Rank Has Its Privileges: Explaining Why Laboratory Safety Is a Persistent Challenge

Citation: Basbug, Gokce, Cavicchi, Ayn and Silbey, Susan S. 2022. "Rank Has Its Privileges: Explaining Why Laboratory Safety Is a Persistent Challenge."

As Published: https://doi.org/10.1007/s10551-022-05169-z

Publisher: Springer Netherlands

Persistent URL: https://hdl.handle.net/1721.1/150598

Version: Author's final manuscript: final author's manuscript post peer review, without publisher's formatting or copy editing

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Cite this Accepted Manuscript (AM) as Accepted Manuscript (AM) version ofGokce Basbug, Ayn Cavicchi, SusanS. Silbey, Rank Has Its Privileges: Explaining Why Laboratory Safety Is a Persistent Challenge, Journal of Business Ethics https://doi.org/10.1007/s10551-022-05169-z

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The authors of this manuscript have complied with the ethical standards in conducting this research, and have no conflict of interest in conducting or reporting of this research. This manuscript has not been published previously and is not under consideration elsewhere.

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Abstract

Environmental, health and safety management systems have become common in research settings to improve laboratory safety through systematic observation and self-regulation. However, there is scant empirical evidence assessing whether these surveillance and inspection systems meet their intended objectives. Using data from safety inspections in research laboratories at a large university, we investigate whether conducting inspections, and recording and reporting findings back to the formally responsible actors (i.e., principal investigator scientists) lead to the improvement of regulatory compliance. Our analyses identify a population of well-funded, high-status, tenured researchers whose non-compliant practices persist. Our interviews with environmental, health and safety personnel suggest that higher-status actors disengage from the regulatory system, the compliance officers, and the system's feedback process by their variable recognition and acknowledgement of relevant regulations, attention to the inspection reports, and responses to the feedback concerning repair of the unsafe situation. This study extends previous literature on regulatory compliance by providing evidence for the role of power and status in explaining actor-level non-compliant behavior.

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Introduction

In the late afternoon of December 29, 2008, Sheri Sangji, a 23-year-old technician working in Professor Patrick Harran's laboratory at the University of California Los Angeles (UCLA), was transferring T-butyllithium from one sealed container to another. The chemical spilled from the syringe and burned the synthetic fibers of her sweater. Sheri was not wearing her lab coat at the moment. After 18 days fighting for her life, Sheri died from burns to her hands, face, and torso.

Professor Harran and UCLA were criminally indicted on four felony counts for "willful violation of an occupational safety and health standard causing the death of an employee". The professor and the university were indicted because safety regulations governing laboratory practices were ignored. During an inspection conducted two months before the accident, university health and safety personnel identified unsafe laboratory conditions and reported to Professor Harran that lab members were not wearing their statutorily required lab coats and that there was an unsafe profusion of chemical containers. Although Professor Harran was informed of his responsibility to correct unsafe and unhealthy conditions, the problems were not fixed. The university personnel responsible for environmental, health and safety in the laboratories did not follow up on the inspection to ensure compliance. The investigation report of the California Division of Occupational Safety and Health (Cal/OSHA, 2009) stated that "Dr. Harran simply disregarded the open and obvious dangers presented in this case and permitted Victim Sangji to work in a manner that knowingly caused her to be exposed to a serious and foreseeable risk of serious injury or death." This was criminal negligence.

In November 2015, seven years after the accident, The American Association for the Advancement of Science (AAAS) reported that Professor Harran was nominated to be a fellow, an honor bestowed upon AAAS members by their peers that recognizes efforts to advance science or its applications (AAAS 16 November 2015). On December 9, Sheri's family sent a letter to the AAAS asking the association to reconsider their decision: "No one should suffer the way Sheri did. No family should have to deal with our loss. And certainly, no principal investigator who runs their laboratory in a criminally negligent manner as Patrick Harran has should be bestowed with any awards. We respectfully request that you refuse to honor the unsafe science conducted by an unethical scientist" (Sangji and Sangji 9 December 2015). After re-evaluation, the AAAS decided not to proceed with the nomination of Patrick Harran as a fellow (AAAS 22 December 2015).

The Harran case begs the question: why do organizational members ignore regulatory warnings and rules? A fair amount of literature has been devoted to the question of why some organizations fail to comply with regulations. This literature has offered two main explanations for non-compliance: the failure of regulatory agencies (Edelman et al. 1999) and the decoupling efforts of organizations (i.e., complying symbolically but not substantively) (Kellogg 2009). However, it is important to note that these studies adopted organizations as the unit of analysis, describing regulatory compliance as an organizational accomplishment. This narrow focus is limiting our understanding with regard to how within-organization factors influence regulatory compliance. If organizational action is the collective action of decentralized actors with varying roles and resources, it is crucial to study the variation among these actors' compliant behavior in order to understand the micro roots of organizations' responses to regulations.

In this paper, we combine analysis of actual inspection records and face-to-face, in-person, semi-structured interviews, to study compliance with environmental, health, and safety (EHS) regulations in research laboratories at a major academic institution. Specifically, we focus on the role of power and status of organizational members (i.e., Principal Investigators) in explaining the variation among actors' responses to inspection results. We argue that principal investigators (PI) who enjoy higher-status in the institution act in an unresponsive manner to inspection feedback and consequently, non-compliant behavior persists.

This study offers important contributions to our understanding of regulatory compliance, with a special focus on laboratory science in academia. First, the violation of EHS standards in research laboratories is an understudied phenomenon in spite of the importance of regulations in these settings. By building on several studies on the role of regulation in labs (e.g., Fink et al. 2012; Huising and Silbey 2011), we investigate how researchers in these settings respond and react to regulatory warnings. Second, we investigate the effects of power and status on compliance with EHS regulations. Previous studies have studied the role of individual and group characteristics in creating safe work environments (e.g., Parboteeah and Kapp 2008; Zohar 2002), however, a specific focus on power and status is lacking in this literature. In this study, by applying the situated focus theory of power to regulatory compliance (Guinote 2007a), we investigate how the social standing of actors in the organizational hierarchy affects their compliant behavior. This theoretical approach is especially important, when the actors who are required to act in accordance with regulations are dispersed across the organization and hold varying degrees of power and status. Third, our study contributes to the larger organizational literature. Although the variation in regulatory compliance across organizations has been investigated extensively, only a few qualitative studies looked closely inside the regulated organization (e.g., Gray and Silbey 2014; Huising and Silbey 2021a; Pérezts and Picard 2015). We build on those studies to examine the variation across organizational actors' compliant behavior. Finally, our study moves beyond existing studies by drawing on two sources of data. We exploit actual EHS violation records to test our hypotheses. In addition to the quantitative analysis of records, we interview EHS personnel who conduct inspections in laboratories and provide feedback to PIs. The interview data provide additional insights and possible explanations for the patterns observed in the inspection data.

Compliance with External Rules and Regulations in Academia

Academic Audit Cultures

In recent decades, academic institutions have been transformed from free and unusually autonomous organizations to places of active surveillance and audit (Strathern 2000). In response to proliferating regulatory regimes in scientific and educational institutions, researchers from different disciplines such as management, ethics, law, and science, technology, and society have been observing the emergent patterns of implementation and compliance. Based on our review of these literatures, we categorize the studies on compliance in academia into three streams. The first research stream has studied academics' compliance with new managerialist practices such as the diffusion of performance appraisal measures and auditing systems in universities (e.g., Willmott 1995). The second stream has examined compliance with formal ethics programs and policies such as ethics training and the adoption of Institutional Review Boards (IRBs) (e.g., Babb, Birk and Carfagna 2017; Heimer and Petty 2010). Finally, in another line of research, researchers have studied compliance with diverse EHS regulations in academic and research settings (Evans and Silbey 2021; Huising and Silbey 2018; Silbey 2022). Although the sources of surveillance and particular subjects of regulation vary, these external interventions to the historically hallowed halls of academia share common aspirations: to introduce measures of quality control, transparency and accountability into the academia. This increasingly regulated organization generates both compliance and resistance among academics and researchers.

The neoliberal policies of recent decades have transformed most social institutions including academia (Wilmott 1995). These changes are primarily characterized in universities by the adoption of private sector corporate management practices. Conceptualized in varied terms such as new managerialism (Teelken 2012), academic capitalism (Slaughter & Rhoades 2004), audit culture (Strathern 2000) or the entrepreneurial university (Slaughter and Leslie 1997), this new regime introduced performance management measures, monitoring and auditing systems, as well as private industry and business norms (Hoffman 2017; Lam 2010). It constitutes an accountability infrastructure – roles, rules, resources – dedicated to the mutual coordination of external and internal expectations with distributed performances (Huising and Silbey 2021a).

The commercialization of universities – produced in part by neoliberal reductions in public funding for higher education – increased researchers' dependence on external funding and engagement in entrepreneurial activities (Cooper 2009; Smith-Doerr and Vardi 2015; Vallas and Kleinman 2008). Investigating academic responses to these new public managerialist practices, Clarke and Knights (2015) found, for example, that a majority of academics developed an enhanced preoccupation with pursuit of their individual careers. Instead of engaging in critical inquiry, the academics commit to apparent, sometimes superficial policy compliance while focusing on strategies to secure personal recognition and identity markers. Other studies have arrived at similar findings showing that academics' self-discipline is associated with career goals rather than knowledge production (Shore 2008). They normalize commercialization by reserving and exercising agency within the parameters of neoliberal knowledge economy (Holloway 2015) and play the academic game by concentrating time and effort on increasing their human and social capital (Kalfa et al. 2018).

A second line of research on compliance in scientific and educational settings has studied the adoption of formal ethics policies and IRBs (Stark 2012). The new ethics policies began by establishing the principles for informing human subjects about the risks and benefits of research in which they were asked to participate, seeking their consent and protecting their confidentiality (Babb 2020; Heimer and Petty 2010). Over time, these principles have been institutionalized through training programs, computerized tests for individual researchers, and certifications for both individuals and institutions. Drawing from ethnographic data and interviews in four different countries, Heimer (2013) studied compliance with official ethics regulations among researchers in HIV clinics. The formally instituted ethical obligations generated a burden of compliance for researchers by turning ethical issues into "wicked problems", defined as intractable problems on the ground that cannot be solved by the guidance provided through the official regulations. Comparing industry to academic ethics compliance, Smith-Doerr and Vardi (2015) describe the tension these rules generated among academics and the ways in which academics used humor to distance themselves from compliance with ethics programs. The increasing regulation of ethical conduct, surveillance and audit in these settings has been labeled as accountability infrastructure by Huising and Silbey (2021) and ethics creep by Haggerty (2004).

Lastly, a series of studies have looked specifically at compliance with EHS regulations in universities, the topic of this paper. Previous studies showed that scientists comply with regulations by delegating requirements to subordinates and staff members (Gray and Silbey

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2014; Huising and Silbey 2011). Recent studies show that compliance varies across types of risk and research. For example, the law recognizes risks for human bodies (e.g., radiation, injury) and the environment (e.g., hazardous waste, toxic emissions); the scientists recognize and try to contain risks to experiments (e.g., contamination) and relations among colleagues (e.g., trust and sociality needed for collaboration and working in close proximity). When all four risks are present, the legal rules are followed absolutely; when only some risks are present, the legal rules are complied with on a case-by-case basis; when the science or trust is threatened (and not bodies or environment), new local rules are created (Evans and Silbey 2021). Furthermore, historical and entrepreneurial experiences of different disciplines seem to shape contemporary academic compliance practices (Silbey 2022).

In these distinct bodies of scholarship, study after study has shown that most academics comply with external interventions most of the time (Clarke et al. 2012). What is striking in the extant literature on compliance with external regulations – managerialism, ethics, and EHS specifically – is the lack of studies investigating how these compliance practices among academic researchers vary by power and status. In this paper, we aim to address this gap.

Power and Status Effects on Compliance

Universities, like other organizations, are composed of networks of individuals with distinct and varied roles, resources, and power (Blau 1964). Thus, the collective action is a result of the coordinated efforts of actors with differing degrees of autonomy and authority. Looking at universities as single entities, as an actor rather than a composite of multiple actors, misses within-organization dynamics and differential behaviors of members. Variance among actors with regard to roles, expertise, authority, and resources directly affect the organization’s ability

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to comply with ethical expectations, professional norms, as well as legal rules and regulations covering the wide array of subject matters (Gray and Silbey 2014).

Compliance with regulations is not only a question of collective action but is also a problem of ethical behavior: why would an actor want to do what the regulation requires in the absence of credible regulatory enforcement, since regulatory compliance is costly and does not provide the actor an advantage in her field of expertise (Gunningham et al. 2004)? Imagine a professor who is presented with an inspection report of her lab's compliance (or lack of compliance) with EHS regulations. As a moral subject, she can do the right thing, claim her civic responsibility, engage in environmentally sustainable, thus ethical behavior (Flannery and May 2000) and fix the reported problems, or she can ignore the report and persist with the current, non-compliant practices. An issue becomes a matter of ethics when a decision has consequences for others (Jones 1991). Since it has direct effects on the well-being of other individuals, concern shown to health and safety in itself is an important ethical issue (Lorenzo et al. 2010; Palmer et al. 2014; Pierce and Snyder 2008). Particularly, actors dealing with risky work have an ethical obligation to minimize risks and establish a safe environment for their own well-being, the safety of those in close proximity, and societal welfare more generally (Douglas and Swartz 2017). The actor who performs day-to-day work, interpreting and responding to regulations that are designed to specify her work practices is no longer only the enactor of the organization's logic, but is also an enactor and central agent of ethical reasoning (Pérezts and Picard 2015). Thus, violating EHS requirements is simply an unethical behavior since it may lead to accidents with social and economic costs (Yuan et al. 2020), including deaths, as in the case of Sheri Sanji. Despite the theoretical relevance of social hierarchies in unethical behavior (Galperin et al. 2011), with few exceptions (Liu et al. 2019; Pitesa and Thau 2013), an empirical investigation of

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the role of social stratification in shaping compliance and ethical behavior is lacking in the literature.

Hierarchies, pervasive throughout social and organizational life (Chen et al. 2012), explicitly or implicitly rank order individuals along a valued social dimension (Magee and Galinsky 2008). The consequent stratification systemizes the variations in roles, responsibilities and resources (i.e., power and status) of members, of the society or the organization (Bunderson and Reagans 2011). In social systems, formal organizations or civil society at large, resources are distributed across and among individuals, which ultimately affects interpersonal dependence and control (Emerson 1962). An individual or group that possesses more desired resources is able to act more powerfully in relationships with others, especially those with fewer resources. The resources can vary from verbal acuity to physical strength; in contemporary organizations, legitimate position in the organization’s hierarchy, technical expertise, and control of material rewards are among the most common resources mobilized to enact power.

While power is the ability to achieve intended and foreseen effects in relations with others (Wrong 1988), status is understood as relative social or occupational standing (George et al. 2016) and associated or correlated deference (Weber 1946). The differential value given to distinct characteristics generates inter as well as intragroup status hierarchies (Berger et al. 1980). These status differences can lead to power inequalities leading to the neglect of contributions from those lower in the hierarchy while also creating openings for high-status members to ignore the entreaties of lower-status members (Bunderson and Reagans 2011). Protected by more abundant resources – materially, symbolically, and in terms of phalanxes of supporting staff – more powerful actors can disregard their actions’ consequences on less powerful others. When individuals become powerful, they are more likely to approach others as

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means to an end and to disregard the value of other qualities in others that are not perceived as instrumental for goal achievement (Gruenfeld et al. 2008).

Empirical research, as well as popular culture, report that powerful actors more often display egocentric focus and judgement, self-oriented decision making, objectification of others, and unethical behavior (Fiske 2010; Galinsky et al. 2015; Pitesa and Thau 2013). Moreover, power appears to affect motivations for social information processing such that more powerful actors tend more often to activate automatic-cognitive responses, ignore social causes, and rely on dispositional characteristics when interpreting others' behaviors (Fiske and Taylor 1991).

How might academics' power and status affect their compliance with regulations? Since more powerful and high-status actors care less about the consequences of their own actions for socially distant others, they do not feel the need to regulate their behavior within externally imposed standards and consequently they act more idiosyncratically than less powerful actors (Galinsky et al. 2006). Because powerful individuals are more likely to resist others' influences and less likely to adopt the perspective of others in social interactions (Greer et al. 2017; Lammers et al. 2008; van Kleef et al. 2008), they might be less aware of and responsive to inspectors' inputs (Keltner and Robinson 1996). As a result, a heightened sense of status and personal or organizational power may lead to more non-compliant behaviors that are dysfunctional for the academic organization as a whole (Blader and Yu 2017).

In addition, because more powerful actors usually have greater responsibility than those with less power or status, they tend to give more importance to the central task for which they are responsible. According to the situated focus theory of power, powerful individuals thus direct their attention to their personal goals and preferences (Guinote 2007a). Experimental studies show that more powerful individuals possess the ability to update goal-relevant information and

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ignore goal-irrelevant information whereas less powerful individuals are distracted by peripheral stimuli (Guinote 2007b). This focus on the central task increases cognitive load, consequently powerful individuals often lack the cognitive resources to pay attention or devote energy to peripheral tasks that are not central to the completion of main tasks (Gruenfeld et al. 2003). This is specifically important in the context of workplace safety, when selective allocation of cognitive resources towards safety-related feedback from others (i.e., regulators, inspectors) is crucial for creating safe workplaces (Yuan et al. 2020; Xu et al. 2014; Zheng et al. 2016).

EHS Regulations at Universities: The Case of Research Laboratories

Research laboratories are risky places (Ménard and Trant 2020). Lab personnel lose eyes, limbs and sometimes life itself in laboratory accidents. Varieties of performance-based regulation through management systems have been recommended by national environmental agencies as a potential means of identifying hazards and improving compliant practices in research laboratories by creating systematic self-observation and response (National Academies of Sciences, Engineering, and Medicine 2016a, 2016b, 2018; National Research Council 2014). However, research laboratories have been observed to be intractable governance sites (Huising and Silbey 2013). The professional status of principal investigators, autonomy of faculty researchers, and the opacity of scientific research to outsiders make these sites difficult to regulate and the organizational members relatively immune to rules and compliance warnings. Faculty members in academic research universities are an example of and similar to high-status actors in most organizations (e.g., top executives, high-skill experts) who occupy relatively exclusive, organizationally privileged and protected status positions. Due to their status and the organization's reliance on them, these actors may refuse to acknowledge their responsibility

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while also guarding their work practice from outside interventions (Huising and Silbey 2013). Rank as tenured faculty provides degrees of privilege not shared by untenured faculty or non-faculty researchers. For example, high-status faculty are protected from direct regulatory engagements by supporting staff who manage their labs and help supervise bench workers. Although they may ultimately be required to comply with governing regulations, their relative autonomy, expertise and less frequent interactions with enforcement actors, encourage interpretations of regulators and regulations as obstacles to productive science (Gray and Silbey 2014). Their rank and status create the privilege to ignore and deny less powerful actors.

Because explicit external sanctions are not necessarily or often present in self-regulating management systems, alternative informal means such as normative or mimetic forces should be available to make the system work (Gunningham 1995). However, the availability and use of these inducements are problematic in the case of university research laboratories. Informal coercion from administrative managers or peer pressure through publicity is not likely or practically feasible when principal investigators occupy higher-status positions than safety inspectors. In research universities, scientists enjoy extraordinary authority based on their knowledge and expertise in their respective fields as well as on the research funds they bring that help support basic university functions. These power bases (i.e., expertise and funds) become the foundation of the university's overall status and rank, thus creating yet greater status and power for faculty in their transactions with other organizational members, ultimately providing a shield against external pressures (Weber 1947; Wrong 1988). Although normative and mimetic forces were often thought to enhance compliance through the diffusion of best practices, scientists actively cultivate their unique identities (Clarke and Knights 2015) while protecting the boundaries of their own labs as well as science more generally (Gieryn 1983; Silbey 2019). Labs

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are usually distinct from one another, with each lab having a unique local culture, usually derived from the personality and philosophy of the principal investigator. Even though the outcomes of science are universal, the practices that generate the outcomes are often particular and idiosyncratic (Knorr-Cetina 1999).

As mentioned earlier, status refers to relative professional position or social standing. In our study, we operationalize status by using an indicator of formal social rank: whether the PI has tenure or not. Previous research showed that non-tenured academics commit their efforts not only to improving their job performance (i.e., research productivity) but also to cultivating strategies for managing relationships with stakeholders to signal their institutional loyalty (Pifer and Baker 2013; van Emmerik and Sanders 2004). We expect that tenured PIs will ignore regulatory warnings whereas non-tenured PIs would take external pressures into account to improve their social legitimacy in the organization and be responsive to inspection feedback.

An alternative hypothesis is that because non-tenured PIs experience high pressure to produce and publish, they may ignore the time and resources that safety compliance demands whereas tenured PIs may allocate more time to safety issues since the protection of tenure can reduce some of the pressure to publish. However, the context we study is a highly competitive research environment where tenured professors also experience high levels of pressure to publish. Therefore, we expect tenured PIs to pay relatively less attention to safety than their untenured counterparts by taking advantage of their status. In addition, one might expect that the number of violations may be endogenous to the amount of work undertaken. One way to operationalize the amount of work is to take work outcomes into account. One outcome produced in lab settings is the number of publications coming out of the lab. We use the number of publications as a proxy for productivity and control for it in our analyses. Thus, we posit the following hypothesis:

Hypothesis 1: Having tenure will be associated with more EHS violations, after controlling for productivity.

In our study, we operationalize power in terms of the amount of a scientist's available research funding. In most organizations, the generation or control of material resources is a key factor in determining organizational power and performance (Campbell et al. 2012; Finkelstein 1992). In the case of research institutions, highly funded scientists add disproportionate value to the organization (Hackman 1985; Musselin 2013). Thus, research funding is an important signal for predicting the impact of scientists, which in turn is a signal of the university's status (Azoulay et al. 2010; Ma et al. 2015). With the increasing emphasis on external sources – both governmental and philanthropic – for funding research projects, investigators who manage larger research budgets become more powerful within the organization (Bol et al. 2018; Salancik and Pfeffer 1974). While they may not alone shape the organization's agenda, the distribution of work, or the organization's ostensible mission, they achieve greater autonomy from administrative and managerial control. The organizational pressure on academics to secure external funds, professional competition to rise above peers among scientists, and the stature of labs to sustain themselves as semi-autonomous units encourage an egoistic-individual climate with a flourishing self-interested focus (Smith 2010; Victor and Cullen 1998). Thus, we expect that PIs with increased power through greater research funds are more likely to pursue their own goals such as producing patents and publications and less likely to pay attention to goal-

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irrelevant inputs such as EHS inspection results and feedback. Considering these documented behaviors of powerful actors, we posit the following hypothesis:

Hypothesis 2: Managing larger research funds will be associated with more EHS violations, after controlling for productivity.

Social hierarchies can be dynamic and may change over time (Feng et al. 2014). Organizational actors might gain more power as they accumulate more expertise or as valuable resources under their control become larger (Schaerer et al. 2018). Thus, we expect that as the amount of research budget the principal investigators manage increases, they will secure greater status within the university, and consequently their non-compliant behavior will intensify.

Hypothesis 3: As the amount of research funding managed by the PI increases, the number of EHS violations in his/her lab will increase.

To understand how status, budgets and material resources encourage laboratory practices that violate EHS regulations, we accompanied the analysis of inspection data with in-depth, semi-structured conversational interviews with EHS personnel (Mishler 2009). In the interviews with EHS inspectors, we specifically wanted to learn about their experiences while working with PIs with varying degrees of power and status. The accounts of EHS personnel identify the challenges they face and tactics they utilize in their interactions with PIs, as well as students and other lab personnel. These interviews help us identify the mechanisms driving variation in regulatory compliance.

Methods

The setting

Our organizational and interview data come from a major research university (hereafter "The University") located in the eastern United States. The University has a locally built EHS management system, designed to meet U.S. Environmental Protection Agency (EPA) requirements. Each academic department in the University works with an EHS coordinator whose job is to oversee laboratory compliance within the department, ensuring that researchers integrate concern for safety and the environment into their research protocols and practices. Those coordinators work with a centrally located staff organized according to their distinctive fields of expertise in various hazards (e.g., biomatter, radiation, chemical waste, air quality, occupational health and safety). The department coordinators and the central staff experts work together to provide both expert advice and oversight of laboratory safety. The data for this study come from the records of laboratory inspections and interviews with these coordinators and EHS experts.

Quantitative Data and Measures

The quantitative data exploited in this study include inspection findings in research labs recorded by department coordinators from 2006 to 2010. The data consist of inspection records from 236 labs in nine departments at the University. Fifty-four of these labs belong to untenured PIs whereas 182 of them belong to tenured PIs. The unbalanced panel data include 5057 violations that were recorded in these labs. Importantly, the observation of EHS practices at the University and the actual record of EHS violations provide a unique opportunity to isolate some of the factors that might otherwise interfere with a reliable and valid analysis of the inspection

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outcomes. In the time period observed, each laboratory had been inspected by the same inspection team and all coordinators used the same inspection protocol and recording template. These two important characteristics of the setting rule out the possibility that inspection outcomes were affected by changes in inspectors or inspection templates. After each inspection, feedback about findings (observed discrepancies between regulations and performance) was provided to the PI (faculty member) of each lab, with instructions for the PI to fix the observed EHS problems.

Dependent Variable

EHS violations. The main variable of interest in this study is the number of EHS violations in each lab, which was recorded by inspectors during semi-annual inspections. These violations include instances of any type of non-compliance with EHS regulations from minor issues such as the untidiness of the lab to major issues such as the mismanagement of chemical waste, working with an inoperative or faulty fume hood, or failure to wear personal protective equipment (e.g., safety glasses, gloves, lab coats).

Independent Variables

Funding. We operationalized power as the amount of funding under PI's control and collected information on the amount of yearly research funds managed by each PI from 2006 to 2010 from the university archives. The funds come from various sources such as the federal government, industry, and the National Science Foundation.

PI tenure. We operationalized status in the organization as the tenure status of the PI and recorded whether the PI had tenure.

Control variables

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PI employment and academic variables. We used employment duration of the PI at the University (in years) as a control variable since time spent in the organization is a potential source of power (Allen 1981). In addition, we controlled for the quality of PIs' Ph.D. degree granting institution using rankings from the Times Higher Education World University Rankings since it may signal status in the organization (Burris 2004).

PI demographics. We controlled a set of PI-level demographic variables including age, gender, race (White vs. non-White), and country of origin (U.S. vs. non-U.S.). Taking these characteristics into account is especially important because past research showed that in environments where collaboration between different actor groups is required (i.e., ensuring safety in an organization), the demographics of actors matter. More specifically, in a study of high-status actors (i.e., scientists) such as this, it is important to consider cross-cutting demographics because the interaction of different status characteristics such as high occupational status and lower demographic status (i.e., female scientist) might lead to varying levels of positive experiences with the low-status actor group (i.e., inspectors) (DiBenigno and Kellogg 2014).

PI research output. To control the productivity of PIs, we determined the number of publications published by each PI from 2006 to 2011. Because publications are often outcomes of previous year(s)'s work, we treated it as a lagged variable by associating the number of violations in year *y* with the number of publications in year *y+1* in our analyses.

Lab size and departmental affiliation. We controlled for lab size operationalized as the number of people working in the lab. We also controlled for the department that the lab belongs to since disciplinary organizations are impactful in shaping local practices (Silbey 2019; Whitley 2000).

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Qualitative Data

Over the years of inspections reported in this paper (2006-2010) and again between 2017-2019 after discovering the pattern in the inspection findings, we conducted 105 face-to-face, open-ended, conversational interviews with EHS department coordinators and central EHS office staff. Interviews ranged from a half hour to two hours, conducted in-person by us on the campus of the University. All interviews were recorded and transcribed verbatim.

In the interviews, we asked about many issues ranging from the design and implementation of the original management system to the organizational as well as legal requirements for record keeping, training, and pollution prevention policies. For this paper, we specifically focused on references in the interviews to inspection processes, lab conditions discussed in the inspections, and responses of scientists to the inspection feedback.

For analysis, first each of us read the interview transcripts independently and coded the relevant information. Then, we met periodically to discuss our preliminary coding to develop consensus on the codes. Adopting a grounded theory approach (Charmaz 2006; Glaser and Strauss 1967) we coded the interviews using Atlas.ti, first with inductively generated codes, later with theoretically and analytically generated codes, moving back and forth from data to theory to data to theory (Tavory and Timmermans 2014). Our initial independent readings of transcripts helped us have multiple perspectives on the issues and our subsequent meetings and discussions allowed to establish a convergence in our understanding of the data (Eisenhardt 1989). These discussions led to the emergence of themes that we discuss in this paper.

We do not quantitatively analyze the comments in these interviews but use the insights of these inspectors to suggest explanations for the patterns we find in the EHS violations data. Because the interviews are semi-structured, (that is use a protocol of topics for discussion but do

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not follow a fixed script without variation), quantitative analysis would be unreliable since not all interviewees received the same exact prompt in the same order of discussion. Nonetheless, such conversational interviewing provides rich, detailed engagement on a topic, enacting the cultural tropes and circulating memes of the discussant's local culture. This back-and-forth discussion has proven very successful at revealing the tacit knowledge of a wide array of organizations and social groups (Mishler 2009).

This grounded theory approach allowed us to identify the themes and theory we discuss below. Coordinators described how PIs disengage from the actual lab activities denying the relevance of safety regulations, being preoccupied with budgets, sometimes growing the lab beyond their capacity to monitor, creating crowded labs to whom they delegate responsibility while attending to audiences and funders outside.

Results

Quantitative Findings

Means, standard deviations, and intercorrelations among study variables are provided in Table 1.

[Insert Table 1 here]

For inferential analyses of the data, we ran random and fixed-effects models. Panel data analysis with random-effects model is provided in Table 2. The random-effects model assumes that the variation across units is random and uncorrelated with the predictors included in the model. In the first random-effects model, we regressed the number of EHS violations on PI tenure status. In this baseline model, tenure status is significantly associated with the number of violations ($\beta=2.27$, $p<.01$). In the second model, we controlled for PI-level and lab-level

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variables as well as the number of publications. We also included year and department dummies in the second model. The results indicate that controlling for a host of variables, having tenure is associated with more violations, confirming Hypothesis 1 (β=2.91, p<.05). In Model 3, we added the PI's volume of research funding into the regression equation, measured in US dollars (logged). The results show that controlling for demographic, employment, academic variables, and productivity, research funding is significantly and positively associated with the number of violations observed during inspections (β=0.66, p<.05). Thus, Hypothesis 2 is confirmed.

[Insert Table 2 here]

Since scientific work does not produce results of the same quality, in Model 5, we added PIs' publication quality as a control in our model. As a proxy for publication quality, we used h-index metrics of PIs. H-index metric is often used to measure research quality (for a review, see Bornmann and Daniel 2007) and calculated as the maximum value of "h" – such that "h" refers to the highest number of PI publications that have been cited at least h times. We were able to identify the h-index of 55 PIs in our dataset. For this subset of PIs, controlling for publication quality, funding amount is still significantly and positively associated with the number of violations (β=1.21, p<.05).

Although we included a host of control variables in the random-effects model, we cannot totally rule out the existence of unobserved heterogeneity across individual labs. To deal with this, we ran fixed-effects analyses which allow us to rule out heterogeneity across labs. We used three time-variant variables in the fixed-effects analyses: the number of violations, the yearly research funding, and the number of publications published in a given year.

To see whether the amount of research funding affects compliance performance, in the first fixed-effects model, we regressed the number of violations on the funding amount (see

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Table 3). The results of this model show that the relationship between funding amount and violation performance is marginally significant ($\beta=0.80$, $p<.10$). In the second model, we added the number of publications. After controlling for the number of publications in the second fixed-effects model, the relationship between funding amount and violation performance still remains marginally significant ($\beta=0.82$, $p<.10$). These results suggest that as the amount of research funding increases, the number of violations intensifies, after controlling for productivity. Thus, our third hypothesis is confirmed.

[Insert Table 3 here]

As a robustness check, we ranked labs based on the percentile at the University they fall into with regard to the amount of funding in a given year and ran fixed-effects regressions by introducing dummies for each percentile. The analyses in Table 4 show that labs in the 75th percentile and above violate at significantly higher rates compared to the labs below median. As seen in the second step, this finding holds valid even after controlling for the number of publications.

[Insert Table 4 here]

The Burdens and Privileges of Rank and Status: Interview Data

From the interviews with EHS personnel, we have identified common practices that help explain why the labs of more well-funded, high-status scientists display more violations and why these actors do not respond to reports of violations within their labs. These proffered explanations constitute hypotheses for future work, products of our grounded theory analysis (Glaser and Strauss 1967). As suggested earlier in generating our hypotheses for the analyses of the inspection data, the scientists whose labs are repeatedly cited for EHS violations give less

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attention to the laboratory conditions and are often absent from the university. Of course, there is always some level of disorder and variations from ideal. The purpose of the EHS system is to identify any problems on a regular basis, weekly by the lab's own 'safety rep' (usually a student or lab manager) and semi-annually by the inspectors. Our research question asked whether improved performance – reduced inspection findings (i.e. violations) – follow inspection reports, which would be the virtuous feedback cycle characterizing well-functioning systems (Silbey and Agrawal 2011). Our findings from the interviews show that the issue of management system efficacy is not dependent on the reported inspection violations per se but the response of the principal investigator to that information. Here, a coordinator describes the most difficult and non-compliant lab within her set.

> *"For the most problematic lab, they had had the same inspection findings for several years. They were at the higher end of the number of inspection findings… I'd meet with the rep [*student or technician with safety responsibility within the lab*]. We'd go over things that needed to be fixed. I'd go back a few weeks later, nothing would be done. Eventually the [*department*] EHS committee stepped in, and at that point … the PI said, "Well I kept getting these findings, but I didn't think they were important." Well, if the PI doesn't think the findings are important, then he's not going to be concerned when they keep reoccurring, 'cause it's just nothing he cares about." (ML1.9)*

The coordinator continues, describing initial success but eventually a return to a stable, only slightly improved equilibrium.

> *"He didn't really see the issues were safety issues. But, once he had kind of the pressure from the EHS committee, he did start to get more involved… He'd ask*

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> *questions and we'd give either the regulatory or [*university*] policy reasons for the things we were saying, and that pushed him more towards the state of caring. But, it's still a lab where we do have to do some prodding to kind of keep them up." (ML1.9)*

"*Ultimately, it's up to the PI*," another coordinator said, "*where the power sits in academia is not with the grad student.*" *(CS1.5).* Nor does power lie with the staff. When there are non-responsive faculty, the EHS personnel can achieve results only with the support of other faculty. "*She's sort of untouchable***,**" another coordinator said, describing a professor who held a prestigious chair and ignored her lab, delegating all responsibility to a lab manager who put "*EHS training at the bottom of [*his*] list. "It's not going to happen," the lab manager said*." *(RL1.9).* A high-level administrator explained further why it is difficult for staff to be able to move faculty to comply, if they do not choose on their own to do so. Apparently, the staff interpret the tenure system as putting the faculty beyond criticism and accountability. This is confirmed by our data showing that tenured faculty are more likely than untenured to have labs with more violations.

The social isolation of some faculty members with self-focus on their own goals was also brought up by coordinators. The coordinators stressed that the social isolation has a trickle-down effect on students in the lab.

> *"They kind of view themselves as on their own and separate from the university. So some of these –the requirements of the management system- they happily just brush off. And it's at all levels, you know, within the lab. I think the students are – would be happy to, you know, get involved, but because the PIs aren't really as supportive, it makes it difficult to kind of do their own thing."(BB1.8)*

Rank Has Its Privileges

Furthermore, the status differences between PIs and inspectors add an extra layer on top of faculty's social isolation and further aggravate coordination problems. The inspecting coordinators repeatedly mentioned how status hierarchies create problems.

> *"I did a pre-inspection, and I went through, and I visited the laboratory, and I wrote down whatever findings that I saw, and I sent an email to the PI under my name. And because I'm not a faculty member, and I'm –I mean, it was, "Who is this guy sending me an email saying that he found some issues in the laboratory?" And it really hit the fan." (JS1.7)*

As exemplified in the quote just above, it is not rare for inspectors to encounter PIs who perceive feedback as a status threat (Gray and Silbey 2014). This, as described by a coordinator below, can lead to the undervaluation of EHS personnel's work:

> *"There was one instance in the past where I did an inspection of a faculty member's lab and he basically told me that, well he said, these are not issues in my lab. So either I had made them up or...something. So he sent me this pretty long e-mail that was a little bit vicious I would say." (TB1.9)*

To reiterate, the issue of management system efficacy depends on the PI's response to the reports of violations, not the violations themselves, as all labs are going to have some problems at one time or another. Another coordinator emphasized the centrality of responsiveness with an energetic reply to our query about what constitutes a problematic lab, by saying "*What characterizes a problem lab? I learned the word recalcitrant! I hadn't known it before.*" He described a member of the department whose lab failed two or three inspections in a row. A letter was sent requesting the professor to clean up his lab, explaining that the inspectors would be back in a few weeks to see the response.

"So the third letter basically says that in the event that there are still any problems with the third inspection, we will have no alternative but to order your laboratory closed to further research until these problems are corrected. And then there was a kind of postscript that federal law requires that, if you have any funding from federal agencies, we have to notify them that work is ordered halted here." (SI1.6)

In this instance, and in all others in which such repeated violations were ignored, the third letter always gets a positive response. The threat of a lab closing is spoken about often, especially in training sessions, the notice to federal funding agencies mentioned less frequently. But, from our search of the records, no lab has ever been closed in this university for EHS violations, only for financial misconduct or scientific fraud, where federal agencies were informed immediately.

A Taxonomy of PIs' Responses to Inspections

Our analysis of interviews with EHS personnel helps us explain the counter-intuitive findings from the violations data with a taxonomy describing variations in PIs' responses to inspections. The interviews also show that the status differences between faculty members and EHS inspectors add an additional barrier to the functioning of the management system, designed to provide organizational accountability (Huising and Silbey 2021a). A simple three category taxonomy with three dimensions derived from our empirical case (Bailey 1994; Rich 1992) describes the reactions of high-status actors to regulatory feedback. The PIs' varied social insulation, focus on their own production goals, and lack of attention to feedback contribute to system ineffectiveness. From these interviews, we see that higher-status actors disengage from the regulatory system, the compliance officers, and the system's feedback process by their variable recognition and acknowledgement of *relevant regulations*, attention to the inspection *reports*, and responses to the feedback concerning *repair* of the unsafe situation. We encapsulate this taxonomy in three forms of disengagement we label: *deny*, *dispute*, and *delegate* (see Table 5).

A considerable number of high-status actors simply *deny* the relevance of safety regulations and requirements of compliance. As several inspecting coordinators said, the PI simply "*did not see"* the relevance of regulations and rules concerning the condition of the lab as safety issues. In cases when denial is not possible, when the accumulating chemical waste or the lack of personal protective equipment (e.g., gloves and lab coats) is made evident to the PI, they engage in outright refusal by *disputing* the fact that the situation is an real safety problem: There is not that much waste in the containers, or lab coats are not necessary for this experiment. Finally, when it is practically impossible to withdraw from some sort of engagement, PIs cope with the situation by *delegating* responsibilities to subordinate lab personnel, including students and staff, without themselves actively getting involved in the repair process.

[Insert Table 5 here]

In response to these forms of disengagement, compliance officers develop a repertoire of interpersonal tactics mobilized to make high-status actors compliant: persistent prodding, providing additional rationale, threatening with external authorities, and fixing problems on the spot. Our observations show that these tactics by officers are often deployed in sequence. First, inspectors push for compliance with constant nudges and additional explanations. As a last resort, they threaten scientists to hold them accountable to external authorities such as

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department heads or the EPA. For labs showing persistent incompetence or unwillingness to fix problems, they engage in hands-on intervention by fixing the problems themselves. Such in situ fixes range from verbal instruction concerning improved practices to sample demonstrations to actual repair of deficient conditions.

Thus, our interview data support the analysis of the inspection data, showing that high-status privileged scientists often choose to ignore feedback concerning the hazardous situations in their labs until threatened with extraordinary consequences. Importantly, this is a small sub-population of the university's faculty and a small fraction of those who receive reports of inspection violations. It does confirm, however, that social isolation and status differences prevent some of the most successful scientists from devoting attention to what they – by the evidence of their lack of attention – interpret as peripheral obligations.

Discussion

Research laboratories can be very risky environments. With the installation of EHS management systems, both university administrators and responsible agents as well as government regulators expect that environmental and health hazards can be contained. Conducting regular inspections and taking remedial steps based on inspection findings can help prevent tragic outcomes. However, the findings of this study of inspections in a major university show that despite regular audits and feedback to scientists, the number of safety violations did not decrease for some labs. A closer examination of inspection findings and interviews revealed the differential reaction of PIs to audits showing that social hierarchies in academic settings lead to scientists' varied responses to inspection feedback. The quantitative analyses of inspection reports and administrative records indicate that the magnitude of economic resources available to

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a PI, a resource enabling and thus an indicator of power in academia, is an important predictor of non-compliance. In addition, tenure, a formal marker of status in academia, is also significantly associated with the number of violations; tenured scientists violated EHS regulations more frequently than their non-tenured peers. Interviews with inspectors help us theorize the processes of regulatory compliance, in particular explaining this non-compliance by powerful actors, showing how they disengage from the regulatory system, the compliance officers, and the system's feedback process. A simple three category taxonomy of reactions of high-status actors (*deny, dispute, delegate*) to regulatory feedback synthesizes these actors' responses, and how their varied social insulation, focus on their own production goals, and lack of attention to feedback contribute to system ineffectiveness. The PIs disengage by their variable recognition of regulations, attention to reports, and responses to feedback. These actors simply ignore the safety regulations or dispute the accuracy or relevance of the inspection findings, or if denial and dispute are ineffective, end up delegating responsibility to others for whom they do not provide close supervision. In sum, powerful PIs ignore feedback from inspectors whom they perceive as the low-status service personnel of the organization. In turn, inspectors develop a tactical repertoire of sequential responses, hoping to encourage compliance by these recalcitrant actors. These findings are in line with previous research which showed that status differences may create coordination and efficiency problems when individuals or teams from different professions work together (Dibenigno and Kellog 2014; Huising and Silbey 2011; Karunakaran 2021; Ranganathan 2013). These problems are especially intensified when the task is knowledge-related (Bailey et al. 2010; Bechky 2003; Carlile 2004; Huising and Silbey 2013).

Business and legal scholars have been interested in compliance with legal regulations for decades. Among many others, one line of analysis has explored whether and why groups or

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organizations react differently to regulations. These scholars have studied uneven compliance with regulations at different levels of analysis. Earlier generations of research in this area investigated variation in terms of uneven compliance across organizations within one institutional context (e.g., Edelman and Suchman 1997). Later generations studied variation across actor groups within the same organization (e.g., Gray and Silbey 2014). However, the question of how different individuals within the same actor group in the same organization react to a constant regulatory environment has not received attention. In this study, we pulled the unit of analysis yet one level down and examined individual differences in reaction to EHS audits in an elite group, namely scientists in a large research university.

This study of differential responses to EHS regulations offers new explanations for the persistently observed variation in compliance with legal regulations. Conventionally explained by accounts of inconsistent and lax enforcement, misaligned incentives (Deutch and Lester 2004; Hawkins and Thomas 1984), or the greater power of some organizations to shape the regulations in their favor and capture the regulatory process (Stigler 1971), much recent academic scholarship and policy prescriptions recommend innovative nudges to influence behavior of the actual ground level actors to reduce anticipated risks (Thaler and Sunstein 2008). Yet organizational governance studies repeatedly describe decoupling of habitual practices from organizational and legal mandates (Kellogg 2009) and symbolic compliance (Edelman 1992) that often responds to conflicting institutional logics (Pache and Santos 2013; Raaijmakers et al. 2015). All of these studies take the organization as the unit of analysis. Consequently, this extensive body of empirical research gives insufficient attention to the ways in which actions within the organization by ground level actors lead to compliance or non-compliance with regulations (Baldwin et al. 2010).

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With specific attention to regulatory compliance, our findings are in line with previous research that showed that actor's variable autonomy, expertise, and frequency of interaction influence interpretations of regulations and regulators and orientations toward compliance (Gray and Silbey 2014). Our observations of differential compliance with EHS rules and regulations in one research university force us to rethink and amend regulatory models that emphasize the importance of tuning regulatory processes to the differing motivations of regulated actors (Ayres and Braithwaite 1992).

In contrast to historic models of regulatory compliance derived from command and control as well as energetic, rule-bound legalistic enforcement (Bardach and Kagan 1982), recent policy prescriptions recommend various forms of pragmatic regulation (Huising and Silbey 2021a). In pragmatic regulation, regulators – both internal organizational actors as well as external agents – adapt the formal regulations on paper to the regulated space in a realistic, practical, sometimes innovative fashion appropriate for the local circumstances. This approach acknowledges the impossibility of perfect compliance between textual prescriptions and material, behavioral enactments, keeping the deviations from the textual accounts within an acceptable yet flexible range, an adjustable container rather than a railroad track. Regulatory agents work together with the organizational members to fashion processes and rules to fit the specifics of the different and varied regulated spaces (Huising & Silbey 2021a; Silbey, Huising and Coslovsky 2009). Consider the following example of a local, pragmatic solution to a persistent problem we learned about in our interviews. A senior faculty member consistently failed to take the yearly online training required for his laboratory, which included chemical, biological, and radioactive materials, each demanding special prescribed handling. Because all faculty are required to complete the training, the department EHS coordinator made an appointment to visit the faculty member's office. During the face-to-face meeting, the coordinator sat next to the faculty member as he logged into the training site and guided the scientist through the instructions. Throughout the session, the scientist commented on the text, the procedures being described, and ways in which the processes would or would not work in his lab. By the end of the two hour-long meeting, the scientist had completed the training, learned some facts he did not know about chemical waste, and offered some suggestions for better ways of handling bio-waste. Of course, this kind of personal hand-holding is not possible were every or many scientists to refuse to do safety training. But, it is possible to provide assistance for the relatively few who are entirely resistant and whose status, in this case himself department head, impedes administrative oversight. The scientist did the training in a manner consistent with his sense of entitlement, the coordinator could feel confident that now the department head actually knew more about EHS policies and procedures, and brought back to his department some suggestions for changing the procedures for handling bio-waste. Since academic settings with their historic features of scientific autonomy, and academic freedom more generally, might create room for non-compliance for actors, enacting an adaptive model of pragmatic regulation, as exemplified by this anecdote, might be one of the effective strategies to promote compliance in research universities (Coslovsky 2011; Huising and Silbey 2018; Lakey and Orehek 2011; Rodwell and Munro 2013).

Regulatory governance is an important question of business ethics as well since it emphasizes the role of individual responsibility in ensuring that the workplace is organized in compliance with rules and regulations (Coglianese and Nash 2001; Coglianese et al. 2003; Howard-Grenville et al. 2008; Norman 2011). Although the role of social influence and individuals' cognitions and emotions have been studied as predictors of ethical behavior, proper

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attention is not given to the role of status and power in shaping compliance with ethical expectations. By investigating an understudied phenomenon – the role of social hierarchies in enacting norms and regulations within organizations rather than intentional purposes – this study improves our understanding with regard to the role of power and status in enabling compliance in organizations composed of elite actors.

Although our paper contributes to the literature, it certainly has some limitations. First, our empirical case is limited to one organizational context. Therefore, future research is needed to see whether our findings are generalizable to other organizations. Second, since our data come from the early years of the establishment of a safety management system, the organization we study may appear to have a weak safety culture. Ideal future research would be comparing different organizations with varying kinds and embeddedness of safety cultures (strong vs. weak) to see if the strength of safety culture moderates powerful actors' responses to inspections. Third, in our research, we studied an academic institution where the strategic design of the organization leaves room for loose alignment of practices across different groups, leading to varying degrees of safety compliance. In other sectors, specifically in industrial or private research firms, the processes and outcomes could be different. A future research agenda looking at the variation of actors' responses across different sectors would be useful. Finally, the taxonomy we proposed deriving from our empirical case is a simple classification of high-status actors' behavioral responses to the regulatory system. Because we do not directly observe PIs' responses and rather depend on inspectors' accounts of past interactions with PIs, we are not able to quantify the magnitude of each response. However, we believe that our taxonomy can serve as a useful empirical tool for future survey development and data collection efforts to study behavioral reactions to regulations.

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The ongoing coronavirus pandemic (COVID-19) resulting in a death toll of millions of persons, no less economic losses of billions of dollars, has reminded everyone once again of the importance of EHS interventions. The COVID-19 has radically transformed how public spaces and workplaces are organized. Facilities now need to be reconfigured to ensure appropriate health and safety measures such as social distancing and ventilation; personnel need to be trained to comply with good hygiene protocols and other practices such as mask wearing; surveillance and testing systems need to be developed to monitor people's health status and symptoms (Rodrigues et al. 2021). Universities have already formed committees and developed guidelines for health and safety measures to prevent transmission on-campus. Research labs adopted control measures such as limiting the number of on-campus hours and implementing work shifts to prevent overcrowding. Thus, considering the fact that we are going through an era of increasing global transmission of infectious diseases, understanding the factors that prevent compliance with EHS regulations has become of even greater relevance and immediate importance.

More importantly, the escape of the virus from a research laboratory in Wuhan, China, circulates as a possibility for the origin of the pandemic (Bloom et. al 2021; Maxmen and Mallapaty 2021). This lab-leak hypothesis is generating a related discussion in popular media about the importance of compliance with safety in research settings (Huising and Silbey 2021b). We believe that the increase in public attention on these issues is important, which would ultimately put pressure on officials to take the necessary steps to ensure safety rules and regulations are consistently followed and part of normal laboratory habits.

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TABLES

Table 1. Means, Standard Deviations, and Intercorrelations

	M(SD)	1	2	3	4	5	6	7	8	9	10
1. Age	55(13.20)										
2. Female	0.18(0.39)	-0.09**									
3. White	0.78(0.41)	0.31***	-0.04*								
4. US origin	0.62(0.48)	0.09**	0.02	0.22***							
5. Tenured	0.82(0.38)	0.45***	-0.11***	0.21***	-0.03						
6. Duration	22.27(13.02)	0.90***	-0.12***	0.26***	0.08*	0.45***					
7. PhD rank	30.09(61.76)	0.10**	0.02	0.01	-0.23***	0.03	0.05				
8. Log-funding	13.44(1.26)	0.14**	-0.10*	0.17***	0.07	0.41***	0.11*	-0.00			
9. # of publications	7.74(7.01)	0.04	-0.02	-0.00	-0.02	0.25***	0.05	-0.03	0.39***		
10. Lab size	18.09(23.64)	-0.04	0.02	0.02	0.05	0.06	-0.00	-0.03	0.29***	0.48***	
11. # of violations	6.59(7.16)	0.01	0.04	0.11*	0.09	0.12**	0.02	0.01	0.20***	0.19***	0.12**

***p<.001, **p<.01, *p<.05

Table 2. Random-Effects Model

	(1)	(2)	(3)	(4)
Tenured	2.279**	2.916*	-0.819	-2.126
	(0.81)	(1.35)	(-2.47)	(4.68)
Age		-0.056	-0.033	0.216
		(-0.07)	(-0.09)	(0.15)
Female		1.708	1.47	7.774*
		(-0.89)	(-1.06)	(3.07)
White		0.554	0.838	1.083
		(-0.94)	(-1.10)	(1.98)
Country origin (US)		-0.164	0.100	-2.619
		(-0.82)	(-0.96)	(1.83)
Duration at the U.		0.065	0.006	-0.90
		(-0.07)	(-0.09)	(0.16)
PhD institute rank		0.004	0.008	-0.00
		(-0.01)	(-0.01)	(0.03)
Number of pubs.		0.094	0.079	-0.03
		(-0.05)	(-0.06)	(0.09)
Lab size		0.017	0.007	0.017
		(-0.02)	(-0.02)	(0.03)
Department dummies		+	+	+
Year dummies		+	+	+
Research funding			0.664*	1.219*
			(-0.31)	(0.57)
Research impact				-0.003
				(0.01)
R^2 (between)	0.02	0.36	0.42	0.59
N of observ.	767	581	509	188
N of groups	236	170	153	55

**p<.01; *p<.05

Note. Standard errors are in parentheses. The number of observations vary due to missing values.

Table 3. Fixed-Effects Model

	(1)	(2)
Research funding	.80$^{\beta}$ (.435)	.82$^{\beta}$ (.439)
Number of pubs.		-.01 (.079)
Year dummies	+	+
R^2 (within)	*0.21*	*0.21*
N of obs.	*577*	*572*
N of groups	*181*	*176*

$^{\beta}p<.10$. Standard errors are in parentheses.

Table 4. Fixed-Effects Model with Funding Percentiles

	(1)	(2)
Funding budget per. 95th	5.60** (2.07)	5.64** (1.93)
Funding budget per. 90th	3.24$^{\beta}$ (1.76)	3.33$^{\beta}$ (1.79)
Funding budget per. 75th	3.21* (1.25)	3.24* (1.26)
Funding budget per. 50th	1.37 (0.92)	1.39 (0.93)
Number of pubs.		-.02 (0.07)
Year dummies	+	+
R^2 (within)	*0.22*	*0.23*
N of obs.	*577*	*572*
N of groups	*181*	*176*

**p<.01, *p<.05, $^{\beta}p<.10$
Standard errors are in parentheses.
Below median is the omitted category.

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Table 5. A Taxonomy of PIs' Responses to EHS Inspections

	Deny	**Dispute**	**Delegate**
Disengagement from Regulations	*Yes*	*No*	*No*
Disengagement from Reports	*Yes*	*Yes*	*No*
Disengagement from Repairs	*Yes*	*Yes*	*Yes*

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