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Introduction

From the Editor’s Desk
Dr. Edward Gabriele

This has been a year of remarkable anniversaries. It is the International Year of Astronomy remembering Galileo’s first use of the telescope. This year calls to mind the 200th anniversary of the birth of Charles Darwin and the 150th anniversary of the publication of his *Origin of Species*. This year celebrates the 40th anniversary of the first lunar landing and the 25th anniversary of the first American woman to walk in space. It is the year in which world scholars celebrate prestigious academic leadership in the United Kingdom --- 800 years at the University of Cambridge and 100 years at the University of Bristol. To those of a growing vintage on this side of the Atlantic, we look back 40 years and recall the cultural ferment and social protest of the 60’s captured in names such as Woodstock, Berkeley, and Stonewall.

Much like Cambridge scholars who were called to the act of learning and wisdom by ancient bells such as that on the cover of this edition, we too are called always to the act of remembrance and significance while steadily progressing forward to things yet to be discovered. We are ever in the act of remembering --- but not of events without meaning. Rather we look to hear again something of our past so that the present might be reinterpreted in the hope of an unforeseen but expectant future. Scholars remind us that this type of memory was central to ancient culture; and it is as much a part of our experience today as it was in centuries past. We are a people of living tradition.

Our profession is steeped in and called to a living tradition. We are not perfunctory shop-keeps ensuring no gathering of dust on volume and file. In contrast, research administration has become more and more central to the energy of research itself. We have become partners in the process of human inquiry, helping to pulse the engine of discovery. From proposal formation, to sponsor relations, to post-award oversight, to development and knowledge transfer, we have become professionals and executives whose leadership is of immense value to fellow academics, scientists, and developers alike all across the globe. This edition of the *Journal of Research Administration* captures this very well.

As we face a new decade, we are deepened in our tradition of service not for ourselves, but for those whose ingenuity is needed to face new, critical human questions and concerns. Much like one philosopher at the end of the Greco-Roman period, we stand always in the face of something ever ancient, ever new. The task that remains for us is, while being steeped in our yesterdays, to be open to what might be. Such a posture is never comfortable. It costs. It costs us our tendency to keep doing things in the same manner time and time again. Yet the living tradition of our profession parallels brilliantly the tradition of research we serve: To meet the unexpected not with a fear of change, but with the anticipation of the “unknown better” to come. This is what fired the imagination of the Galileo’s, the Darwin’s, our space explorers, our teachers and students, and those who gathered in song and protest to hope for something new. I wonder --- are we ready for the same?
Re-Imagining the Human Dimension of Mentoring: A Framework for Research Administration and the Academy

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Author’s Note
The explanation of technical mentoring and alternative mentoring appears in an earlier form (Mullen, 2005, Mentorship Primer, Peter Lang). However, that source focuses on K–12 public schooling and policymaking contexts; in contrast, this article examines the graduate school context, with comparisons to “outside” contexts. A second source to describe the changing climate of higher education is Mullen’s (2007) article published in The Educational Forum. The creative language used throughout this discussion (e.g., co-mentoring, collaborative mentoring) appears elsewhere in the author’s published works, and she confirms that the opinions stated in this article are her own, not The University of North Carolina at Greensboro’s. Carol Mullen of The University of North Carolina at Greensboro can be contacted via camullen@uncg.edu.

Abstract
This article offers mentoring frameworks for higher education that are applicable to research administrators and academic scholars. The author describes theories of adult education, mentoring, and leadership that relate to these populations. In addition to the pertinent literature, support is drawn from the author’s scholarship and professional experience in mentorship, leadership, and democracy in postsecondary settings. Critical and feminist perspectives on various mentoring approaches are articulated, as well as forms of mentoring that address the early adaptation and success of doctoral students and new professionals. These theory-informed practices of mentorship could assist mentors and administrators in both improving their work and deepening their impact. Administrative leaders are encouraged to proactively support the newer models of mentoring as well as to reward beneficial learning and socialization processes. Mentors and mentees who are searching for guidance in their own academic domains can adapt, for implementation purposes, the mentoring ideas and strategies shared.

Keywords: Mentorship, graduate student mentoring, research administrator mentoring, alternative mentoring, technical mentoring, reward structures, systems thinking
Introduction

Administrators and educators have become so metric oriented that it has become challenging to retrieve the human face of mentorship. In fact, mentoring may be considered a lost art and science. In Greek mythology, the spirit of mentoring is reflected in the character Mentor who serves as a faithful and wise advisor whose experience and knowledge benefit youth. The name “Mentor” is proverbial for a guide who opens up others to new experiences and the world, and who encourages and protects protégés. Today, exemplary research administrators and faculty mentors provide their expertise to less experienced individuals to help them advance in their academic programs and careers. Given that effective graduate student mentoring is not as common as it should be (Johnson, 2006; Johnson & Huwe, 2003), and given that fast-paced demands on education are suffocating quality mentoring (Mullen, 2007), how do those in research leadership and academic positions practice the wisdom and prudence necessary for developing, assessing, and improving programs? Because research administrators are systems thinkers who view the component parts of a system in relation to the whole (Senge, 2006), they should understand that the mentoring of novice research administrators is integral to their own work. As human relations experts, research administrators realize that human learning is a complex, and even mysterious and messy, business. Research leaders who comprehend that mentoring the new professional depends on intimate relationship building and new forms of learning are more apt to understand that mentorship defies quantification as well as formulaic approaches. Thus, leaders who grasp the qualitative dimensions of learning and situations lend strength to their professional domains.

Understanding the fuller breadth of mentorship and its potential for educating and preparing students for the professions is an emergent competency in the world of research administration. As the culture of higher education institutions changes, one-on-one mentorships can be expected to expand. Creative collaborations and group-learning contexts are slowly on the rise in the education discipline, serving not only to supplement but also to modify the traditional mentoring arrangement that is dyadic in nature (Arnabile, 1996; Mullen, 2005). A goal of this essay is to raise awareness about how the mentoring of novice research administrators and graduate students can become a more potent force, with implications for the mentoring of non-tenured faculty. Some of the historical, philosophical, and epistemological foundations of mentoring that aid in this vision are addressed, including theories of adult education, mentoring, and leadership. In particular, the problem—that piecemeal understandings of mentoring that lead to the inadequate preparation of the next generation of professionals—is examined. Toward this end, alternatives are presented for developing or transforming mentoring relationships, programs, and cultures, and for finding solutions to educational problems. The research on group learning that has relevance for educating female and ethnic students, in addition to a mentoring scenario involving research administrators, provides further support.

Mentoring and Learning in Education Theories

The educational literature presents an imbalanced picture of mentoring and learning in terms of the emphases given to school-based contexts and populations (Mullen, 2009). Consequently, study of higher education contexts and adult learning lags behind and needs greater attention. Researchers, leaders, and policymakers focus on issues pertaining to teacher supervision and instructional leadership, as well as the mentoring of preservice and inservice teachers and of
children across grade levels and from various backgrounds. Also, prospective and practicing administrators, and related matters of transition into leadership roles, have been the beneficiaries of steadfast research; hence, mentoring phenomena relevant to graduate students (Johnson, 2006) and dissertation candidates (Piantanida & Garman, 1999), in addition to novice research administrators (Easterly, 2008) and junior faculty members (Johnson-Bailey & Cervero, 2004) reflect emerging areas of research. Knowles (1984) has referred to the adult learner (e.g., research administrator mentee) as “a neglected species.” In addition, research on postsecondary settings highlights particular aspects of mentoring—specifically, advising and supervising students—as do graduate programs. Because of this disjointed treatment of the mentoring enterprise, only a few discrete, isolated functions of mentorship receive attention. Hence, a comprehensive scope of mentorship that embeds multiple options and flexibility for participants and institutions alike needs to be promoted (Mullen, 2005).

Just as education is a powerful force that continually shapes the quality of experience (Dewey, 1938), so too is mentoring. Education as community and culture-based needs rediscovery—the ubiquitous energy of mentoring should be more fully utilized to connect people, reform values, affect decisions and actions, and contribute to the life, world, and future of institutions, communities, and societies. While pervasive in a more limited form, mentorship is misunderstood, depersonalized, and left to chance encounters in the academy (Eby, Rhodes, & Allen, 2007). Ironically, mentoring, focused on the development and success of graduate students, career professionals, and junior faculty members, is embedded in the mission of some professional associations. For example, as pertains to the author’s service leadership, association-wide initiatives in mentoring graduate students (and junior faculty) have fundamentally changed the mindset and program offerings of the American Educational Research Association (McDonnell, 2009) and the University Council for Educational Administration.

**Relevant Definitions of Mentoring**

In university and policymaking circles, mentoring is thought of as academic advisement and supervision (see Council of Graduate Schools, 2008). **Mentoring** is not only commonly used interchangeably with **advising and supervising** but also with **coaching**, **assisting**, **guiding**, **leading**, **teaching**, **learning**, **readiness**, **compensation**, **support**, and **socialization** (Rix & Gold, 2000). Such linkages, while vital to the theory and practice of mentorship, fail to address its wider and deeper dimensions, which has implications for how mentoring is applied. In actuality, because mentorship is simultaneously an art and a science, performance supervisors and academic advisors cannot be “programmed” to function as mentors.

Thus, Merriam’s (1983) assertion that mentoring and its dynamics need to be more clearly defined still has currency. As a starting point, **mentoring** is an educational process focused on teaching and learning within dyads, groups, and cultures (Mullen, 2005). Thinking beyond reductionist and piecemeal conceptualizations, mentorship is a holistic form of teaching and learning that embraces the professional, personal, psychosocial, and career facets of a protégé’s development, and such activities as advising, tutoring, coaching, and counseling. Mentorship is a framework for theorizing developmental relationships in which people with experience and expertise invest time in those who are less experienced, responding to critical needs and enhancing the capacity for growth, productivity, and achievement (Johnson, 2006; Shea, 1994).
Mentors and mentees can engage in learning partnerships that are formal (e.g., structured) or informal (e.g., spontaneous). In the case of formal mentoring, relationship structure, objectives, and expectations are communicated at the outset, as in grants programs and programs of study that involve mentors and mentees; regarding informal mentoring, relationships are self-initiated, unplanned, and left to chance. Further, mentoring extends beyond job-related tasks and coursework, with respect for learning (and relearning and unlearning) as a lifelong commitment (Mullen, 2005). Mentoring is thus an integral part of the developmental and life cycles of human and organizational systems.

**Higher Education Challenges and Barriers**

Whether one-on-one or group based, the success of any mentoring relationship or program depends on acceptance, full participation, and transparency (Mullen, 2008). Learning is, fundamentally, a social process that activates these conditions, as in the instance of transparency of social relations and of the social organization itself (Lave & Wenger, 1991). Educational relationships are thought to rely on and benefit from ideological transparency that is situated within contemporary mentoring situations (e.g., peer learning). Mentors must understand that mentees constitute vulnerable populations to be protected from concealed agendas and ulterior motives (Johnson, 2006; Lincoln & Holmes, 2008). Such principles of adult education foster the idea that mentoring—a form of developmental learning—brings together mentors and mentees in a “mini learning community” in which each proactively teaches the other (Galbraith, 2002–2003, p. 17) in ways that are open and honest, reflective and critical (Herman & Mandell, 2004).

Proactive mentorship is essential to the academic success of graduate students (Merriam, 1983). Whether relationships develop informally or formally, graduate mentors need to be intentional in their mentoring practices (Johnson, 2006; Johnson & Huwe, 2003). In the United States, as many as 50% of doctoral students never graduate (Dorn & Papalewis, 1997; Glatthorn, 1998); this loss financially burdens universities and devastates students (Golde & Dore, 2001; Lovitts, 2001). Importantly, national studies report that the program attrition of female students from U.S. institutions is higher than male students, minority students drop out more often than white students, and Americans leave at a higher rate than international students (Council of Graduate Schools, 2006; National Education Association, 2007). Given this snapshot of reality, mentoring is seen as an investment and tool for curtailing program attrition. As Lovitts (2001) observes, “It is not the background characteristics students bring with them to the university that affect their persistence outcomes; it is what happens to them after they arrive” (p. 2).

In fact, the myriad of challenges facing doctoral students and the associated low completion rate calls for new mentoring interventions offering creative solutions (Allen & Eby, 2007; Hansman, 2002a; Johnson, 2006; Mullen, 2005, 2007). Programs that boost higher graduation rates and student satisfaction sponsor intentional mentoring by dissertation chairs and through program (e.g., cohort) structures. In this context, practical apprenticeship learning is facilitated via the preparation of dissertation and grant proposals and more (Johnson & Huwe, 2003; Mullen, 2006; Plantanida & Garman, 1999). Internationally, researchers confirm that mentoring influences student retention, degree completion, and overall satisfaction (Council of Graduate Schools, 2006; Dinham & Scott, 2001; Nyquist & Woodford, 2000). Intentional mentoring by faculty and administrators confronts the perennial problem of disillusionment and academic
Trends in the applied professions have had an impact on higher education in unprecedented ways. For example, a growing demand exists in teacher education and educational leadership programs at the graduate and undergraduate levels to become standardized and aligned with the expectations of the field. Even doctoral education, especially within applied-knowledge disciplines involving the preparation of teachers and leaders, must “modernize” by accommodating the current needs of the professions (Nyquist & Woodford, 2000). Unfortunately, as Weinstein (2004) argues about the changing values of universities, “The capitalist model of human behavior has restructured academic choice, and our goal has become to satisfy our students, not to provide them with an education” (p. 105). Doctoral education is becoming a means to an end for students seeking promotions, credentials, and salary increases.

Coined the “McDonaldization of society,” Ritzer (2004) reveals how the mentality of the fast-food industry dominates entire sectors of westernized society. Extending this line of thought, “fast food” education characterizes graduate education as a “Hurry up! I have to get this done so I can get a (better) job” process, which is antithetical to the notion of a lifelong learner and respect for the process of education and lifelong learning. Compounding the issue, dissertation candidates are often so obsessed with completing their study and “getting on with their lives” that they miss becoming immersed in the very issue for which they will be viewed as an expert, or even learning the requisite skills. Consequently, many shortchange their development. Due in part to the “professionalization” or “modernization” of the graduate degree, then, many students have become career-focused to the detriment of their own education (Nyquist & Woodford, 2000). Unfortunately, this cultural change, intended to make scholarship useful and programs competitive, has inadvertently led to a “dumbing down” of programs. Otherwise willing research leaders and faculty mentors may not want to educate adults within these changing systems, even though they know this is mandatory for “staying in business.”

Doctoral supervisors and instructors alike complain that many doctoral students do not exhibit the capacities expected of lifelong learners. These include a willingness to learn and to accept constructive criticism, a yearning to engage in meaningful inquiry, the ability to be an independent problem solver, and a desire to contribute new insight to the field (Mullen, 2005). In a random survey of 800 professors in 2004, the National Education Association (NEA) found that “higher education faculty overwhelmingly believe that students are less prepared for college today than they were in the past,” and that their aspirations for an increased salary are rivaled only by the desire for better prepared students (NEA Higher Education Research Center, 2005, p. 1).

Such scenarios hint at a deeply fractured culture within higher education institutions that are themselves fragmented, outdated systems (Tierney, 1999). Such complications conspire to make the roles of mentor and mentee even more challenging, placing undue stress on promising practices of mentoring within and across university contexts. Hence, professors who are deliberate in their mentoring practices stand out, especially given the host of other elements.
central to their professional competence and performance evaluation (Johnson, 2006). Certain fundamentals in the formation of mentoring relationships must be established if supervisory practices are to flourish; notably, faculty and their students should share interpersonal chemistry and mutual respect. Similar goals and interests matter, as advisees who are practitioners report feeling disconnected when mentors devalue their life and work. Moreover, in studies of what graduate students look for in their mentors, they have identified as crucial certain salient behaviors (e.g., encourages a high level of motivation), mentoring functions (e.g., provides career and psychosocial support), and personality characteristics (e.g., conveys intelligence, caring, and honesty) (Allen & Eby, 2007; Clark, Harden, & Johnson, 2000; Johnson, 2006).

While promising mentoring practices may be slowly gaining recognition at the executive levels of higher education (see, e.g., McDonnell, 2009), they are nonetheless insufficiently supported (Mullen, 2008). Both targeted and whole-scale reward structures are needed. Of course, this “reculturing” solution assumes that, with systemic support, all experienced faculty members will rise to the occasion of mentoring novice administrators and students through their programs and careers. This sentiment is idealistic, but rigorous faculty performance assessments (that the author thinks, in her role as department chair, should include the productive mentoring of others) can help remedy this problem (Tierney, 1999).

**Historical Associations of Mentoring**

The wider dimension of mentoring and its historical antecedents are vital to this conversation. Mentorship historically involves training youth or adults in skills building and knowledge acquisition, both inside and outside education (Merriam, 1983). Professionals in universities, schools, and other organizations enact technical mentoring—a needs-based, short-term solution involving the transfer of know-how to apprentices within skills-building (advising and training) contexts (Mullen, 2005)—or, to use Darwin’s (2000) term, functionalist mentoring. Technical/functionalist mentoring hierarchically transmits authoritative knowledge within organizational and relational systems (Mullen, 2005). Examples within the academic disciplines and professional domains include scientific management, technical efficiency, bureaucratic leadership, and skills-based learning—what English (2003) quips, “management speak.”

Technical mentoring occurs in instructional supervision and professional development contexts—what might be thought of as the “parents” of mentoring—perpetuating scientific management approaches to teaching and learning. Unlike mentoring theorists, supervision experts think of mentoring as collegial supervision. Difference in theoretical outlook aside, in recent years the surging interest in mentoring has created a new relationship among these practices that, ironically, links mentoring and supervision as change forces. The new era that began through ardent educational reform efforts in the early 1980s has reintroduced the past in the form of neoconservative or “neoscientific management.”

Technical mentoring also circumvents “why” and “what if” questions, the spectrum of sociocultural and political issues, and especially the regulatory dimensions of its own making. Instead, what gets promoted is an efficient, managerial perspective on advising, training, instructing, coaching, and leading. Largely patterned after Tyler’s (Pinar, Reynolds, Slattery, & Taubman, 1995/1996) view of program development as divorced from human inquiry, technical mentoring
is a firmly entrenched paradigm in American education. Even though supervising, advising, and training do not equate with the complex and creative art that is mentorship (Mullen, 2005), mentorship gets reduced to supervising, advising, and training. As one effect of this reductionism, creative solutions (including reciprocal and group learning) are not accommodated. Because mentoring activities are not exempt from transmissions of power and authority, these dynamics must be investigated from the perspective of mentors and mentees (Darwin, 2000; Hansman, 2003; Mullen, 2000). It is troublesome that female and minority protégés are socialized to unconditionally accept the power-laden politics of academies that many find oppressive (Hansman, 2002b; Johnson-Bailey & Cervero, 2004).

While ideologically restrictive, many would counter that technical mentoring is useful and necessary for the support it gives within practical apprenticeships and in skills building contexts. Human interaction, positive engagement, and fair treatment can be honored in this context. Hence, one cannot assume that technical mentoring has absolutely no educational value or that it cannot function synergistically with alternative forms. On the other hand, critics (e.g., Darwin, 2000; Freire, 1997; Hansman, 2003) believe that the power and authority, and the efficiency and competitive values implicit in technical mentoring undermine the capacity for democratic mentoring at human and organizational levels, and so should not be tolerated.

A Feminist Deconstruction of Technical Mentoring

While some mentors consider technical mentoring viable for teaching and socializing individuals, critics judge this method passé and, depending on the situation, even politically unsound or morally dubious. Top-down guidance of a faculty mentor who functions as an expert and teacher (but not co-learner) and who manages the learning tasks of (but does not journey with) others presumed incapable results in adult learners (e.g., novice research administrators) who act as codependent, diplomatic receivers of facts and knowledge. In Freire’s (1997) worldview, this mentoring arrangement is terribly misguided. Synonymous with “banking,” mentors who treat mentees as repositories of information to whom they make “deposits” can perpetuate actions that are oppressive, degrading, and dehumanizing. In contrast, mentoring relationships steeped in humanity are based on respect and equality, and developed through dialogue, engagement, and challenge. While many adult educators blend technical and alternative mentoring approaches in their advising, supervising, and teaching or “training,” they may not realize that the epistemological tenets and values embedded in these paradigms radically differ. As a result, they hold implications for the socialization and educational process itself. Hence, one can deepen one's impact when these paradigms are well grasped and knowingly implemented.

Clearly, technical mentoring is problematic. First, it perpetuates cultural socializing forces that produce inequities for particular groups (Freire, 1997). Second, it justifies the algorithmic reduction of complex developmental issues, with the consequence of treating mentoring as a mechanical problem. Consider what Aristotle wrote in a treatise: “... moving a big weight with a small force [such as a lever] seems absurd, and the more so the bigger the weight” (Aristotle [or a follower of Aristotle’s, unknown], see Winter, 2007, p. 1). The analogy here is that academic mentorship has a better chance of succeeding when major efforts, not just minor ones, are enacted. The goal, then, becomes to think and act beyond technocracies that support learning as efficiency oriented, power based, and unidirectional (Mullen, 2005). “Technical mentors” can
re-learn their craft by engaging in critical self-relation and by maximizing risk taking and inquiry in their educational relationships (Freire, 1997; Herman & Mandell, 2004). They would, in effect, begin to ask protégés, “How can we learn from each other?” The challenge they would accept is becoming personally immersed in complex interactions aimed at facilitating substantive guidance and interpersonal connection.

Hierarchical authority structures set the parameters for technical mentoring wherein non-critical reflection and feedback is encouraged, as well as the mediation of autocratic (non-democratic) frames of reference (Hansman, 2002a, 2002b, 2003). As such, inappropriate “father” and “mother” transferences and power plays compound instrumental, linear processes of learning. Educational processes rooted within a Eurocentric male ideology confront, and even disarm, many female and minority university students and faculty (Bona, Rinehart, & Volbrecht, 1995; Johnson-Bailey & Cervero, 2004; Packard, Walsh, & Seidenberg, 2004). Antithetically, a smaller number of empirical studies have found that women and men fared equally well in the mentoring venture and post-graduate employment placement (e.g., Clark et al., 2000), but few comparative studies of white majority and ethnic student populations exist.

Mentoring is a moral act that permeates the mentor–mentee relationship, yet technical mentoring, at its best, allows mentors to fulfill their role only to the extent necessary. At its worst, technical mentoring reflects poor performance and is ethically unsound. Clark and colleagues’ (2000) analysis of the mentoring literature in higher education identified behavioral downfalls. Mentors who are “ethically suspect” may (1) engage in sexualized behavior toward their mentees; (2) exercise poor boundaries and become too emotionally involved; and (3) steal students’ work for personal credit and self-promotion (Johnson, 2006). Needless to say, the reverse also occurs, with protégés as predators, plagiarists, emotional dependents, and unreliable professionals who drain or exploit their mentors. Unethical behaviors must be monitored and changed so that entire communities can be protected.

**Alternative Mentoring**

Contrasting with authoritative or transmissive mentoring relationships, co-mentors (e.g., administrators, professors, students) develop egalitarian relationships that are collaborative. Mentoring as an equalizing force requires a commitment to ethical agendas centered on power, virtue, and circumstance in all projects (Easterly, 2008; Hansman, 2003; Herman & Mandell, 2004). Intentional mentors promote the dynamics of challenge and care, and foster satisfying learning environments (Galbraith, 2002–2003) through promising practices of alternative/non-technical mentoring. These include cohort learning, cross-cultural mentoring, inquiry/writing groups, learning communities, mentor-based programs, peer coaching and learning, professional activism, staff development, telementoring, and e-mentoring. Mentors use such conduits to remedy the drawbacks of traditional mentoring relationships, support issues of quality in student learning and success, and vigorously problem solve within changing organizational structures.

Alternative ideologies of mentoring include collaboration, co-mentorship, democratic learning, and shared leadership. Co-mentorship refers to individuals or groups proactively engaged in reciprocal teaching and learning that value egalitarianism and transforming power structures to reflect this value. Democratic learning can be a formal or an informal experience of mentoring.
central to the social justice perspective on alternative mentoring are constructivist, connectivity, and radical formulations. Connectivity links persons by a common set of beliefs as they conduct themselves from a premise of connection to others. Constructivist means that people see knowledge as actively constructed by individuals who are situated knowers. Radical refers to extreme conservatives or liberals seeking major reform in society, politics, or institutions (Mullen, 2005). The wheels of social justice itself have as spokes the agendas of antiracism, collaboration, community, dialogue, empowerment, subjectivity, and transformation. Proliferating examples of diversity and experiments in learning are outgrowths of the critical democratic framework of mentoring (see, e.g., Davis, 2008; Mullen, 2008).

Political agendas are a driving element within alternative mentoring contexts. The mentoring of non-white women by white males is one such issue that has been overshadowed by the inequitable systems of socialization and learning for women and minorities in postsecondary institutions. Some researchers support mentoring that is open to white males being paired with female and minority protégés (e.g., Johnson, 2006). Dreher and Chargois’ (1998) studies of historically black universities have found that women and minorities paired with white male mentors can benefit from access to power structures that provide compensation through such means as visibility, assistantships, and employment. Hence, they encourage the infusion of cross-race mentoring to foster professional networks and increase social capital. Critics see access for disenfranchised groups within organizations as the issue, not whether white males should mentor women of color (e.g., Darwin, 2000). Darwin’s “cycle of power” is a systems concept that depicts cultural socializing forces as closed systems that recycle power between male mentors and protégés, in effect reducing the likelihood of women and minorities being mentored. Because
career advancement is a protected “investment,” “only those who best represent dominant
cultural values may be chosen to serve as mentors. . . .” (Hansman, 2003, p. 103). Hence,
intentional mentors seek to diversify higher education systems by eliminating constrictive access
and critiquing the replication of organizational values.

**Synthesis of Mentoring Paradigms**

In administrative and academic contexts, an “unapologetic” free-flow exists between the
contradictory ideologies of technical and alternative mentoring. The synthesizing of these
paradigms in everyday life and in scholarship is practically indiscernible. For example, Paulus
and Nijstad (2003) uncritically discuss how domain knowledge (e.g., background knowledge)
and creative skills (e.g., risk taking) can be taught and, moreover, used to support intensive group
creativity. Their perspective, a combination of social psychology and industrial administration,
aligns a technical–rational training approach to mentoring with work-group innovation.
Intermixing perspectives on training with those of social transformation is common practice.
Educators collapse, with apparent ease, the language of management (e.g., “monitoring
quality,” “managing conflict,” “accountability safeguards”) with empowerment (e.g., “learning
environments,” “relationship sensitivity,” “cross-cultural mentoring”). If the deep semantic
structure of technical language informs our thoughts and actions, then technical mentoring
would seem natural and even have magnetic appeal.

Another example of the blending of the two ideologies can be seen in the role of mentors as
evaluators. The alternative mentoring stance is that faculty mentors should not serve an evaluative
function, yet their feedback often does involve assessment with respect to their instructional and
supervisory tasks (Mullen, 2005). The evaluative function of mentoring also extends to classroom
learning and such actions as creating activity settings and determining appropriate assessments
(Herman & Mandell, 2004). Further, instructors and dissertation (and thesis) chairs use a range
of assessments not only for assigning course grades but also for judging the merits of a student’s
inquiry and progress. If anything, the increasing intensification of standards for program
improvement has amplified the evaluative aspects of mentoring.

Hence, while technical and alternative mentoring may appear bipolar in theory, in practice
they overlap, at times becoming indistinguishable. Nonetheless, fundamental distinctions exist
and distinctions are discernable in practice. Overarching paradigms of technical mentoring and
alternative mentoring embed very different views of the purpose of education. As a result, this
affects how programs, relationships, and systems are envisioned and organized.

**Feminist Approaches to Mentorship**

Feminist scholars underscore the potency of informal mentoring in adult learning and
development (e.g., Davis, 2008; Mullen, 2008). Some mentees have taken it upon themselves
to compensate for the perceived inadequacies of their education by creating democratically
organized, collaborative support groups. Doctoral students belonging to one such group
successfully bridged their differences in background and expertise, augmenting their learning
in programs and dissertation mentorships (Harris, Freeman, & Aerni, 2009). Alternative
mentorships reach beyond the academic and career development of protégés to address
psychosocial development in such areas as friendship and emotional support, enhanced self-esteem, and confidence (Darwin, 2000; Hansman, 2002a, 2003; Mott, 2002).

**The Mentoring Mosaic Model**

A significant alternative conception of mentoring (e.g., Eby et al., 2007; Head, Reiman, & Thies-Sprunghall, 1992; Mullen, 2005) is Kram’s (1985/1988) “relationship constellation,” also known as a “mentoring mosaic” or “academic network.” Even though the concept of network mentoring was articulated more than 20 years ago, its impact on the education literature is only more recently felt. In fact, developmental networks in which people invest in one another’s learning and success have even been heralded by *The Wall Street Journal* as not only “a new approach to mentoring” in business organizations but also essential for staying abreast of global trends (Kram & Higgins, 2008, p. R10). The mosaic model can be formal or informal in nature (Head et al., 1992) and members can benefit from “enhance[d] performance, learning, self-awareness, social skills, and leadership capability” (Kram & Higgins, 2008, p. R10). Easterly (2008) describes a dynamic mentoring mosaic that enabled women academics to collaborate on grant writing within a research institution wherein the culture of collaboration had to be created.

Mosaics can be designed as a primary or secondary network, or as a more informal resource, and they assume various guises, such as network, community, and even resource. Because mentors cannot be “everything” to any one person, mentoring mosaics play a practical role in helping protégés optimize the effects of mentoring (Kram & Higgins, 2008). In fact, Head and colleagues (1992) have encouraged mentees to access developmental networks to overcome shortcomings in their primary mentoring dyads and expand academic and career opportunities.

Within the mentoring mosaic, peers interact around an area of shared interest, tapping the strengths and qualities of their partners. Members interchange roles as mentors and protégés, sponsoring the learning of all parties through a synergistic, flexible structure. This kind of network is indispensable for cultivating peer mentors, compensating for the dissatisfactions of traditional mentoring relations, and facilitating larger, team-oriented projects (Mullen, 2005). Indeed, if mentoring is defined more as a learning process than an activity performed by an individual, then several people can simultaneously engage in nurturing, advising, befriending, and instructing. Within such networks, one person may serve as a subject specialist and others as counselors, advocates, advisors, and promoters. Co-mentoring is a key element in the creation of such scholarly think tanks, dependent on commitment, discipline, and synergy (e.g., Davis, 2008; Mullen, 2008). Mentees have been given opportunities for peer collaboration and networking, and skills development in research, writing, and speaking. The camaraderie and interdependence, and identity formation and ownership in learning that emerge from this activity setting underscore that how mastery is achieved matters no less than mastery itself (Galbraith, 2002–2003).

**The Co-mentoring Relationship Strategy**

The co-mentoring relationship strategy complements mentoring mosaics as a model for engaging adult learners. Activities that are especially valued include power sharing, turn taking, co-leading, dialogue, constructive feedback, and transparency and authenticity in learning. Specifically,
co-mentorship is a process of reciprocal learning whereby mentors function as adult educators and mentees as adult learners within the mentoring dyad or group (Cohen, 2002).

Group approaches to co-mentoring help students grapple more effectively and creatively with problems associated with one-to-one mentorships. For example, the issue of mentor pairing with respect to similarities in gender, ethnicity, age, and discipline (e.g., Wilson, Pereira, & Valentine, 2002) becomes diminished when groups are configured to reflect diversity. Some minorities may feel that ethnic mentors would be more ideal but nonetheless draw strength from diversified activity settings that include cohort peers. Women students, who generally prefer female mentors because of the perceived opening for personal contact (Wilson et al., 2002), can derive satisfaction from mixed-gender groups led by male mentors. Peer mentoring has maximum benefit within groups whereby “the opportunity for synergy and cross-fertilization of ideas and experience” contributes to the bridging of “organizational chasms” and enhanced “teamwork and improved performance” (Ellinger, 2002, p. 22).

The idea of a mentor as somehow separate from or above the group that follows one’s charge is outdated (Banks, 2000). Thus, beyond individual and group learning, co-mentoring also functions as a catalyst for changing traditional practices, hierarchical systems, and homogeneous cultures (Bona et al., 1995; Easterly, 2008). Diversity is promoted when women and minorities are brought into a network or culture (Bona et al., 1995; Darwin, 2000; Easterly, 2008) and when “unequal power relationships” are changed (Hansman, 2003, p. 105). Because mentoring relationships tend to be hierarchical in nature (Hansman, 2003; Johnson-Bailey & Cervero, 2002), mentors who are explicitly critical of “the inherent power of mentors” and organizations (Hansman, 2003, p. 103) confront such mentoring behaviors as “fierce negotiation, infantilization, prejudicial grading, and silencing” (Ervin, 1995, as cited in Mott, 2002, p. 8). Such behaviors erupt when mentors, male or female, exert control over female mentees. Because not all mentors are comfortable with power sharing and promoting the “mutual enhancement of independent and critically reflective thinking” (Galbraith, 2002–2003, emphasis in original, p. 9), administrative researchers can make a difference by providing leadership and guidance.

A Mentoring Mosaic for Research Administrators

Novice research administrators “hit the ground running” within academic contexts that are intentionally designed for collaborative and interdisciplinary science (Laughlin & Sigerstad, 1990; Lowenstein, 2006). According to a study carried out by Carnegie Mellon University, while individual faculty initiate interdisciplinary research, administrators facilitate a supportive environment and make available the funding for conducting research (Laughlin & Sigerstad, 1990). These days, socializing novice research administrators should rely less on individual mentoring relationships and more on group learning contexts. Promoting a boundary-spanning approach to the research endeavor should reduce the time it takes for mentees to adjust to a new environment, develop their learning capacities, and become socially integrated. Females and persons of color frequently experience professional and social isolation in their new professional roles. If not circumvented quickly and in their early years, this isolation can have a negative affect on development and promotion (Davis, 2008; Easterly, 2008; Lowenstein, 2006; Mullen, 2008). For example, in a 2005 study, only 52% of junior faculty reported having a mentor to assist with their career development. But even among junior faculty who were matched with a career
mentor, only 24% had received assistance with the requisite skills-development, as many of the mentorships had not been launched (see Lowenstein, 2006).

Newer mentoring models, primarily the mentoring mosaic and co-mentoring relational model, can enable research administrators to address such cultural deficits in their work environments. This can be accomplished while more wisely investing university resources to support the mission of their institutions. As Sá (2008) attests, “Traditional university structures and reward systems were built to support and account for single-investigator, discipline-based research” (p. 37; see also Mullen, Murthy, & Teague, 2008). Outdated systems do not support the development and early success of novice research administrators and faculty members whose needs range from entry-level concerns (e.g., learning the functions of key personnel) to academic agendas (e.g., securing resources), to performance reviews (e.g., clarifying requirements). Research shows that entry-level professionals, in general, falter not because of inadequacies relating to expertise or motivation but from lack of access to mentors. Nurturing the academic career prowess of new professionals through primary and secondary mentors who work together as a team means providing support in a myriad of ways. New professionals need to understand the promotional process, generate a research agenda, identify funding and writing opportunities, problem solve (e.g., negotiate resources, manage time), learn presentation and teaching skills, and navigate the political workings of their environment (Lowenstein, 2006). Learning to resolve ethical dilemmas related to research administration means becoming educated about ethical dilemmas that affect one’s decision-making. Mentors should ask their mentees questions that promote moral awareness and action, and that provide them with models and examples that will help them to make ethically sound judgments (see Lincoln & Holmes, 2008).

In institutions that emphasize collaborative and interdisciplinary science, research administrators are called upon to deal with these new stresses, with the need for strong interpersonal relations, and with the need to be organized and to multi-task. For example, they must not only be exceptionally resourceful in today’s worsening budgetary climate but will also need to be unusually creative as they problem-solve ways to assign credit to collaborating scientists (e.g., principal investigators, project developers)—according to their relative contributions and across units and universities (Sá, 2008). Research administrators must work to dissolve traditional boundaries to research productivity—typically lack of communication and collaboration—that impede team-based approaches across organizational and disciplinary boundaries (Mullen et al, 2008). For example, they will need to figure out how to align assessment-based performance (e.g., promotion and tenure) with the collaborative and interdisciplinary science values that have permeated the academic culture (Sá, 2008).

New professionals across disciplines consider mentors important and vital to their success. A university-wide faculty survey of research resources and academic culture found that junior faculty members considered “intellectual and scholarly resources”—that is, research mentors and senior researchers—indispensable to their acclimation, progress, and achievements (Mullen et al, 2008, p. 29). The newer mentoring models can be fostered through cross-race mentoring, scholarly programs, research panels, and workshops organized to promote academic collaboration and mentee development. Research administrator mentors can share information about the norms and culture of the school, and facilitate skills building in such areas as career planning, time management, and grants writing (Lowenstein, 2006; Mullen, 2008).
A challenge to research administration and the professorate is to align theories and practices of adult development. To avoid replicating hierarchical and demeaning power situations as they themselves grow into research administrator mentors, mentees will need understanding of how power dynamics are structured in organizations and how these influence relationships and settings. It must become widely known that women and minorities encounter troubling dilemmas as learners (Darwin, 2000; Hansman, 2002b, 2003), and that they report having fewer academic mentors, collegial relationships, and other resources that facilitate success (Lowenstein, 2006; Mullen, 2008). “Pathways of power” wend their way “from the bureaucracy of government” through “systems of human interaction and language” (English & Irving, 2008, p. 307) reproducing organizational values and influencing power in professional mentoring contexts. Developing an organizational capacity for mentoring requires that mentors and mentees establish culture-changing solutions and experiment with them.

Obstacles to collaboration can be overcome within mentoring mosaics and co-mentorships that enable research administrators to model professional expectations, including research ethics. Mentors should be supported in their efforts to work closely with mentees from inside and outside their units. As new research administrators join schools and universities, they will need to be socialized at the outset to experience success and a sense of belonging. Importantly, the group context functions as a catalyst for female faculty who, for example, submit fewer proposals than their male counterparts for external funding and yet who thrive in research-based mosaics (Easterly, 2008). Where university infrastructure and organizational culture are brought into alignment, units will be better organized to support the development and success of novice professionals. However, mentors and mentees do not need to work at the center of established systems to generate productive mentorships. They have the option of working at the margins to “grow” the new professional. A distinctive intellectual signature arises out of networks of scientists from multiple units that rely on the common interests of participants and very little on established infrastructure (Sá, 2008). Other networks are organized around university-based initiatives, with input and even controlling interest from senior administrators for whom collaboration among scientists serves as a grant strategy and vehicle for securing highly competitive federal and private funding, contract opportunities, and sponsored research support. Mentors will need to know both the vision of their institutions and the research interests of the next generation so they can devise contexts for professional learning that cultivate human, physical, and financial resources. New professionals will be looking to them for proactive assistance in developing their identity and reputation as collaborative and interdisciplinary investigators. Research administrators can enable the conditions that allow faculty to work together through established reward systems (e.g., incentive programs) and creative solutions.

“Banking” on Mentoring in Research Administration

Administrators and faculty members are expected to retool outdated graduate programs (Nyquist & Woodford, 2000), be knowledgeable about promising practices in mentoring new professionals, and experiment with fresh ideas in their own settings (Mullen, 2005, 2007). However, unless the effective mentoring of research administrator mentees becomes fully supported at the executive levels of their organizations, they will continue to encounter roadblocks. Sullivan and colleagues (2007), scholars from the Carnegie Foundation for the
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Advancement of Teaching, state in no uncertain terms that “institutional intentionality” must become a reality if new developments and mandates in mentoring are to succeed.

Bringing home these ideas to research administrators as a group and to the profession of research administration raises questions: First, how can research administrators assist with the establishment and development of mentoring programs for scientists and new research administrators? For both of these targeted populations, research administrators can lead or facilitate relevant program activities by becoming familiar with the research on mentoring and best practices, and by identifying ideas for implementation that fit their own environments. They can also create mentor–mentee matches using proven criteria (e.g., shared research interests). Another component of intentional mentoring practice is the establishment of participant roles, the development of guidelines and orientation, and the preparation of mentors (Mullen, 2008). In addition, social events can be organized for all participants so they can develop mentoring relationships more naturally; other gatherings, such as team-based workshops and research panels, can be sponsored throughout the year. Procedures can also be established for recruiting and screening mentor and protegé applicants. Moreover, leaders can facilitate problem solving by, for example, adjusting procedures and plans to enhance effectiveness and making available to mentees and mentors a confidant who addresses relational issues. One may also want to utilize an e-mentoring administrator or develop electronic components that support the communication of participants and administrators. By collecting data through surveys and possibly other means, one should periodically assess the intervention’s effectiveness from the perspective of those involved and by making modifications to ensure continuous improvement. Finally, updates can be distributed to highlight the work and impact of the intervention (Mullen with Hutinger, 2008).

Second, how does mentoring challenge and expand the idea of “education” as something that takes root in the person? By digging deeply into their own experiences, mentors and mentees engage in reciprocal learning within dyads and groups. In these contexts, value is given to a social constructivist approach to knowledge created through mutual learning and lived experiences. A shift of education from a delivery model to a constructivist model puts the spotlight on self-efficacy and the notion that one must accept, as a starting point, responsibility for one’s own education. According to US President Barack Obama, we are living in a social responsibility era that is, simultaneously, a personal responsibility era. Traditional ideas of education limit the possibilities of what we can become; for example, emulation is at work in being “groomed” for professional and academic success. Freire (1997) warns that “banking” and emulating are potentially dangerous forms of mentorship. In the case of women and minority protégés, they must realize that while organizational cultures shape their experiences, they in turn shape their relationships and cultures, recognition of which is the first step toward embracing what they can become (Clover, 2006).

Third, what prophetic stance(s) might research administrators promote among the researcher communities and academic departments they serve? Progressive mentoring calls for a vision of a world in which the ideology of patriarchy is subverted through organizing principles that foster holistic development, cultural engagement, and institutional change. Reclaiming mythological stories sheds light in this direction. Few may be aware, that in Homer’s The Odyssey Mentor is actually a woman, disguised as an elderly male sage. While under this guise, Athena, the Greek goddess of wisdom, persuades Telemachus to seek news of his father. She also teaches the boy...
how to think and act for himself and nourishes the intellectual, spiritual, social, and professional facets of his life. Telemachus develops shrewdness without sacrificing virtue, two qualities that Mentor treats as a formative part of a “higher” education (Herman & Mandell, 2004; Mullen, 2005).

Research administrators, too, can contribute to communities of scholars in profound and sustaining ways. Their own prophetic pragmatism can be expressed through structures and activities that are multi-faceted, not “metrified,” and that infuse ideologies of cultural diversity, group learning, learner-centered pedagogy, and personal change. Because research administrators and academic scholars are members of hegemonic groups (Hansman, 2002b), they are being called upon to rebuild who they are. We can begin by discerning how models of scientific management and democratic renewal influence our own educational ideas and practices. Then, we can reflect on the impact of our selfhood on the places in which we work. Next, in order to affect systems-wide change, we must endeavor to promote congruency between who we are and what we are called upon to be. By taking these steps, we can more fully commit to undertaking the important cultural work of mentoring others (Bash, 2003).

**Conclusion**

To “re-culture” their organizations, research administrators must exhibit institutional intentionality. Current tough economic times in which deficit thinking abounds will require that they be especially resourceful about not only perpetuating but also recognizing exemplary mentoring that builds human and organizational capacity. Studies show that administrators fail to assign mentoring as a faculty duty embedded within reward structures (e.g., Clark, et al., 2000) and yet they depend on professors stretching well beyond their work assignments. Needed, then, are incentive programs and other reward structures that acknowledge the expertise, creativity, and time of mentors who foster best practices. One can make a difference by valuing mentoring accomplishments that emerge not just at the level of the individual but perhaps especially at the level of the group. This has strong implications for elevating the creativity, motivation, and productivity within one’s domain (Arnabile, 1996) and for better satisfying the needs of non-traditional student groups (Mullen, 2008). Mentoring that results in the diversification of academic contexts and the enrichment of adult learners is a precious resource that institutions depend on but take for granted. By combining intentional mentoring and reward structures, one can have a lasting impact on root systems.

**References**


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Establishing User Needs – A Large-Scale Study into the Requirements of Those Involved in the Research Process

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Abstract
The aim of the project was to develop a set of online tools, systems and processes that would facilitate research at the University of Nottingham. The tools would be delivered via a portal, a one-stop place providing a Virtual Research Environment for all those involved in the research process. A predominantly bottom-up approach was used with emphasis placed on effective consultation with research practitioners, administrators, technicians and research managers. Over two years, 41 focus groups were run to ascertain from users the sorts of electronic tools, systems and processes they felt would most support them in their work. Questions to the groups were guided by the lifecycle stages of most research projects from the initial scoping of ideas, through the writing of proposals and monitoring of projects up to the dissemination of results (Wilson, 2004). Key points were collated, and duplications and requests for support that could not be delivered electronically were removed or forwarded to relevant departments, respectively. A cross-group analysis was carried out to determine overlap in requirements and used to establish a priority list for development. Online questionnaires are being administered to all those who took part in the project to obtain feedback and determine user satisfaction with developments.

Keywords: Virtual Research Environment, research support, focus groups, research management
Introduction

In 2004, the British Government announced its plan to support the development of Virtual Research Environments (VREs). The definition and understanding of what constitutes a VRE has continued to evolve since that time. Based on a definition put forward by Fraser (2005) and upon a variety of projects and discussion arising from those projects, the Joint Information Systems Committee (JISC) constructed its own definition of a VRE. JISC is an advisory committee to the UK post-16 and higher education funding councils. It facilitates and promotes the effective use of information and communications technology across non-compulsory education and research. Its definition of VRE (JISC, 2006) is shown below:

A VRE comprises a set of online tools and other network resources and technologies interoperating with each other to support or enhance the processes of a wide range of research practitioners within and across disciplinary and institutional boundaries. A key characteristic of a VRE is that it facilitates collaboration amongst researchers and research teams providing them with more effective means of collaboratively collecting, manipulating and managing data, as well as collaborative knowledge creation.

The evolution of the definition is evident in the broader focus of today’s work compared with that of a few years ago. In 2004, JISC defined the main purpose of a VRE as “to help researchers in all disciplines manage the increasingly complex range of tasks involved in carrying out research.” By 2006, JISC had explicitly identified three main groups of VRE users: research active staff, research support staff and system administrators. This broader view of a VRE was adopted by the project team at Nottingham.

Work had already started at Nottingham on the development of electronic resources for researchers as a result of a 2003 survey (Dransfield & Wilson, 2003) that sought to ascertain from researchers and academics their priorities for improvements to the existing systems that supported research. The survey was, however, limited in its scope both in terms of the population it accessed and the questions addressed. In this project, the team wanted to obtain wider engagement with all categories of staff involved with research, whatever their role might be. Thus, as well as academics and research staff, the project team consulted research managers and administrators, technical staff, business development executives and postgraduate students. The aim of the project was to identify the electronic resources and tools that any of these groups of users would like to have available to support the implementation and management of research. The kind of resources envisaged as potentially helpful included funding alerts, tools to help the financial monitoring of projects, tools to help collaboration by identifying skills across the University, online discussion areas for sharing expertise, and tools to aid the dissemination of information about journals, seminars and conferences. By determining what researchers and research managers actually wanted, the project team could develop those tools and deliver them via a portal – a one-stop place for all electronic resources. In this way the team hoped to provide a Virtual Research Environment (VRE) for the whole of the research community at the University of Nottingham based upon users’ actual requirements as acquired through the consultation.

Discovering what people actually wanted, as opposed to what the team thought they wanted, meant embarking on a user-led consultation process that included representatives from a variety
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of roles and across a variety of domains. Such an in-depth consultation meant that development might have been slower, but might also lead to more effective implementation in the long run as users felt more involved in the decision-making process (Moreland Council Consultation Framework, 2000). Maintaining an open, transparent relationship with users throughout the project and providing them with feedback about how their contributions were being used and how final decisions for development were made, helped to retain their engagement and ease the implementation and embedding of new technologies.

The Organisational Structure of the University

The University of Nottingham is a leading research and teaching university. In 2005, it had more than 32,000 students including over 4,000 international students from over 100 countries. Its organizational structure is described below and illustrated in Figure 1. Three main bodies apply governance: Senate, Council, and the University Court. The Senate is the academic authority of the University; the Council approves the University’s strategic plans and is responsible for its finances, buildings, and staff; the University Court provides a forum for involvement of external organizations and individuals in University life. The University is supported by four Centres that provide the administrative infrastructure: Information Services, External Relations, the Registrar’s Department, and Financial and Business Services. Research and Innovation Services (RIS), a department within Financial and Business Services, leads the drive towards excellence in research standards and the development of new areas of research in emerging fields. It encourages the transfer of technology and knowledge from within the University to the business world, and identifies opportunities for collaborative research. Strategic decisions are made at the faculty level while day-to-day academic activity takes place at the school level. Budgets are devolved to schools and directed by a Head of School and School Manager. Some schools employ Business Development Executives (BDEs) to investigate funding opportunities, build relationships with external companies and facilitate the development of commercial activities. They report to the RIS and thus provide an important link between school and centre. There are 34 schools within the University organised under five faculties. The size of schools varies within and across faculties in terms of staff employed and students enrolled. This was an important consideration when trying to ensure that all disciplines and all categories of staff were represented in the sample.

Figure 1. Organizational structure of the University of Nottingham.
Method

Choosing a methodology

As effective consultation with users was considered by the team to be essential to the success of the project, a great deal of consideration was given to choosing an appropriate methodology. It was important that users felt fully engaged in the consultation process and that the project team had a proper understanding of users’ requests that was not influenced by preconceived ideas or prejudices. Several different methods were considered, each with its own advantages and disadvantages.

Questionnaires would have allowed access to all relevant users thus potentially providing a large sample of responses. Questionnaires are quick to administer, particularly if delivered online, and generally quick to analyse. They do, however, provide limited data in terms of the richness of the responses. They do not allow topics to be thoroughly explored, and responses may often be superficial, ambiguous and occasionally absent altogether.

In contrast, one-to-one interviews often elicit very rich data and, because they are conducted face-to-face, there is a much smaller risk of ambiguity or missing answers. Their disadvantage is that they are very time-consuming, and consequently only small samples of people can be consulted. Responses do not easily lend themselves to quantitative analysis so generalisation is unlikely. For a consultation that seeks to provide a VRE that is useful to all users, a method that uses such sampling would have been too limited.

The final method the project team considered was focus groups, which are small discussion groups of 6-10 people. Focus groups access far more participants than interviews, but far fewer than through questionnaires. In terms of the richness of the data, this method aims to promote open discussion and facilitate the expression of criticism and the exploration of different types of solution. By exchanging ideas within the group there is the potential for more creative thinking and wider opinions than afforded through individual interviews -- qualities that are invaluable when the aim is to improve services (Kitzinger, 1995). While the smaller sampling may mean that caution should be applied before attempting to generalize the results from focus groups in any empirical sense, theoretical generalization may still be possible. This is especially true when the number of groups permits insights gained from the data to possess a “sufficient degree of generality to allow their projection to other contexts or situations” (Sim, 1998, p. 350). This transferability increases the validity of focus group data.

One further consideration in the choice of method was that the team wanted users to feel fully involved in this exercise. When those consulted feel fully engaged with the process, this is likely to be reflected not only in the data obtained from the consultation but also at the embedding stage when new tools and resources are rolled out to users. Such engagement is more likely when the consultation is face-to-face as it produces a stronger sense of satisfaction in participants and a firmer belief that their opinions count (Gibbs, 1997).

Based on these factors, the method of choice was well-run focus groups.
**Starting the Engagement Process**

The team’s first stage of the engagement process was to meet with each of the School Managers to explain the purpose of the project, enlist their advice on recruiting staff and find out the best times to arrange focus groups within their school. School Managers also provided information about which support and administrative staff were involved with research in their school, and who should therefore be included in the consultation. Schools that had insufficient support and administrative staff to form one focus group were asked to join with others, and School Managers were helpful in advising which schools could be appropriately combined in terms of their culture.

**Recruitment of Consultees**

The method of recruitment of staff to the consultation varied across schools and was based on the advice of each School Manager. Sometimes School Managers sent out letters of invitation to their entire school, with replies coming directly to the project team. Sometimes the managers provided the team with lists of contacts, and sometimes Heads of Schools advertised the project at school meetings. Sometimes the project team selected staff randomly from website lists. In general, the greater control the team had over the recruitment process the more successful it tended to be, as it allowed the response rate to be monitored and the method of approach adapted and changed as necessary.

A number of lessons were learned from the recruitment process in terms of optimizing engagement:

1. Email invitations needed to be brief with links to more detail if required by the recipient.
2. Email headings needed to be serious and informative so they were not dismissed as spam.
3. The language in the email needed to match that of the user. Using unfamiliar terms to describe familiar concepts tended to alienate staff and reinforced feelings of distance between different groups within the University.
4. It was better to ask staff to commit to a short period of time (one hour) and hope that they might want to stay longer than to invite them for longer (two hours) and risk refusal altogether.
5. Engagement is a voluntary process and, while it can be encouraged, the decision not to engage in the consultation should always be respected.

Twenty-eight of 34 schools participated in the project, and 41 focus groups were run over two years. Nineteen focus groups were for academics or researchers or both, five were for postgraduate students (the least eager to engage in the project), 12 were for School Administrators and five were for Central Administrators.

**Designing the Questions**

One way of considering the research process is to envisage it as a lifecycle with a number of
distinct stages (Wilson, 2004). For the purposes of the project, the team identified the following 10 Lifecycle Areas (LAs) that occurred in most types of research:

LA1) scoping the context when the investigator explores the literature
LA2) finding funding
LA3) finding collaborators/building relationships
LA4) creating a proposal (including contractual issues such as Intellectual Property Rights [IPR])
LA5) costing and pricing
LA6) approval and submission of the proposal
LA7) project administration (setup and ongoing monitoring)
LA8) undertaking the research
LA9) outcomes (dissemination and publication, new research, commercialization)
LA10) management of the research portfolio

As each of these areas was relevant to Academics and Researchers, questions concerning each were addressed to these users. They were asked about their current practice, any frustrations with the tasks they had to perform, how things could be improved, and what resources or tools they felt would help them carry out their role. Because focus groups were organised to last one hour, not all areas could be covered by one group. A system was therefore designed to ensure that every Lifecycle Area was covered at least once by each Faculty. This is illustrated in Table 1 below for the Faculty of Science.

Table 1

Coverage of Lifecycle Areas by Focus Groups Run in the Faculty of Science

<table>
<thead>
<tr>
<th>Faculty of Science</th>
<th>LA covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>1, 3, 4, 5, 6, 7, 8 and 9</td>
</tr>
<tr>
<td>Biosciences</td>
<td>1, 3, 4, 5, 6, 7, 8 and 9</td>
</tr>
<tr>
<td>Chemistry</td>
<td>2, 3, 4, 5, 6, 7, 9 and 10</td>
</tr>
<tr>
<td>Computer Science</td>
<td>2, 3, 4, 6, 7, 8 and 10</td>
</tr>
<tr>
<td>Mathematical Science</td>
<td>1, 2, 3, 4, 7, 8 and 9</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>6 and 7</td>
</tr>
<tr>
<td>Physics and Astronomy</td>
<td>1, 2, 3, 4, 5, 6, 7, 8 and 9</td>
</tr>
<tr>
<td>Psychology</td>
<td>5 and 6</td>
</tr>
</tbody>
</table>
Questions addressed to School Managers, support and administrative staff covered those Lifecycle Areas relevant to their role. Thus, this group of users would not be asked questions concerning LA1, scoping the context, and LA8, undertaking the research, as those areas dealt with the implementation of research rather than its management. They were, however, asked some additional questions about their satisfaction with communication among themselves, academics and researchers, and central administrators. They were also asked about their need for a shared virtual working environment where they could exchange ideas, experiences and good practice with their counterparts in other schools.

Postgraduate students were not asked questions concerning LA5, costing and pricing; LA6, approval and submission of the proposal; or LA7, project administration. Additional questions addressed to this group concerned general support within the University and the Graduate School, and any ideas they might have for improvement of resources. They were asked to relate both positive and negative experiences, as well as ideas for improving communication and inclusion.

As for Central Administrators, separate focus groups were held with those sections responsible for financial reporting, negotiation of contracts, intellectual property, and engagement with external businesses. A focus group was also held with administrators from the Graduate School, which supports postgraduate students and is responsible for both their training and the training of University researchers. Questions to Central Administrators addressed the quality of the relationships they had with staff and students in schools and ideas they might have for easing any existing tensions. Ways of improving transparency and openness in communication were discussed, as well as ways of clarifying areas of responsibilities and easing frustrations with the role. The project team hoped that information obtained from the Central Administrators would provide a different perspective from that of the research practitioners, thus presenting a more complete picture of the processes involved in the research cycle.

Although the project was concerned primarily with the delivery of electronic tools and resources to support research, the team identified three reasons for soliciting any ideas for support that participants could suggest. First, it would help maximize engagement and minimize any preconceptions about delivery being a “technical” problem. Second, such information would provide the team with greater insight into the needs of users and the context within which they worked, which in turn would shape the way in which the team developed and delivered the requirements. Finally, it allowed the team and users to think more broadly and to consider the possibility that some suggestions for face-to-face support or training could be delivered electronically.

**Running the Focus Groups**

Effective consultation requires several key ingredients. The first is the assurance of confidentiality. If participants are to be open about the frustrations they feel about their role and to feel free to be critical of present systems they must be assured anonymity. Permission to record and transcribe the sessions was obtained from all participants with the assurance that only the group facilitator would have access to the tapes, and that all means of identifying individuals would be removed from the final transcripts. No groups refused to be recorded.
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The composition of groups was also critical as it was important that no individual felt inhibited or intimidated by the presence of another in their group, as might occur when junior researchers were combined with senior staff members.

Every effort was made to make the focus groups as relaxed and enjoyable as possible. Initial questions were general in nature to initiate and then promote free-flowing discussion. More specific questions were introduced as the discussion progressed. The aim was to extract opinions and ideas about specific Lifecycle Areas while not allowing the discussion to be too researcher-led. Time was always allowed at the end of each session for participants to add any comments or mention any issues that were important to them but which hadn't been covered. The team sought to ensure that no participant left a focus group feeling that his or her views had not been heard.

After each session had been transcribed, the comments were returned to participants for verification. This not only ensured accuracy in reporting, but also gave participants a second opportunity to elaborate upon or amend their opinions. The opportunity to amend comments was taken by several participants. For example, one project manager felt that she had exaggerated the number of errors she had experienced by the finance team when recording the “spend” on projects and adjusted the figure in the transcript to one she considered to be more realistic. Another participant revealed that she had much more to say about the adequacy of training and career development in her school. She had felt unable to express her true feelings in the focus group because her mentor had been present. In spite of the care taken with the composition of groups, on this occasion it had not been a complete success.

The verification process, although time-consuming, was an essential part of the consultation as it helped participants to realise that accuracy in reporting their requirements was a serious consideration of the team. It also reminded them of their discussion and ensured their continued engagement with the project.

**Results**

**Summary of Results**

Over 700 key points were collected, including 577 from Academics, Researchers or Postgraduate students. This included much duplication where similar points were made by more than one focus group. Once duplication had been removed, 293 key points covering the 10 Lifecycle Areas from the five different faculties remained. Sixteen completely generic requirements emerged from cross-faculty comparisons. The majority of these were requirements that could be supplied electronically, but more training, better communication, and more resources were also noted.

One hundred-six key points were collected from School Managers and School Administrators. Once duplication had been removed, 37 key points remained. Twelve of these related directly to Lifecycle Areas, most of which could be supplied electronically. The remaining key points were concerned with general management requirements such as an increase in resources, information, and transparency. There was also a request for systems to facilitate the monitoring of work requests and the management of postgraduate students.
Twenty discrete key points were collected from Central Administrators. Six of these related to the Lifecycle Areas, and all could be supplied electronically. As with the previous group, the remaining points related to more general issues such as resourcing, communication, and management.

The final group, the Graduate School, raised seven key points, none of which related directly to any of the Lifecycle Areas. The key concerns of staff from the Graduate School were for more effective communication and greater transparency across the University.

**Analysis of Results**

One of the aims of this project was to obtain an all-round picture of the requirements of all those involved in the research process. Previous work done at the University of Nottingham had accessed the views of academics and researchers but had omitted the opinions of several vital groups of people -- School Managers, School Administrators, technical staff and Central Administrators -- without whom the research cycle could not be satisfactorily completed, and among whom occasional tensions arise. It is therefore interesting to compare the key points raised by the different groups with respect to the different Lifecycle Areas (see Table 2):

Table 2

*Comparison of Requirements of Practitioners and Administrators of Research Across the 10 Lifecycle Areas*

<table>
<thead>
<tr>
<th>Lifecycle Areas</th>
<th>Generic requirements of academics, researchers and postgraduate students</th>
<th>Requirements of School Managers and School Administrators</th>
<th>Requirements of Central Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA1</td>
<td>Access (including off-site) to as many online journals as possible.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Direct links to journals through the portal and minimum clicks to actual paper</td>
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<tr>
<td>LA2</td>
<td>An efficient, uncomplicated, customisable and flexible method of finding funding opportunities</td>
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<td></td>
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<tr>
<td></td>
<td>Efficient focused system of notification of research calls</td>
<td></td>
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<tr>
<td></td>
<td>A central information resource on open calls and new funding sources.</td>
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<td></td>
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<tr>
<td></td>
<td>BDs to get the same calls as their academics.</td>
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<td></td>
</tr>
<tr>
<td>Lifecycle Areas</td>
<td>Generic requirements of academics, researchers and postgraduate students</td>
<td>Requirements of School Managers and School Administrators</td>
<td>Requirements of Central Administrators</td>
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<td>----------------------------------------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>LA3</td>
<td>Finding collaborators and building relationships</td>
<td>Face to face meetings with opposite number or a sort of School Managers’ chat room to discuss specific problems.</td>
<td>Something which might help disparate groups to do more together</td>
</tr>
<tr>
<td></td>
<td>Day-by-day calendar of seminars, lectures, guest speakers and events on campus with efficient search facility, titles of papers and links to Abstracts.</td>
<td>Efficient, effective way of finding out staff/PhD students research interests, projects, funders and publications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Efficient, effective way of finding out staff/PhD students research interests, projects, funders and publications</td>
<td>Information about what colleagues are up to in other Schools.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Face to face meetings with opposite number or a sort of School Managers’ chat room to discuss specific problems.</td>
<td>Any mechanism that improves communication between Schools</td>
<td></td>
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<tr>
<td></td>
<td>Shared resources</td>
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<tr>
<td>LA4</td>
<td>Creating the proposal - contractual issues, such as IPR</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Guidance/expertise online and in human form in formulating proposals. Examples of successful and unsuccessful proposals in a relevant field.</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LA5</td>
<td>Costing and Pricing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training seminars on costing and pricing projects and administrative help with same.</td>
<td>For new members of staff information about who to contact in RIS, who has to sign it off and rubber stamp it. Information about the research process, where the bottlenecks are and somebody to take staff through the process. Less duplication – at present staff are sorting out funding information on one system and repeating the process on another.</td>
<td></td>
</tr>
<tr>
<td>LA6</td>
<td>Approval and submission of the proposal</td>
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<tr>
<td></td>
<td>Easy physical access to and good, clear communication with people in RIS.</td>
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<td></td>
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<tr>
<td></td>
<td>Seminars about services provided by RIS backed up by a clear website with points of contact.</td>
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</tbody>
</table>
The requirements of Academics/Researchers and those of School Managers/Administrators reflect agreement about the tools they would like and the things they would like improved. For example, for LA2, finding funding, there was a similar need by both groups for greater notification of research calls. BDEs emphasized their desire for greater involvement in the

<table>
<thead>
<tr>
<th>Lifecycle Areas</th>
<th>Generic requirements of academics, researchers and postgraduate students</th>
<th>Requirements of School Managers and School Administrators</th>
<th>Requirements of Central Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA7</td>
<td>Accessible information/training for staff and postgraduates about how different accounts work and on costing system (PFACT). User-friendly, up-to-date, accurate and transparent financial statements</td>
<td>A finance system that’s more layman friendly. Improved project monitoring - items should be entered immediately – even if it’s only a title or a number and start date. Something that informs staff when invoices have been paid Easy way of pulling out statistics rather than holding them in lots of different data bases</td>
<td>Project management tools in proforma and models or samples that academics can choose from with worked examples Systems that are more user friendly - one big browser instead of separate ones that you have to go in and out of.</td>
</tr>
<tr>
<td>LA8</td>
<td>Groups or shared workspaces tailored to needs Shared resources, tools and support sites for software</td>
<td>Evaluatory tools for academics. Central point where you can search for information about all the products and services the University has to offer and with information about who to talk to. Hand and fast rules about forming spin-out companies published on the internet. Any deviation from the published system to be accounted for by documentation.</td>
<td></td>
</tr>
<tr>
<td>LA9</td>
<td>More money for conference attendance.</td>
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</tr>
<tr>
<td>LA10</td>
<td>Information about bigger plans and strategic development of Schools, Divisions and University.</td>
<td>More meetings with RIS to discuss strategy and direction</td>
<td></td>
</tr>
</tbody>
</table>
process so they could provide the value-added element their role required. For LA3, finding collaborators/building relationships, there was a shared desire for collaboration with colleagues and for any tool that could assist the communication between Schools. For LA6, the approval and submission of proposals, both groups expressed a need for greater clarification of who to contact in RIS; for LA7, project administration, both groups wanted a more user-friendly finance system. Finally, there was a plea for more information about the University’s strategic plans (LA10, management of the research portfolio). Schools generally felt ill-informed and excluded from discussions about the direction the University wished to take in terms of the bigger research picture.

Key requirements collected from Central Administrators focused primarily on tools to help the two groups noted above. Thus, they suggested the pro forma provision of project management tools online to help with project administration, LA7. Further, they identified an increasing need for accountability and, therefore, some type of evaluation tool by which academics could measure outcome success, LA9. They also welcomed any tool that would help “disparate groups to do more together,” thus echoing the suggestions of the other two groups for a tool to help with collaboration, LA3. Tools that meet the needs of the other two groups in turn meet the needs of Central Administrators by helping them perform their role in the research process. As far as their own specific needs were concerned, like the other two groups, they requested systems that were more user friendly (LA7, project administration), plus two requirements that would help them to assist academics in achieving satisfactory outcomes. The first of these was a central place online that listed all the services and products the University had to offer together with the name of the relevant academic contact. This would enable Central Administrators to bring together outside agencies and academics and allow discussions about possible work. The second requirement was for online published procedures for the formation of spin-out companies. This would both help ensure that academics conformed to the rules and would eliminate some of the past difficulties that had been encountered by Central Administration.

In terms of requirements that could not be directly defined under a particular Lifecycle Area, several points made by School and Central Administrators were related to research. Some requirements were for greater involvement in the research cycle or for better communication to enable them to carry out their role more efficiently. Technical support managers, not part of the information loop when project proposals are submitted, wanted to be kept informed of the equipment requirements of new projects so they could more effectively allocate time and space. Newly appointed research administrators wanted online guides or locations that new staff would be directed to for information. This would allow them to familiarize themselves as quickly as possible with the University’s procedures and reduce the delays caused by having to make frequent phone calls to find information.

School Administrators, Central Administrators and members of the Graduate School expressed a wish for improved and more transparent communication and a general need for more information. All three groups also mentioned inadequacies in the process of appointing new staff although their actual grievances varied. School Administrators requested an easier system of assigning codes to new staff, Central Administrators wanted vacant posts filled more quickly, and the Graduate School staff requested transition periods between outgoing and incoming staff. Both School Managers/Administrators and Central Administrators felt that School Managers
Articles

were insufficiently utilized. School Managers wanted greater involvement in management meetings and Central Administrators felt that School Managers could be a vital link between Schools and the Centre with the potential to play a useful role in overseeing strategic work. All these requirements were forwarded to the relevant bodies and departments for consideration and possible implementation.

Two things should be noted. First, as previously stated, tensions could arise between the different groups. Second, all groups identified a need for better communication, transparency and clarification of roles. Some of the tensions that exist between groups occur because people are confused about who is doing what, when things will be done and why things have to be done in the first place. Meeting the need for clarity and improved communication may go a long way towards easing any tensions that exist between the groups.

That said, very little dissent about staff in other roles occurred during the focus groups. In fact, Academics were often keen to express an appreciation of the services School and Central Administrators provided for them. It was often the system itself and the lack of resources that they criticized. Likewise, Managers and Administrators expressed an understanding of the time pressures that faced Academics and Researchers and their desire to focus on the science rather than the financial administration of projects. Effective communication can only aid the understanding and empathy each group has for the other.

Developing the VRE

Describing the VRE

As for requirements that fell within the definitions of the 10 Lifecycle Areas, the next stage was to determine which could be delivered electronically and which would need to be forwarded to other departments outside of Information Services. Table 3 shows the combined requirements of the different groups for the 10 Lifecycle Areas with duplications removed, and includes only those requirements that can be delivered electronically as part of a VRE.

Table 3

Combined Requirements of the Different Groups for the 10 Lifecycle Areas that can be Delivered Electronically via a VRE

<table>
<thead>
<tr>
<th>Lifecycle Areas</th>
<th>Combined requirements of academics, researchers, postgraduate students, School Managers/Administrators and Central Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA1 The idea / scoping the context for the research</td>
<td>Access (including off-site) to as many online journals as possible. Direct links to journals through the portal and minimum clicks to actual paper</td>
</tr>
<tr>
<td>Lifecycle Areas</td>
<td>Combined requirements of academics, researchers, postgraduate students, School Managers/Administrators and Central Administrators</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| **LA2** Finding funding | An efficient, uncomplicated, customisable and flexible method of finding funding opportunities  
Efficient focused system of notification of research calls  
A central information resource on open calls and new funding sources.  
BDEs to get all the calls that their academics get. |
| **LA3** Finding collaborators and building relationships | Day-by-day calendar of seminars, lectures, guest speakers and events on campus – with efficient search facility, titles of papers and links to Abstracts.  
Efficient, effective way of finding out staff/PhD students research interests, projects, funders and publications  
School Managers’ chat room to discuss specific problems.  
Shared resources  
Information about what other managers/administrators are up to in other Schools.  
A tool to improve communication and collaboration between Schools |
| **LA4** Creating the proposal - contractual issues, such as IPR | Guidance and expertise online in formulating proposals. Examples of successful and unsuccessful proposals in a relevant field. |
| **LA5** Costing and Pricing | |
| **LA6** Approval and submission of the proposal | Information about who to contact in RIS, who signs off particular projects, who has to rubber stamp it. Information about the research process and a timeline to show where the bottlenecks are  
Some way of transferring funding information from one form to another |
| **LA7** Project administration | User-friendly, up-to-date, accurate and transparent financial statements  
Automatic notification when invoices have been paid  
A system that allows easy extraction of statistics  
Project management tools in pro forma and models or samples with worked examples  
Systems that are more user friendly and that use one browser |
| **LA8** Undertaking the research | Groups or shared workspaces tailored to needs  
Shared resources, tools and support sites for software |
Articles

<table>
<thead>
<tr>
<th>Lifecycle Areas</th>
<th>Combined requirements of academics, researchers, postgraduate students, School Managers/Administrators and Central Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>LA9 Outcomes</td>
<td>Evaluation tools for academics.</td>
</tr>
<tr>
<td></td>
<td>A central point in the University where you can search for information on all the products and services the University has to offer with a named contact.</td>
</tr>
<tr>
<td></td>
<td>Rules about forming spin-out companies with published procedures on the internet.</td>
</tr>
<tr>
<td>LA10 Management of</td>
<td>Information about bigger plans and strategic development of Schools, Divisions and University.</td>
</tr>
<tr>
<td>research portfolio</td>
<td></td>
</tr>
</tbody>
</table>

Implementation

This combined list of requirements provided the team with a priority list in terms of development. Developing tools that meet the requirements from that list provides a win for all Faculties, most Schools and all categories of staff involved in the research process. Other more individual requirements can be developed in the future.

Several requests within LA3, finding collaborators, and LA8, undertaking the research, were for a tool that allowed the sharing of resources and information, something that would facilitate communication and collaboration across and within Schools and Faculties. Developers have responded to this need by providing a wiki facility across the University. This has allowed staff to set up groups and share ideas, comments, documents, data, and even equipment. Groups can be exclusive or inclusive according to need. As the adoption of wikis becomes a more widespread practice across the University, communication and collaboration should be facilitated.

As for the request for more online journals (LA1, scoping the context), the University continues to increase the number of journals available. Realistically the University cannot subscribe to all journals, and there will always be times when staff or students are disappointed that a particular e-journal is not listed. Easy access to all the major databases with direct links to the full text of the most frequently requested journals has been provided. The move towards an increase in electronic resources – e-books for example – has also enabled staff and students not only to access books from home but to access books which previously may have been physically unavailable if they were in use by others.

There were many requests for easier access to staff in Research and Innovation Services (RIS) and, in particular, information about who should be contacted when particular problems arise. Having named contacts can help to reduce the stress involved in proposal submission. RIS has now updated its website to include a clear diagram of its organizational structure and the names of staff in each of the teams together with their job titles or roles. The request for an online document outlining each stage of the submission process with some indication of the amount of time that should be allowed for proposals to be signed off by RIS has been passed on to that department and is currently awaiting completion.
The request for clear rules about the formation of spin-out companies (LA9, outcomes) has been addressed in the new RIS website. It is, however, a detailed document and there may be support for a short summary sheet that draws attention to the key aspects of the process by means of a list of bullet points. Similarly, the University’s Research Strategies and Policies (LA10, management of the research portfolio) are described in detail in a 24-page document on the RIS website. While such a document is an essential communication, some staff did request a shortened version of the University’s Strategy that could be read and absorbed more quickly. Summary documents are an effective way of communicating key information and a useful first stage in getting busy staff involved. Requests for this summary have been forwarded to RIS for their consideration.

Other requirements that have been partially developed include the provision of a search facility for staff’s research interests. At present staff’s electronic profiles, i.e., their research interests, projects and publications, are collated into a database in readiness for Research Assessment Exercise (RAE) submission. Developing this further so that staff can search the database and identify prospective collaborators or simply communicate with others in their field of interest will fulfill many requests logged under LA3.

A day-by-day calendar of events at the University of Nottingham is available to staff and students (LA3, finding collaborators). Further development can provide a higher profile for research-related activities that will include more detail as well as links to abstracts and information about speakers’ backgrounds and areas of expertise.

While some requirements on the list require little more than refinement, development of others has not yet started. Prioritizing which tools to develop is based upon the constraints of time and resources. The team strives to keep users informed about their decision-making processes and the reasons why some requirements have been selected for development while others have been placed in the queue. Honest and transparent communication is an important factor when seeking to maintain the engagement of users and in gaining their acceptance of any decisions made.

What is also important is the need to obtain user feedback on those requirements that have been developed to find out if they meet users’ needs and expectations and whether they require further refinement. This need will be met by administering questionnaires to all those who took part in the study to obtain ideas for further improvements. Effective development is often an iterative process, and user feedback is as important as the initial consultation is to that process.

Conclusion

The aim of this project was to design a VRE for use by the whole of the research community at the University of Nottingham. An in-depth consultation with users from that community was used to discover the kinds of support they felt would most help them in carrying out their role at the University. Analysis of the data allowed the team to draw up a list of requirements that could be supplied electronically and form part of a VRE. A great deal of overlap was found in the requirements suggested by Academics and Researchers, and School and Central Administrators. This overlap allowed the team to formulate a list of development priorities. Many items from that list have now been developed and the team is seeking feedback from users on the usefulness of...
the tools developed. The team believes that it is only through this process of iteration that it can successfully develop a VRE that truly meets the needs of its research community.

An important finding from the project was that users in all roles expressed a need for greater transparency and more effective communication across the University. While this can be facilitated using electronic resources, it does require a commitment at all levels to create a culture of openness and the creation of an explicit communication strategy from which a proper communication plan can be formulated.

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Teaching and Assessing the Responsible Conduct of Research: A Delphi Consensus Panel Report

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Abstract
In an effort to foster research integrity, the National Institutes of Health and the National Science Foundation mandate education of all trainees in the responsible conduct of research (RCR). Nevertheless, recent studies suggest that rates of questionable research practices and scientific misconduct are both high and considerably underreported. In part, this may be due to the fact that some ethical norms (e.g., authorship assignment) are far from clear and researchers are unsure how to respond to perceived misconduct. With funding from the U.S. Office of Research Integrity (ORI), we convened four panels of experts to develop a consensus on the overarching goals and teaching content of RCR instruction. Our panelists recommended nine overarching objectives for RCR instruction that require us to rethink common modes of instruction, and
they identified issues and standards that should be covered within controversial areas such as authorship assignment and whistle-blowing. Additionally, our experts recommended two new core areas for RCR instruction: The social responsibilities of scientists and current topics in RCR.

Keywords: responsible conduct of research, research integrity, research ethics, instruction, training, assessment

Introduction

Responsible Conduct of Research (RCR) education and training too often emphasize rules like “Do not falsify data” or “Do not plagiarize.” These are simple extrapolations of what most researchers learned in kindergarten: lying and stealing are wrong. Reminding researchers of such rules involves stating the obvious, with the result that RCR education and training may be perceived as boring, unnecessary, and ineffective.

However, not all issues in research ethics are so clear-cut. In a survey by Martinson, Anderson, & de Vries (2005) of over 1,700 researchers, 33% reported engaging in so-called “questionable research practices” such as dropping data points from analyses based on a hunch or inappropriately assigning authorship. The example of inappropriate authorship is particularly instructive. First, practices for assigning authorship vary across disciplines (Steneck, 2004). Second, even in a discipline such as medicine, in which international standards have been published (International Committee of Medical Journal Editors, 2007), authorship assignment has not become standardized. A recent review of 234 biomedical journals found that 41% gave no guidance about authorship and only 19% were based on the current criteria of the International Committee of Medical Journal Editors (Wager, 2007). Uncertainty about criteria helps to explain the high rates at which researchers admit to assigning authorship in a questionable manner. Yet, given a lack of standardized criteria within professions, even RCR instructors are uncertain what should be taught in the area of authorship.

While rates of strict research misconduct (data falsification, fabrication, or plagiarism) are much lower than rates of questionable practices, they are also higher than many might assume. A survey by the U.S. Office of Research Integrity (ORI) of researchers holding funding from the National Institutes of Health (NIH) at 605 different institutions, inquired into the number of times researchers had observed suspected research misconduct in their own departments over the previous three academic years (Titus, Wells, & Rhoades, 2008). A total of 2,212 researchers completed the survey (yielding a 51% response rate); they reported observing a total of 201 instances. By extrapolating this rate of observed suspected misconduct —assuming that the 49% who did not respond observed no instances of misconduct — the authors estimated that there are more than 2,300 observations of likely misconduct per year in research funded by the U.S. Department of Health and Human Services (DHHS).

Given that ORI receives an average of only 24 institutional investigation reports per year (approximately 1% of the estimated incidences observed), these numbers suggest the need for RCR education and training — not only to reduce rates of misconduct, but also to provide guidance to researchers in how to respond to observed misconduct. Yet this topic is also controversial. Real-world decisions regarding whistle-blowing are often far more complex (Smith,
2006) and their consequences far more devastating (Couzin, 2006) than ethics textbooks suggest. While it is not sufficient for RCR instructors to remind people of a duty to report misconduct, it is unclear precisely what content or standards should be taught.

In 2000, ORI identified nine core areas that RCR courses should address: (1) data acquisition, management, sharing, and ownership; (2) mentor/trainee responsibilities; (3) publication practices and responsible authorship; (4) peer review; (5) collaborative science; (6) human subjects; (7) research involving animals; (8) research misconduct; and (9) conflict of interest and commitment. While these core areas provide a useful initial framework, there is no evidence of professional consensus that ORI's list includes the most important areas of RCR, nor what content should be taught and assessed within the core areas (Steneck & Bulger, 2007). For example, Pimple (2002) has recommended approaching RCR through the lens of six domains, some of which overlap with the nine core areas, and some of which extend into new areas such as social responsibilities (including fiscal responsibilities, advocacy by researchers, and environmental impact).

RCR trainers may also have different goals in mind: to convey knowledge of right and wrong; to foster professional virtues; to inculcate values that support good science, to raise awareness of ethical issues; to motivate people to do what is right; and — most ambitiously — to improve behavior (DuBois, Ciesla, & Voss, 2001). The behavioral goal is probably the most widely proffered — even if controversial — insofar as ethics instructors frequently begin courses, textbooks, or funding proposals by citing instances of scientific misbehavior, thus implying that RCR training can help prevent such events. In this vein, one leading research administrator writes, "the value of . . . RCR education from an administrative perspective can be summed up in the oft-used adage, an ounce of prevention is worth of pound of cure" (Vasgird, 2007, p. 835).

Two studies examined the content and goals of RCR education and training. In 2005, Heitman and Bulger published a content analysis of 20 RCR textbooks. Content reflected each of ORI’s core areas and became more comprehensive after ORI published its policy on RCR instruction in 2000. The authors also identified gaps in the core areas of compliance, ethics of lab safety, institutional responsibilities, and the role of scientists in society (Heitman & Bulger, 2005). Kalichman and Plemmons (2007) studied the goals of existing education and training programs. They conducted interviews with 50 instructors and identified over 50 distinct goals pertaining to knowledge, skills, attitudes and behavior. They found that actual educational goals varied widely across instructors.

These two studies reinforce the need to pursue consensus on RCR instruction. On the one hand, important gaps appear to exist in RCR textbooks (e.g., institutional responsibilities and the role of scientists in society), while on the other, the study of actual education and training programs identified over 50 distinct educational goals, which varied widely across instructors. Add this to the vagaries surrounding authorship and whistle-blowing, and a muddy picture of the goals and content of RCR instruction emerges.

Whereas these previous studies examined the goals or content of existing RCR education and training programs and materials, our project sought to establish a consensus among experts on what RCR education and training should look like. We addressed four specific questions:
Articles

1. What should be the overarching goals of RCR training (e.g., knowledge, problem-solving skills, or virtue)?

2. Are the nine core areas of RCR instruction identified by ORI complete, or should additional core areas be addressed?

3. Within the core areas, what specific content should be taught?

4. What objectives and content should be assessed?

Methods: Delphi Expert Panels

About Delphi Consensus Panels

One way of developing recommendations for a field is to convene a diverse panel of experts to engage significant questions. Such an approach is regularly used by the U.S. National Academies of Science to address questions in the fields of engineering, medicine, and science. With funding from ORI we used an online Delphi panel process to foster an expert consensus. Delphi panels involve administering a questionnaire to groups of individuals across several rounds with the aim of identifying shared evaluations or recommendations (Ferguson, 2000). Key elements of the Delphi process are a structured flow of information, controlled feedback to participants, statistical analysis of responses, and participant anonymity. Interactions among panel members are controlled by a coordinator, who filters feedback and organizes data for subsequent presentation in the next round. The Delphi method maximizes the benefits of group decision-making while the anonymity of the process minimizes limitations such as domineering group members, personality conflicts, or groupthink (Delbecq, Van de Ven, & Gustafson, 1975). Other advantages to an online Delphi method include its relatively inexpensive cost and convenience for participants, who can access the survey at any time of day.

Delphi Panel Procedures

Because few people possess expertise in all areas of RCR, we formed four separate expert panels. Each panel worked independently and simultaneously. Our Delphi process involved multiple rounds of questioning. Round 1 consisted of an open-response format. Panelists were directed to one of four websites corresponding to their panel assignment(s), where responses were collected in text-boxes.

Our Objectives panelists were asked: (1) What should be the overarching educational objectives of RCR instruction; and (2) Are the nine core areas of RCR instruction complete, or should new core areas be addressed within RCR instruction?

Scientific Data panelists were asked: Within RCR instructional programs, what specific topics should be taught and assessed in the areas of: (1) Data acquisition, management, sharing and ownership; and (2) Research misconduct?

Scientific Relationships panelists were asked: Within RCR instructional programs, what specific
topics should be taught and assessed in the core areas of: (1) Mentor/trainee responsibilities; (2) Collaborative science; and (3) Conflicts of interest and commitment?

*Scientific Publications* panelists were asked: Within RCR instructional programs, what specific topics should be taught and assessed in the core areas of: (1) Publication practices and responsible authorship; and (2) Peer review?

We excluded from our project two of ORI’s nine core areas for RCR instruction: human subjects and animals. There were several reasons for this: (1) Institutional Review Boards and Institutional Animal Care and Use Committees typically mandate ethics training that is separate from general RCR training; (2) the scope of these core areas is very large (thus excluding them made the project more manageable); (3) it appears that significant consensus exists on what needs to be covered in such courses; and (4) these areas do not comprise ORI’s primary areas of focus for education and oversight.

After all participants had completed round 1, their responses were carefully condensed, re-worded and organized into topics and subtopics to enhance clarity and prevent redundancy. Round 2 involved presenting panelists with the revised lists of topics they had generated and asking them to rate on a four-point scale the importance of teaching each topic in an RCR course: 1 = Unimportant, 2 = Less important, 3 = Important, and 4 = Very important. Panelists were also asked to make additional comments about the wording or clarity of each item.

Topics receiving a vote of “Important” or “Very Important” from at least two-thirds of panelists were deemed to meet consensus criteria and were presented to panelists in the next round, after they were revised according to the panelists’ comments. Topics not meeting consensus are displayed in the tables below, with their corresponding consensus values and mean scores.

Round 3 added to Round 2 by re-asking panelists the importance of teaching each item, and also asked panelists to rate the importance of assessing each item within an RCR course. Assessment rankings followed the same four-point scale used in the previous round. We asked separately about the importance of teaching and of assessing goals and content because we believed instructors might think some material is worth teaching without the need to assess learning (e.g., historical cases taught simply to provide context).

In each round, we asked panelists to prescind from whether it is feasible to assess a goal or topic and to focus on the importance alone.

**Recruitment**

We recruited experts for our panels during October and November 2006. The three rounds were conducted from November 2006 through June 2007. Recruitment began with: (1) a literature search to identify authors actively researching and publishing in RCR; (2) a review of ORI Annual Reports from 2000 through 2005 to identify those who received ORI contracts and grants; and (3) a review of recent research administrative and RCR conference programs to identify those who had presented on relevant topics. Based on these activities we generated a list of experts with overarching knowledge of RCR, many of whom provide RCR training.
Additionally, we produced a list of Chief Research Officers, scientific journal editors, and pre- and post-doctoral trainees who we believed would be interested in participating in our consensus project. From the resulting list of possible panelists, the Project Director, in consultation with ORI, selected those who were both qualified to serve on a particular panel and who represented diverse backgrounds. Recruitment letters were sent to these individuals, asking them to volunteer without compensation for a total of 1.5 hours (30 minutes for each round) per panel, over approximately nine months. Those who declined participation, but represented a subgroup of interest, were asked to provide a recommendation for another possible participant.

Overall, 41 individuals served as panelists on either one or two panels, participating in at least two of three rounds on any particular panel. (Individuals selected to serve on the Objectives panel were also asked to serve on one of the remaining three panels — Scientific Data, Scientific Relationships, and Scientific Publications.) The project retained nearly all experts across three rounds of questionnaires. The Objectives panel had 18 total panelists, with 16 to 18 panelists participating in any given round. The Scientific Data panel had 13 panelists with 12 to 13 participating per round; Scientific Relationships had 14 panelists with 12 to 14 participating per round; and Scientific Publications had 13 panelists with 10 to 12 participating per round.

**Compliance**

This project was presented to the Institutional Review Board at Saint Louis University, which concurred with the project director that the project did not constitute research because it was aimed at producing a consensus among experts rather than generalizable knowledge. The participants were experts serving on a panel seeking consensus on recommendations (akin to serving on a committee of the National Academies of Sciences).

**Results**

We defined a consensus as two-thirds of panelists supporting a rating of important or very important. What follows are highlights of our findings.

**New Core Areas**

The Objectives panel initially proposed several possible new core areas of RCR instruction. These are listed in Table 1. The panel reached a consensus on two new core areas: *Social Responsibilities of Researchers* and *Current Issues in RCR*. Because consensus on these new core areas only emerged through the process itself, the panelists were unable to propose content for these new areas, as they did with the pre-existing ORI-recommended core areas. However, some of our expert panelists have independently described in publications possible content that could be covered under such headings (Bulger & Heitman, 2007; Kalichman, 2002; Pimple, 2002). For example, under “social responsibilities,” Pimple (2002) includes research priorities, fiscal responsibilities, public service, public education, advocacy by researchers, environmental impact, and forbidden knowledge. Under current topics, a wide variety of issues might be discussed. For example, in today’s environment, instructors might want to discuss NIH policy on stem cells or the relationship between science and politics.
Table 1

Proposed Additional Core Areas

<table>
<thead>
<tr>
<th>Core Area</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. The financial and operational responsibilities of Principal Investigators</td>
<td>50 (2.56)</td>
</tr>
<tr>
<td>2. Social responsibilities of researchers</td>
<td>89* (3.28)</td>
</tr>
<tr>
<td>3. Historical background in responsible conduct of research</td>
<td>61 (2.72)</td>
</tr>
<tr>
<td>4. Current issues in responsible conduct of research</td>
<td>89* (3.28)</td>
</tr>
<tr>
<td>5. Lab safety and environmental health</td>
<td>56 (2.72)</td>
</tr>
<tr>
<td>6. Philosophy of science, including roles of bias and world views in science</td>
<td>39 (2.50)</td>
</tr>
</tbody>
</table>

Legend:

* = Item achieved a “consensus” by receiving a rating of important or very important from two-thirds of panelists

† = Not applicable because these items were eliminated after round 2 and their importance of being assessed was not measured

Objectives of RCR Training

Table 2 presents nine overarching objectives that the panel agreed should be taught in RCR training programs. Panelists supported assessing four of these nine objectives: fostering understanding of the importance of RCR and the consequences of misbehavior; examining how ethics may go beyond compliance with regulations; fostering sensitivity to ethical issues; and developing ethical problem-solving skills.

Table 2

Overarching Educational Objectives for RCR Instruction

<table>
<thead>
<tr>
<th>Topics (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. Understand the importance of RCR</td>
<td>94* (3.59)</td>
</tr>
<tr>
<td>a. Know the history of research, including historical examples of research misconduct and unethical conduct</td>
<td>82* (3.29)</td>
</tr>
<tr>
<td>b. Understand the social context of research</td>
<td>94* (3.29)</td>
</tr>
</tbody>
</table>
### Articles

<table>
<thead>
<tr>
<th>Topics (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c. Consider consequences of unethical conduct in research for self, institution, science, and society</td>
<td>Teaching: 100* (3.83) Assessing: 89* (3.22)</td>
</tr>
<tr>
<td>2. Identify sources of RCR regulations and policies</td>
<td></td>
</tr>
<tr>
<td>a. Federal regulations</td>
<td>Teaching: 83* (3.22) Assessing: 61 (2.78)</td>
</tr>
<tr>
<td>b. State laws</td>
<td></td>
</tr>
<tr>
<td>c. Institutional policies</td>
<td></td>
</tr>
<tr>
<td>3. Examine limitations of RCR regulations and policies and variations in standards across fields, institutions, and labs</td>
<td>Teaching: 83* (3.17) Assessing: 61 (2.83)</td>
</tr>
<tr>
<td>a. Understand that regulations permit discretion and creative problem solving</td>
<td></td>
</tr>
<tr>
<td>b. Understand that regulations require discretion and creative problem solving</td>
<td></td>
</tr>
<tr>
<td>c. Understand that regulations do not cover all ethical responsibilities</td>
<td></td>
</tr>
<tr>
<td>4. Understand key distinctions within the field of RCR</td>
<td></td>
</tr>
<tr>
<td>a. Distinctions within ethics, such as ethically obligatory, prohibited, and praiseworthy actions</td>
<td></td>
</tr>
<tr>
<td>b. Distinction between ethical and regulatory duties</td>
<td></td>
</tr>
<tr>
<td>c. Distinction between research misconduct and questionable research practices</td>
<td></td>
</tr>
<tr>
<td>5. Foster research integrity or professional character</td>
<td></td>
</tr>
<tr>
<td>a. Motivate morally good action</td>
<td></td>
</tr>
<tr>
<td>b. Inculcate professional values such as pursuit of truth, honesty, intellectual humility</td>
<td></td>
</tr>
<tr>
<td>6. Foster ethical sensitivity or the ability to identify ethical issues in the conduct of research</td>
<td></td>
</tr>
<tr>
<td>a. Identify common ethical issues such as those addressed within the core areas of RCR</td>
<td></td>
</tr>
<tr>
<td>b. Identify threats to RCR, including pressures in the research institution and personal bias</td>
<td></td>
</tr>
<tr>
<td>c. Distinguish between ethical responsibilities in research versus other professional activities such as education or clinical care</td>
<td></td>
</tr>
<tr>
<td>7. Develop ethical problem-solving skills</td>
<td></td>
</tr>
<tr>
<td>a. Knowledge of relevant ethical frameworks, theories or principles</td>
<td></td>
</tr>
<tr>
<td>b. Ability to identify key elements of an ethical situation, including stakeholders, relevant ethical and legal norms, relevant facts, and options</td>
<td></td>
</tr>
<tr>
<td>c. Ability to critically reason using ethical principles or values</td>
<td></td>
</tr>
</tbody>
</table>
**Instructional Content**

Within the seven core areas of RCR instruction that we examined, the panels achieved a consensus on the importance of teaching 43 main topics (with 0-6 specifications of content within each main topic). They supported assessing learning in 21 of these 43 main topics.

Tables 3-9 provide results from the three panels dedicated to ORI’s core areas of RCR instruction (See Appendix A). To illustrate the topics identified, within the core area of publication practices and responsible authorship, the panelists identified nine main topics instructors should address: the significance of authorship; authorship assignment; inappropriate authorship practices; dealing with controversies surrounding authorship; scientific responsibilities of authors; poor publication practices; protecting privacy in publications; addressing the study’s ethical compliance within articles; and responsible disclosure of scientific information within the popular press. Within most of these areas, further subtopics were recommended. For example, under the controversial topic of “authorship assignment” our panel arrived at a consensus that RCR courses should address: criteria for authorship (including substantial intellectual contribution to the study or paper and familiarity with and approval of the final text); the ideal of transparent contributions (i.e., descriptions of authors’ roles on the paper); how to deal with multiple authors; the appropriateness of discussing authorship at the outset of a project; the purpose and examples of acknowledgements versus authorship; and discussion of variations of published standards and norms across disciplines. Similarly, within the general topic of “responding to misconduct,” panelists identified several specific issues that should be addressed: the responsibilities of whistleblowers; the evidence needed to report misconduct; protections for whistleblowers; and alternatives to whistle-blowing, including illustrations of good and poor responses to observed misconduct.
Conclusions

Based on our review of the literature, our project appears to be the first attempt to convene a large group of experts to determine the ideal objectives and content of RCR instruction and assessment.

The project is limited in that it reflects the consensus among specific individuals; were different individuals selected, our consensus would likely be different. Moreover, we asked experts to consider RCR instruction in general — regardless of the trainee populations. If given the opportunity, experts might recommend different educational objectives or topics for undergraduate science students versus independent investigators.

Despite its limitations, our project reflects the consensus of individuals with considerable expertise, and ORI is exploring ways to disseminate our findings and recommendations to RCR instructors. We believe our results may guide the development and quality improvement of RCR education and training programs in several ways.

First, our results provide instructors with guidance in developing content for RCR curricula. For example, our project identified issues and standards that should be addressed across disciplines within controversial areas such as authorship attribution and whistle-blowing. This may help investigators who feel uncertainty regarding what to teach in the current absence (described above) of clear professional standards in some areas like authorship. Certainly the nine major topics recommended by the panel on publication practices would provide a useful starting point. Moreover, they may empower authors themselves in dealing with others on matters of authorship and acknowledgements, particularly in interdisciplinary research, where standards may vary.

Our experts further proposed two new core areas for RCR instruction: social responsibilities of researchers and current issues in RCR. Insofar as some popular training programs have limited their treatment of topics to the nine core areas originally proposed by ORI in 2000, this development may encourage the teaching of a variety of new topics such as research priorities, fiscal responsibilities, advocacy by researchers, or the relationship between science and politics.

Second, our panels identified important knowledge that should be assessed. Student performance on corresponding test items might provide an important measure of how well a course or training program fosters relevant knowledge and concepts.

Third, and most importantly, our project produced a list of objectives for RCR instruction that transcends the rote knowledge of regulations and basic societal expectations. For example, our panel believed that RCR instruction and education should foster integrity or professional character, examine how ethics may exceed compliance with regulations, and develop ethical problem-solving skills. These objectives may be described as promoting the development of researchers as individuals of integrity, ultimately contributing to the creation of a culture of ethics and integrity that goes beyond minimum compliance or risk management. Consider, for example, the matter of informed consent. Currently, no regulations require formal assessment of the decisional capacity of potential research participants. Yet arguably, an investigator of integrity who seeks to transcend mere compliance will recognize the need to ensure that participants understand consent information and will have the problem-solving skills to identify what options
exist for assessing capacity and to recognize which options best fit particular circumstances.

These more robust objectives may have far-reaching consequences for how RCR training is provided. As Kalichman (2007) observes, “active learning modalities are more effective than passive learning . . . We are more likely to internalize and understand new information when challenged to do something with it than when someone simply tells us what we ‘should’ know” (p. 872). Yet formal RCR instruction is often restricted to passive online reading or lecture formats. While such instructional formats may foster rote knowledge, we question whether they are well suited to fostering professional character, ethical problem-solving skills, and other higher-order objectives. In contrast, instructional methods that provide a framework for reasoning through complex ethical dilemmas — particularly dilemmas or cases that are relevant to day-to-day work—are most effective in fostering moral reasoning and ethical decision-making skills (Bebeau, 1995; Kligyte, Marcy, Sevier, Godfrey, & Mumford, 2008).

Given the extensiveness of the content and the complexity of the objectives our experts recommended for RCR instruction, it is unlikely that any single education or training intervention will meet all of the goals. We recommend that, in addition to offering generic instruction on RCR aimed at knowledge of many topics, institutions develop education and training programs tailored to the population they serve (Heitman & Bulger, 2005; Kalichman, 2007). The Council of Graduate Schools’ (2006) recent report on Graduate Education for the Responsible Conduct of Research explicitly recommended such a two-tiered approach to RCR instruction, noting that “graduate students respond best to RCR training that is directly relevant to their experience as graduate students” (p. 25). Such specialized courses might be less comprehensive even as they are more relevant and engaging, perhaps focusing more on the development of high-order skills as described above. Most importantly, formal RCR instruction should be only one component in the overall project of fostering research integrity. Other components include: mentoring; the institutional climate; the establishment, communication, and enforcement of clear policies by institutions, funding agencies, and journal editors; and codes of ethics from professional societies (Adams & Pimple, 2005; Institute of Medicine & National Research Council, 2002; Macrina, 2007). In combination with formal RCR training, such efforts might eventually achieve some of the loftier goals our panels set for the field of science.

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### Appendix A:
**Tables on Proposed Content for Core Areas of RCR Instruction**

**Table 3**

*Proposed Content for “Data Acquisition, Management, Sharing and Ownership”*

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. Ethical values behind the scientific standards for data acquisition, management, sharing, and ownership</td>
<td>92* (3.58)</td>
</tr>
<tr>
<td>a. Confidentiality and privacy</td>
<td>100* (3.67)</td>
</tr>
<tr>
<td>b. Trustworthiness, honesty, and transparency</td>
<td>100* (3.75)</td>
</tr>
<tr>
<td>c. Right to property or to prosper from work</td>
<td>58 (2.67)</td>
</tr>
<tr>
<td>d. Scientific collegiality and virtue of sharing</td>
<td>100* (3.50)</td>
</tr>
<tr>
<td>e. Value of having regulations and standards</td>
<td>75* (3.25)</td>
</tr>
<tr>
<td>2. Variations in lab practices—legitimate and illegitimate variations</td>
<td>92* (3.42)</td>
</tr>
<tr>
<td>3. Data acquisition issues</td>
<td>100* (3.82)</td>
</tr>
<tr>
<td>a. Informed consent or permission to gather or use data</td>
<td>100* (3.83)</td>
</tr>
<tr>
<td>Articles</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>b. Sampling and data selection</td>
<td>100* (3.75)</td>
</tr>
<tr>
<td>c. Verifying and cleaning data</td>
<td>100* (3.67)</td>
</tr>
<tr>
<td>4. Data storage, protection, and archiving</td>
<td>92* (3.50)</td>
</tr>
<tr>
<td>a. Techniques for entering, storing, and archiving data</td>
<td>64 (2.82)</td>
</tr>
<tr>
<td>a. Data storage longevity (how long to save data and what format)</td>
<td>83* (3.17)</td>
</tr>
<tr>
<td>b. Data protection and backup</td>
<td>92* (3.25)</td>
</tr>
<tr>
<td>c. Unique issues pertaining to special kinds of data, such as tissue, DNA, photographic data</td>
<td>92* (3.33)</td>
</tr>
<tr>
<td>5. Data Sharing</td>
<td>100* (3.50)</td>
</tr>
<tr>
<td>a. How and when data should be shared, advantages and disadvantages</td>
<td>100* (3.50)</td>
</tr>
<tr>
<td>b. Transferring data</td>
<td>64 (2.55)</td>
</tr>
<tr>
<td>c. Acceptable and unacceptable uses for shared data</td>
<td>100* (3.45)</td>
</tr>
<tr>
<td>6. Legal aspects of data ownership and rights</td>
<td>92* (3.58)</td>
</tr>
<tr>
<td>a. Ownership of data, patents, copyrights, and intellectual property</td>
<td>83* (3.50)</td>
</tr>
<tr>
<td>b. Institutional versus research rights to own and use data</td>
<td>92* (3.50)</td>
</tr>
<tr>
<td>c. Commercially useful data</td>
<td>100* (3.58)</td>
</tr>
<tr>
<td>d. Negotiating contracts</td>
<td>33 (2.50)</td>
</tr>
<tr>
<td>7. Data privacy</td>
<td>100* (3.50)</td>
</tr>
<tr>
<td>a. HIPAA and other privacy rules</td>
<td>67* (3.50)</td>
</tr>
<tr>
<td>b. HIPAA and other privacy standards</td>
<td>55 (2.91)</td>
</tr>
<tr>
<td>c. Confidentiality protection techniques</td>
<td>100* (3.42)</td>
</tr>
<tr>
<td>8. Scientific methodology issues, including research design, objectivity, and bias</td>
<td>92* (3.67)</td>
</tr>
<tr>
<td>a. Importance of research design</td>
<td>100* (3.75)</td>
</tr>
<tr>
<td>b. Elements of good scientific design and methodology</td>
<td>100* (3.75)</td>
</tr>
<tr>
<td>c. Proper use versus abuse of statistics</td>
<td>100* (3.75)</td>
</tr>
<tr>
<td>d. Challenges to maintaining objectivity in designing research questions, controlling bias</td>
<td>92* (3.58)</td>
</tr>
<tr>
<td>9. Data reporting</td>
<td>100* (3.75)</td>
</tr>
<tr>
<td>a. Ethical issues when reporting data in publications</td>
<td>92* (3.67)</td>
</tr>
<tr>
<td>b. Responsibility to interpret findings appropriately to diverse audience, scientific and otherwise</td>
<td>100* (3.58)</td>
</tr>
<tr>
<td>10. Special issues related to scientific roles</td>
<td>82* (3.18)</td>
</tr>
<tr>
<td>a. Obligations of students to supervise their own data collection efforts</td>
<td>64 (2.91)</td>
</tr>
<tr>
<td>b. Roles and relationships among team members</td>
<td>92* (3.25)</td>
</tr>
<tr>
<td>c. Who has the authority to make data related decisions</td>
<td>92* (3.25)</td>
</tr>
</tbody>
</table>
Legend:

* = Item achieved a “consensus” by receiving a rating of important or very important from two-thirds of panelists

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Table 4

Proposed Content for “Mentor/Trainee Responsibilities”

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. Definitions and expectations of the mentor/trainee relationship</td>
<td>100* (3.75)</td>
</tr>
<tr>
<td>a. Defining research advisors, mentors, and trainees—across a variety of settings including degree programs, postdoctoral training, and jobs</td>
<td>42 (2.50)</td>
</tr>
<tr>
<td>b. Boundaries of the mentor/trainee relationship</td>
<td>100* (3.58)</td>
</tr>
<tr>
<td>2. Power relationships and the potential problems they involve</td>
<td>100* (3.58)</td>
</tr>
<tr>
<td>a. Power structures and hierarchical relationships within science and the mentor-trainee relationship</td>
<td>92* (3.33)</td>
</tr>
<tr>
<td>b. Friendships and mentoring relationships</td>
<td>42 (2.50)</td>
</tr>
<tr>
<td>c. Harassment, sexual and other types</td>
<td>67* (3.08)</td>
</tr>
<tr>
<td>3. Scientific responsibilities of the mentor</td>
<td>100* (3.42)</td>
</tr>
<tr>
<td>a. Promoting professional research skills, including identifying research questions, writing proposals, conducting research, and publishing</td>
<td>92* (3.17)</td>
</tr>
<tr>
<td>b. Fostering research compliance (IRB, IUCUC, etc.), RCR, and integrity</td>
<td>100* (3.58)</td>
</tr>
<tr>
<td>c. Finding funding and negotiating grants and contracts</td>
<td>33 (2.25)</td>
</tr>
<tr>
<td>d. Sharing discipline-specific wisdom on how to operate in the field</td>
<td>33 (2.33)</td>
</tr>
<tr>
<td>4. Non-scientific responsibilities or roles of the mentor</td>
<td>67* (2.92)</td>
</tr>
<tr>
<td>a. Career counseling, including trainees with science and non-science career goals</td>
<td>42 (2.42)</td>
</tr>
<tr>
<td>b. Conflict resolution</td>
<td>67* (3.00)</td>
</tr>
<tr>
<td>c. Fostering autonomy with trainees while accomplishing mentor’s goals</td>
<td>67* (2.92)</td>
</tr>
<tr>
<td>d. Management skills</td>
<td>42 (2.50)</td>
</tr>
<tr>
<td>5. Responsibilities of trainees within the mentor-trainee relationship</td>
<td>100* (3.42)</td>
</tr>
<tr>
<td>a. Work with integrity</td>
<td>100* (3.42)</td>
</tr>
<tr>
<td>b. Willingness to blow whistle or challenge misconduct and questionable conduct</td>
<td>100* (3.50)</td>
</tr>
<tr>
<td>6. How to get the most out of the mentor/trainee experience</td>
<td>58 (2.67)</td>
</tr>
</tbody>
</table>
### Articles

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>a. Optimal characteristics of mentors and trainees</td>
<td>58 (2.58)</td>
</tr>
<tr>
<td>b. Effective mentoring strategies and characteristics</td>
<td>83* (3.08)</td>
</tr>
<tr>
<td>c. Contracting for a good mentoring relationship</td>
<td>33 (2.33)</td>
</tr>
<tr>
<td>7. Addressing challenges and problems in the mentor-trainee relationship</td>
<td>100* (3.25)</td>
</tr>
<tr>
<td>a. Conscientious refusal</td>
<td>58 (2.58)</td>
</tr>
<tr>
<td>b. Importance of clear communication of expectations</td>
<td>100* (3.25)</td>
</tr>
<tr>
<td>c. Dealing with diversity of cultures, races, and other personal traits</td>
<td>92* (3.25)</td>
</tr>
</tbody>
</table>

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---

### Table 5

*Proposed Content for “Publication Practices and Responsible Authorship”*

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. The significance of authorship</td>
<td>91* (3.45)</td>
</tr>
<tr>
<td>a. The benefits of publishing</td>
<td>40 (2.70)</td>
</tr>
<tr>
<td>b. The problems of inappropriate authorship for legitimate authors, illegitimate authors, and science</td>
<td>91* (3.45)</td>
</tr>
<tr>
<td>2. Authorship assignment</td>
<td>91* (3.36)</td>
</tr>
<tr>
<td>a. Authorship criteria</td>
<td>91* (3.55)</td>
</tr>
<tr>
<td>i. Substantial intellectual contribution to study or text</td>
<td>100* (3.64)</td>
</tr>
<tr>
<td>ii. Familiarity with and approval of the final text</td>
<td>82* (3.36)</td>
</tr>
<tr>
<td>b. Ideal of transparent contributions</td>
<td>73* (3.00)</td>
</tr>
<tr>
<td>c. Multiple authors: how to determine senior/first author</td>
<td>82* (3.36)</td>
</tr>
<tr>
<td>d. Appropriateness of discussing authorship at outset of a project</td>
<td>91* (3.64)</td>
</tr>
<tr>
<td>e. Acknowledgments: purpose and examples (including faculty contributions to students work)</td>
<td>90* (3.40)</td>
</tr>
<tr>
<td>f. Variation of standards and norms across disciplines</td>
<td>82* (3.00)</td>
</tr>
<tr>
<td>Topic (Subtopics indented)</td>
<td>Percentage of panelists rating item as “important” or “very important” (Mean score)</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>3. Inappropriate authorship practices</td>
<td></td>
</tr>
<tr>
<td>a. Ghost authorship</td>
<td>73* (3.36)</td>
</tr>
<tr>
<td>b. Forced or “courtesy” authorship, e.g., when students are asked to add authors for political reasons</td>
<td>73* (3.27)</td>
</tr>
<tr>
<td>4. Dealing with controversies that arise in authorship</td>
<td>82* (3.36)</td>
</tr>
<tr>
<td>5. Scientific responsibilities of authors</td>
<td>91* (3.73)</td>
</tr>
<tr>
<td>a. Disclosure of funding sources and other sources of potential bias</td>
<td>100* (3.82)</td>
</tr>
<tr>
<td>b. Specification of any deviations from standard scientific practices</td>
<td>91* (3.55)</td>
</tr>
<tr>
<td>c. Full and accurate description of methods, procedures and analytic techniques that allows repetition</td>
<td>91* (3.64)</td>
</tr>
<tr>
<td>d. Citation of relevant literature without bias</td>
<td>100* (3.55)</td>
</tr>
<tr>
<td>e. Duty to report findings accurately and completely, including reporting critical or negative findings (even if they are contrary to own research agenda)</td>
<td>100* (3.73)</td>
</tr>
<tr>
<td>6. Poor publication practices</td>
<td>91* (3.45)</td>
</tr>
<tr>
<td>a. Plagiarism versus proper citation or paraphrasing</td>
<td>100* (3.73)</td>
</tr>
<tr>
<td>b. Delay in reporting for commercial reasons</td>
<td>70* (2.80)</td>
</tr>
<tr>
<td>c. Publication bias</td>
<td>100* (3.36)</td>
</tr>
<tr>
<td>d. Text recycling; overlapping publication; duplicate and salami publication</td>
<td>100* (3.55)</td>
</tr>
<tr>
<td>e. Quality standards</td>
<td>91* (3.27)</td>
</tr>
<tr>
<td>7. Protecting privacy in publication</td>
<td>60 (3.00)</td>
</tr>
<tr>
<td>8. Addressing compliance with ethical standards within articles (e.g., mentioning IRB or IACUC approval, and discussing ethically controversial elements of a study)</td>
<td>100* (3.18)</td>
</tr>
<tr>
<td>9. Responsible disclosure of scientific information within the popular press</td>
<td>60 (2.60)</td>
</tr>
</tbody>
</table>

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Table 6

*Proposed Content for “Peer Review”*

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. The significance of peer review</td>
<td>100* (3.64)</td>
</tr>
<tr>
<td>a. Peer review as a mechanism for quality assurance in publication and funding</td>
<td>100* (3.18)</td>
</tr>
<tr>
<td>b. The need for reviewers to be competent and genuine peers</td>
<td>91* (3.36)</td>
</tr>
<tr>
<td>2. Conflicts of Interest and Peer Reviews</td>
<td>100* (3.73)</td>
</tr>
<tr>
<td>a. Identifying potential conflict of interest reviewers may have</td>
<td>100* (3.73)</td>
</tr>
<tr>
<td>b. Managing conflicts of interest by excusing oneself from a review or disclosing and managing the conflict with the assistance of those directing the review</td>
<td>100* (3.82)</td>
</tr>
<tr>
<td>c. Other sources of peer review bias</td>
<td>82* (3.09)</td>
</tr>
<tr>
<td>3. Qualities of a good review/reviewer</td>
<td>82* (3.36)</td>
</tr>
<tr>
<td>a. Respecting confidentiality and intellectual property (e.g., by avoiding use of information and destroying manuscripts after review)</td>
<td>91* (3.27)</td>
</tr>
<tr>
<td>b. Fairness and objectivity</td>
<td>91* (3.55)</td>
</tr>
<tr>
<td>c. Collegiality—conveying a respectful and professional tone while offering critical feedback</td>
<td>80* (3.20)</td>
</tr>
<tr>
<td>d. Timeliness</td>
<td>82* (3.18)</td>
</tr>
<tr>
<td>e. Providing clear, scientifically competent, and complete reviews</td>
<td>91* (3.27)</td>
</tr>
<tr>
<td>4. Logistics of peer reviewing</td>
<td>50 (2.40)</td>
</tr>
<tr>
<td>a. Format of written review</td>
<td>30 (2.20)</td>
</tr>
<tr>
<td>b. Peer review process</td>
<td>60 (2.70)</td>
</tr>
<tr>
<td>c. Selection of reviewers</td>
<td>50 (2.60)</td>
</tr>
<tr>
<td>5. Responding to reviewers</td>
<td>82* (3.18)</td>
</tr>
<tr>
<td>a. Responding to competent reviews: the revision and resubmission process</td>
<td>60 (2.60)</td>
</tr>
<tr>
<td>b. Responding to questionable, biased, or conflicted reviews: the roles of authors (PIs), editors, and scientific review chairs</td>
<td>91* (3.18)</td>
</tr>
<tr>
<td>c. Inappropriate responses to reviewers and modifications to publications or proposals</td>
<td>60 (2.50)</td>
</tr>
<tr>
<td>6. Reviewer roles in ensuring RCR</td>
<td>82* (2.91)</td>
</tr>
<tr>
<td>7. Editorial responsibilities</td>
<td>55 (2.73)</td>
</tr>
<tr>
<td>a. Selecting appropriate reviewers</td>
<td>55 (2.73)</td>
</tr>
<tr>
<td>b. Attending to matters of RCR (proper authorship, disclosure of bias and conflicts, etc) – 2.70</td>
<td>60 (2.70)</td>
</tr>
<tr>
<td>c. Respecting rights of rebuttal and mediating disputes</td>
<td>60 (2.60)</td>
</tr>
<tr>
<td>d. Maintaining confidentiality</td>
<td>64 (3.00)</td>
</tr>
</tbody>
</table>
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Table 7

Proposed Content for “Collaborative Science”

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. The nature and advantages of successful collaborations</td>
<td></td>
</tr>
<tr>
<td>a. Reasons for collaborating</td>
<td>83* (3.17)</td>
</tr>
<tr>
<td>b. Risks and benefits of collaborations</td>
<td>58 (2.83)</td>
</tr>
<tr>
<td>c. Identifying a good collaborator</td>
<td>75* (3.08)</td>
</tr>
<tr>
<td>2. Types of collaboration</td>
<td></td>
</tr>
<tr>
<td>a. Collaboration within an institution</td>
<td>63 (2.73)</td>
</tr>
<tr>
<td>b. Collaboration between institutions</td>
<td>63 (2.73)</td>
</tr>
<tr>
<td>c. International collaboration</td>
<td>58 (2.83)</td>
</tr>
<tr>
<td>3. Working well with others</td>
<td></td>
</tr>
<tr>
<td>a. Identifying the authority and procedures for establishing collaborative relationships</td>
<td>92* (3.00)</td>
</tr>
<tr>
<td>b. Defining and clarifying roles, responsibilities, and expectations in a collaboration</td>
<td>100* (3.42)</td>
</tr>
<tr>
<td>c. Identifying mechanisms for ongoing decision-making</td>
<td>75* (2.92)</td>
</tr>
<tr>
<td>d. When are written agreements necessary, and what should be addressed in contracts</td>
<td>92* (3.25)</td>
</tr>
<tr>
<td>e. Knowing how and when to end collaborative relationships</td>
<td>83* (3.00)</td>
</tr>
<tr>
<td>4. Dealing with challenges in collaborative relationships</td>
<td></td>
</tr>
<tr>
<td>a. Addressing failures in RCR or research integrity</td>
<td>83* (3.33)</td>
</tr>
<tr>
<td>b. Allocating rewards such as credit, authorship, ownership, and rights of use</td>
<td>100* (3.58)</td>
</tr>
<tr>
<td>c. Dealing with competition</td>
<td>50 (2.58)</td>
</tr>
<tr>
<td>d. Addressing power discrepancies when junior scientists collaborate with senior scientists</td>
<td>75* (3.00)</td>
</tr>
<tr>
<td>5. The role of institutions in collaborative science</td>
<td></td>
</tr>
<tr>
<td>a. Working with appropriate officers</td>
<td>50 (2.58)</td>
</tr>
<tr>
<td>b. Knowledge of institutional policies</td>
<td>83* (3.08)</td>
</tr>
</tbody>
</table>
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**Table 8**

**Proposed Content for “Research Misconduct”**

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. Significance of misconduct</td>
<td>100* (4.00)</td>
</tr>
<tr>
<td>a. History of scientific misconduct</td>
<td>82* (3.00)</td>
</tr>
<tr>
<td>b. Incidence rate of misconduct</td>
<td>58 (2.58)</td>
</tr>
<tr>
<td>c. Consequences of misconduct for individuals, laboratories, science, and society</td>
<td>100* (3.64)</td>
</tr>
<tr>
<td>2. Factors that contribute to scientific misconduct</td>
<td>100* (3.73)</td>
</tr>
<tr>
<td>a. Effects of laboratory environment</td>
<td>100* (3.64)</td>
</tr>
<tr>
<td>b. Reward systems in academic and industry settings</td>
<td>100* (3.45)</td>
</tr>
<tr>
<td>3. Plagiarism</td>
<td>100* (3.91)</td>
</tr>
<tr>
<td>a. Definition and examples</td>
<td>100* (3.73)</td>
</tr>
<tr>
<td>b. Case studies with outcomes and punishments</td>
<td>83* (3.18)</td>
</tr>
<tr>
<td>4. Falsification</td>
<td>100* (4.00)</td>
</tr>
<tr>
<td>a. Definition and examples</td>
<td>100* (3.82)</td>
</tr>
<tr>
<td>b. Case studies with outcomes and punishments</td>
<td>100* (3.60)</td>
</tr>
<tr>
<td>5. Fabrication</td>
<td>100* (4.00)</td>
</tr>
<tr>
<td>a. Definition and examples</td>
<td>100* (3.82)</td>
</tr>
<tr>
<td>b. Case studies with outcomes and punishments</td>
<td>100* (3.55)</td>
</tr>
<tr>
<td>6. Other serious deviations from scientific best practices</td>
<td>80* (3.22)</td>
</tr>
<tr>
<td>a. Sabotage</td>
<td>58 (3.00)</td>
</tr>
<tr>
<td>b. Questionable research practices (e.g., data manipulation)</td>
<td>100* (3.55)</td>
</tr>
<tr>
<td>c. Unintentional deviations</td>
<td>100* (3.45)</td>
</tr>
<tr>
<td>7. Regulations and policies addressing misconduct</td>
<td>82* (3.40)</td>
</tr>
<tr>
<td>a. The Office of Research Integrity’s role in addressing misconduct</td>
<td>92* (3.18)</td>
</tr>
<tr>
<td>b. Institutional policies</td>
<td>92* (3.36)</td>
</tr>
<tr>
<td>8. Responding to observed misconduct</td>
<td>100* (3.91)</td>
</tr>
</tbody>
</table>
Table 9

Proposed Content for “Conflicts of Interest and Commitment”

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>1. The significance of conflicts of interest</td>
<td>100* (3.73)</td>
</tr>
<tr>
<td>a. Historical examples of conflicts of interest in science</td>
<td>50 (2.58)</td>
</tr>
<tr>
<td>b. Psychology and conflicts of interest, i.e., how conflicts of interest may cloud judgment or influence decisions</td>
<td>83* (3.33)</td>
</tr>
<tr>
<td>c. The pervasiveness of conflicts of interest, including sponsored research</td>
<td>83* (3.25)</td>
</tr>
<tr>
<td>d. Consequences of conflicts for researchers, institutions, students and research participants</td>
<td>92* (3.33)</td>
</tr>
<tr>
<td>e. Why conflicts of interest are pervasive and not always bad</td>
<td>83* (3.42)</td>
</tr>
<tr>
<td>2. Types, definitions, and examples of conflicts of interest</td>
<td>100* (3.55)</td>
</tr>
<tr>
<td>a. Financial conflicts of interest, including gifts and honoraria, patents, spin off companies, SBIR/STTRs, personal investments, funding contracts with industry</td>
<td>92* (3.58)</td>
</tr>
<tr>
<td>b. Non-financial conflicts of interest (e.g., recognition, publications, promotions)</td>
<td>58 (2.67)</td>
</tr>
<tr>
<td>c. Role conflicts (e.g., physician-researcher or teacher-researcher) and conflicting duties to self, clients, institutions and society</td>
<td>75* (3.08)</td>
</tr>
<tr>
<td>d. Conflicts of interest are objective relationships—they do not imply actual or intended wrong doing</td>
<td>83* (3.00)</td>
</tr>
</tbody>
</table>
### Articles

<table>
<thead>
<tr>
<th>Topic (Subtopics indented)</th>
<th>Percentage of panelists rating item as “important” or “very important” (Mean score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching</td>
</tr>
<tr>
<td>3. Conflicts of commitment (i.e., dividing one’s percent effort within a job)— definition, examples, and management</td>
<td>58 (2.67)</td>
</tr>
<tr>
<td>a. Effort reporting rules</td>
<td>58 (2.67)</td>
</tr>
<tr>
<td>b. Balancing sponsored research with other duties</td>
<td>58 (2.67)</td>
</tr>
<tr>
<td>c. The perils of becoming over extended</td>
<td>67* (2.92)</td>
</tr>
<tr>
<td>4. Institutional conflicts of interest</td>
<td>50 (2.58)</td>
</tr>
<tr>
<td>a. Conflicted oversight (e.g., IRB and IACUC members are employees who review work of peers)</td>
<td>42 (2.50)</td>
</tr>
<tr>
<td>b. Institutional investments and profits from research</td>
<td>42 (2.42)</td>
</tr>
<tr>
<td>5. Managing conflicts of interest</td>
<td>100* (3.50)</td>
</tr>
<tr>
<td>a. Avoiding or eliminating conflicts of interest</td>
<td>100* (3.25)</td>
</tr>
<tr>
<td>b. Disclosing conflicts of interest / conflicts of interest and informed consent</td>
<td>100* (3.58)</td>
</tr>
<tr>
<td>c. Management plans, including, e.g., role separation</td>
<td>42 (2.67)</td>
</tr>
<tr>
<td>6. Conflicts of interest law and policy</td>
<td>50 (2.58)</td>
</tr>
<tr>
<td>a. Regulatory and statutory laws</td>
<td>50 (2.75)</td>
</tr>
<tr>
<td>b. Institutional policies on conflicts of interest</td>
<td>82* (3.27)</td>
</tr>
</tbody>
</table>

Legend:

* = Item achieved a “consensus” by receiving a rating of important or very important from two-thirds of panelists

\* = Not applicable because these items were eliminated after round 2 and their importance of being assessed was not measured.
Faculty Perspectives on Academic Work and Administrative Burden: Implications for the Design of Effective Support Services

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Authors’ Note
This paper includes highlights from a faculty workload study conducted by the Faculty Standing Committee of the Federal Demonstration Partnership (FDP), Washington, D.C. The authors acknowledge the contributions made by the committee members to that study, including Robert Decker, PhD (Principal Investigator), Joseph Konstan, PhD (Chair, Faculty Standing Committee), and Nancy Wray, PhD (Administrative Representative, Faculty Standing Committee).

Abstract
This paper uses literature on faculty worklife and findings from a recent study conducted by the Federal Demonstration Partnership (FDP) to shed light on the sources and extent of administrative burden experienced by faculty engaged in federal grant research. Discussion focuses on the implications for research administrators, including strategies for designing faculty support services that take into account a variety of factors that motivate academic engagement.

Keywords: Research productivity, sponsored research, research administration, academic workload

Introduction
Around the world, higher education institutions face significant fiscal pressure and escalating costs. At many institutions, researchers are under increased pressure to obtain funded-project revenue as a way of counteracting a decline in government allocations for higher education (Gumport, 1997; Santos, 2007), with such involvement often seen as a key metric of individual
faculty activity and performance. Moreover, heightened demands for accountability, increased competition for research grants, expanded demands on faculty time, and growing complexity and costs related to administering the research enterprise are among the challenges that make achieving institutions’ research missions increasingly difficult. It is now commonplace for researchers to collaborate with institutions from multiple countries and even continents. As a result of the increased complexity and scope of research programs, offices of sponsored research have had to adapt to help researchers and their institutions win and manage funding, add value to the research mission and work toward continuous development of the institutional portfolio. There can be little doubt that research and its administration is an increasingly complex endeavor, one which poses opportunities and challenges to those involved in its leadership, administration and delivery.

The environment in which universities function today demands that the institutions’ research enterprise be both efficient and effective. This article seeks to support this goal by describing the results of a study exploring faculty responsibilities and burdens related to ensuring research compliance. Several research questions guide this inquiry, including: How efficient are faculty members able to be when conducting research? What assistance do they receive from administrative and support personnel in ensuring research compliance? Is this assistance effective? To what extent are relationships between administrators and researchers helping or hindering the research enterprise? What recommendations do faculty members offer for increasing their research productivity?

As a foundation for understanding the results of this study and related implications, it is worthwhile to first consider challenges faculty members face. These challenges include a lengthening work week, expanding demands on their time, and increasing stress levels (Gappa, Austin, & Trice, 2007). A review of literature related to these topics may be helpful in understanding how faculty researchers frame the concept of administrative burden. This review will also explore how the role of the research administrator has changed in recent years, and how these changes may have altered the nature of the relationship between faculty and administrators as they work together to fulfill their institutions’ research missions.

Faculty Work Life

One challenge faced by faculty is a lengthening work week. Faculty at nearly every type of institution are spending more time engaged in research, teaching and preparing for teaching than they have in the past (Bentley & Blackburn, 1990; Dey, Milem, & Berger, 1997; Milem, Berger, & Dey, 2000). Although the U.S. Office of Management and Budget (OMB) continues to limit the budgeting of faculty grant effort to a 40-hour work week, research shows that faculty typically average 45 to 56 hours (Cataldi, Bradburn, & Fahimi, 2005; Conley, 2002). The percentage of faculty members who report working more than 55 hours a week grew from 13% in 1972 to 47% in 2003 (Bayer, 1973; U.S. Department of Education, 2004). Despite this level of investment, many faculty feel dissatisfied with the time they have available to stay current in their fields (U.S. Department of Education, 2004).

The expansion of faculty roles in recent years has gone a long way toward lengthening the work week. Faculty today are called upon to incorporate new technologies into their teaching, to be
available to students and colleagues through email and other technologies at any time, to engage with their surrounding communities in more meaningful ways, to conduct more assessment in the classroom, to become more entrepreneurial in securing funding for their work, and to effectively teach an increasingly diverse body of students (Gappa et al., 2007). These expanding demands are occurring at the same time that faculty are being hired into a wider variety of appointment types. At most institutions this means that a shrinking proportion of tenure-track faculty is responsible for covering the majority of governance and service duties.

Given lengthening work weeks and expanding demands on time, it is not surprising that faculty stress levels are high. According to Lindholm, Szelenyi, Hurtado, & Korn (2005), 66% of faculty members report institutional procedures and red tape as a source of stress. Longer work weeks are also reflected in the fact that a majority of faculty report managing household responsibilities (74%), lack of personal time (74%), and their physical health (51%) as additional sources of stress.

Minority and female faculty members report particularly high stress levels in some areas. Ethnic and racial minorities are likely to experience higher levels of stress related to subtle discrimination and research or publishing demands compared to Caucasians (Hendel & Horn, 2005). They are also significantly more likely to intend to leave their careers or institutions than Caucasians (Rosser, 2004). Women, compared to men, report experiencing significantly higher levels of stress related to teaching loads, time pressure, lack of personal time, subtle discrimination, and research or publishing demands. Women also tend to report lower levels of satisfaction than men with their opportunities for scholarly pursuits. (Hagedorn, 2000; Hendel & Horn, 2005; Hult, Callister, & Sullivan, 2005)

Many of these areas of dissatisfaction and stress take on particular significance in light of research related to job satisfaction. First, research administrators instinctively know that equitable access to campus resources and work-related satisfaction go hand in hand for most faculty members (Gappa et al., 2007; Hult et al., 2005; Johnsrud & Rosser, 2002; Rosser, 2004). Salary, staffing, working conditions, and the resources available to accomplish one's work are all tangible commodities that affect how appreciated and supported faculty members feel at their institutions. Several resources identified as being of particular value include secretarial and office support, technical support, library services, availability of materials, teaching and graduate assistants, and support for both professional development and research activities (Johnsrud & Des Jarlais, 1994; Olsen, 1992; Wimsatt, 2002). Sources of support can vary dramatically by college, department, and even by individual faculty member, and such perceived inequities can be demoralizing (Kerlin & Dunlap, 1993).

In addition to valuing equitable access to the resources necessary to do good work, faculty members need to feel respected by those with whom they work (Gappa et al., 2007). Research indicates that positive interactions with and support from the institution's administration is related to faculty satisfaction (Hult et al., 2005; Iiacqua, Schumacher, & Li, 1995). In addition, support from the chair and “humane treatment by the dean” (Donohue, 1986) positively influence work satisfaction (Olsen, Maple, and Stage, 1995). Research outside the realm of higher education also supports the pivotal role that respect plays in work satisfaction (Alderfer, 1972; Campbell & Koblenz, 1997; Herzberg, 1966; Maslow, 1970).
Issues of adequate support and respect for individual faculty members take on more importance as the tasks related to conducting funded research continue to grow broader and often more cumbersome. Faculty research involves a variety of related activities, including planning and performing studies and experiments, analyzing data, developing new models and theories, advising and supervising students at all academic levels as they conduct research, and collaborating with research colleagues. Research activities also include disseminating results to the public by writing journal articles and conference papers, presenting at conferences and technical meetings, and giving seminars.

In addition to these direct research activities, faculty researchers also undertake indirect activities that enable and support their research projects (e.g., managing personnel, purchasing equipment and laboratory supplies, complying with institutional rules and state and federal laws that govern research). Further, faculty collectively commit substantial effort to research-related service activities such as organizing professional meetings, peer-review of research articles and grant proposals, and service on compliance committees and panels. Such activities put faculty members in sustained touch with new research and with the best work that is being done both in and beyond their disciplines (Teagle Foundation, 2007). They also commit to tasks intended to guarantee effective use and stewardship of sponsor funding, such as writing periodic scientific progress reports, providing financial reports, and certifying the effort of research personnel.

These indirect research activities comprise an additional set of burdens that may reduce the time available to conduct research. Rutherford and Langley (2007) note that a major challenge facing research administrators is to ensure that institutional missions remain focused on relieving the academic community of administrative burdens despite distractions created by “the day-to-day development of system requirements and specifications” (p. 92). Previously, Rose (1991) encouraged research administrators to base programmatic decision-making on the specific “needs and desires” of researchers and not to lose sight of the need to facilitate the research process (p. 26).

The Faculty/Research Administrator Relationship

Developing and maintaining effective partnerships between faculty and research administrators is a critical issue if both are to be in a position to do their best work. Colleges and universities may initially appear as havens of consensus to those on the outside, but cooperative relationships between faculty and administrators are sometimes difficult to achieve (Welsh & Metcalf, 2003). Academic and administrative cultures are two separate and, in many respects, competing domains (Birnbaum, 1988; Morphew, 1999; Rice, Sorcinelli, & Austin, 2000) with different implicit models of the shared work environment (Del Favero, 2005; Peterson & White, 1992). An international survey of the academic profession conducted between 1991 and 1993 confirmed significant (and nearly universal) alienation of faculty from administrators in 14 countries (Altbach & Lewis, 1995). Less than half of the faculty felt informed about what was happening on their campuses, and close to half characterized communication with administrators as poor. Very few faculty members expressed an interest in taking on more administrative responsibilities.

“Faculty feel accountable to a body of knowledge, to a tradition of inquiry, and to accepted methods of investigation and instruction. In the minds of faculty, these obligations are different...
than those that other enterprises exact from their staffs” (Pew Higher Education Research Group, 1996, p. 6). Faculty value scholarship while administrators value practical matters such as organizational efficiency and accountability (Blackburn & Lawrence, 1995). Scholars tend to be autonomous and individualistic in their work. In contrast, administrators are perceived as having a focus on bureaucratically defined institutional needs. As such, they frequently take the needs of the collective into account when engaged in decision-making. Administrators are more likely to interact with external stakeholders, which also makes them more receptive to external aspirations for higher education (Schilling & Schilling, 1998). Tension between administrators and faculty is inherent in these differences. The challenge is for those involved to explore ways to break down these defined prejudices and seek to ensure that both researchers and their administrators work in partnership. Research administration should involve more than clerical functions and institutions should encourage such professionalization whenever possible (Langley, 2007).

In the past, research administrators were responsible for searching for funding sources, requesting guidelines, preparing budgets, and sending out proposals. Now, however, the administrator’s role has expanded to include interpreting, creating and implementing policy (Vargas & Hanlon, 2007). Administrators are also called upon to develop strategic alliances and manage risk as it relates to research compliance (Langley & Ofosu, 2007). Research administrators need to recognize the importance of helping faculty understand why change is taking place in order to improve receptiveness (Rutherford & Langley, 2007).

Research administrators and faculty must adapt and work together to bridge academic and administrative cultures if both are to be served effectively. Disconnection and division must be avoided because they weaken the ability of faculty and administrators to work toward a collective purpose and increase the likelihood of creating a culture of resistance among faculty (Koslowski, 2007; Pew Higher Education Research Group, 1996). Expectations for institutional effectiveness activities are often presented by administrators as common sense appeals for improvement and accountability, yet can be perceived by faculty as attacks on tenure and academic freedom, or as selling out to business ideologies and governmental bureaucracies (Ryan, 1993).

**Faculty Research Burden**

During the fall of 2005, the Faculty Standing Committee of the Federal Demonstration Partnership (FDP) teamed with FDP member institutions to undertake a study of the sources and extent of administrative burden among faculty managing federal research grants. Measures of burden were collected from faculty employed at the traditionally busiest federal research institutions. Prior to this, few large-scale studies had been conducted to investigate the federal research grant administration process from the perspective of faculty. The FDP funded this baseline study of burden to develop recommendations to the federal government for maximizing the time spent by faculty on active research while maintaining regulatory accountability and compliance.

**Methodology**

The 2005 FDP Faculty Workload Study randomly sampled 23,325 research faculty at member institutions to explore the extent to which they experienced burden associated with the
administration of their federally funded grant research (Decker, Wimsatt, Trice, & Konstan, 2007). The aim of the study was to help institutions and federal agencies develop new strategies for making federally funded research more efficient and productive without sacrificing accountability and compliance with federal regulations. Key findings from the study are highlighted below.

The FDP questionnaire was based on an extensive review of the literature on faculty research productivity and funded project involvement, as well as collective input from the FDP Faculty Standing Committee. Wherever possible, items were included from faculty surveys previously conducted by other federal agencies and research organizations (e.g., NCES 2002; HERI 2003). The questionnaire consisted of 20 items and several sub-items. It was designed in an online format that allowed for both forced choice and written responses.

The Internet-based survey instrument was piloted by 72 FDP faculty researchers employed at 13 FDP-member institutions. Included in the online pilot survey were a series of pre- and post-award administrative tasks. Information from the pilot study informed the revision of the survey instrument and administration of the full study, which was hosted by the Survey Sciences Group of Ann Arbor, Michigan. Invitation to participate in the full study was limited to a random sample of full-time faculty members who held federally funded research grants during the 2004-05 academic year and were employed as assistant, associate, or full professors at FDP member institutions. The survey instrument was sent to the institutions in October 2005 and responses were returned by mid-December. The survey was self-administered and self-paced.

A total of 6,081 faculty employed at 69 of 99 FDP member institutions responded to the survey, representing response rates of 37.4% for faculty and 69.6% for institutions. The item completion rate was 87.1%. Statistical analyses were completed during the spring of 2006. An SPSS statistical software program was used to code and analyze the data, distributions were produced, and chi-square and analyses of variance were used to compare responses. Significance levels of p<.001 were highlighted in the final report (Decker et al., 2007).

While the response rate limited the ability to generalize the results beyond the FDP respondent group, the study has provided first-of-a-kind feedback from faculty at the nation’s leading research universities. The resulting dataset contained measures of administrative burden, individual and institutional characteristics, workload, time allocations, and perceptions of work climate. The results of the final study mirrored the initial pilot study in several respects, with seven of the top burdens identified in the pilot emerging as significant burdens in the full study. Detailed questions about grant proposal writing were removed from the final study because such tasks are not eligible for federal research grant support. However, this task was recognized as a major burden by faculty involved in the initial pilot and was also identified as a major drain on faculty research time in the final study.

Results

Due to the criteria for sample selection, the FDP respondent group consisted of more research-oriented and senior-level faculty members than many previous studies of instructional faculty worklife conducted at the national level by the U.S. Department of Education. Hard sciences
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(e.g., biological/life sciences, health sciences, physical sciences) and engineering faculty employed at institutions with more than $200 million in federal-grant funding dominated this response group, with faculty reporting an average of $434,753 in total direct-cost funding (median $213,000). Many worked at institutions associated with medical schools. Almost half held active grants funded by the National Institutes of Health and approximately one-third by the National Science Foundation. A slight majority (54%) were professors, 24% associate professors, and 22% assistant professors. Sixty-seven percent of the respondents were tenured, 68% were male, and 77% were White, Non-Hispanic.

Results of the FDP study suggest that faculty are spending large amounts of time on administrative duties related to federal grant management that they could otherwise be devoting to active research. The findings further suggest that faculty burden is cumulative, and that the sheer volume of burdensome tasks is growing past the point of reasonable management by many researchers.

FDP study respondents reported that about 38% of their work weeks went toward federally funded grant projects. Of the time committed to federal research, 42% was devoted to pre- and post-award administrative activities – not to active research. The time devoted to administrative tasks was divided almost equally between pre-award (writing/submitting proposals and budgets, applying for approvals, developing protocols, drafting safety/security plans) and post-award tasks (purchasing supplies/equipment, supervising budgets, managing personnel, complying with regulations, monitoring safety/security plans, writing reports).

Six of the twenty-four administrative tasks related to federal grant management took away “a moderate amount” to “a great deal” of research time. From a list of specific administrative tasks, faculty respondents identified the following as the most time consuming (in rank order): (1) grant progress report submissions; (2) personnel hiring; (3) project revenue management; (4) equipment and supply purchases; (5) IRB protocols and training; (6) training personnel and students; and (7) personnel evaluations. However, faculty reporting the greatest level of burden (i.e., those who experienced at least some level of burden from each administrative task) felt that a broader group of burdens took considerable time away from their active research: (1) IRB protocols and training; (2) IACUC protocols and training; (3) training personnel and students; (4) grant report submissions; (5) IRB compliance issues; (6) IACUC compliance issues; (7) personnel hiring; (8) project revenue management; (9) HIPAA compliance; (10) subcontracting and collaborations; (11) safety planning and monitoring; and (12) equipment and supply purchases.

When examined by institutional characteristics (e.g., Carnegie classification, public/private affiliation, federal funding level), there was no substantial variation in the time faculty spent on pre-award tasks, but faculty at private institutions reported spending less time than those at public institutions on post-award responsibilities. Financial responsibilities created significantly more burden for faculty at public institutions than for those at private institutions, particularly payroll issues, budget transfers, cost accounting, cost-sharing agreements, project revenue management, spending authority oversight, and subcontracting and collaboration. Those at private institutions reported greater burden linked to conflict of interest, laboratory safety
and inventory, and animal and human subjects use (IACUC, IRB, HIPAA), perhaps due to differences in institutional policies and procedures for ensuring compliance.

Although the differences were not always large, burden among underrepresented minority and Asian/Pacific Islander faculty exceeded burden experienced by White, Non-Hispanic faculty across more than two-thirds of the measures. Women also reported significantly higher levels of burden than men on more than half of the administrative tasks and they spent significantly less time on active research.

Most faculty reported receiving “very little” or “some” assistance with all 24 administrative tasks included in the FDP survey. They reported the most assistance with financial tasks, such as payroll issues, budget transfers, cost accounting, cost-sharing agreements, project revenue management, spending authority oversight, and subcontracting and collaboration.

Ninety-five percent of respondents reported that they could devote more time to active research if they had greater support with administrative tasks. In addition, 95% reported that at least some of the time they spent managing federal grants could be conducted by administrative personnel, and 76% were willing to reallocate direct costs to provide for research-required administrative support. On average, faculty believed that approximately 28% of their grants-management time could be handled by administrative personnel. Women estimated that they would recover a significantly greater number of research hours than did men if allowed additional support. Women also indicated a willingness to allocate a significantly greater percentage of direct costs to such an effort than men if given the opportunity. These gender differences remained significant after controlling for academic rank.

Just over 200 faculty provided additional comments regarding the need to improve support for grant proposal development and award processes. Faculty expressed frustration at the time that it takes to prepare and submit grant proposals, especially given current limitations on funding availability.

Likewise, 140 faculty contributed comments about their reactions to burden created by IRB, HIPAA, and IACUC compliance:

“I will never do another study involving human subjects again, and I am someone who helps administer IRB policies on my campus.”

“The total impact of the regulatory burden, e.g., IRB, HIPAA, and conflict of interest, are several orders of magnitude greater than when I began clinical research in 1981. These changes over the past 25 years have reduced by ~50%, the amount of research that gets done. The inefficiency is a major factor in my decision to discontinue clinical research next year (2006) and focus on health services research.”

“The major time issues involve approvals and paperwork required by on campus offices (such as IACUC) that cannot be dealt with by an administrator. I spend a large amount of my time responding to their requests ‘for clarification’ and ensuring that my paperwork actually makes it through their bureaucracy.”
Almost 90 faculty raised issues about the relationship between indirect cost recovery allocations and their need for assistance:

“. . . [V]ery little money trickles down from indirect costs to pay for secretarial and administrative costs for individual scientists.”

“In the face of NIH cutbacks, I am facing my division shifting more grant administrative tasks back to me. I am strongly committed to continuing my research but am very concerned that I am not receiving enough return on my indirects to support the administration of my grants.”

“. . . [W]ithout an increase in funds (either direct or indirect), the problem of eroding the time spent in research will not be solved. One potential solution, given the restraints in funding, is to designate a portion of the indirect costs specifically for support of the administrative needs of individual investigators and require institutions to document that those funds are going to support individual investigators (as opposed to getting swallowed up by general university ‘overhead,’ which is so far over the heads of faculty that it is of no direct benefit).”

Additional comments focused on the role of institutional regulations in creating burden:

“Our institution places a great deal of regulatory burden on investigators that is NOT required by the federal government. The modular budget for NIH grants, for example, is an excellent policy but doesn’t help us here because our University requires detailed budgets.”

“The university paperwork is overwhelming and the greatest deterrent to time on research.”

“The university concern about federal auditing requirements has increased our work load noticeably in the past few years.”

Another set of statements referred to the issue of lost productivity:

“I calculate that I waste 35-40 percent of my time doing work that could be done by others. Ultimately this slows down my current research and potential research productivity.”

“As it is, most investigators use their lab techs to perform many administrative duties; as much as 50 percent of a lab tech’s time is spent in this fashion for a given grant. This is time taken away from productive research.”

The following comments reflected variation in the types and quality of assistance available to faculty across campuses:

“I am fortunate enough to have a technician paid for by the college. This relieves me from many of the burdens noted — such as safety plans, safety training, reporting, ordering, etc. I could not survive without this support.”

“I believe that my institution and department provide much of the services that I need to
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administer grants — the problem is that the quality is not that good.”

“I actually take more issue with the existing institutional ‘support’ for administrative tasks. It is often not support at all and is often inefficient as well as ineffective. Written policies that are not comprehensible, that change frequently without notice, and the impossibility of obtaining consistent responses to questions necessitating multiple submissions of the same documents for approval, etc., waste a good deal more of my time than the actual requirements imposed by federal funding sources.”

“There does not seem to be a system of best practices for central grant administration, which could help substantially. The people involved could benefit from better training. They could also significantly benefit from automation. They are far too dependent on tedious manual vs. computer-based processes. Manually signed forms are required — digital signatures are not used, as they have been for many years in industry.”

“. . . [A]s the fed demands have gone up, the university has not provided any help.”

A few respondents raised the issue of burden created by conducting international research and hiring international students. Others expressed concern about technology support and funding required to manage research projects, particularly issues related to regular computer maintenance, acquisition of software licenses and upgrades, extending networking capabilities, and creating backup protections.

Overall, the findings suggest that the stress of working in a research environment enveloped by declining federal support for research and increasing demand for compliance appears to be taking its toll on our nation’s top researchers. By combining findings from the literature on faculty worklife and the FDP study, the following discussion will explore steps that can be taken by research administrators to facilitate more effective use of academic research time.

Discussion

The results of the studies presented in this article, when considered in the aggregate, shed light on the sources and extent of administrative burden experienced by faculty engaged in federal grant research. A number of clear messages are conveyed by these findings.

First, it is evident that faculty are spending substantial amounts of time on administrative duties related to grant management, and subsequently less time than they want to spend on active research. Grant proposal writing and the cumulative burden of administrative tasks consume much of this time. This finding highlights the need to create new types of organizational support structures that expedite the completion of academic research tasks. One approach could involve the provision of funds to underwrite faculty release time and/or reduced workloads for faculty involved in sponsored research projects.

However, a major problem with the administrative compliance and burden issue is not simply the time involved, but what this pressure does to erode faculty motivation and creativity. If left unchecked, such pressures can have a negative impact on the research enterprise by driving the best faculty and students away from scientific careers. Time spent conducting research also ties
into article publication rates, which has implications for the career advancement of emerging researchers (Chen, Gupta, & Hoshower, 2006). Goldberg and Lyons have warned that “academic research is often encumbered by the secondary or tertiary influence of regulations and policies intended to do something else” (1990, p. 3). The challenge facing research administrators is how to reduce this burden and provide support while ensuring compliance.

The FDP findings parallel those of a study involving 32 senior faculty employed by several major research universities, all of whom received at least $1 million in federal research funding (Cole, 2007). In that study, reduction in the time researchers spend with administrative paperwork was rated a top priority, as was the reduction in bottlenecks linked to financial accounting, the reporting of grant funds, and timelier purchasing. Recent interviews involving the heads of eight university research groups in Germany suggest that the issue of burden is not unique to the United States. In that study, burden resulting from administrative tasks was identified as a key inhibitor of research efficiency and knowledge creation (Wang, Peters, & Guan, 2006).

Some institutional approaches to ensuring compliance are seen by faculty as more burdensome than others, and these perceptions vary depending upon the institutional contexts in which they work. Administrators should consider how a review of best practices might inform their construction of institutional regulations. For example, one approach might involve the study of peer institutions to compare IRB, HIPAA, and IACUC policies and procedures. Focus groups and interviews could also be conducted to gather information on which to base the reshaping of institutional guidelines, with input provided by a variety of campus stakeholders, including appropriate compliance administrators, department chairs, and principal investigators.

Indirect cost allocations are also of concern, given reports of hardship created by inconsistent policies for disbursement. In the FDP study, 89 faculty members made specific mention of the need to remedy the allocation of indirect cost returns, with a reasonable portion going toward faculty and department support of the associated research. Davis and O’Hanlon (1992) surveyed education deans working at 78 research universities and also found that indirect funds were handled quite differently within and across institutions. Some funds were returned to the generating departments or faculty members while others were used for purposes such as unit equipment purchases and travel. The study of 32 faculty conducted by Cole (2007) similarly identified the importance of supporting researchers by returning a significant yet reasonable portion of indirect costs to colleges, departments, and principal investigators.

Research burdens and administrative approaches to addressing them also vary considerably across institutions. According to the FDP faculty, some institutions are doing a better job than others in terms of reducing burden and providing support. In that study, a majority of respondents felt that they received the most assistance with financial tasks – which implies that support in this area is the most uniformly developed or established across FDP member institutions. Unfortunately, little is known about the situation at non-FDP member institutions with less research-intensive missions.

What additional support or services should research administrators provide to faculty? Although not a specific focus of the FDP study, faculty reported grant writing as the most burdensome task among those who participated in the pilot survey, and faculty in the final study provided over
200 unsolicited comments about proposal development and processing on their returned surveys -- which included no items about proposal writing. This parallels earlier findings identified by Boyer and Cockriel (1998) in their study of funded project development, wherein lack of training and knowledge in grant proposal development were identified as barriers to faculty involvement. Their research involving 248 tenured and non-tenured faculty revealed that barriers to grant seeking and writing varied in importance based on the length and type of appointment held by faculty.

To address this need, research administrators may want to consider traditional approaches to training such as grant writing workshops, the distribution of resource information and newsletters, and the funding of off-campus workshops hosted by federal and state agencies (Mishler, 1989). However, faculty members today have limited amounts of discretionary time to devote to professional development sessions. As a result, it is critical that those involved with research administration restructure the delivery systems used to transmit this kind of information, and to thoroughly evaluate the effectiveness and efficiencies of new approaches as well as incentives and disincentives for faculty involvement.

Faculty comments included in the FDP report indicate that heightened international activity among researchers may call for the development of a more global research management function. In response, research offices may want to explore the utility of partnering with other entities on campus to assist with paperwork linked to international research projects and the hiring of international students. Enabling technologies that facilitate collaboration are also becoming essential to the research enterprise, thereby increasing the need for regular computer maintenance, acquisition of software licenses and upgrades, extension of networking capabilities, and creation of backup protections.

Results of the FDP study suggest that experience of burden and levels of assistance vary by race, ethnicity and gender. The FDP report states that although the differences were not always large, women reported significantly higher levels of burden than men on more than half of the administrative tasks and that women spent significantly less time on active research. They also reported significantly less administrative assistance than males on a number of different tasks. Burden among underrepresented minority and Asian/Pacific Islander faculty exceeded burden experienced by White, Non-Hispanic faculty across more than two-thirds of the FDP measures.

Gender differences with regard to institutional support have been documented in previous studies of faculty (Hopkins, 1999; Monahan, 1993). When compared to Caucasian faculty, those underrepresented in the academy and within specific fields of research are also known to experience higher levels of stress related to conducting research and publishing (Hendel & Horn, 2005). Allowing adequate indirect funding to cover administrative support may, therefore, have important implications for women and underrepresented faculty seeking to more efficiently and effectively manage their research programs. The availability of research mentors and personalized training opportunities would also seem to be of critical importance. Such initiatives can be designed to work in tandem with other campus programs to encourage the recruitment and retention of female and underrepresented minority researchers.

With regard to support, the majority of FDP researchers perceived that they received relatively
little assistance with burdensome tasks. These findings parallel those of previous studies in which faculty reported receiving research assistance on a relatively infrequent basis (Monahan, 1993; Onyefulu & Ogunrinade, 2005). The results pose a variety of interesting questions, such as:

1. Was support provided but the FDP faculty respondents failed to appreciate the extent to which it was handled “behind the scenes?”
2. Was support provided but not the right type of support, or at a sufficient level?
3. Was support provided but rated poorly by the FDP faculty? If so, was this due to a general discontent with campus administrators, or did the institutional climate for research seemed overly compliance-oriented rather than service-focused?
4. Was support available but they did not know the extent of it?
5. Was support available but faculty in the FDP study did not go out of their way to use it?
6. Was support not available?

These questions highlight the importance of cultivating solid working relationships and open communication between faculty researchers and administrators. Faculty members need to have some way of knowing about the scope and content of tasks undertaken by their campus research offices. Lack of knowledge about such processes inevitably leads to lack of appreciation for the services provided. Rutherford and Langley (2007) stress the importance of keeping the campus community informed about any changes that have been implemented, recognizing that change and its impact on the morale of both faculty and research administrators should not be underestimated.

Past research indicates that faculty value (and now require assistance with) grant proposal and budget preparation as well as access to streamlined procedures for timely proposal review, mentoring and critiquing support, and a climate for research administration that conveys a sense of service as its central purpose (Cole, 2007). Faculty members value equitable access to the resources necessary to do good work, and they also have a need to feel respected by those with whom they work (Gappa et al., 2007). Vargas and Hanlon (2007) recommend gaining trust by ensuring that faculty members’ basic needs are met and building relationships by showing genuine interest in their research. Because scholars tend to value efficiency and accountability to a lesser degree than administrators (Blackburn & Lawrence, 1995), building cooperative relationships between the two groups can sometimes be difficult (Altbach & Lewis, 1995; Welsh & Metcalf, 2003). In order to bridge any faculty-administrator “disconnects” that may exist, research administrators should try to communicate in a way that lets faculty know that they are supporting work toward a common goal. Communication is a two way process, however, and faculty invariably need to improve outreach and nurture relationships across the administrative functions of their institution. It is not uncommon for research administrators to operate in a ‘blame culture,’ which serves no one. Ross (1990) has noted that “the relationship between research administrators and research scientists is a key variable in determining the success of an organization’s research endeavor” (p. 5).
Institutional leaders may want to explore whether existing methods of campus communication fit the needs of their faculty. Researchers require timely access to information about the types of support services offered on campus, and this information should be presented using formats, venues, and language that are easily accessed and understood by non-administrators. Focus group discussions and interviews with faculty researchers could be used to gather innovative suggestions. Academic deans and department chairs could assist with internal dissemination of research office information. Information about resources and services could be provided at new faculty orientation as suggested by Mishler (1989).

If faculty are aware of existing support services on their campuses, to what extent are they taking advantage of this assistance? Is the right type of assistance provided, and at appropriate levels? Past research suggests that faculty overwhelmed with administrative duties may not have time to seek research support (Davis & O’Hanlon, 1992; Onyefulu & Ogunrinade, 2005). Further, Davis and O’Hanlon advise research administrators to be careful about their assumptions and not to assume that all university administrators and faculty members have even a basic awareness of services provided by the university grants office, or that all units have the same needs for services. They encourage research administrators to be proactive in serving all units of the university and to reach out to faculty to provide assistance.

For faculty involved in the FDP study, the possibility exists that time constraints and/or language barriers inhibited their use of research office services. Lack of geographic proximity to research services or other institutional barriers might have played a role as well. In such instances, access to online assistance via videoconferencing, or the availability of consistent on-site assistance in faculty offices and laboratories might provide better service delivery.

It is important to remember that the field of research administration is evolving. Emphasis should be placed on the development of skills and professionalization of research administrators given the importance of their involvement in the overall research enterprise. Administrative leaders should consider what balance of talents work best at each institution. Given past research and the types of feedback provided in the FDP study, it may be important for staff to better understand each other’s motivations and work preferences. This could be addressed through a variety of approaches ranging from the redesign of staff hiring criteria and programs of continuing professional development to the creation of innovative training workshops for both faculty and research administrators.

The role of research administrators is also changing. While early service consisted of supporting faculty by searching for funding sources, requesting guidelines, preparing budgets, and mailing proposals so that researchers could focus on writing proposals and conducting funded activities, it now involves interpreting, creating and implementing policy (Vargas & Hanlon, 2007). The function of a research administrator is to help expedite the process of research and assist research investigators in accomplishing their work (Roberts & House, 2006). Although the responsibilities of research administrators are moving in new directions, the need to provide service to faculty remains a critical element of our work.
Conclusion

A major aim of the recent FDP study was to help institutions and federal agencies develop new strategies for making federally funded research more efficient and productive without sacrificing accountability and compliance with federal regulations. Because thoughtfully considered recommendations do not necessarily lead to significant improvement in the administration of academic research (Stanley & Sellers, 1991), reaction to these and earlier findings should not be left to coincidental occurrence. Rather, research administrators are encouraged to “. . . help relieve our faculty of administrative burdens as best we can, and do as much as possible with the resources we have” so that academic researchers can devote “their time and minds to solving the critical challenges of our age” (Killoren, 2008, p. 5).

Regardless of the solutions pursued, successful research management will forever rely upon effective partnering between faculty and administrators. Although the specific roles and responsibilities of research administrators may change over time, the challenge remains – how to customize ongoing development and skills training for the profession in a way that supports the individual needs of faculty researchers on each campus? The findings presented in this article suggest several implications for administrative practice, most of which do not necessarily require complex or expensive remedies.

References


Articles


A Report of a New Zealand-Based Funding Initiative Designed to Improve a University’s Research Culture

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Author’s Note
The initiative reviewed in this paper was carried out at Victoria University of Wellington, Wellington, New Zealand. The author thanks her former colleagues in the Research Office at Victoria who provided support for the grant scheme. An earlier version of this paper was presented at the New Zealand Association for Research in Education Conference, Christchurch, 4-7 December 2007.

Abstract
Over recent years universities in New Zealand have come under pressure from Government to increase quality assured research outputs and raise the level of staff participation in research-focused activity. One response to this pressure has been to target research development funding toward new researchers within an institution. This paper reports on the initial evaluation of one such targeted scheme: a three-year, university-wide funding initiative designed to improve research culture (including the research-teaching nexus) and increase outputs. The funding scheme evaluated in this paper began in 2004 as a strategic initiative designed to provide impetus to the research programs of new researchers and to give them experience in completing grant applications. Following attendance at orientation workshops staff members apply to a new researchers’ development fund for an internal grant to support a specific project. Experienced researchers then mentor applicants regarding how to improve their applications before final approval is given. This paper reports on the impact of the scheme in four key areas: contributions to scholarship; teaching informed by research; relationships to external funding; and career progression of participants. The paper concludes with recommendations for the future funding of new and emerging researchers.

Keywords: Professional development, research culture, research grants

Introduction
In common with developments in the international community over recent years, tertiary institutions in New Zealand have come under pressure from Government (e.g. via the Performance Based Research Fund [for details of the PBRF regime see http://www.tec.govt.nz])
to increase quality assured research outputs and raise the level of staff participation in research-focused activity. A web search suggests that institutional schemes to provide seed funding to enhance research capacity are prevalent across the country. As Porter (2004) reminds us, those who do not establish effective habits of research and grant writing early in their careers are unlikely ever to do so. Workshops that demystify grant application processes and schemes that mentor new staff in development of writing skills can thus stimulate greater participation in research culture throughout a career. It is not surprising that a number of institutions have targeted research development toward new researchers. They have put in place measures to encourage members of staff new to the academy and those new to research to develop an appropriate portfolio of knowledge, skills, relationships and research outputs in line with the Government’s national quality assurance exercise. There have been few published studies that focus on the use of internal funding to promote research capacity, and those that do exist tend to focus either on the links between research and teaching (Morris and Fry, 2006) or the problems associated with the acquisition of grant writing skills (Porter, 2003). This paper attempts to address this under-reported area by providing an account of an initial evaluation of an internal grants scheme at Victoria University of Wellington targeted at new and early career researchers. Although the University recognises that such a scheme might also be used to support and encourage mid-career researchers who may have become inactive, the focus of the scheme and this evaluation is on how best to facilitate early career researchers.

Description of the Funding Scheme
The New Researchers’ Grant Funding Scheme began in 2004 as a strategic initiative designed to provide impetus to the research programs of new researchers and to give them experience in completing grant applications. This paper reports on the scheme for the three years 2004 to 2006 inclusive. The grants during this period were for a maximum of NZ$2,500 (in 2007 this was raised to NZ$5,000), and were available to members of academic staff in the first four years of their first academic appointment. The scheme’s stated aim was to “provide impetus to the research programs of new researchers and, in particular, to give them experience in completing successful grant applications” (Victoria University of Wellington, 2006).

To apply for funding staff members followed a five-step process:

1. Attend an Orientation to Research workshop.

The three-hour orientation workshop included an experience-based talk from an early career researcher and practical information relating to the university’s research strategy, ethics policies and procedures, internal research grants and study leave, and an overview of the New Researchers’ Grant Scheme. Workshop evaluations have been consistently positive, with average ratings of workshop quality showing 83% of respondents recording scores of excellent or good. Qualitative comments show that clear explanations of funding processes are most appreciated, and that exemplars of past successful applications and the availability of Research Office staff to answer any queries are highly valued.
Articles

2. Submit an application.

The application form includes project title, description (written in plain language, suitable for a non-expert audience), anticipated outputs, project timetable and milestones, an explanation of how the assessment criteria will be met, and a fully justified budget. The Head of School must sign off the application, thereby guaranteeing that he or she is aware of and approves the staff member’s plans, and that necessary support will be provided by the school.

3. Applications are reviewed by the Research Development Subcommittee (a subcommittee of the University Research Committee).

The subcommittee includes representatives from each faculty, experienced and early career researchers, a representative from the University Teaching Development Centre, and a member of Toihuarewa (the University’s virtual faculty charged with ensuring that appropriate strategies and policies are followed to develop partnership with Māori, New Zealand’s indigenous people). Applications are reviewed in line with the following broad criteria: the quality of the research proposal; the research outputs and outcomes, including links with high quality research-informed teaching; the accuracy and justification of the budget; and the strategic significance of the project for the applicant’s School or wider University.

4. The committee allocates a member to act as a mentor to provide expert feedback to help develop grant-writing skills.

The committee formulates a consensus view with regard to recommended changes, and a member, usually from the same faculty as the applicant, provides individualised feedback over one or more sessions. It is rare for an application to be approved with no alterations.

5. Once the mentor is satisfied with the amended application a research funding account is set up.

Grant holders are required to sign a contract with the Research Office, and must seek permission if they wish to deviate from the original budget. Grant monies must be spent within one year, and all expenditures must be fully accounted for in line with University financial processes. Three months after the end of the funding period grant holders are required to report on the progress of their research against the objectives specified in their application.

The Study

This paper emerged from an evaluation of the first three years of the New Researchers’ Grant Scheme. It seeks to understand the role and impact of the scheme by reporting on the impact of the scheme in four key areas: 1) contributions to scholarship; 2) teaching informed by research; 3) relationships to external funding; and 4) career progression of participants.
The author was the coordinator of the scheme from late 2006 to early 2008 -- leading the orientation workshop, acting as a member of the Research Development Subcommittee, and mentoring applicants. Data routinely collected as part of the New Researchers’ Grant Scheme was collated and analysed for grants initiated from January 2004 through December 2006. This included numerical data relating to size of grants, types of expenditure, academic role, and faculty of origin. Textual analysis was carried out of all successful grant applications and of available final reports. End of funding period final reports were available for 50 grant holders. The final written report followed a standardised pro-forma seeking information in the following key areas: an explanation of any budget variances; details of relationships with external organisations; potential external funding; and outcomes achieved, including intellectual property generated and outputs produced. Application and report data were anonymised and entered into NVivo7. Coding was carried out according to information features such as type of output, research collaborations, external funding and future plans.

Various factors contributed to partial incompleteness in data relating to the scheme, including the departure of some awardees, inability to locate some evaluation data relating to early orientation workshops, a small number of non-responses to requests for final reports, and some extended, ongoing projects.

**Results and Discussion**

During the period under evaluation, 77 grants totalling NZ$195,571 were funded (80 grants were approved, but three awardees did not make use of funds; four applications were withdrawn before the end of the mentoring process). There was little variation in the size of grants, with virtually all applicants opting to apply for at or very close to the NZ$2,500 maximum, and the variation in actual expenditure was negligible, with most grantees under-spending by less than 2%.

Administrative data demonstrate that grant-holders came from all faculties. There were 38 female and 39 male grant recipients. This is not significantly different to the ratio of female to male new and emerging researchers at the university as defined in the 2006 national staff census for Government. The first orientation workshop was held in 2003, with the first grants awarded in 2004. Since the inception of the scheme 230 people have attended the orientation. Thirty-seven percent of attendees have applied for a grant, 22% were not eligible to apply and 41% of attendees have not applied and may still be eligible.

A short telephone survey of workshop attendees who had not applied for funding was carried out in 2005 (Asmar, 2005). It revealed that although some people were reluctant to apply because they had uncertainties regarding the eligibility of their proposed expenditure or had forgotten the grant closing dates, most were either planning to apply for larger grants, had received other internal funds, did not require funding due to the nature of the research, or had decided to prioritise teaching rather than research at this stage of their careers. Further follow-up with non-applicants is needed. However, the focus of this paper is the analysis of data related to grant-holders. The remainder of this section explores the role and impact of the scheme by reporting on the four key areas outlined in the study description.
**Contributions to scholarship**

One of the main aims of the scheme is to promote the University’s contributions to national and international scholarship. This is reflected in research outputs of various sorts, by collaborative relationships with external organisations and by the generation of intellectual property. Figure 1 shows the proposed outputs as planned in original applications together with the outputs as described within the final reports.

![Graph showing comparison of planned and reported outputs](Image)

**Figure 1.** Comparison of number of instances of planned and reported outputs.

Clearly, there is some discrepancy between planned and actual outputs. There appears to be a slippage toward conference-focussed outputs rather than publication. Further follow up with researchers may identify whether these are precursors of “higher level” outputs or if conferences are regarded as the final outputs (which may be most appropriate in some disciplines).

One factor often identified as an issue in grant funding is that researchers tend to underestimate the amount of time and money projects require and be too optimistic with regard to likely outputs. The evaluation here supports Morris and Fry’s (2006, p. 52) point that “despite substantial discussion with those applying for grants and extensive comments on drafts of applications, most grant-holders are still over optimistic about what can be achieved with limited time and funds.” Nevertheless, the data show that grant recipients are actively disseminating their research findings beyond the institution. The large number of articles listed in preparation suggests that the reporting timeframe may need to be adjusted to more accurately reflect the range and number of journal articles produced, although it should be noted that outputs under
review and those in preparation do not always result in successful publication.

Grant-holders appear to be disseminating research findings through networked relationship building as well as publication. The grants may be acting as catalysts for disciplinary collegiality. The final reports show frequent collaboration with partners and advisors outside the University. In total, 54 instances of collaboration were reported. Table 1 shows the report data relating to external relationships.

Table 1

<table>
<thead>
<tr>
<th>Nature of external relationship</th>
<th>Number of instances</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ academic</td>
<td>8</td>
</tr>
<tr>
<td>NZ community or professional</td>
<td>8</td>
</tr>
<tr>
<td>NZ public sector</td>
<td>6</td>
</tr>
<tr>
<td>NZ private sector</td>
<td>3</td>
</tr>
<tr>
<td>Overseas academic</td>
<td>21</td>
</tr>
<tr>
<td>Overseas community or professional</td>
<td>5</td>
</tr>
<tr>
<td>Overseas public sector</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>54</td>
</tr>
</tbody>
</table>

In summary, it would appear that the New Researchers’ Grants have been successful in encouraging the production of research outputs and in facilitating the development of inter-institutional collaborative and communicative networks. A more detailed evaluation is needed to confirm the transition from outputs in progress to finished pieces in the public domain. The University is also keen to encourage staff to develop non-refereed conference presentations into quality assured research outputs; this is an area both for future research development and for future research.

Teaching informed by research

In line with the University’s Strategic Plan 2005-2015, which emphasises the need to generate initiatives that can effectively highlight Victoria’s distinctive teaching and research capabilities, the criteria for the funding scheme (Victoria University of Wellington, 2006, p.2) state that the principles and purposes include outcomes that represent “High-quality teaching that is informed by research.” The New Researchers’ Grant application form requires applicants to address this criterion. Interestingly, textual analysis of applications reveals that only 17% included planned applications to teaching, and only 3% of final reports detail the input to teaching coursework. Several applications mention the use of honours or research degree students as assistants; however, the outcomes of such relationships are not well reported. The lack of reporting is probably related
to the use of a generalised end of grant online reporting system that has no field assigned to implications and applications to teaching. This evaluation has been valuable in identifying this oversight and there are plans to improve reporting in this area.

More could be done through the grant process to support the effective linking of teaching and research in a coherent manner. In recent years considerable efforts have been made to develop institutional awareness and support for the research-teaching nexus (e.g., Angelo and Asmar’s (2005) discussion paper and collection of case studies, the development of research-teaching awards, and the inclusion of strong research-teaching themes in the inaugural Ako Victoria, teaching development Conference in September 2007). However, as illustrated by the reporting situation, research policies require further adjustment to allow for informed support and monitoring of the research-teaching nexus.

**Relationships to external funding**

Table 2 shows the external funding recorded in end of grant reports. At the time of submitting an end of grant report, 9% of grant holders had achieved external funding, although several had applications under consideration and just under one-third of reports mentioned that external funding may be possible in the future. A brief audit of Research Office records revealed that by September 2007, 21% of grant-holders had been awarded external funding; and 5% had obtained funding from multiple sources. Eight percent had received Marsden Fast-Start Awards, prestigious and highly competitive national funding for early career researchers, worth a combined value of NZ$960,000.

<table>
<thead>
<tr>
<th>Type of external funding</th>
<th>Number of instances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial funding already achieved</td>
<td>2</td>
</tr>
<tr>
<td>Commercial funding may be possible in the future</td>
<td>3</td>
</tr>
<tr>
<td>Grant funding obtained</td>
<td>5</td>
</tr>
<tr>
<td>Grant funding application submitted</td>
<td>10</td>
</tr>
<tr>
<td>Grant funding application in preparation</td>
<td>5</td>
</tr>
<tr>
<td>Grant funding may be possible in the future</td>
<td>13</td>
</tr>
</tbody>
</table>

As external research backing focuses on limited competitive funding, so the quality of an application is vital. However, quality alone is insufficient to win a grant (see the recent OECD (2007) review of the innovation system of New Zealand, focusing on the role of government and including an overview of funding opportunities and difficulties), and track record becomes increasingly important to the decision making of funding panels (see Laudel (2006) for an...
analysis of the Matthew Effect, rewarding those who are already well-rewarded, with regard to research funding and quality. It would appear that the New Researchers’ Grant scheme may have some influence in supporting early career researchers to develop both grant writing skills and a track record of fundable research. In this context it is also noteworthy that 12 grant-holders have gone on to successfully apply for substantial internal monies from the competitive University Research Fund (URF). Anecdotal evidence suggests that many researchers use these URF grants to help build a track record of successful research funding and outputs before they move on to apply for external funding. As a caveat to this section, it is important to highlight that the University remains aware of the need to direct internal monies to some areas that are not well-supported by external funding and to those researchers who “just miss out” on external funding.

**Career progression of participants**

The New Researchers’ Grant Scheme is intended to provide impetus to the research programmes of new researchers and thereby enhance not only the research culture of the University but also the careers of the individuals involved. As seen above, grant-holders produce a range of research outputs, develop collaborative research partnerships, and have achieved success in winning external funding. Whilst it is difficult to obtain a measure of career progression from a study such as this, one possible measure is to assess any changes in the employment status of grant recipients. Without access to academic promotion details, it is impossible to draw conclusions with regard to the nature of any association. However, it is worth noting that promotion criteria emphasise the need for high quality research and scholarship as evidenced by publications and obtaining external and internal funding. The criteria also state that “Promotion to Senior Lecturer recognises meritorious performance of duties as a Lecturer. This will be assessed by considering whether the candidate has established good teaching practices and is establishing him or herself as a researcher” (Victoria University of Wellington, 2007, p. 4).

Bearing the above reservations in mind, an attempt was made to track employment changes as a possible measure of career progression. The employment status of each grant recipient was already known, as this was recorded at the time of the orientation course. At that time 4% of grant recipients were employed as Assistant Lecturers, 74% were employed as Lecturers, 10% as Senior Lecturers, and 12% as Researchers. Forty-four percent of grant recipients were employed as permanent staff, i.e. on continuing employment contracts, and 56% were on fixed-term contracts. It should be noted that Assistant Lecturers and Researchers can only be employed on fixed term contracts.

To assess possible changes in employment status since receiving a New Researchers’ Grant, an internal census was conducted in April 2007 to provide a snapshot of job roles and contract type. With regard to members of staff on permanent contracts at the time of the orientation course, one had left the university; the employment status of the others remained unchanged. The employment status of the 56% of recipients on fixed-term contracts was more fluid. Table 3 illustrates the results of the April 2007 employment census for members of staff who were on fixed term employment contracts at the time of the original orientation course.
Table 3

Employment status staff members who were on fixed term contracts at the time of the original orientation course

<table>
<thead>
<tr>
<th>Post held at time of orientation course</th>
<th>Employment status internal census April 2007</th>
<th>Number of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assistant Lecturer</td>
<td>Asst Lecturer (fixed term)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>1</td>
</tr>
<tr>
<td>Lecturer</td>
<td>Lecturer (fixed term)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Senior lecturer (fixed term)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Lecturer (permanent)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Senior lecturer (permanent)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>4</td>
</tr>
<tr>
<td>Senior Lecturer</td>
<td>Senior Lecturer (fixed term)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Senior Lecturer (permanent)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>1</td>
</tr>
<tr>
<td>Researcher</td>
<td>Researcher (fixed term)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Lecturer (permanent)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Senior lecturer (permanent)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Left</td>
<td>2</td>
</tr>
</tbody>
</table>

Fifty-one percent of temporary members of staff had improved their employment status within the institution by transferring to a permanent contract and/or being promoted. The employment status remained unchanged for 26%, 19% had left the university and data could not be found for 4%. No systematic check was carried out; however, it is known that of the latter group at least three have moved to permanent posts at other institutions.

Conclusions
The New Researchers’ Grant Scheme enhances the profile of research within the University and demonstrates the institution’s commitment to supporting the careers of new members of the community. The scheme was designed as a centrally funded, stable, long-term initiative to promote development of a portfolio of skills including as the highest priority how to write convincing proposals that will win external funding, but also the importance of making links between research and teaching, the setting of research career goals and generation of quality assured outputs. Providing a mentored grant writing scheme appears to contribute toward new researchers developing projects that enable them to produce research outputs and network within their discipline, and strengthens their standing when seeking external funding. The ability to take
advantage of this seed funding may increase the likelihood of temporary staff being retained on a permanent basis.

This early evaluation of the scheme appears to demonstrate its efficacy. Whilst further research is necessary, based on experiences to date some tentative recommendations can be made for the future funding of new and emerging researchers, in particular that a funding initiative targeted at new researchers should:

1. Include experienced researchers as mentors (N.B. discipline-based mentors may not have the skills to provide input re grant writing skills).

2. Profile the services offered by the university to support research.

3. Offer guaranteed funding to researchers who are prepared to persist with the mentoring process until an acceptable application is produced.

4. Require researchers to commit to producing tangible research outputs in a given timeframe.

5. Include appropriate reporting measures and regular evaluations of the scheme.

The evaluative snapshot of the scheme to date has led to suggestions regarding how the scheme may be maintained and extended. Further developments already in place include increasing the maximum grant available to NZ$5,000, extending eligibility to five years from initial appointment, clarifying eligibility for staff pursuing research degrees, and formalising links with specialist research development staff to assist the development of external funding applications.

There are plans for more detailed quantitative and qualitative evaluations of the scheme that will focus on the understandings and experiences of new researchers. In particular the ways in which grant-holders value the scheme, the factors that contribute to the successful operation of the scheme and the experiences of new researchers who decide to not apply for the funding.

References


The 41st Chair: Defining Careers in the Current Biomedical Research Environment

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Abstract
In recent years academic capitalism and a distancing from Mertonian scientific norms have shifted the traditional reward of academic science from peer recognition to the award of grants. With the shrinking of the NIH budget in real terms since 2003, there are increasing numbers of researchers whose careers are at risk from lack of funding. This paper presents themes from an interpretive, narrative study of tenured biomedical research professors who have lost NIH support as the funding environment has tightened. Mechanisms for navigating this funding environment are suggested in light of these findings and inferences are drawn regarding how this may affect faculty careers. The potential of new, damaging scientific norms that are emerging in this funding climate are considered. The paper proposes actions administrators may take to help faculty who either occupy, or are moving towards occupying, the 41st chair. This paper is intended to help research administrators and medical school administrators understand faculty perceptions and experiences of funding loss, thereby allowing for greater perceived institutional support in a fiscally severe environment.

Keywords: biomedical research funding, academic capitalism, faculty careers, norms of science, institutional support

Introduction
Observing that scientists with Nobel Prize-worthy ideas were denied this most coveted award due to restraints on the number of recipients, Robert Merton (1968) described a phenomenon
he called the 41st chair. This name derives from the French Academy of Science’s practice of restricting the number of members to only 40 scientists at any time, thereby withholding membership from a large number of brilliant minds (who all occupy the 41st chair). The appellation is not intended to denote a ranking of either the 40 members or the excluded. Rather, it symbolizes those who could be judged worthy of membership yet who are not elected. Merton notes that “the phenomenon of the 41st chair is an artifact of having a fixed number of places available at the summit of recognition” (Merton, 1968, p. 2; see also Zuckerman, 1996 for an extensive consideration of this concept).

The 41st chair phenomenon is pervasive today in academic biomedical research communities. By altering the scientific reward structure, academic capitalism has helped shape the 41st chair phenomenon in modern medical schools and research institutes. Peer recognition has partly been superseded by financial research support from the National Institutes of Health (NIH). The recent tightening of the NIH budget, however, has limited the available financial reward, forcing more researchers to occupy the metaphorical 41st chair. This has led to a situation where viable scientific ideas are either under-resourced or not funded at all. The crux of the matter here is less that ideas remain unfunded per se, but that superb, innovative ideas from established and recognized scientists, as well as younger researchers, remain unfunded. Since NIH funding for R01 independent investigator grants has been given to only approximately the best 4,000 applications, the French Academy’s 41st chair can, in recent years, be translated to research’s 4001st chair. Although there may be 3960 more ‘chairs,’ the consequences of occupying the 4001st chair are, arguably, higher for an individual’s career today than when Merton first described the phenomenon. The consequences of this situation have not fully materialized, but could include a departure from academic biomedical research by waves of talented scientists from all career stages. This, in turn, would likely slow the rate of scientific advances and, ultimately, negatively affect global public health.

This paper considers the changes in the norms of science over the past 40 years, the evolution of the biomedical research environment, and the actions that institutions and the NIH are taking to alleviate the financial troubles experienced by many researchers who now occupy the 41st chair. Data are presented from unstructured interviews with four tenured full professors at a top ten NIH funded medical school in the United States who, after 20 years of continuous NIH funding, find their laboratories in financial hardship. This research enhances the understanding of the personal consequences and career definition that the current biomedical economy is forcing upon researchers. Based on the personal stories of these scientists, this paper presents possible new – and potentially damaging – scientific norms that could emerge and replace Mertonian norms should the current situation continue. Finding that academic capitalism now appears integral to biomedical research, the paper also examines the effect these potential new norms could have on public health and the advance of science. Ultimately, while biomedical research in institutions of higher education must undergo significant systemic change, the consequences of these changes could be severe for faculty careers in medical schools nationwide.
Grounding in the Literature

Traditional Norms of Science

In the middle of the twentieth century, peer recognition was the ultimate reward in biomedical science (Merton, 1968). This concept was aligned with science's traditional values: communalism, disinterestedness, organized skepticism and universalism (Merton, 1942). These norms dictated that scientific discoveries belong to the community, rather than to the researcher who makes them (communalism); the researcher should not be influenced by personal biases in arriving at and interpreting results (disinterestedness); research must be tested by the scientific community before it is acknowledged as plausible (organized skepticism); and science should know no boundaries, whether personal, racial or national, when advances can be made (universalism). Science was pursued to enhance mankind's understanding of the world. Financial reward was less a motivator than the eternal quest to make a new discovery and be recognized by one's peers. These Mertonian norms have subsequently been recognized by scholars as embodying traditional science (e.g., Etzkowitz, 1989; Hackett, 1990; Renault, 2006; Slaughter & Rhoades, 2004; Stuart & Ding, 2006).

Academic Capitalism – The Mechanism of Change for Scientific Reward

Over the last 30 years, however, the cultural norms of science have changed. Dasgupta and David (1994) make a distinction between the old and new cultures by calling the former “Science” [capitalized in the original] and the latter “Technology.” This trend has been studied extensively under another label – academic capitalism, a term that first appeared in the literature in 1990 (Hackett, 1990), and was associated with Weber's description of large medical and natural science research institutes as “state capitalist” enterprises. Academic capitalism has been defined by Slaughter and Leslie (1997) as “institutional and professorial market or market[-]like efforts to secure external money” (p.8). In the twenty-first century, the term was modified to include “the new economy” (Slaughter & Rhoades, 2004), and took on the meaning of “a regime that entails colleges and universities engaging in market and market-like behaviors” (Rhoades & Slaughter, 2004, p. 37). The authors note that “in the information society, knowledge is raw material to be converted to products, processes or service” (Rhoades & Slaughter, 2004, p. 15), and that universities, with a focus on knowledge creation and transfer to students, are central to the information society and hence to the new economy.

The Bayh-Dole Act of 1980 encouraged formerly reluctant universities to commence patenting activities (Mowery, Nelson, Sampat, & Ziedonis, 2001; Shane, 2004). It legitimized the university ownership of knowledge by making it legal and therefore, one could argue, culturally acceptable. Since the act was passed, universities have increasingly responded to economic stimuli, creating a market of higher education and employing microeconomic theory of organizations in institutional administration (Gumport, 2000).

Academic capitalism is not limited to financial matters. It also encompasses “the attempt to increase individual or institutional … influence or prestige” (Louis, Blumenthal, Gluck, & Stoto, 1989, p. 110) and the consideration of behavior and culture. Hackett (1990) posits that since universities are increasingly dependent on the private sector to provide funding, they will start
resembling the private sector in their operations. He details how academic scientists are adopting an increasingly managerial work style (industrial norms). The trend that led Hackett to develop the term *academic capitalism* was not novel in 1990, but he provided the terminology through which the phenomenon could be studied.

**New Cultural Norms of Science**

The emergence of academic capitalism has resulted in new cultural norms of science, distinct from those delineated by Merton 40 years ago. These new norms are rooted in a corporate approach to scientific discovery and can present a direct conflict in terms of core values (Bok, 1982). The argument propounded by traditionalists in academic science is that the “profit imperative threatens to erode the freedom and autonomy of scientific inquiry, erect institutional constraints . . . to the flow of knowledge and information and allow pressures to engage in revenue generation to shape the questions that researchers are likely to pursue” (Vallas & Kleinman, 2008, p. 284). These pressures are relevant for academic scientists seeking extramural funding. Rather than allowing only research results to dictate future endeavors, if scientists pursue particular paths of inquiry that are more likely to be judged favorably by reviewers, they are engaged in what Hackett (1990) terms *dirigisme*, allowing capitalist values to dictate the direction of research. Many scientists would argue that tailoring research to suit reviewers is sound practice for a successful research program, which is indicative of the deep-rooted nature of the new norms of science.

**Table 1**

*Contradictory Objectives between Corporate and Academic Cultures (Fassin, 1991)*

<table>
<thead>
<tr>
<th>Academia</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>New discoveries</td>
<td>New applications</td>
</tr>
<tr>
<td>New knowledge</td>
<td>Added value</td>
</tr>
<tr>
<td>New financial means for additional research</td>
<td>Financial benefits</td>
</tr>
<tr>
<td>Basic research</td>
<td>Applied research</td>
</tr>
<tr>
<td>Long-term</td>
<td>Short-term</td>
</tr>
<tr>
<td>Know-how, what, why?</td>
<td>Product-driven</td>
</tr>
<tr>
<td>Publications</td>
<td>Secrecy</td>
</tr>
<tr>
<td>Free, public good</td>
<td>Protection, patents</td>
</tr>
<tr>
<td>Academic freedom</td>
<td>Commercial approach</td>
</tr>
</tbody>
</table>
Table 2

“Value Tensions” that Lie at Polar Opposite Ends of a Value Axis within Academic Capitalism (Hackett, 1990)

<table>
<thead>
<tr>
<th>Academic Value</th>
<th>Capitalist Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freedom and autonomy</td>
<td>Accountability and dirigisme</td>
</tr>
<tr>
<td>Educating Students</td>
<td>Producing research results</td>
</tr>
<tr>
<td>Cosmopolitan orientation</td>
<td>Local orientation</td>
</tr>
<tr>
<td>Quality</td>
<td>Quantity</td>
</tr>
<tr>
<td>Generalization</td>
<td>Specialization</td>
</tr>
<tr>
<td>Cooperation</td>
<td>Competition</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>Efficiency</td>
</tr>
</tbody>
</table>

The conflict between academic and capitalist norms is manifested both in practical (table 1) and theoretical (Table 2) polar extremes. These opposing values become sources of tension when academic scientists are socialized into Mertonian norms and yet feel pressured to conform to academic capitalism, either in their actions or in the value systems to which they adhere. It is the theoretical values (Table 2) that may be more applicable to academic scientists who are experiencing the trend towards academic capitalism by being forced to find financial support without seeking to privatize their knowledge. Hackett (1990) suggests that academic capitalism is forcing faculty to concentrate more on research than pedagogy (Table 2), which necessitates greater specialization if the researcher is to produce novel results in a highly competitive environment. In addition, regular, measurable productivity has become increasingly important as faculty are exposed to the shorter timelines more prevalent in industry, which are shaped by the drive for products (focusing on applied research) and the short-sightedness of focusing on quarterly profits (Fassin, 1991). The consequence of the marriage of the two cultures is an increased need for faculty to demonstrate their productivity on shorter time scales to funding agencies, as well as tenure and search committees (Fassin, 1991). This is a practical example of efficiency, one of Hackett’s (1990) value axes at the other end of which sits effectiveness. The result of this increased faculty accountability to funding agencies and university administration (Gumport, 2000; Hackett, 1990) is a move towards more – but shorter – publications, a reduced quality of publications, as measured by the number of experiments conducted to demonstrate findings, or a rush to publish results before research is conducted thoroughly or has even been completed (Hackett, 1990). These measures represent a fall in the quality of science, and the increased pressure could cause a reduction in motivation or available time to mentor the next generation of researchers. In addition, these new norms are at odds with Merton’s (1968) findings from interviews with Nobel laureates. If Merton’s findings are indicative of how great science is achieved, long periods where few advances are made often precede extraordinary leaps in knowledge. Demanding regular productivity from faculty, while sensible from a perspective of accountability, may prevent them from pursuing paths of inquiry that culminate in profound new knowledge.
The cosmopolitan and local orientation value tension in Hackett’s (1990) axis seems at odds with reality now, almost two decades later. Hackett places a cosmopolitan orientation on the academic end and local on the capitalist end. With the increased globalization of knowledge and business, few researchers, whether academic or industrial, can afford a local orientation. Research and business are now multinational, with clients or collaborators frequently on opposite sides of the globe.

The overall culture shift has been described in many ways, but perhaps the most colorful is provided by Giroux, who laments the “corrosive effects of the influence of corporate power on higher education” (2002, p. 435). “Corporate power” is easy to associate with profit; with enough profit, government lobbyists can be bought to argue a corporation’s case and media relations teams can make corporate interests appear to align with public good, swaying public and governmental opinion. In the academic context, i.e., pure university research rather than university start-up and spin-off companies, the financial focus is not on profits but on extramural funding. It is not the purpose here to argue that academic capitalism and the new cultural norms have an explicitly positive or negative effect on daily academic scientific life – it is the change itself that is notable. Academic capitalism has been the mechanism of change for the culture of biomedical research in the United States over the past 30 years, to the point where financial matters are of utmost importance in both running a laboratory and for career progression.

Expectations for Faculty Careers

Regardless of the cultural norms into which a faculty member is socialized, general career expectations among those in the natural and biomedical sciences at Research I institutions (Carnegie Foundation for the Advancement of Teaching, 2001) are broadly similar. After a Ph.D. is completed, it is usual for researchers to assume a postdoctoral position. “Postdocs” are considered trainees, and pursue projects with mentorship from the principal investigator (who leads the laboratory), authoring peer reviewed manuscripts and frequently applying for postdoctoral extramural funding. It is not unusual for researchers to hold two or three postdoctoral positions, for an average of 2.8 years each (Assessing the Postdoc Experience, 2008) before seeking a faculty position. There are two main faculty tracks for researchers: tenure stream and research track. For those on the research track, no (or very few) institutional funds are committed to the individual or the laboratory. The researcher’s salary is paid from grants – either their own or those of their principal investigator. There is little job security in this position as one is dependent on successful applications for extramural funding. Tenure stream faculty usually have an institutional commitment to cover their salary unfunded by grants, but there is frequently an understanding that the institution expects a certain proportion of the faculty member’s salary to be covered by extramural funds and, for those in departments with undergraduate programs, the faculty member to engage in a certain amount of teaching per year. A number of grants are only open to faculty, and readiness to apply for these grants frequently drives the transition from postdoc to faculty status. In addition, there are a small number of grants, known as K99/R00s that are awarded by NIH to provide postdoctoral researchers a means of securing funding in their early faculty years. Once faculty status is reached, however, the funding demands are relentless.
The Current Funding Environment

The majority of biomedical extramural funding in the United States is provided by the National Institutes of Health (NIH) (Mandel & Vesell, 2004; Moses, Dorsey, Matheson, & Thier, 2005). Substantial funding for biomedical sciences and other scientific disciplines is provided by government agencies such as the National Science Foundation (NSF) and the Department of Defense. Between 1998 and 2003, the NIH budget doubled from $13.6 billion to $27 billion (National Institutes of Health, 2007a) – ostensibly good news for biomedical researchers. During this time the average success levels of all Institutes were above 25%, meaning that more than a quarter of applications were funded (National Institutes of Health, 2007b), and there were few restrictions regarding chosen areas of research. This comparatively freely-flowing funding prompted medical schools and research institutes to expand their infrastructure substantially (Couzin & Miller, 2007), resulting in increased research capacity. The favorable environment – both physically and economically – led to a boom in career biomedical researchers (Zerhouni, 2006). This boom is a manifestation of capitalist principals in academia: flowing money will attract individuals.

The commonly recognized gold standard of NIH funding is the independent investigator Research Project Grant, R01 (Mandel & Vesell, 2004; National Research Council, 2005). Since R01 grants are peer reviewed and awarded to individuals, being awarded one is indicative of the esteem in which a researcher’s work is held by independent experts. Receipt of an R01 signifies the achievement of research independence in the academic biomedical research community. For this reason, receiving an R01 has traditionally been necessary for the promotion to assistant professor from either a postdoctoral position or an entry-level instructor faculty position (Vastag, 2006), and extramural funding is often a prerequisite for tenure and further promotion (Ascoli, 2007).

In addition to providing proof of scientific prowess, R01 grants provide an economic service to medical schools and research institutes by paying for supplies, researchers’ salaries, and institutional costs via a facilities and administration overhead charge. The number of R01 applications in 2007 increased almost 48% over 1998, when the budget doubling began (National Institutes of Health, 2008), with success rates for new R01 applications falling to 16.3% in 2006 and 19.2% in 2007 (National Institutes of Health, 2007b).

The widely publicized period of growth was followed by annual growth rates below both the rate of inflation in the wider economy and the NIH’s biomedical inflation index (Koizumi, 2006). This modest decline in spending power and the allocation of current funds has prompted much criticism (Avantaggiati, 2007; Boron, 2006; Cohen & Siegel, 2005; Couzin & Miller, 2007; Finkelstein, 2006; McCook, 2008; Mitka, 2007; Nathan & Schechter, 2006; Nurse, 2006; Werner, 2007), despite its well recognized advent (Frist, 2002; Korn et al., 2002). Several factors have contributed to the current “perfect storm” (Zerhouni, 2006, p. 1088) of the funding climate. First, as the research population expanded (initiated by the doubled budget), the number of grant applications also increased. Since 2003, however, the number of R01s funded annually has remained roughly constant, resulting in a decline in the proportion of successful applications. The NIH-wide 2007 funding rate for Research Project Grants (which include the R01) fell to 19.2%, with a smaller dollar amount allotted to each award (Koizumi, 2006). Second, the process of research and complying with federal regulations has become more expensive (Cohen & Siegel,
2005; Vastag, 2006; Zerhouni, 2006), meaning that smaller awards no longer suffice. Third, the political climate has seen portions of the federal budget that could have been apportioned for biomedical research directed to the War on Terror (Boron, 2006; Frist, 2002; Porter, 2005). Currently, Over 80% of the NIH budget is committed to ongoing projects (Zerhouni, 2006), leaving few funds available for allocation to new research projects.

The current reality facing the biomedical research community, therefore, is that federal funding has become unusually difficult to obtain, but its importance has increased as capitalist cultural values have become the new scientific norms. As a result of the paucity of funds, many experienced investigators are finding themselves without funding, even when their grant applications are given an excellent priority score during peer review.

**The 41st Chair Today**

Four out of five applicants in 2007 failed to win or continue competitive funding. In 2003, the year that the budget doubling ended, 4,521 new R01 grants were awarded (National Institutes of Health, 2007b). In 2006, that number had fallen by more than 20% to 3,601 (National Institutes of Health, 2007b). While the number rose again slightly in 2007, it remains at 87% of the total awards in 2003. During the fifth year of an R01 (which average five years each), it is common for a researcher to apply for a competing continuation of funding. These data imply that if all researchers awarded an R01 in 2003 applied for a competing continuation of their grant in 2007, even if astonishing breakthroughs had been made during the course of all grants, 13% would not be renewed. In reality, the situation is worsened by the fact that additional new applications further decrease the number of successful renewals. Thus, scientists with excellent research ideas are increasingly finding themselves occupying the 4001st chair.

A new and increasingly common story has therefore emerged in medical schools. Researchers who have previously been well rewarded by current academic norms, i.e., maintained a record of continuous NIH funding for a number of years, now find themselves unfunded. Their experience and recognition, to say nothing of their ideas to expand the boundaries of scientific knowledge, count for little if they cannot obtain extramural funding for their salaries, support their laboratory research and pay research personnel. Untenured faculty who receive no institutional support may be forced to leave academic research if they find themselves in this situation (National Research Council, 2005). Tenured researchers are under no such economic obligation, but present a financial burden to the institution, and as such may find that in some of the most aggressive institutions their laboratory space is removed once their ability to pay the rent through facilities and administration charges from grants is hampered. At any rate, with no or little funding, it is difficult to stock and staff a productive research environment. Once research capabilities have been curtailed, returning to extramurally funded research is extremely challenging, as R01 applications require a significant amount of preliminary data to prove the feasibility of the proposed experimental approach. Without a laboratory, personnel or resources, this is difficult to achieve (Boron, 2006; McCook, 2008).

**Bridge Funding**

To prevent the one-time loss of funding from ending a research career, both the NIH and a
number of medical schools and research institutions have created bridge funding programs. These programs have become necessary as the new reward for science – funding – has become a necessity for continuing research. The 41st Chair Syndrome has transitioned from a social phenomenon to one that can make or break careers. Under the NIH program, researchers cannot apply for bridge funding. Instead, they are nominated for an R56 bridge funding grant by NIH staff and study section members during the peer review process, usually if the two following criteria are met: 1) their R01 application falls just short of the current environment’s pay line (the score needed to be awarded funds), and 2) they would have less than $200,000 funding without the grant under review. This interim grant allows the necessary time and resources for additional research to be conducted, with the aim of improving the application upon resubmission. The R56 grant is predominantly awarded to applicants who are likely to be successful after only minor modifications to their research proposal. Instituted in 2005, the number of awards has grown annually, with increases of 15% and 22% in 2006 and 2007, respectively (National Institutes of Health, 2007b). While there are no comprehensive published datasets regarding the success of R56 recipients at subsequently securing R01 funding for the same project, data were gathered for individual R56 recipients via the NIH online Computer Retrieval of Information on Scientific Projects database. Fifty-seven percent of R56 recipients in 2005 have had an R01 of the same title funded. This rate falls to 34% of 2006 R56 awardees and 18% of 2007 awardees. This decline can likely be ascribed to the fact that those awarded a bridging grant in 2007 have had less time to gather more data and apply for a renewal than those in earlier years. It remains to be seen if these percentages increase over time.

While the NIH bridge funding mechanism has provided a career lifeline to a relatively small number of researchers (167 in the period 2005-2007), more have been helped by their institutions. Bridge funding programs at medical schools and research institutions vary, but a common attribute is their increasing demand and proliferation. The author’s informal survey of the websites of the top twenty NIH-funded medical schools in the United States reveals that 13 (65%) have institutional bridge funding mechanisms. Another is currently seeking donations to establish a fund for this purpose. These grants tend to be small (usually less than $100,000), last only for 12 months, and are usually only for faculty with grants that scored near the pay line and need minimal improvement to secure funding.

As the current NIH economic difficulties continue, an increasing number of researchers need bridge funding, yet the effect this will have on their career aspirations and enthusiasm has thus far remained undocumented. To help understand the personal effect that the changing culture and financial necessities of biomedical research can have on individual academic researchers, extensive interview-conversations were conducted with four faculty who have found themselves in need of bridge funding.

Methods
The narrative method with an interpretive stance was chosen to capture the stories of the researchers affected by the 41st chair phenomenon and academic capitalism. In the biomedical research community, the concept of these four researchers’ experiences may be well known in an abstract way; faculty and administrators may have colleagues experiencing something similar. However, being aware of this happening does not give the depth of understanding that
can be gained by hearing the story told by the individual affected, replete with emotion and background information. Telling stories is central to the human condition: “People understand their lives and explain their lives through stories” (Hones, 1998, p. 226). Stories are told through narrative (Connelly & Clandinin, 1990), and provide a platform for making visible the meaning constructed from experience (McCormack, 2000). In trying to obtain an in-depth understanding of how faculty careers are affected by the current biomedical research environment, hearing voices recount the personal stories, events and associated emotions provides significantly more meaning than can NIH- or medical school-provided statistics. The unstructured interview-conversation format allows power in the conversation to rest with the interviewees (Mishler, 1986), who can introduce themes and topics as they desire. This approach led to richer data than those gained from a structured interview, where the interviewer may not have been aware of all relevant topics.

Following approval from the Institutional Review Board (IRB) to conduct recorded, anonymous interviews, the senior administrator in charge of research at the medical school contacted faculty who had applied for institutional bridge funding about the possibility of participating in this research. Four of these faculty approached the author indicating their willingness to be interviewed: Tom, Alice, Joe and Edward. The interviewer-author knew Tom and Joe through professional activities. Unstructured interviews were held in the faculty members’ offices or nearby conference rooms, with the door closed to prevent interruptions. Interviews lasted 45-60 minutes and were recorded. Each interview began with questions concerning the faculty member’s career history to the point of needing institutional funding, with subsequent questions emerging as the conversation progressed, led by the interviewee. Each interview was transcribed verbatim and analyzed recursively through the use of an inductively created coding scheme. Confirming and disconfirming data were sought to refine the common themes that emerged. Once results were written up, they were shared with the four researchers who had the opportunity to confirm that their vignettes and experiences had been articulated as each had intended.

The Four Researchers

Background

Tom, Joe and Edward are tenured full professors; Alice is under consideration for promotion to full professor. They all conduct research at a top ten NIH funded medical school in the United States, and are at different points in experiencing financial exigency in their laboratories. Tom’s laboratory has been under financial duress for a few years. He is considered to be an excellent teacher and is head of a graduate program. Alice began as a non-tenure track researcher, and her career almost ended when funding was lost. Her lab has been financially stable for some time now. Joe's laboratory is experiencing severe financial distress, and his future is the least certain, even as a tenured professor. Edward is the director of an NIH-funded disease-specific center, currently receiving institutional bridge funding to support the center's research following two unsuccessful funding renewal attempts. He also has multiple individual grant applications pending.

The average expectable funding patterns of researchers in the current environment can be represented as a cycle (figure 1), with the four researchers situated at different positions. The starting level and dip in funding are relative for each individual’s circumstances. The timing,
too, is individual—it cannot be expected that researchers follow this cycle at a set speed or for a specific amount of time. Also, the shape of the curve in front of each researcher is unknown; Edward could be about to fall lower in the funding cycle than the line shown, or he could have an early upswing and join Alice. Joe perceives himself to be at the bottom, and is unsure if his cycle will ever go back up. Tom has come through the bottom of the cycle, but his top may never be as high as it was in the past. Alice has seen her research funding return to a comfortable level. In summary, the only certainties for these researchers are their past and present experiences. The dynamics of their future cycle is unknown.

Figure 1. Position of the four researchers along a proposed funding cycle.

By most common scientific and academic standards, all four researchers would be considered highly successful. All play an active role in the scientific community, serving on NIH study sections, one is an editor of a well known journal, another the Director of a National Research Center of Excellence. All are regularly asked to lecture nationally and internationally, and their publication records are strong. Between them, they have more than 80 years of continuous NIH funding. Although they have all experienced the need to revise grant applications before being funded, only in Alice’s case has the viability of a laboratory been previously threatened.

Historical Funding Experiences

These researchers have seen a variety of funding environments in the course of their careers. In the early 1980s, extramural funding was much less competitive than it is now. Speaking of his first grant, which was a postdoctoral fellowship, Tom notes “I don’t think the grant was particularly outstanding” and “I didn’t have very much preliminary data at all,” and yet it was funded on first submission. He attributes this to the fact that he wrote it as a graduate student while still attending an Ivy League university, and that the strength of the institution was sufficient to give reviewers confidence in his abilities. Joe began his independent scientific career in the early-to-mid 1990s, when funding levels fell and a large number of people left science. He appears not to have been affected at this time, remarking that he was “naïve” (in paying little attention to the stress that such an environment can cause) and also “fortunate” to have obtained funding within a year or two of starting out. While Alice had difficulty obtaining an NIH grant in this same period, Edward remarked that he had not noticed the downturn in funding at that time. By all accounts, the current funding environment is the most severe any has experienced.
Themes

Four main themes emerged in conversations with these researchers: 1) luck, randomness and the peer review process; 2) methods to navigate the current funding environment; 3) potential solutions; and 4) unanticipated perspectives gained from their experiences. As may be expected, the immediate effects of the current funding environment contain numerous sub-themes.

Luck

Funding success was attributed to luck by three of the four researchers. Reflecting on his three R01s sustaining an expensive line of research that relies heavily on specific strains of transgenic mice, Joe comments “I’ve been pretty lucky.” At no point does he accredit his success to his ability as a researcher. Similarly, Tom remarks that it was “just fortuitous” that he had two grants. He also tells a story of how, when the NSF was still funding biomedical research, he had failed to win an NSF grant and called up the program officer to find out why. The program officer read him the reviewers’ comments, all of which were superlatively positive, at which point she asked him how much money he needed to do the research and awarded it to him right over the telephone. Alice too attaches a significant role to fate for the rescue of her career when she was struggling to get a grant renewed in the early-to-mid 1990s: “I was just lucky. I just happened to fall into that niche.”

While references to luck could be ascribed to humility (either real humility or to make their discussion of earlier success more socially acceptable), it could also be a coping mechanism. This use of luck to explain the inexplicable correlates with Jencks’ (1994) study of the homeless. In refuting the assertion that homeless people are merely “down on their luck” (p. 46), Jencks writes that luck often is used as a “covert [argument] about the assignment of blame” (p. 47). These researchers are in the opposite position, perceiving themselves as having been the recipient of good luck, but the same observation can be made if “blame” is replaced by “explanation.” These researchers have not identified a clear explanation for their success in obtaining funding thus far; responding to the human need to understand events, therefore, they attribute their success to luck. Perhaps a subconscious benefit of ascribing success to luck is the lack of accountability during less successful periods. Also apparently unconsidered is the notion that the researchers may have positioned themselves in the right place at the right time. If the infrastructure or funding environment was supportive at the crucial times in their careers, they will have benefited. Whether this could be called luck or appropriate alignment of one’s interests with the environment is a matter of debate.

Randomness and the Peer Review Process

Rather than discussing luck, Edward uses the word “randomness” to describe funding decisions. He tells how, when individual projects within his program-project grant have been adapted and submitted as an R01 application, the result has been quite different from the score received when reviewed as part of the program-project grant. With this story he demonstrates the lack of defined standards among different study sections. He also believes that reviewers are unduly influenced by a grant’s previous score, in as much as they feel some compulsion to move the score closer to the pay line on subsequent review, but they also are unlikely to score a grant that
received a prior mediocre review at a fundable level – the improvement must be in smaller steps.

Further perceptions and experiences of the imperfect peer review system also emerge in conversation with the other researchers. Alice tells a story of how, through a series of unusual events, her own grant application ended up at the study section on which she served, providing expertise on a less commonly studied area. Since researchers cannot review their own grants, Alice had to fight to have her grant reviewed by a special emphasis panel (one established if no other expertise exists on the study section). Once this happened she was funded. Joe, too, recounts how people outside his area of research do not fully understand his work. He even notes that “there’s been a lot of people complaining about the expertise on the study section.” NIH examined the peer review system in 2008 and has begun to change the process (Tabak, 2008). However, Joe still maintains, “I guess you never know if a grant’s great or not because it seems like it all depends on who reviews it.”

All four researchers have extensive experience serving on study sections, and so are intimately aware of the vagaries of scoring grants. Although Alice stressed that when serving on study sections she tries to look only at the merit of the science, Tom says that funding decisions appear random and “based on other factors,” such as whether the applicant has additional funding. If the lack of a new award would significantly curtail a researcher’s ability to conduct experiments, they are more likely to have a grant awarded. This comment is also made by Edward, who says that applicants on their final review may be given “extra credit.” Alice discusses how, if it is apparent that the applicant has been creeping towards the pay line in earlier applications, the reviewers may try to move them into a fundable level without specifically commenting on “the F Word” (funding). In this environment, funding decisions “are out of [the investigator’s] control” – all they can do is “write as good a grant as [they] can” and hope that circumstances come together to result in funding. In Tom’s words, there is no longer any “inevitability that you’re going to get funded now if you’re doing good work. You may not get funded ever, or not by the NIH at least … It’s a crap shoot.”

Navigating the Current Funding Environment

In conversing with these researchers, it was apparent that they were being hurt by the current funding environment. Tom commented a number of times on the change in funding levels. He received funding for an R01 that had been scored in the 22nd percentile earlier in his career. When that grant was up for a competitive (i.e., not automatic) renewal, two attempts earned Tom a score of 20%. This score was no longer sufficient to garner funds, which left the application “dead in the water,” meaning that he is no longer funded to pursue a line of research on which he had focused for a number of years. Edward speaks of an acquaintance who had a similar experience, and furthermore was told by the NIH that any subsequent applications would be carefully examined to determine if they were the old (unfunded) grant being submitted as a new application, in which case it would not be reviewed. More recently, Tom had earned a score of 12.5%, but this had not been sufficient to earn him a grant, and was submitted prior to the establishment of R56 awards. In Tom’s words, “It was 0.5% off the funding line. And the person who was . . . managing that grant . . . would not give me anything. Not even any bridge or anything. And I was, like, really pissed off.” Although the grant was subsequently funded, Tom remarks that the changes necessary for the grant to be funded were so minor as to be considered
inconsequential. He is not alone in remarking that there appears to be essentially very little wrong with grants that are not funded – the only problem is the lack of money for good ideas.

**Staying Afloat in the Queue for Funding . . .**

With fewer funds to support the many scientists applying for R01s, all the researchers mentioned how scientists must queue for funding. Specifically, Tom, Alice and Edward spoke of “lining up” for funding, Joe talked about grants “piling up” and Tom called it a “backlog.” The result is that more researchers may be left with gaps between the end of a grant and its renewal, if, as Joe and Edward noted, it is becoming increasingly common for R01s to be funded on the second (and, previously, third) applications -- an observation confirmed by a recent report on peer review (Tabak, 2008). Given the recent removal of the opportunity for a third submission, the “queue” for funding is likely to be shortened, and the situation observed by these four researchers may improve to some extent. Further research will be necessary after the new system has been implemented for at least a year.

Other than bridge funding, researchers have found two notable ways to help their financial situations. The first is collaborating with other researchers; Alice had been “covered” by collaborating with her division chief on another research project and sharing research staff; she says that trying to maintain two independent projects is the safest approach. The second is to encourage laboratory personnel to be aggressive in pursuing their own funding. All have had partial success in funding their postdoctoral researchers and students on fellowships, which helps alleviate some of the burden. However, it does not appear to be enough. Even with two R01s, Joe is contemplating having to let a technician go, and he has not replaced another staff member who recently left to pursue further education. Tom had to reduce his laboratory personnel from seven to two, and says that the “new experience” of having to “let people go” due to lack of money was “really discouraging.” Edward's lab is half the size it was a year ago, despite a larger-than-usual institutional bridge funding award.

. . . Or Sinking

A third measure that some of these researchers have been forced to take is to halt work on specific lab projects – either because animals or supplies were too costly or personnel could not be paid – thereby preventing scientific progress in that particular area. Tom speaks of long periods where no progress was made on specific projects in his lab. In the end, work “got so far behind that the one project I’m funded for I’m not even really that interested in anymore.” This, like his previous grant that did not get funded, means that a path of research has ended. This experience shook Tom’s confidence and changed his attitude. He “became less of a risk taker” in hiring decisions. Where previously he may have been “juggling” between grants, fellows winning independent funding, and finding clinical funding, now “there were no balls to juggle.” In Joe’s case, as soon as he heard that his third attempt to renew his grant was unsuccessful, he immediately destroyed mice that had cost thousands of dollars to engineer. Both Alice and Edward remark that if they are forced to let go technicians and researchers who have been with them for a large part of their careers, it will take years to retrain someone if funding is subsequently awarded. In Edward’s case, this scenario is inconceivable; instead he says, “I would probably just stop.” One can only hope that important work that is losing funding under one investigator will be taken up by other
scientists, otherwise it may result in an unfathomable loss to medicine and science, and even a loss of new understandings and cures.

**Survival of the Fittest . . .**

Although Joe began his career in a period of relatively low funding, the situation was not as severe as it is currently. Drawing parallels between 15 years ago and the current environment, Tom notes that the result of having already lost the “people at the bottom third of the curve” is that the “whole distribution has shifted” and “the competition is tougher.” With a significant part of the scientific community having already left science, the remaining researchers – whom Tom considers generally better scientists than the group who changed careers – now compete against each other for funding, therefore heightening the competition. The result is that to be funded, scientists must be the best of the best. Edward likens this situation to Olympians, who a century ago could devote only a small part of their daily routine to training, versus today’s athletes who frequently train full-time. As Tom asks, “how do you take the top half that have already been, basically, naturally selected for being outstanding scientists, and now say ‘okay, we’re only going to fund 10% of you, or 5, 6% of you, or something like that?’ It doesn’t make sense.” Compounding the problem is the fact that the current system was not designed to distinguish between the eighth percentile and the twelfth percentile of grant applications, as Edward points out. It is possible to discern the top quintile from the second quintile, perhaps, but fine distinctions between percentage points that the current pay lines necessitate are, as noted earlier, subjective and imperfect. In summary, it punishes those who, in other times, would be rewarded.

. . . And the Young Die Out

All four researchers see the current environment negatively affecting younger researchers’ aspirations for a career in academic biomedical research. Alice noted that “we’re scaring off the really good students from continuing in academic research” because they “just don’t want that stress.” Similarly, Joe says that younger researchers see what is going on in their mentor’s laboratory, and “get the feeling that it’s not worth it, so they just go on and do something else.” Edward’s comments focus more on early-career, untenured faculty with Ph.D.s (as opposed to M.D.s), whom he sees as “[questioning] what they’re going to do with the rest of their lives.”

**Futility of Grant Writing**

One commonly held belief is the futility of grant writing in the current environment. While Tom accepts that the medical school administration may like him to pursue ever more funding opportunities, this is not a path he is likely to follow now:

> There’s just so many times you can spend writing grants and then get… rejected. Then you say, ‘well, what’s the point of it? I’ve got one grant, I can do some good work and I can pay attention to these people, or I can just spend my time in here writing and writing and writing for no return.’

Joe shares Tom’s opinion that writing and rewriting grants is a wasted effort: “It’s just not worth it anymore.” Edward says, “I wouldn’t want to say a majority of our time, but a very large amount
of our time [is spent] writing grant applications now, and that’s not terribly productive in the short run.” Tom comments that the enormous focus on winning grants means that investigators can “lose track of what the other parts of science are,” which does not portend well for future research. It appears that he may be calling for a return to more Mertonian norms, before money – whether public or private – became the focus of scientific endeavors. He admits that this attitude may “put him on a collision course” with the administration, but is not overly concerned about this because he is tenured and considers himself to work hard on important parts of science that happen to have a goal distinct from chasing funding. Joe’s situation is less clear cut – at the time of this conversation he was planning on meeting with his department chairman or vice-chair to discuss what would happen if his current two grants were not renewed. His future is currently undefined and “it’s killing [him].”

Alternative Career Paths

Although all four researchers express their love of science, the effect of the current environment is clear. Alice’s confidence in her independent research has been affected: “I felt like I was incompetent, like I couldn’t seem to get my own research going,” despite her prior fifteen years of funding, and it made her feel “really sick.” Despite this, however, she says she never seriously contemplated leaving science. Her ease at saying this could reflect the fact that she has overcome possibly her leanest funding period and is now in a more comfortably funded environment. Edward reflects that he has sufficient teaching experience and wide-ranging interests that he could be comfortable accepting a new definition to his current role – either with increased pedagogical or administrative duties. Tom acknowledges that he may have to withdraw from bench science, and in the last few years has come to terms with the idea of moving into a more teaching-oriented role. Ten years ago he would not have felt comfortable becoming a teaching faculty member in a research institution. Now, however, he recognizes the importance of this contribution to science and the future of research, and declares that he “gets rewards out of it” sufficient to sustain him professionally, if need be.

Alice, Edward and Tom are in a different situation from Joe. They either can see a way out, or no longer need a way out, having garnered funds again. Joe, on the other hand, has lost one grant and is facing the competitive renewal of two more in the near future. He has had numerous “sleepless nights” and remarks on how “demoralizing” he finds it. Unlike Alice, he is currently considering his options if his laboratory’s financial situation does not improve in the next year – before he is due to run out of funds altogether. Although no obvious alternative springs to mind, he comments, “to tell the truth, if I could figure out another way to make this kind of comfortable living doing something else, science-related or not, I’d consider doing that. That’s how bad things are right now in my mind.” He also remarks that, “knowing what I know now, if I was starting out, I would probably think long and hard about going this route.”

Potential Solutions

In this bleak environment, what do these researchers see as potential answers? Both Joe and Tom see institutional bridge funding as fundamental to the continuation of biomedical research. In Tom’s words:
Some of these [institutes that together form the NIH] are down to single digits, you know, and how can you tell somebody who writes a grant that’s in the ninth percentile that they can’t get funding? … I mean, it’s ridiculous. So I think [medical schools] have to pony up the money, and they’re going to have to find a way to … put that into their budgets if they want to maintain … active research faculty.

A problem with relying on departmental or institutional support, however, is that it may not be forthcoming, or there may be emotional strings attached to it. When she lost most of her funding in a non-tenure stream position earlier in her career, it was suggested to Alice by the chairman of her basic science department that she should see if she could use bench space in another investigator’s laboratory. Thus, the department was insinuating that they would not support her if she failed to renew her grant, and would not hesitate to take her space away. (She subsequently left the department and renewed her grant, causing the chairman to rue his hasty dismissal of her.) Later in her career, when the institution supported one of her postdocs, Alice was reminded of the fact at frequent intervals by the administration. This experience was not shared by Tom or Joe, but Alice’s experiences are sufficient to demonstrate some of the pitfalls of relying purely on the institution to support faculty with funding gaps, assuming this is economically possible.

If institutional budgets are insufficient, then shrinking the number of researchers at medical schools appears the only option to Tom, and for Joe is a logical reaction to the current problem. The problem Tom sees with this solution, however, is that this is going to “squeeze the middle much more than it is going to squeeze the top. And the middle is good. The middle is excellent, and a lot of good things come from the middle,” by which he means that excellent scientists who are not the top 5% elite group have much “solid” science to contribute. While they may not provide groundbreaking ideas, they add a significant amount of smaller but “important findings” to enable the progression of research.

Other suggestions that administrators may consider if this low level of funding continues – which Edward thinks will happen for at least the next few years – include Joe’s idea to reduce the salary coverage medical schools expect faculty to maintain on grants and Alice’s idea of five-year rolling tenure. The former idea, Joe admits, may just be “moving money around,” as the financial support must be provided from somewhere. However, the benefit of this idea is that it allows faculty to spend more time on their research and less time worrying about their laboratory finances. Naturally, some consideration must be made to the economics of their research, but not at the current level where funding appears to be almost as – if not more – important than research productivity and creativity. Alice’s proposal is to offer tenured faculty a five-year contract every year. This way, they know their jobs are secure for five years, but if they find themselves in financial distress for two or three years, they still have time to recover their funding before their five year contract expires. Edward’s suggestions include demanding a higher percentile for each subsequent grant held by a researcher. For example, anybody’s first R01 would have to be in the top 30% of grants. To get a second, concurrent R01, one would have to score in the top 20%, with the percentile decreasing to the top 5% for a fourth R01, with nobody allowed to have more than $1 million of direct costs from NIH at any one time. He also suggests trimming R01 funding periods from five years to four.
Unanticipated Perspectives

Serving on NIH study sections has been helpful to both Tom and Alice, although less so to Joe and Edward. This has changed their perspectives, which are now different from those of unestablished researchers. Participating in the process by which others are funded has given Tom an opportunity to see other “totally amazing” people “who were also having trouble.” This afforded him the sense that he is not alone in this experience, and nor is it a reflection of his scientific abilities. For Alice, serving on a study section gave her a perspective of others standing in line for funding from the other side of the review process. Joe, who has been a regular member of a study section, does not share this experience because he remarks that he always has known that “not every good grant is funded.” He also notes that he feels disinclined to serve on a study section until he secures funding; at the moment he feels this is time he cannot afford away from his laboratory. If others share this view, this may partially explain the problems noted earlier regarding finding suitable expertise for study sections.

Of the four researchers, only Tom appears to have gained something positive from this experience thus far. While all remark that tenure provides some income protection, Tom remarks that the “comfort” given by the knowledge that his “life’s not going to stop” and he wasn’t “going to be out on the street” has enabled him to understand that even though “things are going to slow down,” he can still continue making “worthwhile” contributions to science. This becomes an important positive message: although his research may dry up, Tom has a lot to contribute in other ways. He has “a reputation from doing other things too” and has “protected himself” by doing a significant amount of teaching of graduate and medical students, even assuming a leadership position within the curriculum committee at the medical school. He remarks that going through this dearth of funding has changed his attitude towards teaching. While he always enjoyed it and was “excited” to teach, he was aware that teaching faculty were unfairly regarded as “lower class citizens” in the research institution’s culture. Now, teaching appears to be his salvation if he loses all his funding. While this revelation has been positive for Tom, Edward – who shares this outlook – appears to find comfort from this alternative career path. However, Edward says he did not need the current environment to help him see the other ways in which he could forge a fulfilling career.

Tom’s aforementioned comfort extends beyond the scientific realm to increased professional confidence: “I’ve had successes in so many different arenas that I don’t worry about the connotation of not having grant success now.” Whereas earlier in his career when he didn’t get his first grant refunded he “walked around with [his] head hung low,” now he does not feel that the attitude of the medical school administration towards him has changed as a result of needing bridge funding. He reported less of a “stigma of not getting a grant funded” now than 10 years ago because “nowadays it’s so common that I can’t imagine that there’s that much of a negative connotation.” While Joe does not share Tom’s optimism in this regard, he believes that many more researchers will soon find themselves in this position, so feels that medical schools will have to adopt a more clearly defined stance on what will happen to tenured researchers without funds to support their research.

Discussion

The first section of this paper outlined the firm hold academic capitalism has taken in academic
science in the United States. This, combined with the current NIH funding shortage, has evidently populated the 41st chair far more heavily than Merton may have originally imagined. The stories of the four researchers clearly illustrate their personal experiences in this situation and suggest that they are far from alone in this position. However, whereas Merton’s metaphor denied researchers their due peer recognition, now the stakes are higher: careers of both senior and junior professors are at stake. It seems clear that the combined effects of academic capitalism and the shrinking (in real terms) NIH budget of recent years are systemic.

With their experience of occupying the 41st chair, the four researchers in this study describe the beginnings of a possible shift away from the Mertonian norms of science — communalism, disinterestedness, organized skepticism and universalism. While it is too early to say if a shift has indeed started, and the methodological approach of the study does not permit wide-spread generalizations, the stories told by these researchers suggest that they are experiencing a change in Mertonian norms:

Communalism has the potential to become not the secrecy and commercialization seen in the biotechnology world, but abandonment. Instead of belonging to either everyone or a select few, research programs – some of which have been in progress over 20 years – risk desertion due to lack of funding.

Disinterestedness could morph into hyper-interestedness. That is not to say that researchers allow personal bias to influence their interpretation of results. Instead, with careers of researchers and the livelihood of their staff depending more heavily on obtaining significant positive data, it is plausible that paths of inquiry in biomedical research diverge from Merton’s ideals, and are instead driven by a desire to follow the most financially secure route.

Organized skepticism, which demanded that findings be tested by the scientific community, could be reinterpreted as conservative reins. Instead of exercising sensible caution while allowing great leaps of science to occur, the current environment appears to be pulling back the advance of discovery, forcing researchers to focus on projects deemed ‘safe’ by their peers. With research programs sometimes half way to completion by the time they are proposed in grants, due to the demand for strong preliminary data, one could argue that there is no room for organized skepticism in the research environment anymore. Instead, these researchers’ stories could indicate that scientific ideas are tested before they reach the scientific community. If this is not the case, it appears unlikely that funding will be secured.

Universalism appears to come in second to politics in the stories told by these researchers. Instead of science being open to all, regardless of creed or color, they perceive funding decisions to take into account previous funding history and prior scores for grant submission. Even though these researchers all have experience serving on study sections, they feel that merely having good scientific ideas no longer suffices; the paucity of funds has made the peer review process for grants appear politicized, random and a numbers game.

Given the potential shifts in Mertonian norms suggested by these four researchers, the scientific administration community may benefit from further research into this area. A qualitative study on a larger scale could expand on these researchers’ interpretations of how Mertonian norms may
be revised and help elucidate current or currently-forming scientific culture. A quantitative study could then assess whether the proposed depiction of current or new scientific culture is becoming a revision to Merton’s scientific norms.

Academic capitalism’s new norms of science appear integral to biomedical research in the current NIH funding environment. Returning to an earlier quotation, the reduction in funding levels is “[shaping] the questions that researchers are likely to pursue” (Vallas & Kleinman, 2008, p. 284), in the hopes of receiving a positive peer review and, eventually, NIH funding. This observation was also made by Slaughter and Leslie (1997). Six of the seven capitalist values described by Hackett (1990, table 2) have come to the forefront. Researchers are accountable to their institutions in terms of supporting their own research programs; they must be highly productive in obtaining a large quantity of data for grant applications; the drive to secure funding forces researchers to become highly specialized in one area; there is intense competition for resources, which can influence the sharing of data and collaboration; with so much time spent writing grant applications, researchers now must be incredibly efficient in their research as they have less time to spend at the laboratory bench.

The increasing focus on funding makes the scientific enterprise a negative sum game, with the pursuit of funding and the advancement of science as the two components that, rather than remaining at a steady state when combined, eventually detract from each other. As the pursuit of funding increases due to NIH pay lines languishing in single digits, so the advancement of science slows. In conditions of scarce funding, study sections have become increasingly conservative, as demonstrated by the vignettes from Tom, Alice, Edward and Joe. Peer reviewers appear unwilling to take chances on less-than-conventional ideas. Instead, they opt to fund projects likely to provide small, incremental advances to the current body of scientific knowledge, whose success is almost guaranteed by virtue of the fact that applicants are either using technologies already proven or are providing so much preliminary data that the “proposed” work is near completion. Under this practice, it seems highly unlikely that investigators funded by an R01, constrained by conservatism, will make the sort of paradigm-shifting discoveries that create a new path for science and permit rapid advances of knowledge (Kuhn, 1996). In addition to the forced-conservatism slowing scientific progress, those who are unsuccessful at obtaining funding are finding that they must relinquish lines of inquiry that they may have been pursuing – in many cases successfully – for several decades. If not adopted by other researchers in their field, these paths of investigation may never be brought to fruition, which could be deleterious for the public health of the nation as cures are delayed and our understanding of biomedical mechanisms is not advanced.

Thus, it is clear that the adoption of market-like behaviors by institutions and the treatment by administrators of departments and schools as cost centers that must be financially viable (Slaughter & Rhoades, 2004) is having a negative effect on both faculty research outcomes and morale. The increasingly business-like approach to biomedical research may be a financial necessity, but it may also be preventing researchers from fulfilling the institutional mission at research universities – to further knowledge and educate students to do the same in the future. Instead of furthering knowledge in a significant way, only conservative, incremental advances are being made because peer reviewers must opt for the grant applications perceived as “safer” in the
current NIH funding environment. This harms not only science, but also the faculty’s excitement surrounding the potential for their research.

Nevertheless, the researchers studied here have found several meanings to ascribe to their experience of needing bridge funding, which have helped make it more psychologically manageable. One is that established members of the scientific community can make contributions in domains other than research. While research is important and probably the most desirable activity for those who have been successful in it for multiple decades, to secure enough funding for a feasible research program (i.e., at least two grants) and to satisfy medical school administrators, scientists either must be lucky with regards to the timing of their funding or be in the top few percent of grant applicants. This is an environment in which the extremely successful will thrive, denying either entry or continuity of sustenance to the excellent – but not top – researchers. In Tom’s words, “the rich get richer and the poor get poorer,” an example of the Matthew Effect in practice (Merton, 1968). Bridge funding can give more scientists a chance to become successful while they await their turn for funding, if it comes at all. Edward says that without funding, in his current position with his current job definition, “there’s nothing useful I can do.” However, his experiences have allowed him to perceive an alternative career where he accepts additional administrative or pedagogical duties, and finds merit in this new role. This may have seemed unfathomable to him without having experienced the threat of laboratory financial distress. Another helpful understanding derived from their experiences is that funding decisions are not strictly a reflection of scientific merit. Other factors play a part, such as scores received on prior reviews, and an individual reviewer’s understanding of the proposed work.

**Implications for Research and Other Administrators**

There are many different levels of research and other administrators in institutions of higher education. The findings of this study are likely to be of greatest utility to those administrators who interact with faculty on a regular basis. Nevertheless, the findings also suggest a number of implications with relevance to research and other administrators who have less regular personal contact with faculty. Table 3 suggests which actions may be most appropriate for research and department administrators, who may have more frequent faculty contact, and those that may be more suitable for senior administrators and research administrators who have less frequent personal faculty contact.

Foremost of all the findings, and relevant to all administrators, is the understanding of how researchers interpret and react to such experiences on a personal level. In busy and competitive academic environments, researchers may lack the confidence to speak up and administrators may lack the time to listen extensively. It is plausible that the common themes narrated by Alice, Tom, Joe and Edward are replicated at research institutions around the United States, and thus could be used to direct administrative support. Based upon each theme or subtheme described in this paper, there are support mechanisms or attitudes that administrators may consider adopting to help those occupying — or threatened by relegation to — the 41st chair.
### Articles

**Table 3**

Actions that Research and Other Administrators may Take to Help Those Occupying, or at Risk of Occupying, the 41st Chair

<table>
<thead>
<tr>
<th>Theme</th>
<th>Actions for Research and Department Administrators</th>
<th>Actions for Senior Administrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luck</td>
<td>Help faculty assess other factors contributing to prior success</td>
<td>Foster a culture of accountability</td>
</tr>
<tr>
<td>Randomness and the peer review process</td>
<td>Provide an initial empathetic ear. Encourage select faculty to contact funding agency regarding negative decisions.</td>
<td>Encourage faculty to participate in peer review process.</td>
</tr>
<tr>
<td>Navigating the funding queue</td>
<td>Facilitate collaborations. Encourage strategic grant applications. Connect staff from downsizing laboratories to laboratories looking to expand. Encourage younger faculty to gain experience in, and excel at, teaching and institutional administration.</td>
<td>Encourage strategic grant applications. Provide institutional support and leadership in preparing for known future large funding opportunities. Foster networks with science-related organizations in the community.</td>
</tr>
<tr>
<td>Potential Solutions</td>
<td>Develop guidelines and practical obligations for the provision of departmental/institutional support.</td>
<td>Consider other financial models that reduce the proportion of salary coverage required of researchers.</td>
</tr>
<tr>
<td>Unanticipated Perspectives</td>
<td>Help faculty appreciate their other contributions to scientific and academic community.</td>
<td>Appreciate other contributions faculty make to scientific and academic community. Define policy towards tenured, unfunded researchers.</td>
</tr>
</tbody>
</table>

**Luck**

Encouraging faculty to consider the reasons for their successes, other than luck, may help researchers identify prior behavior that they could adopt to become or remain successful in their pursuit of funding. Careful consideration of the steps that led to an earlier, successful grant application may help remind faculty of the parts in the grants process over which they have control and can take responsibility. The act of helping faculty recognize factors other than luck that contribute to funding success or failure may promote a culture of accountability within an institution. Accountability, or focusing on an individual’s contributions towards a goal, can increase productivity and quality of work (Bogue & Hall, 2003), but care must be taken to avoid an overly officious or managerial approach that may run counter to the traditional academic culture of the specific institution (Bergquist, 1992).
Randomness and the Peer Review Process

As shown above, and described further in a recent study on peer review (Lamont, 2009), faculty may perceive that factors other than scientific merit influence funding decisions. Perhaps the strongest support administrators can offer in this regard is to recognize this perception without judging whether it is warranted. In dealing with a researcher unhappy at a funding decision, an initial empathetic ear may be most important.

However, once a faculty member has taken time to absorb the decision and its implications, there are two supportive approaches suggested by the stories of Tom, Alice, Joe and Edward. The first, demonstrated by both Tom and Alice, is to encourage faculty members to contact the program officer at the funding agency to discuss the funding decision. While this will not be appropriate in all cases, where grants have been scored close to the payline or sent to an inappropriate study section, there may be merit in personal communication with the agency to determine if any beneficial outcome could be salvaged. The second – which could be adopted regardless of an individual’s funding experiences – is to encourage researchers to participate in the peer review process. Doing so will provide them with firsthand experience of the difficulty of funding decisions and the care taken by many reviewers over the scientific merit of applications.

Navigating the Funding Queue

With a recent NIH announcement that 14,000 scientifically meritorious grant applications are awaiting funding (Harris, 2009), navigation of, and survival in, the funding queue must be strategically managed. Perhaps one of the most important actions a research administrator may take in the current environment relies on the position serving as a funnel through which pass a large number of applications from a variety of individuals or departments within an institution. As part of the funneling process, it may be helpful to researchers for administrators to take time to consider the content of applications and how they relate to other applications passing through the same office. In this way, staff may be able to point out complementary research interests among individuals at the same institution, thus facilitating research collaborations. Bringing together individuals whose research paths may not have otherwise crossed has the potential to increase partial salary coverage for otherwise unfunded investigators. This oversight role also may be instrumental in cases where funding solicitations are limited to a small number of applications per institution. Research administrators could be best positioned to recommend which faculty members would form a strong team to submit a competitive application.

Another important action point is to encourage faculty to ask their graduate students and postdoctoral researchers to write grants, thus alleviating financial pressure on the principal investigator. In cases where faculty can no longer afford postdoctoral researchers or laboratory staff, administrators may be aware of newly funded researchers looking for individuals with similar skill sets, thereby preventing the end of academic careers for younger researchers or the unemployment of staff in whom the institution has invested resources.

A focus on strategic applications could help avoid the submission of excessive numbers of grants that can appear a futile waste of time to faculty and can place a burdensome workload on the research administration. For example, more careful consideration may be given to the most
appropriate funding opportunities for proposed projects, and preparation for known future, substantial funding opportunities may be made an institutional priority.

If, however, funding and collaborative opportunities have been exhausted, administrators may be called to act as a career counselor for researchers considering alternative career paths. For example, promoting opportunities for younger faculty to make substantive pedagogical and administrative contributions to the academic and scientific communities, and – crucially – fostering the perception that such contributions are valuable and difficult to do well. This experience and professional understanding of activities other than research can help provide some career protection or potential for role redefinition in times of limited funding. If, however, researchers decide to leave academic research, administrators could help them find other fulfilling work by keeping abreast of employment trends in science-related fields and by fostering networks with groups in their communities who may provide suitable employment to former academic researchers.

**Potential Solutions**

Unless there is systemic change, potential solutions to the current funding environment are likely to be limited to reactive, stop-gap measures. Nevertheless, the researchers in this study presented experiences from which administrators could learn. Alice described being reminded of the support her department had given her research, and thus feeling under a constant emotional obligation of gratitude. This created a negative environment for her. Therefore, while departmental and institutional support for researchers can be critical for faculty who have lost funding, the practical obligations should be laid out for both parties in full from the start, and the department/institution should thereafter refrain from behavior that could provoke emotional duress in the researcher related to the departmental/institutional support.

At the institutional level the researchers suggested two solutions – a reduced demand for salary coverage, and rolling tenure. Clearly, these are potentially contentious changes that could be difficult to implement, and will depend on institutional finances and environment.

**Unanticipated Perspectives**

In the course of the interviews, Tom and Edward recognized that there are multiple contributions, other than research, that they could make within the scientific community. As noted above, administrators could encourage faculty to acknowledge this perspective and gain broad professional experience early in their career. However, it is also important that administrators themselves appreciate the contributions of faculty like Tom, who may not have a large laboratory or a well-funded research program, but who bring prestige to the institution through acting as editor of a major journal, and who participate significantly in the educative mission of the institution.

Joe commented that medical schools need to define their policies regarding tenured researchers who have no funds to support their research. This is a clear call to action. The pronouncement of school- or institution-wide policies, regardless of content, may help provide some form of certainty and clarity regarding the professional ramifications of losing funding, and the...
anticipated institutional response. Such a policy could even help individuals in this situation move towards a constructive course of action, rather than languishing in a paralysis of uncertainty.

Limitations

This research was conducted with four faculty members, and while this number may be criticized as not statistically significant, wide generalizability is not the aim of narrative, interpretive research. Rather, this study aimed to elicit thick descriptions and rich stories (Denzin, 1998) to provide a context and more complete understanding of the four researchers’ experiences. By doing so, this study attempts to provide the personal meanings behind the statistics readily available from the NIH and medical schools, and gain an understanding of how some faculty perceive the current funding environment, how it might be affecting their careers, and what actions they feel would be most beneficial. Learning from this, research and medical school senior administrators may be better positioned to help faculty in danger of occupying, or currently in, the 41st chair.

The experiences of these researchers have been shaped by their careers within the United States, their focus on obtaining funding from the NIH, and the scientific norms and academic practices at U.S. medical schools. Given the importance placed on context and personal experiences in narrative inquiry, this research may resonate most for those in similar institutions. Researchers and administrators from other countries, with different funding structures and academic systems, may find they can draw fewer parallels between their own work and experiences and those presented in this study. Nevertheless, in an environment with a strong focus on obtaining competitive grants, there are unlikely to be sufficient resources to satisfy all who apply for funding. Similarly, in countries with severe restrictions on the number of professorships, and where research funds are not as readily available – as is the case in many European and Asian countries – the 41st chair may become more pertinent to those researchers seeking academic jobs rather than research funding.

Conclusion

While the researchers studied here make several suggestions for potential remedies, the ultimate assessment appears to be that significant systemic changes will have to occur – either more money will have to be provided by the government for biomedical research, or medical schools will have to start reducing the number of researchers they employ. The 2009 American Recovery and Reinvestment Act (ARRA) provides two years of increased financial support for biomedical research, with the aim of sustaining employment in the field. Initially, this appears a positive step to assist researchers undergoing experiences similar to those of the four faculty in this study. However, some institutes are anticipating a precipitous drop in funding in FY 2011 (e.g., National Institute of Allergy and Infectious Diseases, 2009), when the NIH budget is expected to return to levels similar to FY 2009. Therefore, while the ARRA may provide temporary relief for biomedical researchers and medical schools, it does not yet appear to be a lasting systemic change. As a result, in FY 2011, the biomedical research community may find itself returning to the issue of the 41st (or 4001st) chair, and its accompanying prospect of reductions in research personnel. This would, logically, lead to a reduction or obstruction in the progression of biomedical
knowledge, which has the potential to harm public health if cures for diseases are set back by years. Even with the best of the best researching problems, as Tom noted, without the mid-grade researchers to do solid science, the laborious and painstaking research underpinning great breakthroughs may not be conducted.

Certainly, the protection afforded by tenure helps researchers who are significantly advanced in their careers. Those earlier in their careers, however, have no such shield. If many researchers decide that depending on the hand of fate for their reward (and livelihood) in the new culture of academic capitalist science is not a path they wish to pursue, then one of the structural suggestions made by Tom, Alice, Joe and Edward may occur naturally as researchers leave the profession. It is impossible to predict accurately the effect this could have on the health of the nation, but it is unlikely to be positive. This study has focused on researchers who have reached the pinnacle of their careers – full professors with an average of at least 20 years of experience. They should be at their most productive period, and have significant management experience to run their laboratories effectively and efficiently. The same cannot be said for the younger and untenured scientists. Further research must be conducted to determine the effect the current biomedical environment is having on this population, and what it may mean for science in the United States over the next twenty years. The increasingly common relegation to the 41st (or 4001st) chair in academic biomedical research today is defining careers. Shaped by academic capitalist values, researchers must adapt their work to position themselves most favorably for NIH funding. Some may be able to continue as before, with minimal change. Many, however, find themselves having to queue up for the NIH lottery and hope that bridge funding can support their research programs in lean periods. This situation is likely to dissuade many graduate students from entering the field and cause postdoctoral fellows and research associates to look for alternative career paths. While the pipeline is currently strong, anecdotal evidence suggests that today’s young researchers are already deterred from remaining in the biomedical research profession, having witnessed the stress suffered by senior, formerly highly successful professors. If this is the case, who will be the senior investigators when today’s elementary school children become graduate students in the biomedical fields, and who will be providing cures for the diseases ailing an increasingly aging population? These are the questions with which this country must be concerned as the 41st chair is forced to become a sofa to accommodate its increasing population.

References


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Book Review:
The Carnegie Foundation for the Advancement of Teaching
George Walker, Chris M. Golde, Laura Jones, Andrea Conklin Bueschel, Pat Hutchings

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Like many others in this world, I am anxious. Change is happening much too quickly in our economies, governments, and ultimately in our personal lives, including my own. Having just resigned a position at my university that I thought would last until retirement, I am now pondering my future in this time of uncertainty. This decision was based on my desire to engage in full-time doctoral studies in an attempt to remove the title candidate that has followed the letters PhD after my name for the last several years. So it is fitting that I was asked to read and comment on the book The Formation of Scholars: Rethinking Doctoral Education for the Twenty-First Century.

This book could not have been published at a better time for me, as a graduate student and research administrator who has been engaged in the process of assisting young minds to develop over the last seven years and who is leaving and now taking the time to reflect on my own accomplishments. The impact that I have had in the development of people and knowledge cannot be underestimated as I think about my role as facilitator, researcher, mentor, and steward, all of which are discussed in this book as essential components in graduate programs but also equally important in research administration.

Sometimes research administrators get bogged down with issues of compliance and regulation and forget the part we could play in the development of university programs for graduate students who will eventually become members of the group we are paid to support. We need to think of ourselves as members of a community of scholars engaged with graduate students, presidents, vice presidents, deans, chairs, and faculty members who all take a keen interest in ensuring current models of graduate education are keeping pace with an ever changing world.

If we do not collectively assume this responsibility for the ongoing assessment of PhD programs then current levels of attrition will continue to impede the development of new scholars and knowledge. Approximately 50% of our PhD students lose interest or drop out in part due to...
the constraints placed on them by inflexible, poorly supported, outdated and/or non-relevant models. The toll that it takes on the personal and financial lives of students and their families, the faculty members who mentor them, the tax payers who fund them, the research administrators who facilitate the acquisition of funding, and the resulting loss of new knowledge that potentially ends with their withdrawal, is substantial.

As a result of these issues, and a belief that the “importance of doctoral education . . . cannot be overestimated” (p. 2), a five-year research study entitled the Carnegie Initiative on the Doctorate (CID) was conceived, culminating in the publication of this book. In these times of rapid change, technological advances, “shifting student demographics, new kinds of competition, growing pressures for accountability, and shrinking public investment” (p. 2), the Carnegie Foundation for the Advancement of Teaching (CFAT) felt it important enough to sponsor this significant undertaking that involved “hundreds of faculty members and doctoral students from more than forty institutions” (p. xiii). Solicited from doctoral granting departments that had expressed a desire to critically look at their programs, participants were taken from six disciplines, including English, neuroscience, mathematics, history, chemistry, and education. In all, 2,176 graduate students from 76 departments and 668 faculty members from 63 departments participated in the survey.

An esteemed team of researchers undertook this large scale research project. This team included three senior scholars at the CFAT: George Walker, vice president for research and dean of the University Graduate School at Florida International University; Chris Golde, associate vice provost for graduate education at Stanford University; and Laura Jones, director of heritage services and university archaeologist at Stanford University. The remaining two members were Andrea Conklin Bueschel, senior program officer with the Spencer Foundation, and Pat Hutchings, vice president of CFAT. Together they co-authored this book.

The book is organized into seven chapters that span 150 pages followed by five appendices that describe the participants, the CID, and an overview of the survey design, data analysis, and interpretation.

The first chapter sets the stage for the remainder of the book as it introduces the themes that are discussed in greater detail in the following pages. These themes include scholarly formation, teaching, integration, intellectual community, and stewardship. Chapter Two provides the reader with the “big picture tracing the contours of doctoral education as it has evolved over time” (p.13). It outlines how change is constant, often reflecting “shifts in the larger social, political, and economic context of the PhD” (p.13). But change is not always fast or appropriate. Academia can be entrenched in traditions that are not easily altered based on the desire to maintain long and treasured traditions.

These traditions are not always steadfastly adhered to, however, as noted in Chapter Three, which addresses issues related to “how graduate programs . . . constructively grapple with questions about what they do, why, and with what success” (p. 13). The authors note that scholars are capable of enacting the principles of “purposefulness, assessment, reflection, and transparency” (p. 13), or PART.
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The CID team was also cognizant of the principles of “progressive development, integration and collaboration” (p. 13), around which Chapter Four is structured. This section of the book provides examples of “new approaches to pedagogy of research, the development of teaching expertise [and] the dissertation.” (p. 13). The team also believes that these approaches can be learned and adapted to a myriad of settings as can leadership and stewardship skills.

Mentoring skills can also be learned, but the current model of “master and student apprentice” (p. 14), developed during medieval times, does not always bring out the best in the student or professor, as outlined in Chapter Five. Without proper training and clear and ongoing communication this model may not be meeting the needs of today's PhD student. Other alternatives need to be introduced, tested, and evaluated in this time of collaboration, shared decision making, reciprocity, and the development of intellectual or learning communities.

Chapter Six continues this discussion by introducing the concept of intellectual communities where students from diverse backgrounds are welcomed and encouraged to engage in debate, knowledge creation, risk taking, and stewardship. The authors suggest that these communities are “happier places to work [but] are also more efficient engines of knowledge production than their dysfunctional, antisocial, or apathetic counterparts” (p. 14).

Finally, Chapter Seven “pulls things together and returns once again to the urgent need for change” (p. 14) by calling upon students, faculty members, university administrators, funding and accrediting agencies to “move doctoral education successfully into the twenty-first century” (p. 15). This call is followed by the introduction of an agenda that the authors feel should be studied and discussed with a view to implementation in some part.

This book is full of important information for graduate students, but it is also relevant to us as research administrators who may find ourselves discouraged with the lack of support for PhD students, the research projects that fizzle when they drop out, and the frustrations faculty members face when trying to nurture these students so that they will remain with them. These scholars take great pride in their ability to assist PhD students with new discoveries, inventions, and innovations, but it would appear that traditional approaches to doctoral education may be stifling young scholars and ultimately the programs of research in which established scholars have engaged them.

The lack of attention to program review is also frustrating for research administrators who see how inefficient research projects can become if PhD programs are not adjusted to meet the needs of today’s society. These sentiments are supported by the authors of this book, who believe that PhD programs may not be meeting the needs of students who are functioning in a fast-paced world not envisioned when PhD programs were developed. They believe that new, flexible, models should be developed based on sound research and stakeholder involvement that includes students, faculty members, university and research administrators, accrediting bodies, and funding agencies. Throwing away the “baby with the bathwater” is not, however, the approach they are espousing. Rather they suggest that the efficacy of traditional tasks currently imbedded in the PhD process should be re-evaluated. For example, the comprehensive exam should be assessed in light of the kinds of skills students should be acquiring based on changes they will face in regards to the economy, technology, diversity, quality of life, and the fast pace with which
knowledge is created and disseminated. They suggest that a comprehensive portfolio might be more appropriate, as participants in this study felt that the traditional “data dump” (p. 54) that occurs when doing comprehensive exams may have little to do with how scholars do their work after they finish their PhDs.

Reviewing the relevancy of exams, portfolios, and other tasks in PhD programs is significant given the fact that approximately 50% of PhD students drop out and, of the remaining who do graduate, 50% do not remain in academia. Programs need to include activities that will enhance skill acquisition that can be applied to industry and the non-profit sector as well as educational settings, so research development and dissemination need to be considered in a variety of contexts.

Teaching and stewardship skills are as important as research in these different contexts so it is essential for PhD students to be community minded, to share their knowledge, and to think about values and morals in relation to the role that they will assume as disseminators of knowledge. This role puts them into a position whereby they will be expected to share their knowledge and skills with the next generation of scholars in their roles as teachers, mentors, and researchers.

A new scholar’s ability to teach is not to be taken lightly and is no less important than research even though research administrators are aware that there is a debate about how the two intersect and which is afforded more prestige. These arguments aside, the authors strongly support strong skill acquisition by graduate students for both. They outline how one informs the other and provide suggestions for what kinds of activities might enhance their teaching and scholarly work.

The acquisition of these skills is discussed in the context of the current mentoring system that most PhD programs embrace with the faculty member being the master and the student being an apprentice. The authors discuss this model in some detail, suggesting that these roles need to be more clearly defined and based on sound principles that allow the student to progress “in a lockstep fashion” (p. 91) from being a receiver of information to one who takes “responsibility for independent work” (p. 94).

These mentor/student relationships can be dramatic both in terms of their success but also their failures, so the authors provide some excellent suggestions as to what the students, faculty members, and university administrators can do to encourage successful outcomes. They also talk about what alternative models might be considered to ensure that PhD programs are capable of creating and sustaining the intellectual community that is developed during these years when scholars are formulating their ideas and skills.

This book should be required reading for new PhD students but also research administrators who may not always see the role that they play in the scholarship of program development and implementation. By reading this book we will be encouraged to think about our role while not only in our own office situations, but also in the development of graduate programs that engage students who interact with professors who then interact with us.
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Research administrators have intimate knowledge of how university research projects can have an impact on the outside world and how they intersect. Our role in this interplay provides us with a unique perspective on the relevancy of PhD programs in the context of today’s society and the impact of technology, diversity, fiscal constraints and changing pedagogies and expectations. The authors feel that the development of communities of scholars in our institutions are integral to the development of new PhD programs, and research administrators should take part in these discussions along with other policy makers and scholars (new and established) who enroll in, design, accredit, or fund these programs.

As members of this community of scholars we would all do well to read this book, engage in ongoing dialogue, then take steps towards ensuring PhD programs attract and retain excellent scholars who go on to become the very people who we serve and who make a difference in our changing world.
Book Review:  
Sentenced to Science:  
One Black Man’s Story of Imprisonment in America (2007)  
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Prisons are filled with people who have made bad choices in life that have exposed them to tremendous risks and sometimes life-threatening or debilitating injuries. In *Sentenced to Science*, Allen Hornblum documents the life of Yusef Abdul Saliquu. As a younger man, then known as Edward or Butch Anthony, Yusef was involved with drugs and crimes to support his addiction; he did not always fulfill his family obligations as father, husband, son, or brother. While he takes full responsibility for those decisions and has changed those life patterns, this book focuses upon another set of decisions that had an even more devastating effect on his life: Yusef agreed to participate in research studies while he was incarcerated at Holmesburg Prison in Philadelphia. This book describes the circumstances and the consequences of his decisions to participate in research, and it is for these reasons that research administrators will want to hear his story.

The story line for this book is familiar. Many reports have been published documenting the ways that the most vulnerable in society — those compromised by the interrelated effects of poverty, racism, literacy challenges, mental illness, health issues, and substance use — have been violated in the name of scientific research (Jones, 1981; Washington, 2006). Thousands of stories could be told about men and women who have been subjected to such abuse. Following the atrocities of World War II, most nations curtailed or eliminated clinical research studies in prisons, but this was not the case in the US. Holmesburg Prison, for example, was the site of an extremely active research program for the University of Pennsylvania from the 1950s through the 1970s under the leadership of Albert Kligman, a professor of dermatology. During those years, an astonishing 75% of the prisoners housed at Holmesburg participated in one or more research studies investigating detergents, deodorants, analgesics, antidepressants, diet pills, hormones, psychoactive drugs, chemical warfare agents, radioactive isotopes, and a host of other topics. The studies were variously sponsored by pharmaceutical or cosmetic companies, or the US army. Kligman and the University of Pennsylvania are reputed to have earned millions of dollars from these research studies, as well as the recognition associated with numerous scientific publications and awards. The details of the research program and its ill effects on the young men exposed to the risks of these studies are documented in detail in Hornblum’s award-winning exposé, *Acres of*
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In contrast to these earlier works, Sentenced to Science moves away from statistics and densely worded reporting to provide a closer, more personal look at the experience of one person: Edward “Butch” Anthony, a 20-year-old young man caught up in drugs and petty crime, as he moves in and out of the Philadelphia prison system from 1963 to 1983, emerging as Yusef Abdul Saliquu, a Muslim leader in his community. The personal story of this one man provides readers with an opportunity to empathize and understand on an emotional level the broader issues addressed in these earlier works. Extensive portions of the book are presented as direct quotes from this man (noted in italics in this review), providing an intimate and conversational tone that speaks to readers on a personal level.

In the opening chapter, readers meet Butch, a slim, young man housed in Pennsylvania’s most violent prison, and witnessing daily the assaults of other young men, including sexual assaults, especially of other slim, young men like himself. He was not yet accustomed to the unrelenting noise, sex, violence, and pressure of a big-city prison with its tightly controlled routines. All around him, prisoners were able to purchase cigarettes, candy bars, and other small luxuries to relieve the daily stresses of this violent place. He had no money. His family — disappointed by his drug use and imprisonment — was unlikely to send any. Butch had only been in jail for a few days and was still waiting to begin his new job in the tailor shop. Until then, he was broke and had little to do. His cell mates, older friends from the neighbourhood who were looking out for his interests, had found a good experiment in which he could participate to earn some money:

My homeys said they had taken care of me and I’d be okay. They said they had made sure I wouldn’t be put on any of the experiments where I’d get hurt. They told me I’d be able to make some money and wouldn’t be hurt too bad. (p. 1)

Testing bubble bath sounded harmless, and Butch could earn $37 in just two to three weeks, much more than the 25¢ that he would make per day in the tailor shop, and certainly easy work. Just as the social worker had said during orientation, he could let time serve him, instead of just serving time. He arrived on H block, where the tests were conducted:

Strange-looking medical equipment was all over the place. There were a bunch of doctors walking around doing stuff, but then I realized the guys in white smocks weren’t doctors at all, but inmates. There were inmates doing all the work. In a way, I felt better. I thought the tests couldn’t be that bad if they had prisoners doing them. If the experiments were really something serious, I would’ve seen more real doctors on the block. (p. 1)

The research assistant asked Butch to remove his shirt, used tape to remove the first layer of skin in six locations on Butch’s back, moistened gauze pads with the bubble bath solution, and then taped the gauze pads to each location.

I’m thinking, this ain’t too bad. I can handle this. He tells me we’re just about done, and I’m not feeling any pain or anything. I’m thinking my guys really took care of me. I’m making money for nothing. (p. 2)
As a final step, the research assistant sprayed a fixative over Butch’s entire back. That was when things changed.

As soon as the spray hit my back it was cold and I began to taste it in my mouth. It tasted bitter and I swear I could feel it seeping in my body. I thought it was toxic or something ‘cause I started to feel dizzy. . . . It tasted like mentholated alcohol. My tongue was beginning to get cold like my back. It was making me feel really nauseous. . . . He then sends me back to my cell block. While crossing center I’m feeling even more nauseous. I get onto G block and wobble to my cell with this disgusting taste in my mouth and all this stuff on my back, and as soon as I lift my leg to step in my cell I fell out. I passed right out. (pp. 2-3)

So begins the story of Butch Anthony’s painful entrance into the world of research subject, provided with insufficient information and exposed to unacceptable risks in exchange for meager financial compensation and a lifetime of health complications. As Hornblum explains,

Literally overnight, Butch Anthony, a healthy, vibrant black man and survivor of one of the most unforgiving ghettos in America, had unknowingly embarked on a confidence-searing and health-shattering journey as harrowing as any landmine-laden trip one could envision. (p. 7)

It’s a tale of the dangers of life in prison, the dangers faced by one who has “not only been sentenced to prison, but sentenced to science as well” (p. 7). As a result of participation in the bubble bath test and two other studies, Butch developed a host of medical complications, all documented in his powerful voice. Readers will learn of his resulting rashes, swelling, hemorrhoids, paranoia, anger, terrifying visions, and suicidal thoughts. Based upon these experiences as a research subject, it is not surprising that Butch developed a fear of doctors that discouraged him from seeking medical attention for these and other unrelated conditions that he encountered. It is difficult to trust a profession and a system that could allow young men like Butch to be exposed to these tests, especially while imprisoned. Even now, as an older man, Yusef is unable to trust medical researchers in prisons. His response to the Ethical Considerations for Research Involving Prisoners report (National Academy of Sciences, 2006) echoes these strong reservations:

They may have good intentions . . . but jail is too risky and corrupt a place to have tests on humans. Whatever comes in those places is gonna get outta hand. It’s gonna turn into something far worse and more dangerous than they ever expected. The protocols and testing may start off proper, but once the public is no longer watching, it will take a totally different direction. I know what goes on in these prisons. They told us years ago, everything will be all right. All the research is safe, and being done by the best doctors. But look what they did to me and all the other guys. I don’t believe them anymore. . . . A lot of medical people and corporations made serious money from those tests, but all we ended up with was scars, bad memories, and a life of pain. It was wrong the first time they did that stuff to us. I don’t believe they deserve a second shot. (pp. 199-200)

The National Academy of Sciences report (2006) emphasizes the inclusion of perspectives from prisoners and prisoner advocates. Research administrators must heed the voices of men like Yusef. Listening carefully to the voice of a research participant enables the “subject-centred” approach that is at the heart of ethics review policies such as Canada’s Tri-Council Policy Statement: Ethical
Conduct for Research Involving Humans (Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council of Canada, Social Sciences and Humanities Research Council of Canada, 1998). The highest levels of scrutiny and care are essential when the stakes are so high and the legacy so devastating. In Hornblum’s words, “The history of the relationship between medical research and prisons in America is not a very comforting one. Uncomfortable to recall, it would be a travesty to relive” (p. 199). Sentenced to Science is an important book that will remind readers to keep a vigilant eye to avoid repeating the mistakes of the past; it should be required reading for all who contemplate research in prisons.

References


Book Review:
On Being a Scientist:
A Guide to the Responsible Conduct of Research
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*On Being a Scientist* is a well-written resource for understanding the principles of responsible research. This is an excellent guide, not only for seasoned scientists and research administrators, but also for newcomers to the field of science and research administration.

This seminal work details the role of research administrators and, perhaps not intentionally, their symbiotic relationship with scientists. It also provides scientists with a blueprint to follow as they develop their own approach to ethics in this age of regulation. Scientists know that, for their profession to survive, it is necessary to foster relationships built on trust, fellowship, and mutual interest.

This knowledge is also understood by research administrators, who are aware of the need to advance and develop their own code of ethical conduct, especially in their leadership role as overseers of publicly and privately funded research. In addition, in support of the researchers and institutions they serve, they are often called upon to provide advice and continuing education in ethics. This book aids in that process.

Prefacing the report is the observation that many beginning researchers, while well-versed in their own discipline, lack sufficient knowledge of the ethical standards of scientific research. Due to the pace and competitive nature of scientific research -- coupled with the numerous guidelines mandated by various regulatory agencies -- any scientist could become overwhelmed or confused. Research administrators can play a key role in the education of researchers in these important and complex areas, thus forging a bond of trust and familiarity.

In its *Introduction to the Responsible Conduct of Research* and *Advising and Mentoring*, the report details the three main ethical obligations of a researcher: 1) to honor the trust of peers by producing work that is scientifically valid and reliable; 2) to produce quality work that is properly vetted; and 3) to serve the public by creating information that may be used to shape public policy.
The role, value, and importance of an advisor or mentor are explained, and readers are invited to consider research administrators as part of a multi-faceted mentoring process. An integral cog in the machinery of the institution, the research administrator can help researchers attain their ethical obligations by providing resources that ensure they engage in responsible research. In addition, integrating research administration into the process of mentoring would benefit both the scientist and the administrator by fostering continued dialogue in all aspects of the research, and ensuring that all parties make the best choices for truly responsible research.

As data are the backbone of experimentation, the material covered in *The Treatment of Data* is crucial to all researchers. Poor or careless experimental design coupled with improper manipulation of data can create misleading results that cause complications for the individual, institutions, and the public trust. There are means to combat the mistreatment of data (intentional or otherwise). The research administrator can and should play a key role in this endeavour through early education and prevention by promoting, for example, data management tools such as statistical analysis, double blind testing, properly worded questions, and peer review.

The next two sections address *Mistakes and Negligence* and *Research Misconduct*. The former may be inevitable; the latter is not. The text (p. 15) provides the federal definition of misconduct (“fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results”), and differentiates between research misconduct and error or negligence. The research administrator can ensure that research misconduct does not occur by communicating its pitfalls and consequences.

By detailing how an institution and individual should act in the case of suspected research misconduct, *Responding to Suspected Violation of Professional Standards* speaks to a role often held by research administrators. It also discusses methods that institutions should use to discourage questionable research practices, such as seeking the counsel of a trusted individual or ombudsperson who can provide insight into possible courses of action. Finally, the text discusses the role of officials specially designated to address suspected misconduct; and notes that these officials must have a strong grasp of the standards that apply.

Those conducting research with humans are required to protect the interests of these subjects by complying with regulations set by various local, state, and federal agencies and professional groups. *Human Participants and Animal Subjects in Research* details the purpose of the regulations, as well as the key components of informed consent and privacy. The federal Common Rule and the role and function of the Institutional Review Board (IRB) are highlighted. The protection of vulnerable populations (such as children, prisoners, and the mentally ill) is discussed, as is the importance of IRB membership with special knowledge of these populations.

*Laboratory Safety, Sharing of Research Results,* and *Authorship and the Allocation of Credit* highlight the role of research administrators -- be it their knowledge of grant funding or standards oversight, or the complexity of investigator responsibilities both within laboratory activities and in preparing results for development, presentation, or publication. Of particular note is the imperative for research administrators to understand and become more involved in facilitating the essential processes of technology transfer and development. *Intellectual Property* provides...
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insight into how research administrators can assist institutions in dealing with patents, copyright infringements, and trade secrets.

The discussion in Competing Interests, Commitments, and Values focuses on the many conflicting interests of the researcher, how these interests might compete, and why they must be managed. These interests may involve the professional benefits accruing from publication, decisions to seek funding for financial versus career reasons, and personal relationships. Relevant regulations and codes addressing conflict of interest are detailed. Many if not all of these subjects are the responsibility of research administrators.

The Researcher in Society notes that the ethos of a good researcher must include: 1) the responsibility to the public trust; 2) the use of knowledge and work from research as a foundation of social benefit; and 3) the professional obligation to perform and present results as objectively and accurately as possible, thereby leading directly to good science and indirectly to a prosperous and ever-evolving society.

A compelling feature of On Being a Scientist is its effective use of case studies that provide real world vignettes. These case studies are designed to motivate the reader to apply principle to practice and reflect more deeply upon the meaning of various policies and regulations that have been developed for the common good. The inclusion of thought-provoking, open-ended, questions related to these real life scenarios challenges readers to better understand the inherent intricacies involved and potential means of action.

Though this text is aimed at the scientist or research practitioner, it is invaluable to research administrators seeking to understand the pressures and issues involved in research in general. This enhanced understanding allows research administrators to better serve researchers who are immersed in their quest for new knowledge.

On Being a Scientist can enhance the leadership abilities of research administrators as they support and educate the scientists with whom they interact. Both partners in this symbiotic relationship know that academic excellence can only be realized when both understand and follow accepted ethical standards to develop and maintain the public trust. Ethical standards are of paramount importance when people’s lives are at stake, and serve to mitigate the impact that pride and self interest might have on the conduct of research.

There is yet another benefit, as research administration becomes increasingly integral to the global research enterprise. In developing its own code for the responsible conduct of research administration (RCRA), the profession is opening a dialogue regarding what might constitute the core of this code. Some scholars have suggested that non-compliance issues might arise as a result of an underdeveloped understanding of the professional and academic values upon which responsible research rests.

On Being a Scientist encourages research administrators to think about their values in the context of responsible research, and points to a deeper sense of ethos or character that is essential for truly responsible and successful research. As they assist others, research administrators would do well to reflect upon the ethos of their profession. In so doing, they can join with the researchers they assist in the continuing process of professional growth.
Voice of Experience

Research Law and Regulatory Affairs Update: Codes of Business Ethics, Codes of Conduct and Conflict of Interest

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Voice of Experience advances the tradition and service of the Journal of Research Administration by fostering consideration of and reflection upon contemporary issues and concerns in research administration. VOE is a celebrated feature column in each edition of the Journal. It is under the corporate authorship of some of the most distinguished and seasoned members of SRA International who lead research administration efforts around the globe. In this issue a brief but important update is given regarding a critical area of law affecting research administration and management. This update will urge staff members to work with local Offices of General Counsel to ensure that parameters are met and that standard operating procedures are aligned accordingly.

Summary

Federal regulations require that government contractors and grantees conduct themselves with the highest degree of integrity and honesty. Both contract and grant regulations require a written code of business ethics and conduct, as well as an employee business ethics and compliance training program. They also mandate an internal control system that:

1. Is suitable to the size of the company and extent of its involvement in Government contracting;

2. Facilitates timely discovery and disclosure of improper conduct in connection with Government contracts; and

3. Ensures corrective measures are promptly instituted and carried out.

The most explicit policy at 48 CFR (FAR) 3.1002 applies as guidance to all Government contractors. The contractual requirements set forth in the clauses at 48 CFR 52.203-13, Contractor Code of Business Ethics and Conduct, and 48 CFR 52.203-14, Display of Hotline
Poster(s), are mandatory if the contracts meet the conditions specified in the clause prescriptions at 48 CFR 3.1004.

Whether or not the clause at 48 CFR 52.203-13 is applicable, a contractor may be suspended and/or debarred for knowing failure by a principal to timely disclose evidence of a violation of Federal criminal law involving fraud, conflict of interest, bribery, or gratuity violations found in Title 18 of the United States Code or a violation of the civil False Claims Act.

Additionally, the payment clauses in the FAR (48 CFR) require that, if the contractor becomes aware that the Government has overpaid on a contract financing or invoice payment, the contractor shall remit the overpayment amount to the Government. A contractor may be suspended and/or debarred for knowing failure by a principal to timely disclose credible evidence of a significant overpayment, other than overpayments resulting from contract financing payments.

For contracts in excess of $5,000,000, the clause at 48 CFR 52.203-13, Contractor Code of Business Ethics and Conduct, is required.

A similar but less explicit requirement is in place for grants. Under 2 CFR 215.42, Codes of Conduct, grant recipients must maintain written standards of conduct governing the performance of their employees engaged in the award and administration of contracts under a grant or cooperative agreement. No employee, officer, or agent of the grantee can participate in the selection, award, or administration of a contract supported by Federal funds if a real or apparent conflict of interest would be involved. Such a conflict would arise when the employee, officer, or agent, any member of his or her immediate family, his or her partner, or an organization which employs or is about to employ any of them, has a financial or other interest in the firm selected for an award. Also, none of the officers, employees, and agents of the recipient can solicit or accept gratuities, favors, or anything of monetary value from contractors, or parties to subagreements. For both grants and contracts the standards of conduct must also provide for disciplinary actions to be applied for violations.

Recent news on this front has come from the National Institutes for Health. See NOT-OD-09-099 (05/08/2009): “NIH Seeks Comments on Regulations for Financial Conflicts of Interest in Federally-Funded Research” and “NIH Requests Comments on Proposed Amendment of Regulations on the Responsibility of Applicants for Promoting Objectivity in Research for which Public Health Service Funding is Sought and Responsible Prospective Contractors.”
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