of rules and the human behaviors they motivate. These interactions also occur in regulatory compliance. In other words, a company's environmental impacts are an emergent property of the interaction of

190. The phenomenon of unintended consequences in law is so common that it has been elevated to the status of a "law" itself. As one author observes: "There is something called the 'Law of Unintended Consequences.' Who enacted this law, who enforces it, and its exact scope are obscure. However, from time to time it manifests itself . . ." A.A. Sommer, Jr., *The Role of State Law in an Era of Federal Preemption: Preempting Unintended Consequences*, 60 LAW & CONTEMP. PROBS. 231, 231 (1997).

191. WILLIAM H. RODGERS, ENVIRONMENTAL LAW § 1.3 (1994). Rodgers has described many other examples of unanticipated consequences in environmental law. *See* Rodgers, *supra* note 158, at 56–74.

192. Cass R. Sunstein, *Congress, Constitutional Moments, and the Cost-Benefit State*, 48 STAN. L. REV. 247, 261–62 (1996).

193. RODGERS, *supra* note 191, § 1.4, at 59. For example, in weighing the need for land disposal regulation, Congress observed that water and air pollution control laws had led to "the federal government spending billions of dollars to remove pollutants from the air and water, only to dispose of such pollutants on the land in an environmentally unsound manner." H.R. REP. NO. 94-1491, at 4 (1976). In its 1978 study of the issue, the United States General Accounting Office concluded that "[p]ollution control produces pollutants which must be disposed of in the air, in water, or on land. Unfortunately, environmental protection laws and programs have such single rigid control requirements that pollution control tradeoffs are not usually considered." U.S. GEN. ACCT. OFF., PUB. NO. GAO/CED-78-148B, 16 AIR AND WATER POLLUTION ISSUES FACING THE NATION 89 (1978). *See generally* Lakshman Guruswamy, *The Case for Integrated Pollution Control*, 54 LAW & CONTEMP. PROBS. 41, 42 (1991). A highly publicized example of this occurred recently in California, where officials required use of the gas additive MTBE to reduce automobile emissions, only to find later that the likely carcinogen was polluting groundwater supplies from leaky storage tanks, and only later to find that banning MTBE in the state to remove that effect could lead to severe gasoline shortages. *See* Carolyn Whetzel, *Governor Delays MTBE Ban by 12 Months, Citing Possible Gasoline Shortages, Price Hikes*, 33 Env't Rep (BNA) 653 (Mar. 22, 2002). *See generally* David Littell, *MTBE or not MTBE—Why is That the Question?*, 14 NAT. RESOURCE & ENV'T 247 (2000); Carrie L. Williamson, *"But You Said We Could Do It!": Oil Companies' Liability for the Unintended Consequences of MTBE Water Contamination*, 29 ECOLOGY L.Q. 315 (2002). Now more aware of the tradeoff effect of cross-media pollution, EPA more routinely considers its potential as it assesses the merit of proposed pollution control rules. *See* Steve Cook, *Water Quality Regulations May Increase Emissions from Livestock Lots, Report Says*, 33 Env't Rep. (BNA) 1261, 1261 (June 7, 2002) (discussing a National Academy of Sciences report that found that a proposed rule limiting water pollution from farms may simply increase air emissions from them).

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all of its discrete compliance actions. The overall effect of compliance with one pollution control rule may be to shift emissions to another medium (for example, from air to water), but this simply reflects the many internal conflicting constraints and feedback/feedforward loops responding to external regulatory controls. The same has proven true for the Endangered Species Act, which has in many contexts led to landowner behavior that undermines rather than promotes species conservation.[194] These and other examples of the unintended consequences of regulation may be viewed as the outcome of compliance patterns that could not have been reliably predicted by examining the regulated party's response to any single rule and that were not intended by the promulgators of any of the rules.

Most of the legal literature covering these examples, as well as other unintended consequences of regulation, is purely descriptive in that it identifies an unintended consequence and proposes a fix. Some authors criticize legislatures, agencies, and courts for failing to predict and avoid the consequence before promulgating the rule.[195] Proposed fixes often assume an ability to remove the problem consequence with surgical precision while leaving all the benefits in place.[196] Many authors, however, appreciate what complex systems theory shows—that some of the consequences of a rule are unintended because they

194. *See* Michael J. Bean, *Overcoming Unintended Consequences of Endangered Species Regulation*, 38 IDAHO L. REV. 409, 415 (2002); J.B. Ruhl, *The Endangered Species Act and Private Property: A Matter of Timing and Location*, 8 CORNELL J.L. & PUB. POL'Y 37 *passim* (1998); *see also* James L. Huffman, *Marketing Biodiversity*, 38 IDAHO L. REV. 421, 425 (2002) (describing other examples and noting that "information deficits guarantee that there will be unintended consequences of our environmental regulations").

195. *See, e.g.*, SUNSTEIN, *supra* note 96, at 91 ("A . . . frequent source of regulatory failure is Congress' failure to understand the complex systemic effects of regulatory interventions."); Alex Kozinski & Eugene Voloch, *A Penumbra Too Far*, 106 HARV. L. REV. 1639, 1641 (1993) (proposing, as a test for development of new constitutional doctrine, the question whether "the rationale for the doctrine, if accepted, [will] sweep far more broadly than we might like?"); Rena I. Steinzor, *The Politics of Subsequent Environmental Legislation: The Legislation of Unintended Consequences*, 9 DUKE ENVTL. L. & POL'Y F. 95, 95 (1998) ("some extraordinarily significant facets of modern environmental law are . . . the result of Congress's failure to foresee the consequences of its actions").

196. *See, e.g.*, William H. Lawrence & John A. Minan, *The Effect of Abrogating the Holder-In-Due-Course Doctrine on the Commercialization of Innovative Consumer Products*, 64 B.U. L. REV. 325, 360 (1984); Steinzor, *supra* note 195, at 108. Not wishing to take all the blame for unanticipated results, some members of Congress have contended that it is through the interpretations by judicial and administrative authorities that statutes often are applied in ways that appear to defeat or at least depart from the legislative intent, and have suggested that Congress periodically convene a "corrections day" to clean up such problems by corrective legislative action. *See* John Copeland Nagle, *Corrections Day*, 43 UCLA L. REV. 1267, 1271 (1996). Nagle posits, however, that while these "mistakes" are generally perceived as errors by either Congress, courts interpreting the statute, or agencies implementing the statute, in fact all such mistakes are attributable to Congress being sloppy, unthinking, neglectful, or just plain wrong. *Id.* at 1273–80. He admits one exception in this regard—if "the consequences of a statute were unforeseeable—not just unforeseen—when Congress enacted the statute, then Congress cannot be blamed for a problem it could not have anticipated." *Id.* at 1280 n.44. This exception is, in a systems theory view, an enormous one, perhaps suggesting that it is not fruitful to think of a rule's unintended consequence as being the result of any institution's "mistake."

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were unforeseeable.[197] Given conflicting constraints and feedback within legal systems, it is exceedingly difficult to predict what emergent behavior the system will exhibit after a new rule is added. The Supreme Court recently observed that while "land-use regulations are ubiquitous . . . most of them impact property values in some tangential way—often in completely unanticipated ways."[198] And once emergent behavior materializes, it is as much a part of the system, and therefore as difficult to isolate and manipulate, as are the intended consequences.

To place this in a compliance context, consider the compliance efforts of Company in the Regulatory Kingdom. Recall that to ensure compliance with 1000 rules, Company has a dedicated employee assigned to each rule. While this is an absurd example of compliance over-assurance, in fact businesses do take a variety of actions on compliance, production, human resources, and other matters, all designed to respond to individual requirements. The managers perceive a multitude of discrete compliance requirements and, for obvious reasons, compliance performance is measured at ground level—rule-by-rule. But as a result of this "bean-counting" approach, neither managers nor regulators can optimize a broad system of regulatory performance such as corporate compliance or environmental quality. Such optimization can only be achieved by recognizing the emergent properties of the system and working at their level. As described in the preceding section, conflicting constraints may cause one group's compliance efforts to undermine those of another group. But the pathways of these effects will never be evident if each manager zealously focuses on compliance with his or her regulation. Emergent behavior arises from this combination of all the problems of conflicting constraints that, by definition, cannot be observed at the rule-specific level. Coordination—such as having the 1000 employees meet frequently—and consolidation—such as reducing the compliance workforce to 100, each of whom must follow ten rules—are ways of forcing compliance efforts to take rules as a "package"; however, they yield diminishing returns as the number of rules grows and emergence effects make it more difficult to identify the sources of noncompliance.

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197. *See, e.g.*, James L. Huffman, *The Impact of Regulation on Small and Emerging Businesses*, 4 J. SMALL & EMERGING BUS. L. 307, 316 (2000) (observing that "the rule of unintended consequences will forever plague our regulatory efforts . . . Our lives are complex beyond our understanding, which means that our decisions, both public and private, will always have consequences we do not anticipate and often do not want."); William P. Marshall, *The Last Best Chance for Campaign Finance Reform*, 94 NW. U. L. REV. 335, 336 (2000) ("the consequences of [campaign finance] reform measures are unpredictable"); Cass R. Sunstein, *Political Equality and Unintended Consequences*, 94 COLUM. L. REV. 1390, 1390 (1994) ("[u]nintended consequences . . . can make regulation futile or even self-defeating"); Jay D. Wexler, *Risk in the Balance*, 30 CONN. L. REV. 225, 241 (1997) ("human culture, human behavior, technology, and the environment interact so unpredictably that no rational system can ever predict the results of the interaction or solve for their unintended consequences–particularly in the long term"); Jay D. Wexler, *Why Things Bite Back*, 16 STAN. ENVTL. L. REV. 334, 337 (1997) (book review) ("even the best efforts of agencies to foresee the results of regulatory policy will fail to anticipate the endless variety of unintended consequences").

198. Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency, 535 U.S. 302, 322 (2002).

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However, the implications of emergence and accretion go farther still, requiring regulators as well to consider their effects. To make this concept more concrete, consider the example of the Amoco refinery in Yorktown, Virginia. In the early 1990s, Amoco and EPA launched a joint study of the refinery to assess the role of EPA regulations in promoting pollution prevention.[199] Both EPA and Amoco agreed that a major concern was air emissions of benzene. In complying with EPA regulations, Amoco had commenced construction of a $41 million treatment facility to trap benzene vapors from its wastewater, satisfying the best available technology requirements of the Clean Air Act. To the surprise of EPA and Amoco, further study at the facility revealed that far more emissions were coming from the loading docks than from the wastewater. These pollutants could have been captured for an investment of $11 million, but the investment was not made in place of the treatment facility because the loading dock activities were completely unregulated by EPA.

The point of the story is not that either group was foolish in overlooking the most important source of pollution but that unless compliance is considered at a composite level, far above that of discrete operations, our environmental protection efforts will under-perform even if businesses achieve full compliance. After all, Amoco met the regulatory standards (albeit for $41 million), but compliance had little relation to environmental performance. Unless both regulators and regulated parties can step back and consider how to manage the whole system in question (in this case a refinery), the overall level of environmental performance likely will be sub-optimal. But this is exceedingly hard to do as accretion occurs, which forces greater management focus on ensuring compliance with individual requirements, particularly at the potential cost of $25,000 per day, per violation. Indeed, given this focus on compliance (analogous to our 1,000 compliance personnel each focusing on a regulation), it remains unclear why compliance personnel would be concerned with the overall environmental performance of the firm versus their own individual job performance outcomes.

3. Path Dependence

Conflicting constraints and emergent behavior patterns tend to be dissipative in that they work in one direction but not the other.[200] If the flows in a complex

199. For a summary of the study, see http://www.people.cornell.edu/pages/akm3/Farrell/Farrell.html (last visited May 14, 2003). For an insider's account, see Ronald E. Schmitt, *The Amoco/EPA Yorktown Experience and Regulating the Right Thing*, NAT. RESOURCES & ENV'T, Summer 1994, at 11.

200. The Belgian Nobel laureate Ilya Prigogine defined a dissipative system as one for which the driving force is the nonequilibrium flux of matter and energy through the system that increases order and sustainability in the system but makes reversing the system impossible. *See* Tony Rothman, *Irreversible Differences*, THE SCI., July–Aug. 1997, at 26 (discussing the implications of Prigogine's theory for theories of time and space). Because these systems experience nonequilibrium in terms of input, they necessarily cannot be "reversed" so as to replicate the conditions of the system at a prior point in time. *See* KAUFFMAN, *supra* note 157, at 20–21. For example, if Company *A* is ordered to compensate Company *B* for illegal overcharges, the economic impacts associated with the multiplier effect that occurred when Company *B* first paid Company *A*, such as payments Company *A* made to its

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adaptive system are reversed, it is not possible for the system components to retrace their steps and assume prior positions; new feedback and feedforward loops may emerge, the old ones may change strength or direction, and new possibilities for the system open up. Complex systems are, in a sense, on a one-way path, with the present position being the function of all past positions. The system, in other words, is path-dependent.

As a manifestation of the combined effects of conflicting constraints and emergence, the path direction of a complex system is extremely sensitive to the environmental conditions in which the system exists. This property, known as sensitivity, means that two similar systems may be found at one time to be located at very close decision nodes, where the choice as to where to go next must be made, but can later be found to have diverged wildly from one another based on seemingly minor differences in the decisions.[201]

Path-dependent effects have begun to receive much attention in legal scholarship as an explanation for the dynamics of common law and regulatory law evolution.[202] In particular, early decisions—such as in cases of first impression for courts or an agency's initial set of implementing regulations for a new regulatory statute—become crucial to the direction of the law, to the consequent "lock in" of the judicial doctrine or regulatory policy to a particular path, and thus to the difficulty later of changing course to a now distant path not taken.[203] Litigants and interest groups instinctively appreciate the importance of these decision nodes as they battle furiously over holdings in cases of first impression and the wording of proposed regulations. Over time, the accretion of rules will present more regulatory decision nodes, which will add to the path dependence of present regulatory positions, and will therefore limit the options for new rules.[204]

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vendors and employees with the proceeds of Company *B*'s payment, do not also unwind to their original state. Rather, a new multiplier effect occurs, and the system reaches a new state.

201. *See* CASTI, COMPLEXIFICATION, *supra* note 157, at 91–92. A useful mental image that illustrates the difficulty of predicting the behavior of systems experiencing sensitivity to initial and temporal conditions is provided by the story of German theoretical chemist Otto Rossler, who observed a saltwater taffy-pulling machine in operation. The story, as told by Casti, is that Rossler observed that the contraption stretched and folded a batch of raisin taffy according to the same mechanical procedure over and over again, but that the raisins in the taffy appeared to change relative positions with no *apparent* order. He contemplated the question of what would be the long-term fate of two raisins initially placed very close together, surmising that over time they might separate in position quite dramatically. Indeed, although we know that the machine applies the same procedure ad infinitum to the taffy, it would be very difficult to predict where the raisins will be in relation to each other, say, one month into the process.

202. *See generally* Oona A. Hathaway, *Path Dependence in the Law: The Course and Pattern of Legal Change in a Common Law System*, 86 IOWA L. REV. 601 (2001); Mark J. Roe, *Chaos and Evolution in Law and Economics*, 109 HARV. L. REV. 641 (1996). In retrospect, while never using the term or any perspective of complex systems theory, one of the earliest and still most profound observations of path dependence in law is found in Oliver Wendell Holmes, Jr., *The Path of the Law*, 10 HARV. L. REV. 457 *passim* (1897).

203. *See* Hathaway, *supra* note 202, at 630–31 (describing the lock-in of common law to precedent).

204. *See* Gail Charnley & E. Donal Elliott, *Risk Versus Precaution: Environmental Law and Public Health Protection*, 32 Envtl. L. Rep. (Envtl. L. Inst.) 10,363, 10,365 (2002) ("Environmental health regulation is path-dependent: actions taken now affect the nature of actions taken later. Governments

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In the context of firm compliance, regulations impose decision-node events that can, over time and with the accretion of rules, also lock in compliance behavior to define the means and methods of compliance. As more new rules are promulgated, compliance options for the incremental rules may be limited based on the compliance options taken in the past for prior rules. Assume, for example, that Company's 1000 compliance personnel have been complying with 1000 rules for twenty years, and now an additional ten rules are promulgated. Company's mode of compliance is dependent on the prior investments and approaches it has taken under the first 1000 rules, and compliance options for the ten new rules thus may effectively be locked in place. Viewed in isolation, Company might have chosen a different strategy or technology to comply with the new rules. Because of fixed costs and ways of thinking, however, its range of options for complying with the new rules is diminished.[205]

4. Nonlinearity and the Bottom Line: Unpredictability

Nonlinearity means that the relationships of system components we wish to measure, even though they may be deterministically related, do not exhibit mathematical proportionality.[206] Indeed, despite the neat and orderly world implied by classical mathematics and science, most of the world is governed by nonlinearity and its inherent unpredictability.[207] Hence the

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may not be able to 'roll back' citizen protections . . . even if the original actions turn out to have been unnecessary or ineffective.")

205. *See, e.g.*, Int'l Minerals & Chem. Corp. v. Llano, Inc., 770 F.2d 879 (10th Cir. 1985). In *Llano*, a new state air emission regulation forced a chemical manufacturer to reduce drastically its emissions by a specified date. *Id.* at 883. Because the company had for decades used a manufacturing process that relied on natural gas boilers to heat the chemicals used in the process, and which complied neatly with the existing rules, it initially tested numerous technologies to reduce emissions from that process, all of which failed. *Id.* With the compliance deadline looming, the company happened upon a new process that more than satisfied the new rule, primarily because it used no natural gas. *Id.* at 884. It adopted the process and met the new pollution limits ahead of schedule. Ironically, the company's natural gas supplier then sued it for breach of contract, which led to the litigation. The court relieved the company of its contractual obligation to purchase natural gas under a theory of impracticability of contract. *Id.* at 886–87.

206. A system is described as linear when the relationship of the agents' interactions can be described in strictly proportional terms (for example, $y = 2x + 3z$). Therefore, a system is nonlinear if the relationships of the agents represents a function in which the output of an element is not proportional to its input. *See generally* P.G. DRAZIN, NONLINEAR SYSTEMS (1992).

207. Most evolutionary systems thus are inherently unpredictable because they are designed to adapt to the inherent unpredictability of their environment. *See* Peter Schuster, *How Does Complexity Arise in Evolution*, COMPLEXITY, Sept.–Oct. 1996, at 22 (describing unpredictability as an integral force in biological evolution). This so-called deterministic randomness of nonlinearity is the behavioral trait known in complexity theory as chaos. Chaos behavior thus has been described as "order masquerading as randomness." GLEICK, *supra* note 157, at 22. Classic examples of chaos in physical systems run by deterministic rules are the erratic dripping patterns from water faucets, *see* Tom Mullin, *Turbulent Times for Fluids*, *in* EXPLORING CHAOS: A GUIDE TO THE NEW SCIENCE OF DISORDER 59 (Nina Hall ed., 1991), and the motion of a pinball, *see* Ian Percival, *Chaos: A Science for the Real World*, *in* EXPLORING CHAOS, *supra*, at 11. Although the rules determining the presence of chaos in such systems may be simple and rigid, the randomness of the system's behavior prevents easy discovery of all the rules merely by observation of the behavior. Thus, chaotic behavior "only looks complicated because you

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concern of some scientists that relatively small changes in global climate may unexpectedly trigger relatively large responses, such as the collapse of the West Antarctic ice sheet.[208] And even bastions of classical economics are resigned to the fact that "[t]wo hundred years of economic 'science' have done nothing to improve the ability of forecasters to predict recessions."[209]

As a general matter, accretion of system components contributes to this quality of unpredictability. Accretion adds to the diversity of components, and thus to potential conflicting constraints. Accretion adds to the potential for couplings between components, and thus to positive and negative feedback/feedforward loops that make conflicting constraints more dynamic. Accretion increases the ways in which emergent behavior can develop and the forms it takes. Accretion increases the frequency of decision nodes that promote path dependence. Accretion can amplify the effects of system sensitivity and nonlinearity. Accretion thus contributes to and changes the overall behavior of the system. In short, adding components to a complex system changes not just the quantity of components, but also the quality of the system in terms of reduced predictability and stability.[210]

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don't know what the rule is." COHEN & STEWART, *supra* note 157, at 197. More to the point, even if you did know what the rule is, thus making the system computable, you couldn't predict what will happen very far into the future.

208. As a report in TIME explained:

> If climate change brings about a large rise in sea level, the principal immediate cause will be the collapse of the West Antarctic ice sheet [WAIS]. WAIS is the world's last remaining marine ice sheet (meaning that it sits on the ocean floor rather than floats). . . . Should this ice sheet collapse or float free, as other marine ice sheets have done, global sea level would rise nearly 20 ft., which would inundate most of Florida and hundreds of low-lying cities from Jakarta to London. . . . As long as accumulation at the center offsets the amount of ice lost through sublimation (as ice turns directly into vapor) or the calving of icebergs, the great ice sheet remains stable. If it begins shedding ice rapidly, however, the sheet gets lighter, allowing warm seawater to intrude underneath, further speeding the flow of ice to the edges. At some point—no one knows when—the whole sheet begins to come apart. That is when sea level around the world would climb rapidly.

Eugene Linden, *Antarctica: Warnings from the Ice*, TIME, Apr. 14, 1997, at 54.

209. Alan Murray, *The Outlook: A Recession Awaits the Next President*, WALL ST. J., Aug. 26, 1996, at A1.

210. Cohen and Stewart vividly explain that the key to understanding why emergence and other system effects occur lies in the number of system components and their interaction—with increasing numbers of system components, eventually the sum effect of the interactions between the components becomes a dominating characteristic of the system. *See* COHEN & STEWART, *supra* note 157, at 182. For example, a system consisting of ten components has forty-five possible one-to-one pair combinations (a 1:4.5 ratio); a system of 1000 components has almost 5,000,000 such combinations (a 1:5000 ratio); and a system of one million components has almost five trillion such pairings (a 1:5,000,000 ratio). *Id.* In large systems, therefore, "if the effect of any particular interaction is tiny, we may not be able to work out what it is. We can't study it on its own, in a reductionist manner, because it's too small; but we can't study it as part of the overall system, because we can't separate it from all the other interactions." *Id.*

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This is as true for an ecosystem[211] as it is for a traffic jam,[212] and we can think of no reason why it should be any less true for the regulatory system. The Formalist vision of legal rules leading to completely predictable, stable outcomes is universally regarded as unattainable.[213] A certain level of indeterminacy and instability in the regulatory system, whether one believes it is normatively positive or negative in sociolegal effect, is inherent because the regulatory system is a system. Moreover, based on the findings of complex-system theory discussed in this section, one agent of indeterminacy in the regulatory system must be accretion of the number of rule components of the system. In the regulatory system, as in any system, size matters.

C. SYSTEM MECHANICS

Our review of systems theory thus suggests four insights into how complex system mechanics affect compliance in a regulatory system experiencing high levels of rule accretion. First, because of accretion, compliance is hindered by system burdens. Compliance is not merely a chain of transaction-cost decisions about whether to comply and how much to invest in the effort. Neither the rational-polluter model nor the resource-allocation model integrates the realities of system burdens; despite unlimited good intentions, money backing up those intentions, and well-planned allocations of the resources, the options available to confront a particular regulatory compliance problem are influenced by legal doctrines and regulations that may have nothing directly to do with the problem at hand. Legal scholarship has mined the policy consequences of these effects with concepts such as tradeoffs and unintended consequences, but those treatments of the subject do not describe the causes. Systems theory, on the other hand, provides a deeper understanding of how noncompliance can emanate from the legal system itself rather than from conscious decisions, lack of budget, or unwise allocation of resources.

Second, accretion of regulatory demands contributes to and perpetuates the system burdens on compliance. Feedback, path dependence, emergence, and other system properties are fueled by disturbance and diversity. Accretion of laws in the legal system is a source of both disturbance (new rules change the rules) and diversity (new rules add new kinds of requirements). Yet, the burdens

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211. As Solé and Goodwin explain:

> Immigration [of species] pushes the ecosystem toward higher and higher diversity. . . . But this driving force cannot push diversity arbitrarily high. Interactions start to operate, and the system reaches some upper limit for the number of species. The limits to diversity would then be imposed by instability.

SOLÉ & GOODWIN, *supra* note 157, at 200.

212. *See* MITCHELL RESNICK, TURTLES, TERMITES, AND TRAFFIC JAMS: EXPLORATIONS IN MASSIVELY PARALLEL MICROWORLDS 68 (2001) ("Traffic flow is rich domain for studying collective behavior. Interactions among cars in a traffic flow can lead to surprising group phenomena.").

213. For a description of the evolution of jurisprudential theory in this regard, see Ruhl, *The Fitness of Law*, *supra* note 158, at 1422–37.

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themselves are not necessarily constantly accreting as well. Some may be mitigated or removed from the system altogether by other social, economic, political, or even legal changes. However, with accretion of regulatory standards happening at a relentless rate, system burdens on compliance have a steady source of creation.

Third, there is no way to avoid the problem of system burdens because there is no way to implement a regulatory system that does not exhibit properties of a system. Therefore, there is no way to demand compliance with the regulatory system without expecting some level of noncompliance. Indeed, systems burdens are only a "burden" in the normative sense because of the policy objective of achieving full compliance. But systems, to be adaptive, sustaining, and resilient, must exhibit the very properties that lead to system burdens. Having a regulatory *system* promotes long-term stability of law in the face of external challenges, but also produces system effects that may prove undesirable to policy goals. As with any system, however, for it to remain a system, the bad (as society sees it) must come with the good (also as society sees it).

Finally, the effects of the problem and any attempt to rectify them are unpredictable. Regulators and the regulated cannot know what new feedback loop or emergent effect some new regulatory standard will trigger or extinguish. Nor can they predict the consequences of removing a regulatory standard.[214] As William Blackstone warned centuries ago of property law, a system not nearly as far-flung as modern regulatory law, "the law of real property in this country is now formed into a fine artificial system, full of unseen connections and nice dependencies, and he that breaks one link in the chain endangers the dissolution of the whole."[215] Tinkering can be dangerous.

In sum, the system burdens fueled by accretion of rules do not, in and of themselves, cause discrete instances of noncompliance. However, they can, and most likely do worsen the effort and information burdens of accretion, hindering regulated parties' ability to comply and strongly hindering efforts to optimize environmental performance. As our survey revealed, these effects of accretion appear to be foremost on the minds of practitioners from a broad array of practice settings.[216] Yet the rational actor and good apple models of compliance fail to take this system-based component of noncompliance into account. Indeed, regulatory compliance literature in general has failed to identify system-based causes of noncompliance as a discrete component in the overall mix of

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214. Again we recall Susan Rose-Ackerman's observation that:

> [d]eregulation of one area of the economy may itself produce the need for more regulation someplace else. In moving toward a more competitive situation in one dimension, bottlenecks and market imperfections in other dimensions may become newly relevant. . . . In short, deregulation in one area often requires new regulation and oversight someplace else.

Rose-Ackerman, *supra* note 59, at 520.

215. *Quoted in* FRANCIS HARGRAVE, A COLLECTION OF TRACTS RELATIVE TO THE LAW OF ENGLAND 489 (London, 1787) (our thanks to Adam Hirsch for this gem).

216. *See supra* notes 133–36 and Table 3.

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factors leading to the "slippage" between full and realized compliance.[217] We thus turn to the question of whether it is important to take these effects into account.

III. THE IMPLICATIONS OF ACCRETION FOR REGULATORY LEGITIMACY

No doubt, at this point some readers might be muttering to themselves (in their best sarcastic voice), "Boo hoo, my heart is just cracking to pieces over these poor companies finding it so hard to comply. Snap out of it! Sophisticated businesses should know full well that complying with regulatory commands is difficult." Indeed, from the standpoint of the environmental regulator, the problem-solving hurdles posed by the demand for effort and information, and the burden on systems, may be justified as simply a cost of doing business in a complex world. Yes, involuntary noncompliance is an issue, but as the gains in clean air and water over the last three decades prove, our environmental protection requirements work.[218] An entire field of regulation cannot jeopardize its mission because of potential unforeseen feedback effects, and companies need to recognize that some choices will have problematic effects over time as new and revised regulatory demands accumulate. That's life. Get used to it.

The answer to these no-nonsense replies, we contend, lies in *why* compliance is difficult. Treating compliance as purely a matter of ethics and transaction costs will cause regulators either to label some good apples as bad apples, or to demand additional increments of compliance investment that have little chance of eliminating the targeted noncompliance. But, as demonstrated above, in advanced administrative states there will always be some level of noncompliance attributable to the inevitable, unpredictable, system burden effects of regulation. This component of noncompliance not only is unintentional, but is itself unavoidable and unpredictable. Hence, we would suggest, the not-so-startling result that every compliance study of environmental law to date has

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217. Professor Daniel Farber has described the problem of widespread noncompliance as "negative slippage," arguing that:

> In a well-ordered society, presumably, the law on the books would generally correspond with observed conduct, apart from the inevitable shortfall due to human error or antisocial motivations. In environmental law, however, shortfalls are widespread at all levels of the system, for reasons that cannot simply be attributed to antisocial or deviant conduct.

Farber, *supra* note 14, at 300. The now extensive body of literature on slippage, however, fails to attribute any portion of total noncompliance to system burdens. To the extent that system burdens account for a significant portion of slippage, which we contend is quite likely, the implications of slippage and the policy responses must take into account the fundamental characteristics of system behavior. These are the subjects of Parts III and IV of this Article.

218. With few exceptions our air is cleaner and our water is purer than in 1970. For background on air, see, for example, U.S. EPA, EPA-454/R-00-002, NATIONAL AIR POLLUTANT EMISSION TRENDS, 1900–1998, ES-1 to ES-6, 3-1 to 4-11 (Mar. 2000), *available at* http://www.epa.gov/ttn/chief/trends/trends98 (presenting and discussing trends in emissions of several major air pollutants).

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revealed significant levels of noncompliance.[219] The problem, however, is that identifying the systems component of noncompliance and differentiating it from the component of noncompliance attributable to lack of ethics and lack of effort is excruciatingly difficult.

In the final analysis, then, the reason to care about accretion is that it stands in the way of compliance and, ultimately, environmental protection. In any evaluation of a regulatory program, the following two measures should concern us: first, the ability of the regulated community to comply with the law; and second, the effect compliance has on the desired policy outcome, which in our case is environmental protection. As accretion of rules magnifies the system burdens on compliance, increased compliance effort is less likely to be capable of being specifically correlated to positive compliance outcome. We call this the "compliability" factor. And as system burdens increase, compliance efforts, even if they can be shown to lead to an improved compliance outcome, are less likely to be capable of being specifically correlated to a positive social welfare outcome. We call this the "payoff" factor.

In the easy case, of course, these consequences may not matter appreciably. For example, a business could confidently assume that investing in pollution control equipment to reduce emissions of chemical *X* from an industrial smokestack is likely to improve compliance with a rule regulating emissions of *X* from

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219. Studies by the General Accounting Office found that a remarkable 41% of industrial users were not complying with the pretreatment discharge limits for publicly owned treatment works. Rechtschaffen, *supra* note 10, at 1207–08 (citing U.S. GEN. ACCOUNTING OFFICE, WATER POLLUTION: IMPROVED MONITORING AND ENFORCEMENT NEEDED FOR TOXIC POLLUTANTS ENTERING SEWERS, GAO/RCED-89-101, at 3 (1989)). A later GAO study of EPA compliance data from 1992–1994 revealed that 18–27% of major facilities were in "significant noncompliance." U.S. GEN. ACCOUNTING OFFICE, WATER POLLUTION: MANY VIOLATIONS HAVE NOT RECEIVED APPROPRIATE ENFORCEMENT ATTENTION, REPORT TO THE RANKING MINORITY MEMBER, COMM. ON ENVIRONMENT AND PUBLIC WORKS, U.S. SENATE 1 GAO/RCED-96-23, at 4 (1996), *cited in* Markell, *supra* note 172, at 55.

Other studies have also shown very high levels of noncompliance. A survey of general counsels at major corporations in the early 1970s, for example, revealed that two-thirds believed their businesses had operated, at least some time in the prior year, in violation of environmental laws. Nearly seventy percent indicated that they did not believe absolute compliance was achievable. Lavelle, *supra* note 23, at S1.

> This comports generally with Wes Magat and Kip Viscusi's 1990 study of Clean Water Act compliance in the paper industry, which estimated a seventy-five percent compliance rate with effluent limitations. Looking beyond the Clean Water Act context, John Brehm and James Hamilton's 1996 study of compliance with the Emergency Planning and Community Right-to-Know Act of 1986 found similar compliance rates, while an analysis of inspection data by the Massachusetts Department of Environmental Protection in 1997 found that about ten percent of all inspections revealed violations of environmental laws meriting enforcement action. The EPA's Sector Facility Indexing Project (SFIP) assembles enforcement data for facilities in several heavy industries including rough measurements of compliance with the Clean Air Act, Clean Water Act, and RCRA. Over eight quarterly periods spanning August 1996 to August 1998, participating facilities averaged at least one "noncompliance event" in 3.8 of those quarterly periods (almost half the time). Not only are all of these studies fairly consistent with one another, they seem consistent with prior EPA estimates of noncompliance rates.

Spence, *supra* note 126, at 966–67.

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such sources, and that the environmental benefits of reduced levels of *X* in the ambient air can therefore be traced back to the compliance effort. But environmental regulation, like other highly regulated fields, has expanded far beyond regulating the easy matters, such as gross point-source emission levels of pollutants with obvious health and environmental impacts. It is filled with monitoring, record-keeping, reporting, and assessment requirements. It involves regulating all manner of releases of chemicals, sometimes to concentration levels expressed in parts per billion. It micromanages business practices in industries as varied as mining, forestry, land development, paper printing, and milk processing. This, in general, is a good thing, given the advances in environmental protection over the last three decades. But it is from within this vast network of rules that systems effects emerge to confound the ability to link compliance effort to compliance performance (compliability) and then to environmental quality (payoff). And as much of a concern as these effects may be for regulated entities, in the long run they could be far more problematic for regulators, as they go to the heart of the legitimacy of the administrative state itself.

A. THE "COMPLIABILITY" FACTOR

"Compliability" is a measure of how closely compliance effort correlates with actual compliance. High compliance efforts that lead to high levels of compliance indicate high compliability of the system of rules. However, high efforts leading to low compliance indicate low compliability and the potential for significant involuntary noncompliance.

We have previously identified effort burdens, information burdens, and system burdens as three consequences of regulatory accretion that have the potential to reduce compliability. At some point good apples are likely to perceive low levels of compliability as unjust regardless of the source. They may complain that the assumptions of the Regulatory Kingdom that apply to each rule have been violated in the aggregate in that it is simply far too expensive and difficult to manage the effort burdens and information demands that the entire body of environmental law imposes.[220] This is what commentators usually have in mind when they refer to "over-regulation" or "unreasonable regulation."[221] Moreover, even if a business was to select specific rules for intensified compliance efforts, if system burdens are high there is no assurance that compliance performance would significantly improve for those rules but not deteriorate for others. The very nature of a complex system is that a regulated party cannot point to a specific input (invest in compliance with Rule

220. This theme is common in business-based criticism of environmental regulation. *See* Lofton, *supra* note 172, at 10,907. As one respondent to our survey observed, "[Accretion] also makes compliance with the important rules more difficult, due to the perception by some employees that compliance doesn't matter."

221. *See* BARDACH & KAGAN, *supra* note 42, at 6–7.

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X) and predict a specific output (improved compliance with Rule *X*) while holding everything else constant (that is, continued compliance with Rules *A–Q*).[222]

Eventually, when the good apples feel that, regardless of effort, they are "hitting their heads against the wall" and "throwing good money away" because they cannot improve compliance performance, they may begin to wonder what the point is of being good apples. Indeed, this is exactly what our survey revealed. When asked to characterize the consequences of involuntary noncompliance, three-quarters of respondents agreed or strongly agreed that it was "frustrating and demoralizing to company personnel." Many of the expositive responses we received in our survey revealed a deeply rooted resentment of low compliability.[223] And a significant number of responses treated noncompliance as simply another business risk to be managed.[224]

Hence, when accretion burdens lead to low compliability levels, it is a problem not only for the regulated, but for the regulators as well in the form of legitimacy concerns. Tom Tyler's extensive study of compliance attitudes revealed as one of its central findings that the degree to which regulated parties perceive enforcement as fair is a critical antecedent to their perception of the enforcement authority's legitimacy, which in turn is a critical antecedent to positive compliance behavior.[225] As David Spence has described in the specific context of sanction-based versus compliance-facilitation models of environmental regulation enforcement:

> Of course, there is "slippage" in every legal system, but slippage occurs in both directions. If the system treats innocent violators like criminals, it fails to meet the expectations of the regulated industries. . . . In other words, a system

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222. The Bob and Sally scenario is an example of this. *See supra* text accompanying notes 172–73.

223. While the nature of the survey allowed respondents so inclined to plead victimization on behalf of their clients, the strength and number of the responses displaying resentment of enforcement policy was striking. These are representative:

> "Nearly all my clients really wanted to be in full compliance. But they also knew it was nearly impossible to be in compliance all the time. And they knew no matter how hard they tried or how much they spent, they'd be screwed if an inspector found the least thing wrong, and would try his or her best to blow it into a big deal. . . . It's a very stupid strategy for the regulators. People lose all respect for them. But they do it over and over."
>
> "Most of my clients had reasonable budgets and staff. I think it's just about humanly impossible to keep up with everything, especially when many agencies use 'informal guidance,' often unpublished, to spring new requirements or interpretations on companies."
>
> "When the entire universe of federal, state, local, and tribal laws are considered, compliance with all is almost impossible."
>
> "An infinite budget would not assure [full compliance]."

224. For example:

> "In an unending but futile search for the perfect, regulators ensure constant regulatory confusion. Knowing they can never get to 100%, most companies just do the best they can and accept that they will run afoul of some unknown, unfathomable requirement."

225. *See* TOM R. TYLER, WHY PEOPLE OBEY THE LAW 161–69 (1990).

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> that treats too many people unfairly can undermine its own legitimacy. . . . The lesson is obvious, perhaps even intuitive. If a system of laws imposes costs and penalties on the regulated in ways that seem irrational or unfair, it undermines its own effectiveness and, perhaps, its long-term survival.[226]

The point we wish to add is that effort and information burdens, which are the conventionally identified sources of this perceived "unfairness," are only part of the picture. System burdens, to the extent they also decrease compliability, and do so with no easy cure, are even more likely to lead to the erosion of legitimacy.

B. THE "PAYOFF" FACTOR

Even assuming that it is possible to link specific compliance investments to specific compliance performance outcomes, system burdens pose another correlation problem in the form of the very purpose of compliance—that is, improved environmental performance. It is not unreasonable for regulated entities to expect that if they invest in compliance, not only can they comply, but that compliance will yield the payoff of positive environmental quality benefits in reasonable proportion to the cost of complying.[227] Put another way, "[a] regulatory requirement is unreasonable if compliance would not yield the intended benefits . . . ."[228] Thus, the legitimacy of the regulatory system depends not only on its ability to link compliance-investment input to compliance-performance outcome, but also on its ability to link compliance-performance outcome to environmental-quality outcome.

Environmental law faces a particularly difficult challenge in this respect. For starters, the environment itself is a complex system; therefore, the effects of our actions toward it are often difficult to predict.[229] The ability of regulators to demonstrate the payoff factor at the firm level can prove surprisingly difficult apart from obvious cases, such as point-source emission controls of known environmental toxins. Even here, linkage often is unclear. Environmental protection is often cast simply in terms of reducing physical impacts on the environment—less pollution and less development means greater protection. The problem, though, is that it is often difficult to measure what society really cares about when it seeks environmental protection. Most observers (and most environmental rules) value environmental protection through the anthropocentric view

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226. Spence, *supra* note 126, at 978; *see also* BARDACH & KAGAN, *supra* note 42, at 112 ("[l]egalistic regulation can turn a regulated enterprise's disposition to comply with the law into a positive disposition to resist"); Rechtschaffen, *supra* note 10, at 1193–95 (arguing that corporate actors are less likely to comply with regulations they perceive are illegitimate).

227. *See* Spence, *supra* note 126, at 978 ("the long-term health of environmental regulatory regime depends upon its ability to achieve its stated goals of minimizing environmental pollution by maximizing compliance").

228. BARDACH & KAGAN, *supra* note 42, at 6.

229. For numerous examples, see Ruhl, *Thinking of Environmental Law as a Complex Adaptive System*, *supra* note 158, at 953–67.

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of how directly those reduced impacts relate to *our* quality of life, whether that be reduced health risks, clearing the haze in the Grand Canyon, or conserving biodiversity. Moreover, because it is difficult to measure the social cost of specific emissions, environmental law relies almost entirely on proxy measures. In the case of power plant emissions, for example, what society cares about is the environmental and consequential social impact of acid deposition. But the environmental rules governing power plant emissions do not regulate or trade units of acid rain impact. Instead they use the proxy of tons of sulfur emitted, which is assumed to be an adequate indicator of potential impact.[230] Regulating at the source of emission is less environmentally meaningful than regulating at the point of impact—at the receptor—but cost and technological constraints force the regulatory hand.[231] The key legitimacy question this approach poses for the regulatory community is whether reducing sulfur from the source is likely to yield real environmental benefit—whether compliance at the firm level can be traced to reduced environmental and social harms.

Moreover, beyond the difficulty of linking specific emissions to specific harms, environmental law mandates many actions with administrative rather than environmental consequences. Such extensive recordkeeping requirements seem unavoidable. Consider that, in a good year, EPA will conduct about 22,000 inspections leading to 4000 civil actions. States, which do the lion's share of enforcement, will conduct 146,000 inspections and 9000 enforcement actions.[232] Impressive numbers, until one realizes that there are roughly eight million regulated parties subject to environmental laws.[233] In other words, a regulated party has about a 2% chance of being inspected—and a 0.16% chance of being sanctioned—in any given year. As with the tax code, where the vast majority of taxpayers face little realistic chance of being audited, establishing a credible deterrent is absolutely necessary to encourage compliance. To this end, little distinction is made in environmental law between how paperwork and

230. One can equally describe this as identifying the *optimal point* of regulation. In the pollution context, one ideally wants to regulate based on units of risk to individual receptors. However, this is technically too difficult and expensive. Short of that, we should seek to regulate the level of exposure to classes of receptors (accepting that individuals have different sensitivities), then the ambient concentration (realizing that airsheds and wind patterns are not uniform), and finally at the level of particular emission sources (the site we actually do regulate). At each step further removed from the ideal point of regulation, what we regulate reflects what we care about less accurately. But note that, even though the ultimate point of regulation is quite far downstream from our ultimate concern (in this case the impacts of acid deposition), it may still be optimal once technological limitations and costs are taken into account, if a close correlation exists between a source's emissions and the risk to individuals, trees, or aquatic life. Hence the use of complex modeling to justify state implementation plans under the Clean Air Act.

231. Proxy choice is not solely a challenge for pollutant trading markets. Environmental protection programs use proxies for traditional command-and-control regulation as well. The emissions from coal-fired utilities, for example, are limited in terms of tons of sulfur, not by the net impact from their release.

232. Silberman, *supra* note 152, at 10,523.

233. *Id.*

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emissions violations are treated.[234] EPA must rely on accurate self-monitoring and reporting by the regulated community to create a paper trail of compliance.

Perhaps more so than in other regulated fields, showing parties why they should comply (beyond threat of sanction) can be difficult in environmental law due to its strong reliance on proxies (for example, sulfur emissions for acid rain) and administrative requirements with no environmental consequences (for example, recordkeeping). Not surprisingly, our survey comments revealed rather cynical assessments of whether such regulations, given their number and diversity of subject matters, can demonstrate the payoff link at either the industry-wide level or the firm-specific level.[235] As one comment made clear, "often the violation is meaningless from an environmental standpoint yet the regulators treat the company and its employees as if they are evil. The result is frustration and a serious attrition problem in environmental compliance departments of major manufacturers."

While we cannot empirically quantify the erosion in legitimacy, we believe that much of the acrimony over environmental regulation is due to this problem of failure to demonstrate the payoff link. And the system burdens that accretion of rules introduces only exacerbate the problem by making it more difficult to predict ex ante or to trace ex post how compliance with specific rules yields specific environmental quality payoff.[236]

IV. ADAPTING TO REGULATORY ACCRETION: MOZART VS. THE RED QUEEN

In this article we have sought to show that: (1) regulatory accretion has been occurring for at least fifty years; (2) significant levels of regulatory noncompliance are the norm rather than the exception; (3) the regulated community believes that accretion is a strong cause of noncompliance; (4) systems theory shows why regulatory accretion makes involuntary noncompliance inevitable; and (5) the net result of accretion is an erosion in the perceived legitimacy of

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234. For example, under the Clean Air Act, EPA may issue fines up to $25,000 per day per violation for a wide range of permitting violations, including both paperwork requirements and actual emissions violations. *See, e.g.*, 42 U.S.C. § 7413(b) (2000).

235. For example:

> "Environmental enforcement is a joke. It is political, agenda-driven and of no real importance in improving the environment—instead of spending billions on enforcement, state and federal agencies should use the money to help companies comply! But then there'd be no headlines, no careers made, no bigger budgets."
>
> "The environmental regulation is now 1 generation old and there is an environmental ethic now embedded in our culture. More 'pushing' from government at this time is creating a counter-productive environmental attitude. In essence, my clients and my students perceive government over regulation as a problem."

236. Indeed, systems burdens may act in such a way that, in some contexts, achieving full compliance might not be rational in terms of payoff. A rule might appear efficient on its own, but its indirect costs may amass to levels that make it inefficient in the larger social context. Why would regulators, and society in general, even want a company to comply with such a rule? The problem, of course, is that screening out such rules ahead of promulgation, or culling them after promulgation, is exceedingly difficult to do with precision.

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the regulatory framework. If these statements are accurate, the remaining question is what to do about it.

One obvious response is to stop accretion. But how, and at what level? The factors we identified as leading to accretion—the growth of government to correspond to the growth of society, the need for regulation to stay apace with change in the regulated community, and the political economy of rules—all are deeply embedded phenomena of the administrative state. While there may be some who advocate turning the tide on these traits,[237] it is difficult to envision how to do so short of massive political and social transformation. Our interest is in dealing with the here-and-now, the foreseeable future that holds the administrative state in place and, we have demonstrated, the accretion of rules as its inevitable consequence.

The challenge, then, is to adapt to the effects of accretion, particularly its effect on the compliability and payoff of rules. This issue is perhaps the hardest of all because, as explained above, accretion is never the direct cause of noncompliance. Rather, the effort, information, and system burdens from accretion make background levels of noncompliance inevitable. As a general observation, this is all well and good, but what does it mean for the enforcement official faced with a specific case of noncompliance, or for the facility compliance manager charged with ensuring compliance?

For the purpose of our arguments, we have been operating within the construct of the Regulatory Kingdom and have assumed that all companies are good apples. In the real world, though, the situation is far more complicated. Noncompliance frequently *is* intentional, and culpable violators are sure to claim their violations were involuntary.[238] Moreover, enforcement is spotty.[239] Thus, for enforcement officials, the key question is how to determine which violations are driven by accretion burdens and which are malign or intentional. Put another way, which violations justify sanctions either as a deterrent to others

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237. *See generally* TERRY L. ANDERSON AND DAVID R. LEAL, FREE MARKET ENVIRONMENTALISM (2001); ECOLOGY, LIBERTY & PROPERTY: A FREE MARKET ENVIRONMENTAL READER (Jonathan A. Adler ed., 2000) (arguing for greater reliance on private property and the common law to achieve environmental protection).

238. As one of our survey respondents observed, "[a]t some point, repeated involuntary compliance becomes voluntary. A wood products company in Colorado recently closed down after years of violations, fire assessments, etc. Violations were always 'Accidental.'"

239. This has been especially true for state enforcement of federal environmental law. As Dan Farber describes:

> [U]nder the Clean Water Act, states have found it possible to dodge or disobey federal mandates outright. As the GAO found, one state refused to apply new federal standards simply because it found them to be too strict, but "EPA did not withdraw the program because it was 'an unrealistic option.'"...
>
> ...
>
> ... In one state, about half of major air pollution sources were never inspected. For two years, the state completely stopped reporting major violations (contrary to federal law), and even after being rebuked by EPA, the state complied only partially.

Farber, *supra* note 14, at 304–05.

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or as a punishment? As difficult as that case-specific inquiry is, the larger question of regulatory design poses a tension between the twin goals of boosting compliability and payoff. The compliability problem is easy at one level, for "[t]he easier it is to comply, the more compliance the rules will achieve."[240] True enough, but if compliance is too easy it may sacrifice the payoff goal and, worse, the very policy objective of the program. There is simply no obvious solution to the problem of system burdens.

Proposals designed to address the conventional critiques of rules in the administrative state have taken four paths toward improving compliability and payoff, two of which are conventional reform responses and two of which are more innovative. The first is to remove the problem rules, either tactically—through careful pre-promulgation culling and post-promulgation repeal, or strategically—through broader deregulation. Alas, this approach walks straight into the Mozart problem because the presence of system effects makes it exceedingly difficult to know which rules to screen out or eliminate.

The second approach, ironically, is to react to the uncertainty system effects make inherent in the operation of rules by adding more rules. But this is simply the flip side of the Mozart coin because adding rules is no more predictable in outcome than removing them.

Two other approaches are more sophisticated than the above reform-minded responses. The first focuses on ways regulators can increase their emphasis on compliance facilitation, primarily through good-old-fashioned education. While a salutary objective, this approach faces the two following problems: there is too much law on the books for the human mind to absorb; and, more pointedly, it is difficult to teach system-based compliance challenges that do not appear on the books. Nevertheless, as a means of addressing legitimacy concerns arising from mounting effort and information burdens, compliance assistance is well worth the investment.

Finally, the emerging theme of regulatory "reinvention" encourages agencies to innovate, stay flexible, and adapt. While inspired to keep pace with the Red Queen, the reinvention approach has in general lacked a compass to guide the new design book. Proposals are all over the map, espousing a variety of justifications.[241] We believe, however, that our systems-burden model both demonstrates the merit of this sought-for reinvention of rules and administrative institutions and offers the movement a core principle on which to base its undertaking.

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240. Mason, *supra* note 152, at 245.

241. We make no attempt to survey all the different reinvention proposals; taking system effects into consideration, we simply offer a guiding principle for shaping reform whatever its manifestations. We provide examples of how to do so *infra* notes 259-96 and accompanying text. For a thorough overview of the variety of reinvention proposals and their respective justifications, see generally Symposium, *The National Symposium on Second Generation Environmental Policy and the Law*, 29 CAP. U. L. REV. 1 (2001); *What's All This About Reinvention?*, 14 THE ENVTL. FORUM 35 (1997).

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A. MESSING WITH MOZART

The dominant response to the problem of accretion has been regulation-specific; it attempts to screen rules prior to promulgation or cull them selectively after promulgation. In other words, this response tries to find and remove a few of Mozart's "too many" notes. As noted previously, regardless of practice background, our survey respondents believed that the sheer number of rules is the single most important obstacle to compliance. Government and industry lawyers alike also overwhelmingly believed that reducing the number of rules would increase compliance without sacrificing environmental quality.[242] Because of system effects, however, rule-culling responses have not worked very well.

The most prevalent rule-culling approach is pre-promulgation review applying principles of cost-benefit analysis, risk assessment, and other screening devices identified previously as the source of "ossification" in rulemaking.[243] Our Regulatory Kingdom assumed the absurd device of measuring each rule in isolation, whereas the approach that should be taken is to question whether a new rule is efficient when added to the existing system of rules.[244] Of course, that immeasurably complicates the endeavor of cost-benefit analysis and other pre-promulgation screening requirements.

As discussed above, the direct cost of compliance with Regulation X may be $\$Y_x$, but once the indirect costs of conflicting constraints and feedback/feedforward with other rules are considered, the real cost is $\$Y_x + (\$\Delta Y_z + \$\Delta Y_{zz} + \ldots \$\Delta Y_n) + \$\Delta Y_{x\text{-}feedback}$. Even assuming that the direct costs can be reliably calculated, the indirect costs cannot be reasonably estimated ex ante. Simply being aware that indirect costs can occur does not make them any more susceptible to complete identification and quantification. Pre-promulgation review could attempt to cabin the scope of indirect-cost analysis in order to avoid having to search out all the potential indirect effects, but that would produce

242. We asked them to state their level of agreement with this statement: "Significantly reducing the *number* of environmental regulations would lead to increased compliance and could be done in such a way as to avoid jeopardizing adequate levels of environmental quality." Sixty-nine percent agreed or strongly agreed, and there was no difference in response distribution between respondents from private practice versus government practice.

243. *See supra* text accompanying notes 61–77. Cost-benefit analysis is advocated as "necessary to allow the agency to understand, to the greatest extent possible, the consequences of its action and to make the basis for its decision known to the public." Cohen, *supra* note 67, at 716–17.

244. As one critic of conventional reform proposals observes:

> Cost-benefit analysis of a new regulation will inevitably focus on whether that regulation itself would be socially desirable. That in turn tends to limit the participation of the regulated to questioning (or, rarely, supporting) the merits of that new rule viewed in isolation. But the social desirability of that regulation might depend on the ability to combine its issuance with the repeal or modification of older requirements that had become less necessary because the new regulation would achieve their ends more effectively.

Pedersen, *supra* note 69, at 10,590.

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only a local sense of system-based costs.[245] However, the nature of system-based costs is that costs of large magnitude can be experienced far away from the event under study, whether substantively, geographically, or temporally. Hence, anything less than a global analysis leaves open the possibility that a significant system effect, even if all such effects could be predicted, will not enter the cost-benefit accounting. A rule in environmental law, for example, could have profound consequences on the health of the children of workers who lose their jobs in an industry several stages of production removed from the industry that is the target of the rule.[246] The tighter the scope of analysis is cabined, the higher the potential for missing these distant effects, but the wider the scope of analysis is opened, the more difficult, costly, and unreliable is the process of assessing total indirect costs.

Equally, post-promulgation rule-culling actions, from careful repeal of specific rules to wholesale deregulation, cannot readily identify which laws exacerbate the compliance burdens that flow from accretion.[247] The problem may have surfaced, but assigning it with certainty to a particular rule to repeal, and knowing the consequences of repealing that rule, is not possible where system effects are strong. Hence, the utility of rule-culling by legislators and agencies, whether pre- or post-promulgation, is severely limited by the nature of system burdens.

Legislators and agencies have adopted two fallback positions to this limitation on pre- and post-promulgation rule-culling, with each approach involving a shifting of the rule-culling task to some other participant. The first approach is simply to ask the regulated sector to grin and bear it: "Yes, the number of rules is an issue, but not a big one because the system works. Companies comply enough so that current levels of noncompliance are acceptable." Under this view, compliance is simply one more business risk to be managed. This cost of doing business view, however, suggests that the proper goal for regulated parties in the face of reams of rules should not be one of substantial compliance

245. Scholars have suggested that "even well-intentioned regulations often have adverse effects on health, safety, and the environment that could have been prevented through better analysis and creative design of regulatory programs." Anderson et al., *supra* note 67, at 128. They have proposed that agencies "be required to demonstrate, to the extent feasible or reasonable, that any countervailing risks created by a rule be justified or outweighed by the reductions in risk expected to result from the regulation." *Id.* at 129. However, the caveat that agencies do not have to demonstrate countervailing risks if not feasible or reasonable opens a wide hole in the process because of system effects. It is intended "to prevent excessive investment by agencies in analysis of countervailing risks," *id.* at 129, but in that respect oversells what can really be accomplished.

246. *See* Corrosion Proof Fittings v. EPA, 947 F.2d 1201, 1211–13 (5th Cir. 1991) (illustrating the wildly varying outcomes of cost-benefit analysis depending on the defined scope of indirect effects). *See also* Matthew D. Adler & Eric A Posner, *Rethinking Cost-Benefit Analysis*, 109 YALE L.J. 165, 241, 245 (1999) (describing cost-benefit analysis as a "useful decision procedure [that] should be routinely used by agencies," but recognizing that "there are significant procedural costs in any scheme of multidimensional assessment where the number of pre-specified dimensions is large.").

247. As Daniel J. Fiorino has observed: "The world has changed since the 1970s, when the existing [environmental] programs were created and a first generation of strategies applied. The bad news is that we have created a complex system that resists easy change." Fiorino, *supra* note 8, at 442.

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(good apple) but, rather, of strategic compliance (bad apple). Hence, the regulated community's task lies in determining the "efficient level" of noncompliance. Of course, this approach demands that regulated parties, not regulators, make the tough decisions about which rules to emphasize and which to ignore.

To be sure, acting in the absence of perfect information is an unavoidable aspect of business. Depending on the sector, companies must manage uncertainties associated with the weather, stock market, interest rates, exchange rates, and so forth. For each of these factors, our statutory and common law regimes reflect societal decisions on how to allocate risk; the law reflects a normative decision of whether to impose the complete risk on the actor. In general, business risks receive no special legal protection. Brokers cannot void contracts simply because the market went down.

But uncertainty over regulatory compliance is qualitatively different from these other types of risks businesses face, is it not? Asking companies to decide which laws to obey, knowing full well that significant slippage in the form of involuntary noncompliance is inevitable, is not the same as expecting a clothing company to bear the risk that teens will change their fashion preferences. After all, if the rule of law means anything, it should mean predictability (that is, perfect compliance should be achievable). When it fails in that respect, perhaps the law should explicitly recognize and treat differently the background noncompliance with regulatory laws driven by accretion burdens.

This possibility is addressed by the second traditional response to the limits of rule-culling by legislatures and agencies, which is the argument that prosecutorial discretion adequately addresses the problem.[248] This approach is captured in the so called "penalty pyramid" that EPA officials apply in enforcement actions: working from the background requirement that penalties should recoup any economic benefit from noncompliance, sanctions for noncompliance are in principle gauged according to the gravity of the violation, the willful intent of the violator, the economic benefit to the regulator of noncompliance, and its past history of violations and cooperation.[249] This response seems well-suited to the inherent difficulty in isolating the impacts of accretion at the level of discrete violations. It can also explicitly consider the efforts to comply and the level of noncompliance.

The problem, however, is that there is a wide variety of perspectives over the practical application of this and similar instruments of prosecutorial discretion. A number of environmental groups charge not only that enforcement agencies detect very few violations, but that agencies treat the violators that they do

248. *See* Jim Rossi, *Waivers, Flexibility, and Reviewability*, 72 CHI.-KENT L. REV. 1359, 1361 (1997) ("Many commentators embrace express agency waiver of published regulations as a means for introducing flexibility to the rigid adherence of agencies to previously published regulations.").

249. *See* Spence, *supra* note 126, at 921–22. *See generally* Robert H. Fuhrman, *A Discussion of Technical Problems with EPA's BEN Model*, 1 ENVTL. LAW. 561 (1995) (providing a thorough discussion of the extensive guidance documents (and even computer programs) implementing these considerations).

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detect too leniently.[250] From the business perspective, the concern is that agencies apply enforcement discretion with uneven, ad hoc principles. In our survey, for example, we asked respondents whether they agreed or disagreed with the following statement: "Based on my experience, I can accurately predict the scale of the penalty for the range of violations of environmental law (that is, the practical consequences of noncompliance)." Nearly half of the respondents disagreed or strongly disagreed.[251]

Perhaps the bitter disagreement over application of EPA's penalty policy means the agency has it just right, antagonizing both sides equally. We think it more likely that the penalty pyramid and other tools of prosecutorial discretion are simply disguised efforts to shift Mozart problems down the chain of regulatory responsibility. The problem of deciding which rules to enforce (that is, which notes to keep) has simply been shifted from the legislature to regulation drafters, and from them to enforcement officials. But why should prosecutors be any better than legislators, agency policy officials, or anyone else for that matter, in deciding which notes to keep and which to ignore? At the end of the day, neither environmentalists nor industry seem to believe that prosecutorial discretion effectively screens out excusable noncompliance from true bad apple behavior.

The problem common to these three rule-culling approaches, therefore, is that they are rule-specific or, at best, category-specific. It is asking too much of any legislator, agency official, or industry compliance manager to look outside his or her field of responsibility to factor all the potential system effects of promulgating, complying with, or enforcing a rule or set of related rules. It is

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250. This is routinely given as a rationale for favoring federal over state environmental regulation—that states will systematically go easy on industry in order to promote economic development. *But see generally* Revesz, *supra* note 165, at 2343–46 (describing and then extensively refuting the argument).

251. The full results were: 3% strongly agree, 35% agree, 15% indifferent, 33% disagree, 15% strongly disagree. Representative comments included:

> "The penalty policies are confusing and subjective. While I can often give a 'gut feeling' estimate that is relatively accurate, it is more based on experience than policies. But it is becoming increasingly difficult to do so."
>
> "Economic benefit can usually be assumed pretty well. Gravity is harder- some pretty minor things can be called major. Other BIG wildcard is counting violations- number of violations based on same conduct or event, number of time/days occurred, etc."
>
> "In my experience the size of the penalty depends as much on the attitude/experience/perception of the regulatory enforcement staff as it does on the factors listed above."
>
> "Prosecutorial discretion results in significant disparities in what is selected for enforcement and in the nature of the enforcement."
>
> "Penalty calculations are too driven by politics, agency budget/goals, relationship to the company, internal messages they want to send to the public, and penalty discretion and the fear that your file goes to the enviro-cop rather [than] the reasonable agency official."
>
> "Politics at the state and local level is far more important, assuming the state/local agency even uses a penalty policy. In addition, state and federal regulators take so long to address violations that all the relevant factors become stale and the facility has moved on."
>
> "Who are they kidding? It's essentially random, especially when you consider criminal versus civil penalties for noncompliance."

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like predicting where the next hurricane or earthquake will hit—it quite simply cannot be done.

On the other hand, just as surely as rule-culling faces the Mozart problem, so does the instinctive desire to shore up system uncertainty with more specific rules. Ironically, as strong as we found the sentiment among our survey respondents that there are too many rules and that rule-culling approaches would not jeopardize environmental quality, they felt almost as strongly that more specificity in rules is the answer.[252] But the move to enhance specificity itself breeds regulatory accretion, for it is difficult to state qualifications, exceptions, and details without also more finely dividing the discrete compliance requirements involved. Clarity and logic may emerge, but so will density, rigidity, and, in the long run, complexity. As Frederick Schauer pointed out in his study of the drive toward more rule specificity, "were we required as we talk to add all conceivable qualifications at every turn, conversation would be impossible."[253]

We are not proposing that legislatures and agencies should intentionally fail to consider the efficiency of rules before and after promulgation, or that regulated parties should not think about how to allocate compliance resources efficiently, or that prosecutorial discretion should not be exercised. Nor are we suggesting that an occasional refinement of rules to improve specificity will not assist compliance. These approaches are useful in dealing with the fact that today's administrative state is a far cry from the Regulatory Kingdom. There may be plenty of inefficient, unclear, institutionally biased rules to weed out of the system or to improve in quality—despite our knowledge that system effects may occur. We have, however, revealed the limits of these approaches in a context of rapid and advanced regulatory accretion. They may help ease the effort and information burdens, allowing all members of the regulatory community to sift out unreasonably demanding or clearly insignificant rules, but they will not make the problem of detecting and managing system burdens any easier. Indeed, these approaches will likely lead to their own unanticipated system effects.

B. RUNNING WITH THE RED QUEEN

The preceding examples of regulatory policy attempting to solve the Mozart problem by tinkering with the number of rules—whether through cost benefit analysis, risk assessment, prosecutorial discretion, or refinement of specificity—are all necessarily rule-specific. Agencies promulgate rules one-by-one, companies track rules one-by-one, and enforcement actions sanction discrete violations. Faced with a growing number of rules, the instinctive reaction to accretion has therefore been to put more money and people into ensuring

252. We asked them to state their level of agreement with this statement: "Additional specificity in laws, regulations, and permits would facilitate compliance." A full 55% agreed or strongly agreed; 17% were indifferent; and only 28% stated some level of disagreement.

253. *See* SCHAUER, *supra* note 33, at 40.

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compliance. Taking this to the extreme leads to our example of hiring 1000 compliance personnel for 1000 rules. Intuitively, this sounds like a good idea, but it is not, because it focuses only on the effort and information burdens of accretion and ignores, or even exacerbates, the system burdens.[254] Messing with Mozart will not capture system effects and indeed may compound them.

In the administrative state, as in nature, the Red Queen may provide a more effective response by staying apace with the effects of the system. Just because regulators and businesses cannot easily predict and prevent system-bred noncompliance does not mean they cannot manage and respond to it once it materializes and is identified. In other words, the regulatory system can try to adapt. Thus, while the rule-by-rule approach of rule-culling and fine-tuning is inevitable, regulators and regulated parties also must learn to manage system effects and their emergent properties with compliability and payoff in mind.

Indeed, our survey detected a strong perception among environmental attorneys that learning to adapt is of paramount importance to compliance behavior. When asked to rate the importance of different firm compliance resources, the emphasis on utilizing internal compliance mechanisms (such as technical staff) versus employing external resources (such as trade associations) was pronounced:

Table 4: Responses to question about importance of different firm compliance resources (percent of responses)

	Very Important	Important	Relevant	Minor	Not Important
In-house technical staff	77	19	4	1	0
Contact with agency officials	38	35	21	5	<1
In-house legal staff	33	36	27	1	0
Outside technical consultants	22	44	28	1	0
Outside legal counsel	21	53	26	1	0
Educational programs/seminars	20	36	33	11	0
Trade association support	13	44	28	13	<1

These responses were remarkably consistent with the answers we received to our question asking how respondents would allocate a two-fold increase in regulatory compliance budgets among a variety of options designed to maxi-

254. One of our survey respondents captured this effect in observing that "the more bodies we throw at [Health, Safety, and Environment] (above some optimal level), the more inconsistency and confusion we have in compliance."

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mize compliance. The responses indicated that devoting more dollars to internal compliance resources was most important; improving physical facilities was second most important; and expending funds on external resources was least important.

Table 5: Responses to question about how to deploy additional compliance budget resources (percent of responses)

	High Priority	Medium Priority	Low Priority	No Investment
Increase employee education on regulatory requirements	67	29	4	0
Hire more in-house technical staff	61	34	5	1
Increase environmental compliance monitoring	59	31	9	1
Invest in facility repair and renovation	53	39	7	1
Invest in new pollution control and other new technology	42	40	16	3
Increase contacts and relations with government agencies	22	44	25	8
Hire more in-house legal staff	13	43	40	4
Increase retention of outside technical consultants	10	53	35	2
Increase retention of outside legal counsel	7	45	43	6

There was no significant difference in response distributions to either of these questions between respondents who had at least some government experience and those who had none. Likewise, client size and sector had no influence on the results.

These results suggest that the highest priority environmental compliance resources are those devoted to internal compliance problem solving. This result is entirely consistent with our finding that the primary sources of noncompliance are the quantity and qualities of environmental regulation. Most importantly, our study reveals a perception that human resources are needed to confront the challenge of understanding and complying with the vastness and complexity of environmental law. When the need for capital investments arises, augmenting human resources becomes a priority. Likewise, where greater exper-

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tise levels are needed to solve compliance problems or address conflicts with government or citizens, companies may look to outside technical and legal resources.

These findings support the movement in regulatory theory toward assisting regulated parties in their efforts to overcome effort and information burdens. The premise underlying compliance assistance theory, which is now gospel at the EPA, is that regulators can and should help regulated parties keep pace with the Red Queen of regulatory accretion through compliance outreach, hotlines, plain English translations of rules, and the like.[255] But compliance assistance theory to date has focused on only effort and information burdens in this regard:

> Compliance assistance is the practice of building the *capacity* of regulated entities to comply with environmental laws. The effectiveness of assistance in assuring compliance is founded on the premise that the targeted regulated community is *willing* to obey regulations, but *unable* to do so because of a lack of awareness or technical capacity. An environmental agency attempts to compensate for those deficiencies through a variety of outreach methods, such as open meetings, hotlines, site visits, and dissemination of printed or electronic resource materials.[256]

Despite these outreach efforts, compliance assistance programs face the problem of there being so much regulation for which assistance is needed. While a *Cliffs Notes* version of the 160,000 pages of the *Code of Federal Regulations* would run to several volumes itself, it might be worth the effort to create such a synopsis. And perhaps through attention to cognitive limitations and the use of cognitive devices such as heuristics,[257] we could actually reduce the effort and information burdens of both new and existing rules to a manageable level. But even such a monumental undertaking of compliance assistance, if aimed solely at effort and information burdens, would fail to recognize, much less explain, the system burdens on compliance that cannot be summarized through plain English pamphlets and hotlines. Indeed, compliance assistance risks making the false promise that one can read the brochures, check the web

255. EPA is deeply committed to the theme, portraying it as a crucial component of an integrated approach along with traditional deterrence-based enforcement, and is actively encouraging states to join its efforts in this regard. *See* Steve Cook, *EPA to Encourage States to Integrate Compliance Assistance, Enforcement*, 33 Env't Rep. (BNA) 1283, 1283 (June 7, 2002).

256. Mark Stoughton et al., *Toward Integrated Approaches to Compliance Assurance*, 31 Envtl. L. Rep. (Envtl. L. Inst.) 11,266, 11,267 (2001). Some compliance assistance programs surely approach this ideal, with ample use of plain English guides and interactive web sites. *See, e.g.*, U.S. EPA, *EnviroSense*, *available at* http://es.epa.gov (last visited May 14, 2003); Illinois Envtl. Protection Agency, Office of Small Bus., *Small Business Office*, *available at* http://www.epa.state.il.us/small-business (last visited May 14, 2003).

257. Scholars have pointed out the utility of designing law based on current understanding of cognitive processes. *See, e.g.*, Adam J. Hirsch, *Inheritance and Inconsistencies*, 57 OHIO ST. L.J. 1057, 1149–51 (1996); Mark Seidenfeld, *Cognitive Loafing, Social Conformity, and Judicial Review of Agency Rulemaking*, 87 CORNELL L. REV. 486, 490–91 (2002).

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sites, call the hotlines, and attain full compliance through this path of enlightenment and education alone. However, this is not the case. While we applaud compliance assistance programs, they are not enough because they do not strike at the underlying problem of system burdens.

Very few commentators, including even the strongest apologists for the conventional administrative state and the most aggressive proponents of compliance assistance programs, suggest that the task of improving environmental compliability can be approached exclusively through rule-culling and education, that is, without changing something more fundamental about the way regulation and enforcement are carried out today. Many proposals, however, avoid opening the discussion to an agenda for deep and broad change.

Ultimately, regulatory policy must reflect an understanding that regulation operates as a system, that regulated parties operate as systems, and that the systems interact. The lesson of the Red Queen is that both the regulators and the regulated are running to keep pace with each other as well as with the accretion of rules. As the Red Queen metaphor demonstrates, competing parties co-evolve over time. Therefore, legal scholars should focus on better understanding how the legal system and regulated parties respond to each other and on using system-based theory to design regulatory responses. Viewed through this lens—something regulatory reinvention proposals have yet to do—[258] reform efforts take on a different light for both regulators and the regulated.

1. The Regulators

Our message to regulators is to think systems. That is, consider system effects, particularly system burdens on compliance, when designing regulatory programs.

So what might this thinking in terms of systems produce? The goal, of course, is to maximize both compliability and payoff. The method is to shape regulatory programs as much as possible to behave as systems and to take advantage of system resilience, rather than to resist system effects through rule-culling and specificity refinement. But going beyond tinkering means integrating into the administrative state wholly new design principles that will permit regulators and regulated parties to operate within system-based compliance programs. In the end, we must accept that such integration moves us

258. One observer recently summed up the current slate of reform proposals in this light:

> Much has been made of the "reinvention" of environmental regulation in the 1990s. However, nearly all recent efforts to reinvent environmental regulation in the United States have come to little more than a tinkering with specific elements of a highly complex system. These efforts aim, for example, to graft flexibility onto parts of an inflexible whole by inviting company proposals for exemptions from rules. They propose reductions in administrative burdens by expediting permitting, consolidating reporting, or replacing paper with electronic transactions. However laudable these improvements may be, they rarely, except rhetorically, deliver the systemic change that the term "reinvention" implies.

Fiorino, *supra* note 8, at 442.

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farther away from the deceptive safe harbor of rule-specific constructs for measuring compliance.

To ground this approach in more practical terms, as we canvass the variety of reform proposals now being debated in environmental law, a hierarchy of three themes seems to fit the mold: (1) use market-based instruments where they fit; and where they do not (2) use information-based instruments where practicable; and where they are not (3) use performance-based compliance requirements.

a. Markets. Markets are systems.[259] Markets are also the darling of regulatory reinvention. In environmental law, for example, market-based instruments (such as tradable pollution credits, pollution taxes, and habitat mitigation banks) are frequently, and correctly, proposed as tools to rectify the perceived shortcomings and inefficiencies of conventional prescriptive rule programs.[260] Rules designed to construct and to take advantage of markets—rather than constrain them through prescriptive text—would replace programs of discrete compliance requirements, where compliance is measured rule-by-rule, with more open compliance systems in which environmental quality outcome (payoff) becomes the measure. For example, rules can impose a "cap-and-trade" market, whereby all polluters in a defined area must keep total emissions below a defined ceiling but are allowed to trade individual pollution rights among themselves. Each firm can therefore integrate environmental compliance decisions into the complete system of business resource allocations, which naturally will differ across firms. Recognizing this potential, there is growing accord that the most significant advances in environmental protection will come through "aggressive moves to implement market-based mechanisms . . . where traditional command-and-control regulations on most emission sources have been largely tapped out."[261]

We and many others have recognized the limits of using market instruments to achieve environmental policy goals.[262] The uncertainty inherent in any market-based instrument may become intolerable when protection of vital environmental qualities is at stake.[263] Constructing smoothly functioning markets or setting pollution taxes that produce the desired level of behavior is not

259. *See supra* text accompanying notes 156–215. *See generally* PAUL KRUGMAN, THE SELF-ORGANIZING ECONOMY (1996); PAUL ORMEROD, BUTTERFLY ECONOMICS: A NEW GENERAL THEORY OF SOCIAL AND ECONOMIC BEHAVIOR (1998). The economist Brian Arthur is a leading figure in explaining the emergence of system effects in markets. *See* W. BRIAN ARTHUR, INCREASING RETURNS AND PATH DEPENDENCE IN THE ECONOMY *passim* (1994). A number of researchers have examined how systems theory might help explain the behavior of stock markets. *See, e.g.*, David Appell, *When Markets Go Mad*, SCI. AM., May 2002, at 28.

260. *See* Stewart, *supra* note 8, at 94–127 (providing a thorough survey of the various market-based proposals).

261. Frank S. Arnold, *Pollution Taxes and Political Capital*, THE ENVT'L FORUM, May–June 2002, at 18.

262. *See, e.g.*, James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607 *passim* (2000) (arguing that environmental trading markets are poor policy); *see id.* at 621 n.28 (listing critiques of trading).

263. *Id.* at 668–87.

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simple. In trading markets, for example, there must be a refined currency of trade that is fungible and reflects the desired environmental quality. There must also be a sufficient and well-defined marketplace and community of market participants.[264] For example, it would be a stretch to consider allowing coastal developers in Florida to trade wetland values they eliminate for reductions in phosphorous emissions in Oregon. Even when an operable trading market can be installed, it will not necessarily be more efficient than so-called command-and-control regulation.[265] But where an environmental good (or bad, so to speak) is fungible and market service areas and participants are well-defined, marketized programs have had demonstrable success in a variety of contexts[266] and, we

264. *See* Jonathan Remy Nash & Richard Revesz, *Markets and Geography: Designing Marketable Permit Schemes to Control Local and Regional Pollutants*, 28 ECOLOGY L.Q. 569 *passim* (2001).

265. *See generally* Daniel H. Cole & Peter Z. Grossman, *When is Command-and-Control Efficient? Institutions, Technology, and the Comparative Efficiency of Alternative Regulatory Regimes for Environmental Protection*, 1999 WIS. L. REV. 887 (arguing that command-and-control regulation can be more efficient than economic approaches).

266. The Clean Air Act sulfur dioxide emissions trading program for electric utilities, *see* Pub. L. No. 101–549, § 401, 104 Stat. 2399, 2584 (1990) (codified at 42 U.S.C. § 7651), is widely regarded as the most successful example of integration of market efficiencies into the command-and-control regulatory structure. *See, e.g.*, Dallas Burtraw & Byron Swift, *A New Standard of Performance: An Analysis of the Clean Air Act's Acid Rain Program*, 26 Envtl. L. Rep. (Envtl. L. Inst) 10,411, 10,411 (1996); *Utilities Achieve 100 Percent Compliance with EPA Acid Rain Program, Report Says*, 27 Env't Rep. (BNA) 885 (Aug. 16, 1996); Timothy A. Wilkins & Terrell E. Hunt, *Agency Discretion and Advances in Regulatory Theory: Flexible Agency Approaches Toward the Regulated Community as a Model for the Congress-Agency Relationship*, 63 GEO. WASH. L. REV. 479, 491 (1995). The program is nonetheless unmistakably part of the command-and-control regime, because the "market" for emission trading is created by regulatory fiat. *See* Roger K. Raufer, *Market-Based Pollution Control Regulation: Implementing Economic Theory in the Real World*, 26 ENVTL POL'Y & L. 177, 184 (1996) ("the market-based systems have relied heavily upon the command/control framework already in place"). The need for even greater reliance generally on market forces to bring about more efficient protection of environmental factors has been forcefully argued by many commentators. *See, e.g.*, AMERICAN ENTERPRISE INST. ET AL, BENEFIT COST ANALYSIS IN ENVIRONMENTAL, HEALTH, AND SAFETY REGULATION (1996); Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law: The Democratic Case for Market Incentives*, 13 COLUM. J. ENVTL. L. 171 (1988); Daniel J. Dudek, Richard B. Stewart, & Jonathan B. Wiener, *Environmental Policy for Eastern Europe: Technology-Based versus Market-Based Approaches*, 17 COLUM. J. ENVTL. L. 1 (1992); Robert W. Hahn & Gordon L. Hester, *Marketable Permits: Lessons for Theory and Practice*, 16 ECOLOGY L. Q. 361 (1989); Robert W. Hahn & Robert N. Stavins, *Incentive-Based Environmental Regulation: A New Era from an Old Idea?*, 18 ECOLOGY L. Q. 1 (1991); Richard B. Stewart, *Reconstitutive Law*, 46 MD. L. REV. 86 (1986). Pollutant trading programs have been controversial, however, as some observers contend that they are poorly administered, allowing participants to "cheat," or, even when administered competently, nonetheless result in geographically uneven concentrations of pollutant emissions based on market-driven factors. *See* Susan Bruninga, *Trading Benefits Elude Some Areas As Mortality Rates Increase, Report Says*, 33 Env't Rep. (BNA) 2503 (Nov. 22, 2002) (noting that environmental advocacy group claims power plant sulfur emissions trading program leads to concentration of emissions from a small number of plants); Steve Cook, *EPA Ignored Employees' Objections On Louisiana Program, Group Charges*, 33 Env't Rep. (BNA) 2401 (Nov. 8, 2002) (noting EPA employees' complaint that state's pollutant trading program will disproportionately concentrate emissions); *EPA Withdraws Proposed Approval of Open Market Emissions Trading Program*, 33 Env't Rep. (BNA) 2327 (Oct. 25, 2002) (EPA withdraws approval of New Jersey's ozone pollutant trading program because of poor safeguards); Lorraine McCarthy, *State Environmental Commissioner Urges Termination of Emissions Trading Program*, 33 Env't Rep. (BNA) 2062 (Sept. 20, 2002) (Director of New Jersey environmental agency describes the state's pollutant

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believe, hold promise in others as system-based schemes for increasing compliability and payoff.

b. Information. Human organizational systems rely on flows of information to achieve their goals.[267] Markets are no exception, but where economic market instruments present a poor fit for achieving environmental policy goals, information-based programs, such as emission reporting and eco-labeling, may still offer significant system-based compliance and payoff opportunities.[268] While not economic in nature, these information markets operate through the same system mechanisms.

The regulatory reinvention movement has captured the power of information flows through a variety of proposed information-based instruments grouped under the heading, "reflexive law," which suggests how the feedback mechanism that operates in systems allows robust sources of information to be used by system participants to self-regulate.[269] In almost all cases, reflexive law programs "aim . . . to promote the internalization of environmental norms by firms"[270] through the generation and manipulation of information, and often successfully so even in the absence of overt prescriptive regulation.[271] These programs promote reflexive behavior by firms because information is the me-

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trading program as a failure). The EPA, on the other hand, continues to point to many examples of successful pollutant trading programs. *See* Approval and Promulgation of Implementation Plans North Carolina, 67 Fed. Reg. 78,980 (Dec. 27, 2002) (EPA approval of North Carolina's nitrogen oxide emissions trading program); Andrew M. Ballard, *EPA Approves North Carolina Nox Trading, Vehicle Inspection and Maintenance Program*, 34 Env't Rep. (BNA) 10 (Jan. 3, 2003); http://www.epa.gov/region09/air/reclaim (EPA report describing success of pollutant trading program in place for the Los Angeles area since 1993).

267. We hope this is well established by prior material. *See supra* Part II.B.2.

268. *See* David W. Case, *The Law and Economics of Environmental Information as Regulation*, 31 Envtl. L. Rep. (Envtl. L. Inst.) 10,773, 10,773 (2001) (surveying legal literature and concluding that information-disclosure regulation can improve environmental performance); Mark A. Cohen, *Information as a Policy Instrument in Protecting the Environment: What Have We Learned?*, 31 Envtl. L. Rep. (Envtl. L. Inst.) 10,425 (2001) (showing that information-disclosure programs can affect behavior but concluding that additional research is needed); Bradley C. Karkkainen, *Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm?*, 89 GEO. L.J. 257 (2001) (arguing that EPA's Toxics Release Inventory pioneers the use of information-based regulatory tools); William F. Pedersen, *Regulation and Information Disclosure: Parallel Universes and Beyond*, 25 HARV. ENVTL. L. REV. 151 (2001) (arguing that social cost disclosure programs can aid regulatory agencies).

269. For the seminal description of this approach as reflexive law, and of its full theoretical and practical dimensions, see Eric W. Orts, *Reflexive Environmental Law*, 89 NW. U. L. REV. 1227 (1995). Again, Dick Stewart's summary of the proposals in this category is unsurpassed. *See* Stewart, *supra* note 8, at 127–51; *see also* JOHN D. ECHEVERRIA & JULIE B. KAPLAN, GEORGETOWN ENVIRONMENTAL LAW AND POLICY INSTITUTE, POISONOUS PROCEDURAL "REFORM": IN DEFENSE OF ENVIRONMENTAL RIGHT TO KNOW (2002) (describing valuable attributes of such programs).

270. Stewart, *supra* note 8, at 127.

271. As Stewart explains, regulators "might not impose any requirements on primary conduct by organizations that directly affects the environment, such as the choice of production methods . . . ." Stewart, *supra* note 8, at 129.

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dium of flows within the firm resource allocation system.[272] As Tim Malloy points out, "differences among firms in how freely information moves between divisions causes the firms to respond quite differently to identical regulatory opportunities."[273] The success of some reflexive law programs suggests that information-based instruments can enhance all firms' access to and use of information so that compliance is possible and becomes the norm.[274]

To be sure, as with economic markets—which are simply specialized forms of information-based instruments—reflexive law tools are limited by the quality and availability of information.[275] Indeed, emphasizing reflexive law instruments would exacerbate information burdens in the compliance resource allocation problem. Because reflexive law tools rely for their operation on system effects—the feedback and feedforward loops generated by the flow of information—it is difficult, just as it is with any system effect, to predict the extent to which the additional information burdens will be offset by the reduced system burdens.[276] And the metric within which the information is packaged in the environmental context is not always as self-evident as the price mechanism in economic markets.[277] What, for example, would be the unit of information

272. Stewart unequivocally proclaims that "information is integral to a reflexive law strategy." Stewart, *supra* note 8, at 131. System effects explain why this is the case—the program cannot be "reflexive" without feedback and feedforward loops that flow the information through the system to the relevant participants, including of course the regulated party that generates the information in the first place. *See supra* Part II.B.2.

273. *See* Malloy, *supra* note 143, at 536.

274. As an example of the potential effectiveness of an information-based approach to environmental regulation, companies subject to the toxic release reporting provisions of the Emergency Planning and Community Right-to Know Act, 42 U.S.C. § 11023, reported the total release of 10.4 billion pounds of specified toxic chemicals into the environment in 1987—including 3.9 billion to landfills, 3.3 billion to other treatment and disposal facilities, 2.7 billion into the ambient air, and 550 million to surface waters. ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 377–78 (3d ed. 2000); *see also* Christopher H. Schroeder, *Third Way Environmentalism*, 48 KAN. L. REV. 801, 818 (2000) (describing positive effects of the Toxics Release Inventory (TRI)). For 1995 the total reported had fallen to 2.6 billion pounds, and by 1997 it had fallen to 2.57 billion. *See* PERCIVAL, *supra*, at 378. Industry sources and scholars have credited the reporting requirement with galvanizing industry into voluntary pollution reduction performance that in many cases exceeds anything required by law. *See CMA Initiative Cuts Toxic Emissions 49 Percent Over Six Years, Official Says*, 27 Env't Rep. (BNA) 11 (May 3, 1996). Reductions have continued. *See* U.S. EPA, EPA TOXICS RELEASE INVENTORY DATA FOR REPORTING YEAR 2000 (2002), *reprinted in* 33 Env't Rep. (BNA) 1229 (May 31, 2002). TRI information is available at http://www.epa.gov/tri.

275. For example, recognizing the growing importance of information dissemination to regulatory policy, the federal government recently has adopted data quality standards that all agencies must follow. *See* Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Republication, 67 Fed. Reg. 8452 (Feb. 22, 2002). At some point, of course, overzealous focus on improving the quality of data may interfere with the dissemination and usefulness of data such as the TRI data. *See* Meredith Preston, *Data Quality Requirements Could Slow Public Release of TRI, Agency Official Says*, 33 Env't Rep. (BNA) 2316 (Oct. 25, 2002).

276. *See supra* Part II.B.4.

277. *See generally* Daniel C. Esty, *Toward Data-Driven Environmentalism: The Environmental Sustainability Index*, 31 Envtl. L. Rep. (Envtl. L. Inst.) 10,603 (2001) (arguing that the Environmental Sustainability Index is needed because environmental decisionmakers often lack reliable indicators and information).

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relevant to conservation of endangered species? How easily would regulated parties be able to "read" that unit of information and make reflexive decisions? Only when robust sources of information are available and their content is capable of being moved through organizational systems in units immediately relevant to the participants should we expect reflexive law tools to outperform rule-based programs. Even strong advocates of reflexive law instruments recognize that they are not a universal panacea for environmental policy.[278] However, they do provide a model, which we believe in appropriate contexts responds elegantly to the problem of system burdens.

c. Performance. Performance is the intended feedback result of regulation.[279] As such, it makes sense to design regulation as rewarding performance, not simply compliance with rules. If society cares about environmental risk, then compliance ought to measure environmental risk, not paper filing. The Amoco Yorktown plant experience, for example, illustrates how changing the locus of compliance measurement from an array of unit-specific points of emission to a facility as a whole can increase both the ability of facilities to comply with and the payoff from regulatory laws.[280] That experience has inspired broader proposals for performance-based programs[281] such as "risk-bubbles" in which facilities are required to meet specified levels of overall risk exposure and are left free to decide how to do so[282] and "contractarian" approaches allowing site-specific negotiation of performance goals.[283] In a more modest undertaking, EPA has attempted to institutionalize a variety of performance-based approaches,[284] most notably through Project XL, the Clinton Administration's flagship regulatory reinvention program. Project XL allowed EPA and facilities to negotiate site-specific contracts designing how performance and compliance would be measured, thus allowing the agency and the regulated party to focus on emergent behavior—the facility's overall environmental impacts—rather than on discrete compliance with the multitude of regulations.[285] Project XL

278. *See* Stewart, *supra* note 8, at 133.

279. *See supra* note 172.

280. *See supra* note 199.

281. *See generally* THE ASPEN INSTITUTE, A CALL TO ACTION TO BUILD A PERFORMANCE-BASED ENVIRONMENTAL MANAGEMENT SYSTEM (2000).

282. *See* E. Donald Elliott & Gail Charnley, *Toward Bigger Bubbles*, 13 F. FOR APPLIED RES. & PUB. POL'Y 48 (1998); Stewart, *supra* note 8, at 116–18.

283. *See* Stewart, *supra* note 8, at 60–94.

284. *See generally* Theodore L. Garrett, *Reinventing EPA Enforcement*, 12 NAT. RESOURCES & ENV'T 180 (1998) (discussing EPA's consideration of new approaches to environmental enforcement and performance measures); George S. Hawkins, *Compliance and Enforcement Changes in Congress and EPA*, 11 NAT. RESOURCES & ENV'T 42 (1997) (exploring the future of EPA's compliance and enforcement activities).

285. Project XL gave:

> [R]egulated entities the opportunity to propose an innovative means of achieving superior [overall] environmental performance at their facilities. Where the EPA approves of the new approach, it offers to lift the traditional regulatory requirements and substitute the alternative

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thus offered the potential to confront system burdens by making it possible to observe the emergent behavior of regulated parties and use it to the advantage of compliance and payoff.

As with the other system-based programs, performance-based approaches such as Project XL have their detractors.[286] Criticisms include the suggestion that site-specific solutions can create unintended anti-competitive outcomes and that the flexibility inherent in them, while good in theory, is subject to abuse at the expense of environmental quality and public participation.[287] Performance-based tools, just as market and information programs, must be used carefully. The investment in site-specific contracts governing, for example, carbon emissions, is unlikely to be cost-effective for regulating global greenhouse gas emissions; given the number of emission sources that would need to be covered. But where environmental performance is primarily a matter of local concern, as it often is (for example, pollution in a defined watershed or the habitat of a species endemic to a particular area), system theory tells us that the optimal global solutions come from allowing local decisions to thrive.[288] Thus, for example, the habitat conservation plan (HCP) program the federal government has promoted under the Endangered Species Act (ESA), whereby landowners negotiate site-specific conservation plans in return for permits allowing limited development in a protected species' habitat, offers greater opportunity for compliance and payoff than would a set of nationally uniform development

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> compliance strategy. The Agency and the regulated entity then enter into a written agreement—the environmental contract—in which the party formally commits itself to implement the new approach and achieve the promised environmental benefits, and the Agency agrees to substitute the innovative strategy for the existing requirements.

Dennis D. Hirsch, *Project XL and the Special Case: The EPA's Untold Success Story*, 26 COLUM. J. ENVTL. L. 219, 224 (2001) [hereinafter Hirsch, *Project XL*] (citations omitted). For a thorough history of Project XL focusing on the difficulty EPA had engrafting this new innovation on the pre-existing regulatory framework, see generally Dennis D. Hirsch, *Bill and Al's XL-ent Adventure: An Analysis of the EPA's Legal Authority to Implement the Clinton Administration's Project XL*, 1998 U. ILL. L. REV. 129. Project XL has shown continued vitality in the Bush Administration. *See, e.g.*, Gwendolyn Glen, *Two Landfill Sites in Virginia Allowed to Use New Technology Under Project XL*, 33 Env't Rep. (BNA) 1608, 1608 (July 19, 2002); *EPA Issues Permit for Egg Producers in Oklahoma, New Mexico Under Project XL*, 33 Env't Rep. (BNA) 1616, 1616 (July 19, 2002). A related program, the National Environmental Performance Track, rewards facilities that have demonstrated "beyond compliance" performance with such tangible benefits as fewer inspections and public recognition. Meredith Preston, *Agency Accepts 23 Additional Companies into "Performance Track" Incentive Program*, 33 Env't Rep. (BNA) 1938, 1938 (Sept. 6, 2002).

286. For the critical view, see, for example, Rena I. Steinzor, *Regulatory Reinvention and Project XL: Does the Emperor Have any Clothes?*, 26 Envtl. L. Rep. (Envtl. L. Inst.) 10,527, 10,527–28 (1996).

287. *See, e.g.*, Steve Cook, *Employee Group Criticizes Project XL, Internal Evaluation Seeks Improvements*, 31 Env't Rep. (BNA) 2271, 2271 (Oct. 27, 2000) (reporting dissatisfaction within EPA staff over Project XL). *See generally* Hirsch, *Project XL*, *supra* note 285, at 238–53 (assessing the critiques).

288. *See* KAUFFMAN, *supra* note 157, at 252–67 (developing the theory of "patches" as a representation of localized, decentralized problem solving in complex systems).

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guidelines.[289] Project XL, HCPs, and other site-specific negotiation approaches, guided by performance-based measurements, hold promise in those local contexts.

2. The Regulated

Because compliance or noncompliance is the behavioral response of regulated parties to the regulatory system, it makes sense to speak of the emergent *system* behavior of a regulated facility. Firms are not people, but collections of people in particular relation to one another.[290] Management theory thus has actively embraced complex systems theory as a foundation for understanding business behavior more deeply.[291] Compliance behavior is only one element of the overall package of behaviors we call, for convenience, a firm. Efforts to enhance compliance must take the entire system into account. In other words, if regulators expect regulated parties to optimize compliance in a regulatory system, they must think of firms not merely as monolithic, rational, profit-maximizing actors, or as good apples to the core, but as "system[s] for allocating and coordinating organizational resources, such as capital, information, and personnel time and expertise."[292]

Using this "resource allocation" model as another way of thinking about regulatory compliance strikes us as corresponding more closely to our systems-based description of regulatory accretion and compliance responses, and therefore as offering a better guide for regulatory design. Efforts to encourage and reward corporate environmental management systems (EMSs), for example,

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289. For the mechanics of the HCP program, see J.B. Ruhl, *How to Kill Endangered Species, Legally: The Nuts and Bolts of Endangered Species Act "HCP" Permits for Real Estate Development*, 5 ENVTL. LAW. 345 (1999). The program is often included as an example of an innovative performance-based regulatory reinvention. *See* Stewart, *supra* note 8, at 63, 73–75. As with Project XL, critics charge the HCP program with being in essence too site-specific, sacrificing public participation for regulatory flexibility. *See* Salzman & Ruhl, *supra* note 262, at 685–86. Again, while we support the use of performance-based mechanisms, they are not a panacea and must be designed for good fit.

290. And it is equally true that "[r]egulatory agencies are, of course, not people, but collections of people in particular relation to one another." JERRY L. MASHAW & DAVID L. HARFST, THE STRUGGLE FOR AUTO SAFETY 26 (1990). The people in firms and agencies thus "are not fungible ciphers. They have individual careers, plans, ambitions, commitments, ideologies, and preferences." *Id.*

291. *See generally* ARTHUR BATTRAM, NAVIGATING COMPLEXITY: THE ESSENTIAL GUIDE TO COMPLEXITY THEORY IN BUSINESS AND MANAGEMENT (1998); SUSANNE KELLEY & MARY ANN ALLISON, THE COMPLEXITY ADVANTAGE: HOW THE SCIENCE OF COMPLEXITY CAN HELP YOUR BUSINESS ACHIEVE PEAK PERFORMANCE (1998). Indeed, Stuart Kauffman, one of the leading early figures in complexity theory, is now CEO of Bios, a joint venture with the consulting firm Ernst and Young, providing complex systems theory consulting to businesses. *See* STUART KAUFFMAN, INVESTIGATIONS 222–23 (2000). An emerging body of literature also extends complexity theory to broader theories of how social and economic organizations, in general, operate and evolve. *See generally* RICHARD H. AXELROD, TERMS OF ENGAGEMENT: CHANGING THE WAY WE CHANGE ORGANIZATIONS (2000); ROBERT AXELROD & MICHAEL D. COHEN, HARNESSING COMPLEXITY: ORGANIZATIONAL IMPLICATIONS OF A SCIENTIFIC FRONTIER (1999); ORMEROD, *supra* note 259.

292. Malloy, *supra* note 143, at 535. Thus, "even a perfectly efficient, profit-maximizing firm will not consist of a group of profit-maximizing employees and managers. The sheer size and complexity of the modern firm virtually precludes it from using profit-maximization as the driving goal for every firm participant." *Id.* at 558.

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thus seem right on point.[293] Traditionally, corporate compliance strategy was to wait until noncompliance was discovered, either from within or by regulators, and deal with it then in event-specific terms. By contrast, EMS theory and policy has focused on building internal management programs designed systematically to identify failures of effort and information that lead to noncompliance, and then to adapt business resource allocations to respond accordingly.[294] EMSs rely on efficient, systematic gathering of relevant information on environmental compliance, independent verification of information gathering reliability, and dissemination of the information gathered to relevant internal and external observers who can initiate compliance responses.[295] The better label, in other words, would be environmental systems management. EMSs hold promise in our view only if they are constructed around system-based foundations; we suspect that one challenge for regulators will be separating rigorous, system-based EMSs from the imposters. However, overall, proactive, system-based EMSs will allow firms to respond far more effectively to the problem of regulatory accretion than will any reactive, event-specific compliance strategy.

Indeed, the controversial aspect of EMSs has not been whether they can assist in the management of system burdens, but the degree to which regulators should promote, reward, or even mandate use of EMSs.[296] For example, proposed incentives for using EMSs include reduced sanctions for violations that are reported and evidentiary privilege rules to protect the findings of EMS surveys.[297] Just as regulated parties must balance the information burden costs of

293. A useful overview of EMSs is found again in Stewart, *supra* note 8, at 143–45.Again, our purpose here is not to survey and compare the intricacies of EMSs, but rather to point to the growing interest in and development of EMS as indicia of the growing need for system-based solutions to the problem of regulatory accretion.

294. *See* Dennis D. Hirsch, *Second Generation Policy and the New Economy*, 29 CAP. U. L. REV. 1, 11 (2001); Keith Pezzoli, *Environmental Management Systems (EMSs) and Regulatory Innovation*, 36 CAL. W. L. REV. 335, 336 (2000) (defining an EMS as "a process by which an organization's management identifies regulated and unregulated environmental aspects and impacts of its operations, assesses current performance, and develops targets and plans to achieve significant environmental improvements."); *see generally* Ronnie P. Hawks, *Environmental Self-Audit Privilege and Immunity: Aid to Enforcement or Polluter Protection?*, 30 ARIZ. ST. L.J. 235 (1998) (discussing the use of environmental self-audits to identify areas of noncompliance and self-audit privilege and immunity statutes which encourage and facilitate company compliance with environmental laws).

295. *See* Jay G. Martin, *Implementing Effective Corporate Legal Compliance Programs*, 11 NAT. RESOURCES & ENV'T, 14, 18–19 (1997); Stewart, *supra* note 8, at 144.

296. Indeed, the drive toward improvement of environmental management has spread to federal agencies as well. President Clinton issued an executive order directing all federal agencies to develop environmental management systems for all facilities under their control. *See* Greening the Government Through Leadership in Environmental Management, Exec. Order No. 13148, 65 Fed. Reg. 24,593 (Apr. 26, 2000). The Bush Administration has stated that it will continue implementation of these directives. *See* Kurt Fernandez, *Administration Takes Seriously Clinton Order On Management Systems, EPA Official Says*, 33 Env't Rep. (BNA) 1985 (Sept. 13, 2002).

297. *See* William L. Thomas et al., *Using Auditing, Pollution Prevention, and Management Systems to Craft Superior Environmental Enforcement Solutions*, 30 Envtl. L. Rep. (Envtl. L. Inst.) 10,299 (2000); John Voorhees, *The Changing Environmental Management Scene: Federal Policy Impacts the Private and Public Sectors*, 31 Envtl. L. Rep. (Envtl. L. Inst.) 10,079 (2001).

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adding EMSs (which could be negative) against the reduced system burdens, regulators must balance the benefits of the increased ability of firms to comply provided by EMS against the payoff benefits. Presumably, with rigorous long-term application of well-designed EMSs, regulated parties will identify effort and information deficiencies at the firm level (and, when aggregated, at the industry level), and thereby initiate improved compliance strategies. In terms of compliance, where a business can demonstrate rigorous application of an EMS, regulators can be more confident that residual noncompliance is a system effect and thus can treat it differently than if it were due to a lack of adequate effort or information gathering.

EMSs represent, of course, only one example of how firms might seek to respond adaptively to changes in the regulatory system. Regulatory accretion has, over time, changed the quality of the regulatory system, with one manifestation being increased system burdens on compliance. True to the Red Queen, firms have run to stay in place, with EMSs arising as an adaptive evolutionary response. Therefore, the question of whether and how to promote EMSs has implications for regulatory law more generally as firms decide whether and how to promote a full array of adaptive responses in the wide spectrum of regulatory fields. The message of the movement toward EMSs may not be simply that firms should adapt, but that the regulatory system as a whole must co-evolve with firm behavior in such a way as to promote such adaptation. In a world where new environmental, health, trade, and other social issues seem to arise indefinitely, regulatory accretion may be inevitable, at least for any predictable time horizon. But regulatory design need never be static.

CONCLUSION

It may seem obvious to many who work in the field of regulatory law that size must matter, but exactly how does it matter, why should we care, and what should we do about it? All too often critics of the administrative state allege that it is "too big" and spawns "too many laws," without explaining either what these assertions mean, why they matter, or how to test them. And the prescription they frequently offer for these ailments is equally devoid of substance. They propose simply to make government "smaller" by repealing the rules that are "unnecessary" or "too burdensome," and by making the remaining rules more clear and specific. The maxim of Occam's razor—to remove all that is not necessary—should be our guiding principle under this view. But where should the razor's edge fall, and how deeply should it cut?

In this Article we have demonstrated that size does indeed matter when it comes to compliance with and payoffs from regulatory law, but that the conventional criticisms and prescriptions that follow from this basic principle are misguided. We have developed a systems-based model for understanding how increasing the number of rules in the administrative state burdens both the ability of the regulated community to comply and the ability of the administrative state to demonstrate its payoff value. This model also shows, however, why

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"downsize," and "repeal" policies cannot live up to their promise of solving compliance and payoff problems. Thus, we have revealed a paradox: As the number of administrative rules increases, the government's ability to foster compliance and increase payoff becomes more limited. The solution, however, is not to tinker with the number of rules. The solution is to change the structure of the regulatory law system within which rules operate.

One cannot reinvent regulation without reconceiving at the same time what compliance, and thus noncompliance, means. What will make agencies "smarter" is not simply a matter of rule design, but also one of system design with ease of compliance and payoff in mind. Numerous regulatory reinvention efforts have their collective eye on designing better agencies and rules. Core guiding principles have yet to emerge from the dialogue, however, except insofar as reducing effort and information burdens is a stated goal. The reform proposals that also offer better management of system burdens are those which themselves are system-based in design, such as market-based, information-based, and performance-based initiatives, as well as programs supporting corporate use of environmental management systems. We suggest that a clearer understanding of accretion's burdens on compliance, particularly its systemic effects, can act as a powerful prism to differentiate and more clearly assess the spectrum of regulatory reform efforts. As much as size matters in defining the system, the system matters in defining the responses.

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