

Constructing Consequences for Non-Compliance: The Case of Academic Laboratories

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“Stanford students often asked me about the differences between managing in business, in government, and in the university. I had a somewhat flip answer. ‘In business,’ I said, ‘you have to be very careful when you tell someone working for you to do something, because chances are high that he or she will actually do it. In government, you don’t have to worry about that. And in the university, you aren’t supposed to tell anyone to do anything in the first place.’” (Shultz, 1993, p. 34 quoted in Zuckerman 2010)

On December 27, 2011 a tsunami swept through higher education and scientific labs nationally when Professor Patrick Harran and UCLA were criminally indicted on three felony counts for “willful violation of an occupational safety and health standard causing the death of an employee in violation of the labor code section 6425.”¹ Professor Harran was arrested and released on \$20,000 bail and a summons was issued for the Regents of the University of California. Three years earlier Sheri Sanji, a 23 year old technician in Harran’s laboratory, died from burns to her hands, face, and torso sustained while using T-butyllithium, a pyrophoric chemical that burns in contact with the air. Professor Haran was charged with failing to provide statutorily required training, with failing to correct unsafe or unhealthy conditions that had been identified during an inspection of the fourth floor temporary lab in October 2008, and with responsibility for Sanji not wearing the statutorily required lab coat. The maximum penalty for each offense is three years imprisonment in a state prison or a fine not to exceed \$250,000; for the corporation, the fine may not exceed \$1.5 million.²

Professor Harran and UCLA were indicted for *willful* violation of the health and safety code leading to a death not solely because of an accidental removal of a syringe of T-Butyllithium. They were indicted because the regulations governing laboratory practices were ignored. The laboratory conditions that allegedly increased the accident’s tragic damages had been brought to Professor Harran’s attention after the October 2008 inspection. University health and safety staff recorded and reported to Professor Harran that lab personnel were not wearing

¹ Insert language of the statute and its citation.

² In November 2012, the district attorney dropped charges against the University of California Regents because the university accepted responsibility for laboratory conditions at the time of Sheri Sanji’s death. As of November 2012, hearings in the case against Professor Harran have been postponed.

their lab coats and that there was an unsafe profusion of open chemical containers. The indictment emphasized that responsibility for the laboratory, including compliance with state and federal regulations, ultimately lies with the principal investigator. This responsibility was something Professor Harran had likely not internalized during his professional training, nor as his career progressed, and which the university administration, despite efforts, was unable to impress upon him. As we write this, Professor Harran faces 18 years in prison and close to a million dollars in fines.

In this paper, we examine academic research laboratories as examples of intractable governance sites. There are several reasons these spaces elude regulatory warnings and rules, including the professional status of faculty members in universities, the opacity of scientific work to outsiders, and the loose coupling of policy and practice in many universities (Weick 1976). Although this paper focuses on university laboratories, most organizations have pockets of extraordinary privilege – high-status actors such as executives, high-skilled experts such as physicians, and high-demand employees valued for their connections with clients, funders, or external decision-makers. Whether because of their elite hierarchical position, the shrouds surrounding their professional work, or because of the organization's dependence on them, these actors may refuse to acknowledge their responsibility toward the communities in which they work and believe their professional practice should be impervious to outside interference or regulation.

As a profession, contemporary scientists enjoy unusual degrees of autonomy and deference. Universities are professional-bureaucracies (Mintzberg 1979). One side of the organization is collegial, collectively governed, participatory, consensual, and democratic. The other side of the organization is a Weberian, hierarchical, top down bureaucracy with descending lines of authority and increasing specialization. These organizational structures have implications for the differential interpretations of and responses to legal mandates, for how regulation is experienced, and what self-governance might mean. This often disadvantages regulators and administrative support staff, who occupy lower status positions with less prestige, in their efforts to monitor, manage, and constrain laboratory hazards (Gray and Silbey 2011). What is regarded as academic freedom by the faculty and university administration looks like mismanagement, if not anarchy, to regulators. What is required by the regulators - consistent conformity - is abhorred by faculty members. Further, universities are often described as an example of loosely coupled system

because coordination and regulation are less restrictive, allowing local adaptation and creative solutions, improving sensitivity and responsiveness to the environment, allowing sub-unit breakdowns that do not damage the entire organization, and of special importance for the culture and norms of science, more self-determination by the actors. Herein lies the gravamen of the risk management problem: The challenge of balancing academic freedom and scientific autonomy with the demand for responsibility and accountability.

To examine academic research laboratories as examples of intractable governance sites, we began with this example of “the first ever criminal prosecution over an accident in a US academic laboratory”³ to demonstrate the complexity of these spaces, the difficulty of ensuring compliance, and the role of the principal investigator. Although we use this example, we could have described the death of a Yale undergraduate in a machine shop⁴ or the loss of a student’s sight in one eye following a laser accident at MIT⁵. In the sections that follow, we introduce the notion of a system — and environment, health, and safety management systems in particular — as a potential means of creating responsiveness, responsibility, and consequences for non-compliant practices in laboratories. We then describe the efforts of one university, Eastern University⁶, to create a system for managing laboratory health, safety and environmental hazards and to transform the established notions that faculty have few obligations to be aware of administrative and legal procedures. We describe the setting – Eastern University, an EPA inspection, and a negotiated agreement to design a system for managing laboratory hazards – and our research methods. We describe efforts, through the design of the management system, to create prescribed consequences for non-compliant practices in laboratories.

We show that in the effort to design a management system that communicates regulatory standards, develops compliance with the requirements and then attempts to respond and correct non-compliant action, Eastern University struggled to balance case-by-case discretion consistent with academic freedom and scientific creativity with the demands for consistent conformity, transparency, and accountability for safe laboratory practices. We demonstrate the specific struggles they face in creating system responsiveness, that is, feedback to re-channel non-compliant laboratory practices. Despite attempting to make faculty members accountable, we

³ Nature News Blog, posted by Richard Van Noorden, Category: Chemistry, Lab Life, 29 July 2012, 22:58 GMT, downloaded <http://blogs.nature.com/news/2012/07/criminal-charges-dropped,11/21/12 1:21 pm>.

⁴ REFERENCE

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⁶ This is a pseudonym.

show how illusory this goal may be and in its place how Eastern University develops a management system that buffers faculty members from responsibility, accountability, and consequences. We conclude by asking where such pockets of intractability reside in other organizations and whether the surrounding buffer, if there is one, creates an effective margin of safety.

Constructing Organizational Consequences at Eastern University: Management System as Solution?

During a routine inspection of Eastern University, a private research university in the Eastern U.S., federal EPA agents recorded over 3,000 violations of RCRA, CAA, CWA,⁷ and their implementing regulations. Despite the large number of discrete violations, both the Environmental Protection Agency (EPA) and the University regarded all but one as minor infractions. The university's major failure, according to the EPA, was its lack of uniform practices across departments and laboratories on the campus. There was no clear, hierarchical organizational infrastructure for compliance with environmental laws, no clear delineation of roles and responsibilities and, most importantly, no obvious modes of accountability for compliance. One laboratory or department was a model of good practice while another produced no accidents, spills, or emissions but could not demonstrate what practices it followed to prevent such accidents. The line of command from the laboratory or department through the safety office to the leadership of the University was opaque to the inspectors and thus it was impossible to say who was responsible for what. Without admitting any violation of law or any liability, the University agreed in a negotiated consent decree to settle the matter without a trial on any issues of fact or law.

The consent decree stipulated a five-year deadline for compliance. Normally, EPA consent decrees demand compliance within six to twelve months. The five-year window for compliance signaled a new kind of regulatory partnership in which a private organization not only changes its own practices but assumes responsibility to invent and disseminate new management models that promise better environmental, health, and safety outcomes. From the point of view of both parties, the consent decree turned liabilities into investments, creating the possibility of a win-win situation. From the government's perspective, private educational institutions are notoriously difficult to regulate because the vast range of loosely coupled

⁷ name epa laws

activities and dispersed authority create seemingly intransigent obstacles to environmental and workplace safety regulations that were designed primarily for mass production industries. By contracting with the university to invent a new management system for research universities, the consent decree offered the EPA an opportunity to solve some of its most difficult regulatory problems. From the University's perspective, the alleged violations threatened the University's reputation, while also creating the prospect of heavy fines and other costs. By assuming responsibility for designing and making publicly available a new management system for scientific research laboratories, the consent decree created an opportunity to enhance the University's reputation for excellence and innovation. Both parties viewed this agreement as an opportunity to create a model of safe and 'green' laboratories.

~~Environment, health, & safety management systems, such as the one Eastern was designing under the EPA consent decree, are style of management system that now pervades most large scale and many moderate size organizations such as those being installed in hospitals for medical records, organizations for personnel records, or publicly held corporations for compliance with financial reporting laws. While many of these systems are installed as efficiency measures to facilitate the work and lower costs, they have also become~~ Management systems, as in Eastern's case, are a favorite response imposed by the EPA and other agencies after failed inspections.⁸

Comment [RH1]: Will this confuse the reader? It makes the MS seem like a record keeping system which it is but with a much more dynamic component than these other examples. Wonder if it is better to take this out. The paragraphs below are probably sufficient in generalizing the management system.

Management systems are a relatively new form of governance that locates the design, standard setting, and implementation of regulation within the regulated organization itself (Coglianese and Nash 2001). Promoters of organizational self-regulation claim that firms can govern themselves more efficiently and effectively at a distance from, rather than proximate to, the immediate coercive force of the state, especially if the regulatory standards become embedded in organizational processes and routines (Hoffman 1997). Management systems not only pursue public goals through self-regulation, they also distribute compliance responsibility by using the distinctive features of all self-regulating systems, most importantly the capacity of a system to observe itself and through feedback loops to respond to negative or undesired action.

⁸Environmental management systems, promoted globally by the International Organization for Standardization under ISO 14001 as well as by the U.S. Environmental Protection Agency, these tools have become a preferred, ubiquitous means for managing organizational compliance (Kagan, Gunningham, and Thornton, 2003).

The key features of system efficacy – effectiveness and efficiency -- lie in the quality of the information that circulates through the system and the consequences for non-compliance. Regulators hope that the prospects and quality of regulatory compliance will be enhanced if the organization institutes means for observing its own activities and adjusting those actions to align with regulatory standards.

Designed to make organizational functions and performances immediately transparent to managers as well as internal and external auditors, management systems ostensibly enable more responsible risk management and regulatory compliance. To achieve improved compliance, management systems attempt to collect, standardize, and codify organizational and technical knowledge that had been the work of professionally trained experts or mid-level management. What had previously been tacit or centralized information about regulatory standards and safe practices is distributed throughout the organization. If management systems more easily circulate information as they are designed to do, they also distribute responsibility. Whether they create greater accountability is, however, uncertain and the subject of much of our empirical work. Inscribing the roles, rules, and routines in web tools and databases, management systems can make low-level actors responsible for organizational outcomes (Shamir 2008, Silbey 2009) or elide human responsibility altogether in the complex informational conduits of the system.

Whether an efficiency device or legal punishment, the key concept here is *system*, with the distinctive features it marks. The word ‘system’ is used to highlight the liveliness and four dimensions in time and space of what is flat, rigid, and inanimate in a visualized organization chart of a firm or its work processes, putting the emphasis specifically *the transactional and emergent constitution of a whole*. The idea has come to describe both continuity and change as well as vulnerability or stability in an organization or process over time. This notion draws critical attention to the role of informational conduits and feedback loops in the constitution and control of coordinated action over time. In effect, a management system is a means of routinely observing, recording, and self-reflexively responding to the organization as it performs its work. Management systems are, in this sense, control systems in which some proportion of the output signal of the system - or information - is passed or fed back into the input or decision making mechanism to control the dynamic behavior of parts of the system or the whole organization, in a process akin to that of a living organism.

Research Methods: Observing the Design an EHS Management System

From 2001 through 2007, we conducted ethnographic fieldwork at Eastern University to investigate what happens when compliance with legal regulations is pursued through a management system. Although accounts of management systems (Hoffman 1997) claim that coordinated components – training, manuals, checklists, scripted procedures, digitized data bases, software and user interfaces– provide administrators possessing only general managerial skill with the resources and competencies necessary to work at arm’s length from and without the expertise of risk professionals, our empirical observations revealed gaps between the system’s prescribed processes and enacted practice (Huising and Silbey 2011). While this should not be surprising to students of organizations generally (Orr 1996, Brown and Duguid 1991) or regulation specifically (Thomas and Hawkins 1984, Kagan and Axelrod 2000), the particular failures of the management system provide an opportunity to understand how difficult and fragile regulatory compliance may be even under the best conditions.

We observed what would be a strong, exemplary case for identifying micro-processes and supporting conditions that constitute a well functioning EHS-MS (Small 2009). The system was being designed in collaboration with the ultimate users, who in their commitment and style, exemplified ‘true believers’ in environmental sustainability, approaching decisions “not purely in pragmatic terms” as a business case, “but also in terms of principle, as the ‘right thing to do’” (Gunningham et al. 2003, p. 101). Eastern’s administration believed that environmental excellence was an essential feature of the university’s reputation and identity. Selecting an organization that had committed to design a system responsive to its local culture and allocate abundant resources to its enactment, the management system had difficulty re-channeling the behavior of passive or recalcitrant scientists.

The fieldwork activities included observation, interviewing, and document collection. It was supplemented by data collection with standardized instruments for some observations and via several surveys of lab personnel and environmental management staff. For this paper, we draw primarily from notes taken at meetings of the committee designing the system, presenting notes (in italics) from the discussions concerning a catalog of consequences for poor performance required by the consent decree. These discussions reveal how the university system designers struggled to identify and use information collected through inspections and audits to adjust non-compliant practices.

**Building Responsiveness and Responsibility into an EHS Management System:
Consequences for departures from specified operating procedures**

The adoption of a management system is an effort to create organizational responsiveness, the capacity to observe performance and adjust processes to better achieve established performance goals. Here, we focus specifically on the potential consequences for departures from required environmental, health and safety practices as mandated by the consent decree between the EPA and the University. The agreement stated that the system manual would:

“(a) [Specify] accountability and responsibilities of organizations’ central management and environmental staff, as well as faculty, researchers, students and staff, on-site service providers, and contractors for environmental protection practices, compliance, required reporting to regulatory agencies, and corrective actions implemented in their area(s) of responsibility.

(b) [Describe] incentive programs for central managers, and environmental staff, as well as faculty researchers, employees, and students to perform in accordance with compliance policies, standards and procedures.

(c) [Describe] potential consequences for departure from specified operating procedures.”

Because the University was given five years to design and implement the system, the various components were developed in pieces and delivered to the EPA on a schedule set out in the agreement. The first year draft of the accountability and consequences portion included a one-page document describing supervisory and individual responsibilities as well as periodic performance reviews, and a two-page set of guidelines of consequences for excellent and poor performance. The five-year report included a twelve-page document, a “Corrective Actions and Consequences Framework”, accepted as compliant with the consent decree. The first draft of the consequences had not been extensively discussed or debated. The final version was agreed to only after hundreds of hours of negotiations among four basic constituencies: the academic leadership, the University attorney overseeing the consent decree, the environmental health and safety support staff located within the administrative, non-academic hierarchy, and the lab managers and faculty within the academic hierarchy.

The first and final documents are distinguished primarily by qualifications, hedging language, and guiding principles that constitute a preamble to the delineated consequences for poor performance. The final document also includes five pages listing the responsibilities of each of the persons along the supervisory chain from faculty responsible for compliance within their labs, department heads responsible for department performance, Vice Presidents and Deans responsible for the departments under them, and the senior administrators of the University ultimately responsible for all below them. These descriptions explain that each person, or role incumbent, works with a committee of faculty and staff of safety professionals that provides consultation, monitoring, and recommendations, although legal responsibility for compliance is placed entirely within the academic hierarchy, with ultimate disciplinary responsibility in a university-wide committee. The EHS office, with a staff of over fifty persons with expertise in bio-safety, environmental management, industrial hygiene, radiation protection, and general safety, is another resource available to the departments and individuals “to assist in supporting good EHS performance and mitigating moderately serious and very serious incidents.”

The UCLA prosecution illustrates what is at stake in the meticulously parsed and contested language in the various versions of the management system manual; who is responsible for safe laboratory practices and who will be held to account for damages from laboratory accidents?⁹ This struggle shaped debate over several years through a series of organizing questions: What will constitute non-compliance? Who will identify non-compliance? How will those formally responsible in this now clearly-delineated line of responsibility be informed? What action will be taken in response to poor performance? Who will be responsible for taking action to correct the non-compliant action?

a. What will constitute non-compliance? Much of the discussion about what is a non-compliant event is emeshed in considerations of distinguishing minor, moderately serious incidents from very serious events. This template formed the text around and through which the discussions moved over dozens of meetings. In the end, the language defining minor, moderately serious and very serious events changed only in the substitution of the word incident for the word

⁹ We use the word accident although the documents refer to incidents. Although it is assumed that no one intends explosions or radiation leaks, the language of incident purposively leaves the determination of intention as well as liability open for investigation rather than posit that no person is responsible.

event. However, it was clear to the committee that not all non-compliance would constitute actionable poor performance.

The associate lawyer, Jeff, hands out the submission to EPA on consequences. As the group begins to look this over the principal attorney, Marsha, states, 'this group saw the EPA submission and endorsed it before –we met some of you individually as well.'

Jeff explains a handout on consequences that is being distributed around the room: there are minor, moderate, and serious events that require consequences. "We also want to reward departments that are doing a good job, but we need to remember that any good system needs a stick," Jeff says. He wants us to figure out who is responsible for determining that an event is occurring and requires consequences, and who has the authority to decide if it is minor, moderate, or serious in different circumstances. He defines minor / moderate / serious issues as they were developed by the committee at an earlier meeting. "The committee is compiling a list of examples, but I would welcome examples from you," he says.

The Vice-President and Associate Provost for Research, Jill, and the Associate Director of Environmental office, Howard, discuss the difference between a coffee cup in a lab trashcan by the door and "a coffee cup on the counter, half-drunk." Someone suggests "housekeeping" as a minor issue.

John Butts, a facilities coordinator in one of the major research centers, says: "Clutter can be hazardous. In my lab, we had an incident where a motor melted down and dripped hot plastic on the floor, inches away from some computer packing material. Computer packing material doesn't seem hazardous on its own, but it could have been a real problem."

Heinrich Doty, one of the most active and meticulous of the faculty participants, warns against becoming "hygiene police." "Some students just live a more cluttered life," he says. "This came up in my lab – certain students were told that their workspace was too cluttered, but they weren't posing a hazard."

Marsha: Incidents can be moderate if they're accidental and not deliberate, but these could also be serious, depending on the seriousness of the event. I think examples are good, but let's not be too specific. "Some judgment by good people" has to play a role in defining these events.

Despite the adoption of the original distinctions between minor, moderate and very serious incidents, the meetings continued to discuss the relationship between these categories and the actual behavior of the scientists. How would the system categories of acceptable and unacceptable actions map onto normal lab behaviors? How much would the lives of the lab workers be constrained by overly restrictive criteria? As Professor Doty said, no one wanted the system to become like police surveillance. Labs are places where science students live, after all. Once a basic list of unacceptable conditions and actions would be created and communicated through safety training, the salient issue would become intentionality, as it is in much conventional legal discourse.

Howard: A major issue would be an intentional violation, avoidance of requirements.

Marsha adds: Consequences are not necessarily disciplinary. Consequences are what do you do when an incident happens? Sometimes an event just needs to be followed up on; "the loop needs to be closed." It's not necessarily about finding fault, but about determining, was this a freak occurrence, or is it something that can be fixed by fixing the system? We need to make sure we explain this to the EPA – that it's not always about finding fault.

Bob, the head of radiation protection says: it's very rare that something gets to the university-wide committee level. We had an incident a year and a half ago – someone was intentionally breaking rules. It ended up going all the way to the President, who recommended termination of the scientist. The scientist "foolishly put it in an email," Bob adds, grinning. So don't put things in email. But, he continues, there have only been 3 such incidents in my tenure here – over 25 years - that have gotten up to that level.

b. Who will identify non-compliance? In a system, the issue of identifying non-compliance is an aspect of its capacity to observe its own behavior. A system observes itself by recording what it is doing and assessing its outputs for compliance with desired or expected production. Here, compliance is understood to be like a thermostat that maintains variation within limits (Easton). A system observes itself, however, not only in this sense of seeking correspondence with ostensibly objective criteria or norms, but also observes its own record of responsiveness to the specified norm or criteria. In this sense, a system is reflexive; this capacity makes management systems attractive tools in an age of complex organizational processes.

The EHS-MS located first level observational responsibility with laboratory safety representatives and with departmental coordinators hired to support, in effect to enact, the system at the disciplinary level. The student, post-doc or lab technician enacting the role of safety rep conducts weekly lab inspections, while the EHS coordinator is always around for consultation and advice (Huising and Silbey 2011). In addition, the laboratories are formally inspected twice a year by a team consisting of professionals from the central EHS office and the department EHS coordinator. Beyond these two specified members, the composition of the inspection teams varied across departments, with some department teams including faculty, administrators, and students and others departments in effect outsourcing inspection responsibilities entirely to the non-academic professional staff (Silbey 2009).

The issue of identifying non-compliance continued to bedevil the committee.

Professor Davis from chemistry said, "If it is serious you don't want a committee that takes time to get together if it needs immediate attention. For routine, EHS is the unifier –for consequences as one group knows if someone has a problem in one area how they are doing in other areas."

Marsha: "I think we're going to need to be more specific, though, for University-wide Committee policy. If the consequence of a particular action is termination from Eastern, then there's policy in place for that, but what leads up to that? When do you shut down a lab? When do you require faculty to do inspections in departments like XYZ? A lot of people here have partial responsibility for things – the system may work well, but it's not always clear who's responsible. Where we need to end up is to remember this key link of the PI. In order for this to work, I think it really comes down to the PI accepting responsibility, but how they deal with that locally is a very personal thing. I don't think we should prescribe action, tell the PI how to keep untrained people out of lab. But we need to convince the faculty of this responsibility."

Bob: "We weren't thinking at that level yet. For instance, if we find minor infractions in Radiation, we don't go to the PI unless it becomes a regular thing. We want to know what to come to the PI for, what are our procedures for minor, moderate, and major events..."

(c) How will those formally responsible in this now clearly delineated line of responsibility be informed? In other words, who will tell the professor that his/her lab is dirty or non-compliant? In the UCLA case, the university inspection team visited

Professor Harran's lab on October 30, 2008; the Chemical Safety Officer sent a laboratory safety report on November 5 specifying 31 findings or examples in violation of the safety rules. Half of these involved missing warning signs, absent first aid equipment, poor tags on hazardous waste, gas cylinders improperly affixed and an abundance of packing materials. The findings also included volumes of flammable and reactive agents beyond the volume limits permitted and visible absence of lab coats

Informing the responsible scientist turns out to be a complex issue at the very heart of the management system design, especially in the specification of distributed roles and responsibilities.¹⁰ In the end, the Eastern EHS-MS system named a hierarchy of responsibility, as described above, from the professor, up through the university academic hierarchy, exempting the professional support staff. Despite the traceable lines of reporting and responsibility on the organizational charts, consultation, advice and support was widely dispersed so that the enactment and holding to account was a constant challenge and remains so to this day. Most importantly, perhaps, because the faculty are the actors with the highest status and yet were made the ground level of responsibility, how to get their attention vexed the committee.

John Butts gives an example of how he thinks the system works. He's being very cut and dry, but in a semi-humorous way. He keeps saying the PI either complies or says, "don't bother me." The following is John's model as he presented it:

-- "If there's a problem, the EHS rep talks to the person responsible.

-- If the EHS rep feels they can't talk to the person, or the person isn't receptive, they go to the PI, and the PI talks to the person.

-- If the PI says "don't bother me," the rep can go to the coordinator, who will go to the PI – then all three will talk to the person.

-- If the PI says "don't bother me," the coordinator and the rep can go to the department head, who will go to the PI.

-- If the PI says, "don't bother me," then the department head can go to the Department EHS committee, who is "all powerful."

¹⁰ We have written about this elsewhere (Huising 2012, Huising and Silbey 2011).

John Butts seemed to us to be ironically saying that the Department EHS committee is all powerful because it simply brought the issue of who to tell about an unsafe practice back full circle back to a committee of faculty who, like the particular PI, do not want to be bothered.

Marsha: We need to figure out who takes responsibility when. If the problem is that it is Gollati, and no one is going to tell him what to do, okay – There are those people – but the department needs to pick up the slack. There is a good support network getting in place – the EHS coordinator, the safety reps, the EHS office – but we can't confuse the support network with those who have real responsibility – the PIs.

*Marsha: It's becoming ever more clear to me that the PI is the "lynch-man" in this. [Does she mean, lynchpin?] So, while you're defining responsibilities and consequences, make sure you don't relieve the PI of his duties. You can assign them helpers, but they need to be responsible. There can be a difference between **who actually does everything and who is responsible**. You need to make sure people are clear about that. It's like being in charge of the EHS office – not to put you too much on the spot, Joe. Actually, if the EHS office doesn't do what it's supposed to, I have the responsibility for that.*

For Marsha, the university's attorney in charge of the relationship with the EPA and the design of the system, the link between "who actually does everything" and "who is responsible" is simultaneously the fundamental challenge that system is designed to overcome and something transparent according to through the lines on the organization chart. It is ultimately a matter of explaining to faculty that they are legally liable; getting their attention it the difficult part.

Marsha: ... we need to convince the faculty of this responsibility... This is what we should be working on this summer. This is unfortunately the labor intensive part – we need to keep "looping back" - going to people's offices and asking their opinions so they don't hear things for the first time at [some committee meeting].

Because the lines on an organization chart are simply that — a pictorial representation of temporally and spatially dispersed transactions — Marsha's confidence that this is merely a matter of getting the faculty's attention seems misplaced. Indeed, from one meeting to another her confidence waxed and waned. The link between "who does everything," and "who is responsible," was opaque to the EPA during its inspection and remains uncertain in the complex division of labor described by the system. As

Marsha previously said, “A lot of people here have partial responsibility for things – the system may work well, but it's not always clear who's responsible.” In loosely-coupled organizations, it is difficult to hold actors responsible for other people's actions, yet the consequences may be tragic. At UCLA, Harran may be held legally responsible for the accident in his lab because he did not respond to inspection findings and recommended actions, but to this date no one knows why the plunger of the syringe with T-Butyllithium came out of its base.

Marsha: “We need department heads and the deans to help us with PIs in the coming months... We need to get PIs – if we don't get them engaged the system will fail... We will get them by pointing out all the support there is for them, but bottom line is they have to buy into taking responsibility.”

Ellen, an industrial hygienist, adds, ‘This is really a bottom-up design and I think faculty will want to come in when it is time to review.’

Bob tells one of his now-familiar stories. “I ran into David Shoemaker the other day and we said hello and I said you know we have seen each other at so many things I feel like I can call you by your first name is that alright.” David said yes, and Bob continued, ‘I asked him how do you get faculty interested in the process... David responded, that is a problem because most faculty are just not interested in the process and you can't get them to be.’ No one responds to this.

A good part of the work of the planning and design committee repeatedly addressed this issue of getting the faculty's attention. Multiple tactics were invented and tried including email distributions, posterings, paper brochures, department meetings, and school-wide meetings. In the end, the system built in three formal means of securing the faculty's attention and acknowledgement of their responsibility for laboratory safety: (1) A registration system in which the EHS personnel went from one faculty office to another registering the faculty and his/her lab into the data based of the system. The faculty were required to sign a document attesting that they had read the list of their responsibilities and had certified that the information describing the location, hazards and personnel in their lab was correctly for entry into the data base. (2) All faculty, as well as students, are required to complete safety training courses; some are available online, some in regularly

scheduled meetings, and others can be arranged for individual research groups in their own lab spaces. The required training modules vary with the hazards and procedures of the different laboratories. (3) Semi-annual university inspections and periodic EPA inspections and audits would provide information to faculty, as well as the university administration and staff, of the quality of compliance in the laboratories.

Surveys of the faculty, students and staff, completed during the design process and more recently, repeatedly show that familiarity with the EHS system varies widely. It is a continuing struggle, of which the EHS staff is painfully aware. When the EHS staff was preparing for the audit that would certify compliance with the consent decree, the team organized a practice run, or pre-audit, and specifically chose 'bad' actors' to be interviewed to see just how badly they would perform. The EHS team was also attempting to game the audit system by offering up a group of sacrificial lambs while reducing the odds that the bad actors would ultimately be included in the sample for the final, official audit. Bob described the audits as "*yet more opportunities to engage the faculty.*" He wanted "*a good result but not so good that [long-term] change would not take place. Some of the others also want the same result,*" he said, "*but they just want to protect their resources. Poor result ... more resources.*" Although the audit found full compliance in the form of a well-designed system, it also revealed that many of the faculty and some administrators did not have deep knowledge of it, despite the effort at participatory design. That finding was less important because the system had the capacity to know which faculty were not knowledgeable and would respond appropriately.

(c) What action should be taken? Consequences vary with the severity of the incident.

"Minor incidents are unintentional isolated events contrary to the EHS requirements, which do not result in harm, or pose immediate risk, to health, safety or the environment. If a minor incident occurs, the relevant supervisors shall apply appropriate consequences, which include one or more of the following actions: (1) Discuss the situation and how to correct it and prevent its recurrence and/or administer an oral warning, as appropriate. (2) Arrange for appropriate intervention by the department EHS Committee or EHS Coordinator, with assistance from the EHS Office to support achievement of better performance. (3) Require the person to take appropriate retraining, create a protocol where one is lacking, or both, as appropriate."

It was essential to the design of the system that there be a systematic method for responding to minor incidents, perhaps inevitably a part of doing of science. It was recognized that even following training, some lab workers would make mistakes, fail to tag jars perfectly, forget to put on lab coats, cover the vents in the hoods with too much material, or inadequately autoclave a biological sample. This might happen once, or perhaps twice. It was assumed that regular interaction with the lab safety representative, discussions in group sessions, and regular visits by the EHS coordinator would reveal these and correct them on the spot with discussion and additional direction. The feedback would be routine, semi-automatic in terms of the ongoing relationships among relatively intimate colleagues in the labs and departments. No written documents would even record the transaction unless it was an official inspection; weekly self-inspections by the safety reps were not to be fed into the data system. Thus, the first consequence for minor incidents was crucial: *“Discuss the situation and how to correct it and prevent its recurrence and/or administer an oral warning, as appropriate.”* The system of consequences would necessarily have to specify minor incidents as a first-order event in the hierarchy of events the codification was developing but the major focus of the code and its implementation would be on more severe incidents.

Professors Doty, Davis, and Jackson are talking about consequences being the power of the university-wide committee with the authority coming from the president. Focus should be on serious situations, extreme cases, firing someone. They don't want everything to go to the committee –most things would want to be handled on a local level.

A moderately serious incident *“is an unintentional, limited repeated, or limited systemic failure to meet EHS requirements, or an isolated incident contrary to the EHS requirements that does not result in significant harm to health, safety or the environment, but does pose a moderate amount of immediate risk or threat of harm to health, safety, or the environment.”* Consequences for moderately serious incidents include one or more of the following actions: oral or written warning(s) consistent with university human resources policies; a peer review of the event with recommendations for corrective action; a written plan by a supervisor which may include retraining, new protocols, approval from the department EHS committee and a follow up plan

and inspection; or suspension of activities until the corrective plan is provided, or completed, as appropriate.

Finally, a very serious incident “*is a persistently repeated or extensive systemic failure to meet EHS requirements, or an isolated incident contrary to such standards and/or requirements, which is either intentional, or results in significant harm to health, safety, or the environment, or poses a significant immediate risk or threat of harm.*” A list of eight possible consequences accompanies the definition of a very serious incident. The list begins with peer review and a written plan, as in moderately serious incidents, but then include new items: appearance before the University EHS Committee or other relevant Presidential Committees to explain the situation, to present and get approval of a written plan to correct the situation, and to implement the plan; restriction of the involved person’s authority to purchase or use regulated chemical, biological, radioactive or other materials/equipment; suspension or revocation of the laboratory facility’s authorization to operate; suspension of research and other funds to the laboratory/facility; closure of a lab or facility; applicable university personnel actions, which may include a written warning, suspension, termination, or other action against the involved person(s) as appropriate.

These descriptions illustrate the sequential escalation of requirements and consequences and display, rather boldly we think, the effort of the committee to draft a legal code for enforcement of the management system’s requirements. This portion of the system, along with the demands to create both an information storage system that could be easily accessed and analyzed, to (in effect) take the temperature of the laboratories’ safety practices, and a pollution prevention plan, turned out to be the three most difficult and contentious aspects of the management system design. One story may illustrate this most succinctly.

After months debating the definitions of the incidents and appropriate responses, the committee developed a set of criteria to guide the discretionary decision-making that they knew could not be avoided, and which, importantly, they wanted the system to permit. They called these additions, “principles.” The language read as follows:

1. *“There is no ‘mandatory sentence’ for any incident; rather, every incident must be considered in light of its specific circumstances.*
2. *The department EHS committee has the responsibility to assign a finding to a category (minor, moderately serious, severe)through the application of professional judgment, in consideration of certain key factors.*
3. *Consequences differ from corrective actions in that consequences refer to steps taken to modify a process or modify behavior, and are focused on preventing future incidents, whereas corrective actions are steps taken to address the current incident.*
4. *Consequences are not necessarily punitive in nature.*
5. *Consequences may be applied either to recognize good EHS performance or to address poor EHS performance.*
6. *Records will be monitored of all inspection findings and moderate and serious events and incidents.”*

The document also included an explanation for determining the severity of incidents. The criteria included: potential or actual harm to persons; potential or actual degree of harm to the environment; potential or actual harm to the university’s reputation’ the potential regulatory/compliance impact and the likelihood of the event occurring. In addition, judgments may include the deliberateness of the incident, its extent; and the frequency of this kind of incident. Further, the document included a general discussion of the expectations,

“based on these standards and the application of general principles described herein, each department will over time develop their own ‘common law’ of what incidents should be considered minor events, moderately serious events and very serious events. EHS staff will function to provide university-wide perspective and work to ensure consistency in rating events across departments for similar incidents.”

Finally, to provide some guideposts for university wide consistency, the committee produced a matrix of examples of some potential events, clustered by the kinds of hazards.

When the committee completed its work, Marsha, the lead attorney, went to work editing it. When it was returned to the committee, the changes, many of which were grammatical rather than substantive, nonetheless so offended the group that participation in the planning process ceased for a long while. The Associate Dean communicated to the EHS leadership that morale among the coordinators and other committee members from the laboratories was low and that

their willingness to do their best was being compromised. They believed that the decisions they made collectively in the working meetings were being undermined and changed so that at subsequent meetings, documents do not read as they were drafted; they believed that crucial “*subtleties, complexities and nuances to policies and proposals*” were being ignored, if not actively erased. If they were to continue working together, they asked for complete minutes, and officially recorded votes.

The collaborative collegial participation had come to a precipice, and as the Dean wrote in an email to the EHS head, “*As you know, it is easier to maintain and grow morale than it is to rebuild it.*” This was not a threat but the system design seemed to be floundering. Whether this lack of enthusiasm in continuing the design collaboration was a minor, moderate or serious incident was, at that very moment, unclear — and perhaps illustrated the fundamental indeterminacy of categorizing any particular non-compliant action at the very moment of observing it as minor, moderate or severe.

Joan brings up the subject of oral warnings as the first stage.

Frank thinks that is problematic: “If there’s no record of an oral warning, one person could get 5 oral warnings from 5 different people for the same problem and never have to fix it, because no one knows it’s a repeat offense.”

Jeff asks: How many people spend most of their time dealing with “chronic” problems? The room is about half and half on this.

The key issue here is the distinction between oral and written warnings and the possibility of making a record of individual person’s safety performance (Ewick and Silbey 1998,xxx). Lab people want no record, in order to protect ongoing research, to minimize consequences for minor lapses, adjustments and the demands of getting work done. Lab directors and EHS coordinators recognized these demands, and supported the inclusion of oral discussion rather than the word warning, but they worried nonetheless. In the end, the first action for minor incidents is discussion and then oral warning, as appropriate, permitting the safety personnel to decide when to turn discussion into warning. There is no written record for minor incidents. Moderate

incidents begin with oral or written warning, rather than discussion, while serious incidents begin with review procedures, a minimal due process requirement.

Nonetheless, it was the scientists' and their representatives' fear that the system would in fact become what a system is designed to be: self-observant and responsive, and thus would eventually and automatically escalate what were momentary and minor actions into moderate, if not severe, incidents. This anxiety animated the planning committee's discussions, feeding the desire to insert qualifications and guidelines to create officially sanctioned room for discretionary interpretation.

In the final published document of the "Corrective Actions and Consequences Framework," the discussion section was moved to the front of the document and expanded from five to eight principles. Criteria for assessing severity were expanded from four to five, adding potential harm to the infrastructure of plant and equipment, and modification criteria were expanded to four, adding control, the degree of personal v. institutional control that contributed to the incident.

(e) Who will be responsible for taking action to correct the non-compliant incident? Clearly, most minor incidents are to be handled *in situ*, when observed, through informal conversation, and the non-compliant action is supposed to be corrected by the observer's instruction and the lab worker's now correct action. Some non-compliance is discovered through inspections that inform the PI of non-compliant incidents; a follow up inspection confirms that the PI instructed her students to change their ways. Very few incidents actually move up the pyramid of seriousness.¹¹

A significant proportion of the chronically reported incidents are associated with the physical facilities and materials in the laboratories, such as broken sashes on the hoods, eye washes not working or absent, missing signage, inadequate tagging on waste, empty first aid kits, or crowding – simply not enough benches or storage areas for the number of people and materials in the lab. Indeed, of the 31 incidents cited in the October 2008 inspection of Professor Harran's lab at UCLA, with the exception of too great a volume of flammable liquids and no lab coats, the rest were of this kind. Corrections are not always straightforward or easy to achieve.

¹¹ Ranganathan and Silbey are currently conducting a longitudinal analysis of incidents at Eastern University.

Tagging of waste, proper signage, and adequate first aid kits may be fixed within a few minutes by ordering new tags and signs from the EHS office, and a first aid kit through the standard purchasing process. While the lab may order its own supplies, it must wait for the EHS office to respond with the tags and signs. The hood sashes and eye wash repairs depend on the university facilities office, which is notoriously behind in its work and thus unresponsive. In nearly every conversation about how to respond to failed inspections, discussion turned to the problems with facilities (cf. Lyneis 2012). The crowding in Professor Harran's lab was temporary, a result of his recent move from Texas to UCLA and the fact that his new lab was not ready, again within the domain of the university facilities office. For others not waiting in temporary spaces, crowding is often the consequence of more research funding than actual space: the scientist hires more students and technicians than there are lab benches. This has been a chronic issue for many universities, with lab construction lagging behind the expansion of research funding over the last 20 years. Some analysts predict a reversal of this process in the next decade as federal budgets shrink research funds.

If the staff experienced the faculty as uninterested in the management system — recall that John Butts described them as “*Don't bother me*” — the scientists have their own version of this mutually dependent relationship because often the ability to take corrective action does not rest entirely with the persons formally responsible for the lab. The PI depends on the extended network of roles and responsibilities across the university in order to sustain a compliant laboratory. This gap between agency (the ability to perform the corrective action) and accountability (being held responsible, liable for action) characterizes the scientists' experience of what they perceive as the staff's attitude of “*Don't bother me.*” The management system is, after all, a set of documents, not a substitute for human behavior.

Discussion and Conclusions

We use the case Eastern University to show how coordination and knowledge problems embedded in complex organizations such as academic research laboratories create intractable regulatory and governance issues, and in a sense to suggest that accountability may be, in the end, illusory. Overlaying bureaucratic procedures on spaces and actors lacking a sense of accountability to norms that may in real or perceived terms interfere with their productivity

highlights the central challenge in any regulatory system: to balance autonomy and expertise with responsibility and accountability.

Science is inhabited by a particularly unruly population, protected by centuries of increasingly public deference and privilege. The historic status of science may derive from its claim to objective truth; these days, it derives as much from the perceived link between scientific knowledge and economic and social well-being. By assigning the responsibility to Eastern for designing, implementing and auditing its own protocols for environmental safety, the consent order threatened to transform the long cherished forms of collegial governance of science.

To achieve compliance with the consent order while leaving as much autonomy and direction at the ground level, the consequences system adopted the familiar legal form of the common law. Rather than an automatically self-correcting system of strictly codified practices, Eastern's EHS-MS relies on case-by-case discretion that values situational variation and accommodation. Compromises between conformity and autonomy produce a system that formally acknowledges large and legitimate spaces for discretionary interpretation, while recognizing the importance of relatively consistent case criteria and high standards of environmental, health and safety. Marsha, Eastern's principal attorney noted the difficulties of balancing standardized ways of working in high autonomy settings, voicing concern about "*the exceptions [that] gobble up the rule.*" The logic of the common law is reproduced in the EHS-MS because, like our common law, only some cases become known and part of the formal legal record: those that are contested, litigated and go to appeal. In this way, the formal system creates a case law of only the most unusual incidents while the routine exceptions gobble up the rule.

The "Corrective Actions and Consequences" portion of the system was intended to create the informational feedback needed to animate the system. Despite its ambition, the University's EHS system failed to produce the automatic informational feedback essential to a self-correcting system because it depends ultimately, as all organizations do, on the human transactions that energize the network of linked action. Nonetheless, the desired consistency to high standards is achieved, although not through the formal feedback mechanisms of the system. Rather, safer practices and self-correcting reforms are produced by surrounding the pocket of recalcitrant actors who occupy the ground level of responsibility with layers of supportive agents who monitor, investigate, and respond to non-compliant incidents. In the end, we describe not an

automatic feedback loop but a system that depends on the human relationships that constitute the system's links.

References – to follow.