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Laurel Smith-Doerr, *University of Massachusetts - Amherst*
Itai Vardi, *Boston University*

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Mind the Gap: Formal Ethics Policies and Chemical Scientists' Everyday Practices in Academia and Industry

Laurel Smith-Doerr[1] and Itai Vardi[2]

Abstract

Asymmetrical convergence is the increasing overlap between academic and industrial sectors, but with academia moving closer toward for-profit industrial norms than vice versa. Although this concept, developed by Kleinman and Vallas, is useful, processes of asymmetrical convergence in daily laboratory life are largely unexplored. Here, observations of three lab groups of chemical scientists in academic and industry contexts illustrate variation in interactions with ethics-related policies (as defined by the respondents). Findings show more tension for academic science with business-based practices, such as the move toward greater accountability, than for industrial science with academic practices. This asymmetry is evident in the process of purposive decoupling: for example, where academic scientists use

[1]Department of Sociology, University of Massachusetts, Thompson Hall, Amherst, MA, USA
[2]Boston University, Boston, MA, USA

Corresponding Author:
Laurel Smith-Doerr, University of Massachusetts, Department of Sociology, Thompson Hall, Amherst, MA 01003, USA.
Email: lsmithdoerr@soc.umass.edu

humor to distance themselves from the performance of compliance in required reporting and top-down ethics training requirements. This distancing from meaningless requirements (formalism) contrasts with mentoring around practices of professional behavior that are thought to matter (engagement). Convergence is evident in how safety policies seem more engaging than other kinds of policies. Yet, power structures shape engagement. Academic engagement often means rule following, and flows vertically from professor's authority to student apprenticeship. Industry engagement includes collaborative problem solving and flows along a more horizontal peer structure where informal power is less visible.

Keywords
ethics, politics, power, governance, labor

Introduction

Asymmetrical convergence is an uneven process of increasing convergence and overlap between academic and industrial sectors, but with academic modes of practice moving closer toward for-profit industrial norms than vice versa (Kleinman and Vallas 2001; Vallas and Kleinman 2008). Although this theoretical concept is useful in comparing scientific work across academic and industry sites, we note that the processes of asymmetrical convergence in daily laboratory life are still largely unexplored. In fact, the concept's authors, Kleinman and Vallas, call for more research on concrete modes of asymmetrical convergence in academia and industry (e.g., with coauthors Moore et al. 2011). A deeper understanding of the processes, on the ground, by which academia converges with industry (and vice versa) is needed. In this article, observations of how chemical scientists interact with ethics-related policies (as defined by the respondents) in academic and industry labs provide a productive site for analyzing asymmetrical convergence. We argue that asymmetrical convergence around matters of research ethics and responsible conduct happens in two main ways: through differences in the ways researchers distance themselves from rules through formalism and through differences in how researchers adopt (and adapt) rules through engagement.

Normative assumptions of science in universities and for-profit firms are expected to differ (e.g., Merton 1967; Hackett 1990); the question here is whether asymmetrical convergence may be observed around ethics-

related policies. This article illustrates that there is more tension for academic science with business-based practices, such as the move toward greater accountability, than for industrial science with academic practices. This asymmetric aspect of asymmetrical convergence is perhaps most evident in the process of *purposive decoupling* from certain kinds of ethics-related policies in academic settings. Here, academic scientists often use humor and other ways of distancing themselves from the performance of compliance in required reporting and top-down ethics training requirements. This distancing from meaningless requirements (formalism) contrasts with academic scientists' mentoring and taking the time to teach around practices of professional behavior that are thought to matter (engagement). In the subsequent sections, we draw on relevant literatures to analyze tensions between academic and industrial institutions of science, and briefly discuss our inductive focus on ethics-related policies.

Where Academia and Industry Meet

As American universities have shifted toward an increasingly commercial ethos, particularly in the natural sciences, observers of higher education have raised concerns about the increasing conflicts of interest for academia (e.g., Clawson and Page 2011; Tuchman 2009; Washburn 2005; Chubin and Hackett 1990). The integrity of academic science may be ethically suspect when universities develop close research ties and receive resources from industrial companies (e.g., Washburn 2005). Criticisms of the conflict of interest between academic and corporate values and the shift toward "business models" in universities have gone by a variety of conceptual names, including "academic capitalism" (Hackett 1990; Slaughter and Leslie 1997; Slaughter and Rhoades 2004), "market models" (Brint et al. 2012), and "audit cultures" (Strathern 2000). In contrast, other scholarship takes a largely positive view of the connections between university and industry. These works on university management (see reviews in Scott et al. 2001; Stephan and Audretsch 1999) have included the "triple helix model," which, along with academia and industry, considers the role of government as the third actor in fostering innovation (e.g., Etzkowitz, Webster, and Healey 1998).

A third, more institutional, approach, notes connections and paradoxical institutional changes in academia and industry (e.g., Kleinman and Vallas 2001; Smith-Doerr 2005; Owen-Smith 2006; Vallas and Kleinman 2008; Hackett 1990). These works acknowledge the need to use industry contexts as a comparative gauge for changes in academic science. Early work by

Hackett (1990) observed the convergent, isomorphic processes (DiMaggio and Powell 1983) of academic and industry science. More recently, Kleinman and Vallas' (2001; Vallas and Kleinman 2008) concept of asymmetrical convergence highlights the *paradoxes* in the shifts in academia and industry: while universities bring in commercial elements (such as increasing emphasis on patenting among faculty and on external funding with overhead), industrial science brings in collegiality and academic legitimacy (such as increased emphasis on basic research efforts and publication for industry scientists). Asymmetrical convergence thus describes new opportunities and restrictions in science, some of which may be paradoxical (Moore et al. 2011). Universities don the clothing of commerce and use the language of cost centers while industrial firms wear the trappings of collegiality and call themselves campuses. The asymmetry arises because industry and market models come to be more powerful in shaping universities rather than vice versa, including a clear trend toward the corporatization of US universities in policy discourse (e.g., Berman 2012; Kleinman, Habinek, and Vallas 2011).

While valuable, the theoretical concept of asymmetrical convergence is still rather abstract. Our substantive focus on scientists' practices around ethics policies allows for closer study of asymmetry processes, including how industry often affords more influence and powerful narratives than academia. Further, while asymmetrical convergence focuses on university and industry sectors, our observations highlight the involvement of a third sector: government. Essentially, the processes observed in this study amount to differences in the ways academia and industry respond to government-imposed requirements. One reason the convergence process is complicated in this study is because the gap—the distance between academia and industry—is changing as a consequence of different responses to government regulations related to ethics.

An Inductive Approach to Ethics-related Policies

This article (and indeed this special issue) tries to think critically about the analysis and implementation of ethical policies in scientific settings in the United States. In this study, instead of asking our respondents about particular ethics policies, we allow our respondents to tell us how they interpret ethics-related policies in interviews and to show us how they engage with formal requirements (like ethics training) through our observations. Rather than focusing on changes in top administration-level discourse and policy,

our analyses look to how scientists experience and engage (or not) with such policies related to ethical and responsible practices.

In general, formal ethics codes may be defined as "a codified set of rules for moral behavior applying to a specific population" (Zelizer 2007, 11). In her definition, Zelizer includes implementation of ethics codes (i.e., forms that grievance procedures take) and statements of principle as well as the written rules. Zelizer's conceptualization draws from Charles Tilly (2006, 102), who defines ethics codes as giving reasons for behavior that "cite their conformity to specialized sets of categories, procedures for ordering evidence, and rules of interpretation. Together, categories, procedures, and rules make up codes." In our analysis, we found that, indeed, respondents blurred together discussion of ethics-related policies and implementation. Some examples of the kinds of ethics-related policies that emerged as meaningful from our data included the federal policies for US academic scientists funded by the National Institutes of Health (NIH) or National Science Foundation (NSF) to demonstrate that they or their students have been educated in responsible conduct of research (RCR), reporting requirements of various kinds in academia and industry, and compliance with safety-related policies.

Other recent work taking a science, technology, and society (STS) view of ethics has considered the organization of compliance and the coproduction of ethics and science in ways useful for this analysis. Diane Vaughan's work (1996, 2007), for example, highlights the organizational processes that account for the responses to ethics codes and formal rules, which produce more nuanced results than simple compliance or noncompliance. As one outcome, she notes that deviance from formal ethics codes may become normalized through organizational processes. We share her interest in the routinization of responses to ethical issues in organizations and look to how variation in scientific organizations may establish or disrupt these responses.

Focusing on ethics-related policies provides a useful window on broader processes of institutional change in science not only because of real moral dilemmas (e.g., conflicts of interest, research guided by profit motives) but also because of the connection to everyday work processes in academic and industrial science. The codification of ethics is of particular interest in shaping everyday work. The formalization of ethics in scientific work has recently been described by STS scholars as the coproduction of ethics and science (Pickersgill 2012; Mamo and Fisher 2013). Yet, STS writing about ethics formalization has not engaged with the institutionalism literature, which we believe can add to understanding how ethics and science are coproduced within different organizational contexts of science. By the same token, a focus on ethics policies allows for the expansion of institutional

analyses of academic and industrial science by considering how all three sectors may be converging (and in ways more problematic, perhaps, than a simple version of the triple helix model) in the practices around these policies.

The chemical scientists we interviewed and observed in field research are working on a variety of research questions in organic and inorganic chemistry, and collaborating with researchers who come from other scientific disciplines. However, the norms and formal policies related to ethical research conduct are common across the settings and areas of chemical science. Everyone must in some way deal with issues ranging from laboratory safety to what the ultimate ends of research are (i.e., responsibilities to society). Much formalization in science has been seen in policies around the ethical and responsible conduct of scientists. It seems likely that gaps between policy and practice will be visible with policies having to do with ethical and responsible practice.

Data and Methods

The data for this article are drawn from observations over ten months in three chemical sciences sites in New England: one industry and two academic research groups. In addition, interviews conducted during 2010-2012 with US scientists outside the three labs are drawn upon for the analysis. The industry lab is in a setting where chemical scientists work in an interdisciplinary environment, a small private biotechnology firm (thirty to seventy employees) with the goal of developing products that will improve human health. The firm was formed as a joint venture between two larger companies and, like many biotech firms, had academic founders; we focus on one group of chemical scientists in the company. The lab group consists of about ten scientists and is supervised by a division leader whose work is primarily administrative. The firm is located in an urban area near many other companies and universities. The academic research groups also include some interdisciplinary research, but are more clearly focused on chemical science than the industrial research group. The academic research groups each consist of about ten scientists, including faculty member principal investigators (PIs) whose work includes teaching and administrative responsibilities at the university as well as oversight of the bench science. The lab groups are part of a department in a research university.

The data collected from the research groups consist of notes from observations in the field and transcripts of interviews with individual scientists. The observations are primarily of regular weekly lab group meetings and focus on collaboration (the focus of the larger project). Members of the

social science research team do not participate in the meetings, but simply sit in and quietly observe. The observers also make reflexive notes on how their presence seems to affect the interactions. Interviews with scientists include specific questions about policies that affect their work, whether the scientist has had any formal training in professional practices or ethics (As a student, did you have any training in professional practices or research ethics?), and how scientists are socialized into proper professional behavior (Here, how do people new to the lab [like students] learn about responsible professional practices in collaboration in your field? [Can you give an example?]). In this inductive approach, we did not enter the interviews with any specific hypotheses, but, rather, allowed meanings to emerge from narratives on the interview topics (like responsibilities and formal ethics training) in our coding of the data.

Interviews were targeted to last about forty-five minutes. All the members of the lab groups were requested (via e-mail or in person) to participate in an individual interview. Additional interviews were conducted with chemical scientists who expressed interest in the project (e.g., the project was described in *Chemical & Engineering News* June 2011, a national publication of the American Chemical Society) or who were requested by the research team to participate as members of the organizations of which the lab groups were a part. Some respondents were interviewed multiple times. The total number of interviews collected for the project was 103. The overall sample is a kind of expanded snowball sample that begins from the labs in which we observed the research groups.

Our study was approved by the Institutional Review Board (IRB) at our university and the authors promised confidentiality for the lab groups and their organizations, as well as for the individual participants; therefore, details of the description of the settings must be masked. All the respondent names used in this article are pseudonyms. In accordance with the IRB's requirements, persons interviewed signed a consent form agreeing to be interviewed and to have the interview recorded. Data were collected by the authors and a graduate student assistant. We met weekly to discuss any issues that emerged in the field or interviews. In order to better address issues meaningful to the respondents, some of the interview questions were slightly modified in response to this ongoing discussion.

In this article, we focus on a subset of interview questions and field observations from our larger project on collaboration: we examine how scientists relate to formal requirements or policies associated with ethics or responsible practices in their work. We did not select policies to observe and compare them in each setting, but rather allowed the meaningful

policies and practices around them to emerge from the data inductively (Corbin and Strauss 1990). Field notes and interview transcripts were coded and analyzed to identify the trends described in the subsequent findings using Atlas.ti software.

In the coding process, the authors read the raw data from transcripts and field notes several times to develop initial codes about formal ethics policies. Through detailed coding, the categories of formalism and engaged practice, described subsequently, emerged as consistent patterns. The issues of ethics-related policies came up in the interviews around the direct question about whether formal policies had affected the chemical scientists' work. The question was open-ended, so a variety of different ethics-related policies were discussed, from safety policies to information technology policies to ethics education policies. In our observations, the policies that were most apparent in scientists' reactions and talk about them (for elaboration see discussion of results) tended to be the safety policies, reporting requirements, and ethics education policies. Ethics education policies were mentioned most often, by seventy-seven of the seventy-nine people interviewed. Over half (forty-seven) of the respondents said they had received some kind of formal ethics training.

Findings

From our inductive analysis, two kinds of experiences of formal ethics policies emerged. At one end were observed wider gaps between policy requirements and meaningful practice, which we refer to as *formalism*. In formalism, scientists seem to comply in a perfunctory way that is disconnected from daily lab practices. This conceptualization draws upon Zelizer's (2007) observation on ethical codes as "display." At the other end were observed narrower gaps between policy and practice, which we call *engaged practice*. In engaged practice, scientists are incorporating policies more meaningfully into daily work and participate in analyzing and discussing the policies' implementation in their labs. In this section, we present findings from our data on formalism and engaged practice in the academic and industry labs, respectively, and note evidence of these two processes underlying asymmetrical convergence between academia and industry.

Formalism

Academic formalism. One area where we clearly observed formalism in approaches to ethics policies in academic labs was responsible conduct

training. In both interviews and observations, a wide gap appeared between formal frameworks and practices. To cite one typical example, Maggie, an advanced PhD student working in her major professor's (Dr. Michelle's) university lab, notes the formal policy requiring training in RCR in the introductory PhD student course (Chem 501): "We have to do annual safety training and make sure we are compliant. Other than that [pauses to think], I don't think there are [training requirements]. I haven't personally taken other classes other than Chem 501 and safety training." Yet later in the same interview, when asked how people new to the lab are trained in professional practices, Maggie does not link that training to everyday mentoring of new researchers: "[It's] not official mentoring, but you're responsible for the new person. So I've been training the newest grad student, and it's a shared effort; making sure that he knows everything my colleague and I know before we leave, and pass on that relevant knowledge." Interestingly, Maggie does not connect policy compliance with the learning that occurs in the lab. This was a common theme—none of the scientists (PI, postdocs, and graduate students) in the academic setting made direct connections between compliance with the RCR training policy and their "real" work. While they did not neglect to list the training as part of the official requirements, none cited the training as a vital forum to inform their actual daily routines of scientific work.

Such formalism toward ethics policies also occurred more explicitly through the use of particular language and humor. Here, our findings correspond with Smith-Doerr's (2006, 2008, 2009) interviews with life scientists. As she has shown, researchers used common language to create rhetorical distance from formal ethics policies, such as the NIH requirement that investigators be "certified" as educated in the ethical treatment of human subjects. Scientists viewed their work mostly as value neutral, and not in need of ethics policies that were imparted through shallow, online training modules. For life scientists who cared about the broader implications of science (including equality of access to treatment), formal ethics policies, like the requirement for training and certification, were seen as irrelevant to doing good while doing science. Thus, one of the unanticipated consequences of the new ethics education policies seemed to be a kind of ridicule by life scientists, demonstrated by either eye-rolling or laughter (Smith-Doerr 2006, 2008, 2009). We witnessed a similar process, which we call purposive decoupling, in our study. One example of purposive decoupling comes from our observations of Chem 501, the introductory PhD student course where the required RCR training took place. During this class, the students watched an "interactive" video about ethical choices that was

entertaining, but did not appear to be very meaningful for actual lab practice. The following excerpt from field notes illustrates this observation:

> Professor Xavier leads RCR training. The last part of the class is dedicated to viewing an instructional video from the ORI's [Office of Research Integrity] website, wherein an ethical dilemma is simulated interactively by the viewers (the students, in this case). The video was projected onto a screen for collective viewing. There is quite a lot of laughter and chuckling going on in the class as the video is played, especially at the various "freeze" moments,—the moral intersections during the movie where the viewers are called on to choose one course of action (for example, "turn a blind eye" or "report the fraud to the PI" etc.). Prof. Xavier often adds his own witticisms, inserts "hmm" in an ironic tone, and in this way instigates laughter during the discussion.

While the RCR training provided both a social space to think about serious issues in a lighthearted way and information on desired formal ethical responses, none of our respondents talked (either in the interviews or any other time) about the content of such training as meaningful. Furthermore, we did not encounter any such discussions in the lab.

In other instances, the inconsistencies in meanings between policies and daily practices are highlighted through more biting humor. In one lab meeting, Rosa, a graduate student, says that the "people from biohazard" came in and "found some problems." She tells the group that several bins were not properly labeled with the appropriate sticker stating the date of material use and pickup. Then, raising one of the standard stickers in the air, she says, "Make sure that you put the sticker on because they need to take the waste away within 24 hours." Gabriel, a scientist who is visiting the lab on that day, responds, "At my lab, people who fail to label biohazard can get a $50,000 fine!" Anna replies, in a tone of disbelief, then sarcasm, "What?! … Just erase and change the date on the label." There is general laughter in the room at this suggestion of deviance. The PI immediately picks up the thread, adding, in a jocular tone, "Rosa, this will be coming out of your paycheck!" People in the lab burst into laughter at the PI's underlying ridicule of the rule. Though carried out in a lighthearted and spirited tone, this exchange provides further evidence of purposive decoupling in approaches to ethics-related policies. While recognizing the importance of institutional rules and standards, the lab members and PI clearly do not take them at face value. Paradoxically, the need to adhere to the formal rules is acknowledged through a *questioning* of their actual relevance to good research practices and the incentives by which the rules attempt to secure compliance.

Purposive decoupling highlights the inconsistencies in meanings between policies and daily practices, often through humor. But disfavor and skepticism are not the only sources for such formalism. Sometimes the purposive decoupling between policy and practice occurs when the rules are felt to not go far enough in protecting scientists. Consider the following exchange in one of the lab meetings. A graduate student, Anna, complains about a supposed safety breach. She addresses the entire group in a somewhat scolding tone:

Anna: Someone threw pipette tips in the general garbage. You need to put them in the Sharps [bin]!
PI: Yeah, sometimes the people from the EHS [Environmental Health Services] see this and will ask it to be removed because the tip can go through the bag.
Anna: Yes, they really *are* sharp! [said in a sarcastic tone, which invokes light laughter in the room].

The PI echoes Anna's complaint not by pointing out the obvious safety repercussions of the breach for people working in the lab, but by adhering to the formal regulations in these cases. Anna is quick, however, to point out that this is not merely a matter of following rules. She reminds everyone that scientists need to incorporate safe practices in the lab not simply because regulations require them to do so, but because proper research demands attention to risky equipment and materials.

Industry formalism. In the industry setting, we also observed places where the gap between policy and practice appeared wide. As in academic formalism, industry scientists at times complied in a way that was disconnected from what they considered meaningful daily practice. One example comes from an industry lab meeting where the group is asked to view several slides on safety. The following excerpt from field notes illustrates how Patricia, a bench scientist who is also the group's designated safety person, presents this required task to the lab group, and how Michael, the middle-level manager who supervises the group, reacts:

> Patricia tells the group, "I need to show three slides about a safety issue. It's a training about liquid bio-waste." Michael looks at the clock on the wall [it is 15 minutes until the meeting ending time] and says, "We are running out of time." Patricia responds, "It's really quick. Otherwise, I'll be in trouble with the safety people." So she goes to the computer and shows the slides on the screen.

> After a minute or two she is done. "Told you it will be quick," Patricia says with a smile.

The content of safety training that Patricia presented was not discussed afterward by lab group members, perhaps in reaction to Michael's comment that ending on time is more important. This moment illustrates what we generally observed in the industry setting—namely, that the scientists try to go quickly and without discussion through such required reporting and accountability. More often in industry than in academia, we observed such moments where regular lab time is put on hold as scientists quickly satisfy a reporting requirement. In this case, ethics-related policies are disconnected from everyday practices by defining the situation as something to be gotten through rapidly. The time pressures in the industry setting provided the context for such expedient formalism, which was less evident in the academic settings.

Unlike in the academic lab, we did not encounter much purposive decoupling in the industry setting. One exception comes from an interview with a bench scientist, Donald. Drawing on his experience in several different companies, Donald mentions that the first few weeks of any industry job are spent reading manuals on a variety of topics, including responsible practices in the company. He then implies that this kind of "cramming" is not how researchers really learn about ethical practices:

> You go through your initial training of all the documents you read. . . . They throw a *huge* amount of paperwork at you to read, which is pretty inefficient when you look at it. If you're reading 150 documents within a month, sometimes quicker than that, it doesn't really retain its *strength of purpose*.

Donald used a wry tone of voice to emphasize the ironic gap between the intention of the requirement and the actual outcome, and shared laughter with the interviewer at the comment. This required reading seems to be another kind of formalism in industry settings that is time bound and lasts only for the first days of employment. The educationally oriented formalism in industry appeared to be a less extensive time requirement than in the academic setting, where students were required to spend two semesters attending the introductory PhD Chem 501 class.

Formalism in the context of asymmetrical convergence. By focusing on formalistic attitudes toward ethics, we can conclude that asymmetrical convergence—where academia comes to look more commercial than industry comes to look collegial—occurred through different means in the different

organizational settings. While widening gaps between ethics-related policies and daily lab practices occurred in both academia and industry, formalism took on a different character in each context. In academia, we observed more purposive decoupling, that is, ridicule of top-down imposed ethics-related policies. We did see plenty of sarcasm and laughter in the industry setting, but it was not aimed at reporting as much as it was in academia. Donald's wry commentary on the requirement to report having read large training manuals in industry was the only industry case. Indeed, decoupling between policy and practices may be related to the types of policies scientists encounter (Smith-Doerr 2008). The formalism gap with having to report compliance, particularly with training in ethics, seems to be more closely associated with purposive decoupling.

The context also matters. In academia, purposive decoupling from ethics-related policies was common, but it was less evident in industry. This variation may be evidence of the asymmetric element in the process of asymmetrical convergence between the two spheres. Academic science, as discussed previously, is subject to pressures to commercialize. The greater tension that academic scientists experience between academic values and a more commercially organized university (and policies that reflect commercialization) may produce the common expression of purposive decoupling. This tension exists differently in industry, in which nearly all intellectual pursuits are tied to business concerns. In contrast, a process that reflects the converging element of asymmetrical convergence is the lack of association between ethics-related policies and daily practices in the narratives of scientists across academic and industry settings.

Engaged Practice

We observed that at times the gap between policy and practice was narrower, as everyday practices matched more closely with formal rules and ethics-related policies. Where we observed closer connections between ethics-related policies and daily discussion about responsibilities and activities in the lab, we refer to this finding as engaged practice.

Academic engaged practice. In the academic labs, engaged practice was more often observed around safety policies. In the interviews, academic scientists commonly made a connection between safety policy and everyday lab work. For example, a faculty member we call Greg explained, "The most pressing issue in a chemistry laboratory is safety. And so responsible practices ... devolve [*sic*] around the notion that you want to have a safe

working environment for yourself and all of your collaborators." This engaged practice around safety in academic settings could be observed in the everyday practice of wearing safety glasses in the lab. An excerpt from field notes illustrates how even we, the observers, were always required to wear safety glasses in the academic lab. The faculty PI, Dr. Michelle, provided an orientation to one of us:

> Michelle tells me that I will have to wear safety glasses to enter the lab, that everyone must wear them. The plastic safety goggles for visitors are in the entryway, where there is a kitchenette. In the lab proper, students at the desk areas working on computers push safety glasses on top of their heads, but all student researchers at the bench, such as working under the hood, are wearing the safety glasses over their eyes. Michelle and some of the students have less bulky safety glasses that look more like large eyeglasses (they are made of glass or very clear plastic and are held by frames over the ears, rather than the elastic strap by which the visitor safety glasses hang on the hook by the entrance to the lab).

Despite the style distinction in safety glasses that easily identifies the lab outsiders, the rule for wearing them is closely followed by everyone entering the lab, including the brief visitor. The narrower gap between policy and practice is reminiscent of Gouldner's (1954) classic ethnography of a gypsum mine and plant where safety rules in handling dynamite were seen as legitimate by both management and workers, in contrast to other rules, such as restrictions that were informally ignored, like taking equipment over the weekend for home improvement projects. Here also the safety policies are deemed important, and scientists follow them closely. The narrowing of the gap between policy and practice in this case appears to reflect the fact that the policy is *meaningful* for the scientists, that is, important to the conduct of good science and the well-being of researchers; thus, it is taken seriously. Engaged practice, unlike formalism, means that policies are internalized and embedded in work processes with less resistance and higher consistency.

Another example of engaged practice came from a discussion during a lab meeting. Boris, who is in charge of safety, reminds the group that university policy requires everyone to wear lab coats. In response, Sheila, another graduate student, grumbles, somewhat incredulously, "In college I remember that we didn't need to wear the lab coat all the time." Interestingly, instead of sticking to a categorical interpretation of the safety rule, the PI responds by recasting Sheila's suggestive remark to fit in the routine

operation of the lab: "That's true, but you need it [the coat] to be available so you can do risk assessment in which situations you will need it." But when another lab member points out that some people wear their coats in the office and kitchenette area, the PI resolutely prohibits it, saying, "That should not happen. You can transfer contamination." Engaged practice does not mean that rules are not subject to interpretation; indeed, the fact that the rules are debated shows that they are meaningful. In the case of safety policies, the way that risk is socially constructed as constantly present and in need of management with consistent behavior that is defined by rules seems to be one approach that brings academic scientists to closer engagement with ethics-related policies.

Industry engaged practice. Where the gap between policy and practice was narrower in the industry lab, we observed a collective engagement with policies. These appeared in two main forms: one was a seemingly individual internalization of guidelines and the second was collective problem solving. On one hand, in interviews, industry scientists commonly construed approaches to ethics-related policies as individual-based. On the other hand, we observed behavior related to the policies as a social process of internalizing expectations shaped by institutional monitoring of compliance.

Notice the individual-focused talk in the following interview excerpts. Heather, a senior scientist in industry, says that people in her company learn by themselves about professional responsibilities:

> I think you probably learn as you go, you know, we don't have a class, or a lecture that someone comes to us and tells us how to collaborate, how to interact with people. You have to learn this by yourself, or read some literature about it, Google it. I don't recall us having a seminar on how to collaborate. You have to figure this out on your own ... You feel how it should be.

Similarly, Yolanda, another senior scientist, describes her approach as "personal":

> Before and during my PhD I worked as a high school science teacher and received some ethics training. But besides that there was nothing formal. My knowledge and ethics is much more personal, I think; my own ethical codes, if you want to call it that way.

Such individualistic rhetoric sounds quite familiar in the US context. Yet upon further reflection, Yolanda notes how those "personal" ethical codes

are shaped by the industry context where monitoring seems more apparent than it did in the academic contexts in which she previously worked. She attributes the monitoring to oversight of the company by federal regulations:

> Now that I work for a private company there are much more regulations and we have to be aware of a lot of things. But they are more related to how the FDA regulates things, now that I am working in applied and not basic science. I have to follow those regulations . . . I know that some people take things in a different way, but here in the company I know that we are being watched more closely than other places. We have an intellectual property department and the person who runs the department participates in our meetings, making sure that everything we are doing has been patented. And there are other regulations. The person from the advanced lab operations is always after us with the regulatory things. So for me it is a little bit more stringent now than before.

David, a bench scientist in industry who has worked in several biotech companies, echoes Yolanda's feeling of greater monitoring in industry contexts due to federal oversight:

> I've moved from job to job and went from one place to another, the environment itself got stricter as a whole. In my first job, there was not a whole lot of regulation, but in the next one, we were under the EPA regulations. And then here it will be, hopefully, under the FDA regulations. So obviously now it will be much stricter in terms of what we can do, or what's allowed.

When asked how this environment has affected his work, David replies:

> I personally call it being institutionalized: You get used to a way, get broken into. As you go down in your career, if you don't know anything else that seems to be the way. So I can't really tell if it had a positive or negative effect, when this was the only path that you've been going down.

Like David, institutional scholars (e.g., Powell and DiMaggio 1991; Meyer and Rowan 1977; Gouldner 1954) might call this process of taking things for granted a form of "being institutionalized." While industry scientists talk about their individual approaches to ethical codes, they also seem to be aware of the ways that national-level regulations shape their workplace, and how their own practices are shaped in a way that leads them to internalize the guidelines. This sort of internalization of rules by bench scientists,

with awareness of pressures from the federal level, seems to be a somewhat different dynamic than the more didactic telling of students and junior scientists to follow rules in the academic setting.

Another dynamic of engaged practice we observed in the industry setting was a collective generation of creative ideas to navigate the rules. One example of such creative problem-solving comes from a conversation during the group's weekly meeting about dealing with decontamination. The conversation soon turns to an open group discussion about how to solve the problem. In contrast to the rush to present the three safety slides described earlier under formalism, Donald, a bench scientist, raises the range of issues involved, while Michael, the division-level manager, responds with several suggestions about whom to consult elsewhere in the company. Donald is discussing a fairly serious contamination issue in a very calm manner. Michael makes some suggestions, as well as jokes to diffuse the seriousness, and talks about consulting with his peer, Andrew, another division-level manager, on the problem. Heather, who is a lab group leader, expresses interest in the details. This excerpt from field notes gives a sense of the dynamics:

> Donald says, "There are some contaminated samples. They think it's a closure thing in the reactors." Heather asks, "Oh, really?" Michael jumps in and clarifies the problem, tells a joke about how disgusting the contamination looks (at which everyone laughs), and then says, "Andrew was talking to a friend of his on this and said that these [type of] contaminations are hard to get rid of, which may be a problem along the way."

Thus, the safety issue here and ethics-related policies are intertwined with concerns about production in the industry setting. Those implied pressures are not always directly stated, and indeed events may be framed as a safety or ethics issue, but the underlying pressure to get products moving remains a strong contextual element that encourages engaged approaches to safety problems.

During a different meeting, Patricia wishes to convey "just a short safety update." She says that following a company-wide safety meeting, a new accident form has been created. She says, "If anyone has an accident or a near miss, there's now a form to fill out," but immediately adds in a reassuring voice, "Don't worry, you won't get into trouble for it. Donald already filled one out last week after he got locked in the cold room. Thank God it wasn't for too long!" Everyone laughs at this comment. We hear Lucy explain to the person next to her that fortunately Donald had a cell

phone with him and that "everyone should have a cell phone with them all the time." Again, formal rules are engaged creatively. It is obvious to everyone that while necessary, accident reports will not prevent the next mishap, but, rather, resourcefulness and ingenuity will.

The previous examples from the industry group demonstrate a common thread: engaged practice here often involves collaborating and coming up with creative solutions to problems. These practices are creative in that (a) there is more selectivity in practices (e.g., choosing to follow some rules according to their perceived effectiveness) and (b) there are ad hoc problem-solving processes (i.e., brainstorming and gathering information on the spot from a diverse pool of participants).

Engaged practice in the context of asymmetrical convergence. Academic settings appear to be converging with commercial business models around ethics codes in their legalistic management and emphasis on compliance. The closer the ethics-related policy is to individual safety, and the further from organizationally mandated reporting, the more the academic labs seem to engage in following the rules in everyday practices, perhaps because these policies match long-standing norms in academic chemistry. Susan Silbey's (2009; Huising and Silbey 2011) work on safety compliance (including in the academic chemical sciences) notes that discourses about safety and ethics are often about responsibilities, which fits well with a traditional academic model. Industry settings—at least in smaller start-ups, like the one we observed—appear to converge with academia in being collegial places focused on learning ethical practices informally and by example. The appearance of creative problem-solving more often in the industry setting may indicate that the original asymmetrical convergence concept (Kleinman and Vallas 2001) does not go far enough. Practices around ethics-related policies appear to go beyond convergence to paradoxical divergence: industry settings provide a location where collective creative problem-solving is fostered, while academia seems to be stymied by uncreative rule-following.

Compliance in the industry setting is practiced in a seemingly collaborative way, with brainstorming around how to improve policies as a common theme in meetings. And yet, the ultimate and sudden death of the company showed the relative powerlessness of both managers and bench scientists in the face of larger financial pressures. During our observation period, the industry site we were studying abruptly closed. The scientists were at work one day and had to clean out their desks and give up their company e-mail address the day after they found out the company would close. The lack of

institutional memory in the fast-moving for-profit sector means the creative new ideas around ethics-related policies probably do not stick. In the next section, we discuss the circumstances and conditions that may shape different practices around ethics-related policies.

Discussion

This article contributes knowledge on the contexts, processes, and tensions in asymmetrical convergence between academic and industrial science. We found ethics-related policy compliance issues to be a rich context for studying the tensions between policies that push academia toward accountability and that create an unexpected place for collegiality in industry. Often, there is a gap between ethics-related policies and scientists' everyday behavior which we call formalism. One way the formalism gap happens is an absence of connection (see Croissant 2014 on absences) between required ethics training and actual lab practice; across academic and industry settings, we observed this gap between acknowledging ethics training in interviews but not connected to daily lab practice. At other times, scientists more actively create the formalism gap. In academic settings particularly, there is ridicule of top-down reporting requirements, which we call purposive decoupling. Tensions between traditional academic autonomy and the pressures toward corporate-like audit cultures in the university settings may help to produce purposive decoupling from reporting policies. We note, however, that processes like purposive decoupling do not really serve to change the rules and institutional pressures, but in a sense allow scientists to negotiate them on their own terms.

In industry settings, pressures toward collegiality were not as strong as the production pressures, which made time feel like a scarce resource on a daily basis. Asymmetry is evident in that industry science stays centered on profit motives, seen in the expedience with which industry scientists deal with ethics-related policies as they face constant time pressure to produce. Thus, industry moves less toward academic values of education and slow mentoring than academia moves toward business values and accountability regimes.

A convergent aspect of asymmetrical convergence can be seen in how scientists across academic and industrial settings define safety policies as ethics-related and find safety policies more engaging than other kinds of policies. The ways scientists engage with policies are related to power structures in the different settings. Academic engagement with safety policies includes rule-following, and flows along the vertical power structure from professor's authority to student apprenticeship. Industry engagement

with safety policies includes collaborative problem-solving, and flows along a more horizontal peer structure in lab groups where informal power is less visible. Still, the ideas of more powerful scientists are the ones that tend to be taken up in these collaborative brainstorming sessions.

In sum, a key contribution of this article is greater understanding of the processes of asymmetrical convergence between academia and industry, and how they are shaped by interpretations of government policies. For example, by examining how purposive decoupling illuminates tensions in academic settings between autonomy and audit pressures on scientists, a sharper focus is provided on why the academic–industry relationship is both asymmetric and convergent. The findings presented in this article also point to potential limitations of the asymmetrical convergence concept. There may be a paradoxical aspect in which certain industry settings (like start-ups) appear to be more collegial and learning-oriented than academic settings. Kleinman and Vallas (2001, 478) did provide an interesting prediction in 2001 that may have proved prescient: "It would surely be ironic if the collegialization of industrial science prompted increased flexibility that workers believed fostered innovation, while increased rigidity in the university was perceived to stifle creativity." By comparing academic and industry settings, this article has provided a close look at how different contexts of scientific production shape the gaps emerging between policy and practice.

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Author Biographies

Laurel Smith-Doerr is the inaugural Director of the Institute for Social Science Research and Professor of Sociology at University of Massachusetts Amherst. In addition to the project described in this paper which investigates collaboration practices in the chemical sciences, she is also working on a project with colleagues examining the role of women in science policy.

Itai Vardi is a Lecturer in the Department of Sociology at Boston University. He studies technological cultures, social problems, and the production of scientific knowledge.