Organizing Enlightenment

Information Overload and the Invention of the Modern Research University

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Introduction

On Sunday, June 10, 2012, Helen Dragas, rector of the University of Virginia's Board of Visitors, announced that President Teresa Sullivan and the board had "mutually agreed" that Sullivan would resign. Citing a "rapidly changing" higher education environment, Dragas insisted that the university had to change, and fast. In the ensuing weeks, Dragas alluded to unspecified "philosophical differences" as the grounds for Sullivan's ouster and enumerated a litany of challenges facing U.Va., including the long-term decline in public funding, rising tuition costs, and—crucially—the changing role of technology.

I say "crucially" because, as a later Freedom of Information request was to reveal, these "philosophical differences" were actually anxieties about the potentially disruptive effects of digital technologies on the university.[1] In a series of e-mails, Dragas exchanged articles from the *New York Times* and the *Wall Street Journal* with fellow board members and well-placed alumni, all touting the revolutionary potential of MOOCs (massive open online courses).[2] New digital technologies posed an existential threat to the university. If the University of Virginia did not immediately adapt to the emerging online learning environment, then it would become irrelevant. Just as digital technologies had disrupted and remade the book, music, newspaper, and magazine businesses, so too would they remake the university.

But it was not just a cabal of University of Virginia trustees who insisted so breathlessly that the university had to reinvent itself in the image of new digital technologies. The president of Stanford University, John Hennessy, has also declared that "a tsunami is coming" that will wipe away any institution that does not adapt to the new digital reality,[3] and former Princeton University president William G. Bowen has predicted that such technologies will transform higher education by controlling costs and increasing productivity, all while preserving quality and other "core university" values.[4] A revolution is upon us: broad access to new digital technologies, argues media

scholar Cathy Davidson, has "flattened" how knowledge is disseminated and has made it less a proprietary good of a "credentialed elite" and more the result of an increasingly democratic, collaborative endeavor.[5] Changes in digital technologies are not merely tinkering with the tools for distributing knowledge. The very authority structure of the university is at stake. Disciplinary distinctions, the way scholars are credentialized, how research-based knowledge is carried out—all these may become obsolete.[6]

These portentous predications belong to an ongoing debate about the raison d'être of the modern research university. Many have chronicled and diagnosed a "crisis" in higher education.[7] On the one side are the broad sociological critiques of the contemporary university. Exemplified most recently by Richard Arum and Josipa Roksa's *Academically Adrift*, they cast a pall on the university by focusing on particular problems: low graduation rates, skewed admission policies, indifferent faculty, disengaged students, and uncontrollable costs.[8] On the other side are the utopian voices warning that universities face existential threats and calling for intrepid entrepreneurs to offer bold, salvific solutions. Digital technologies can reinvent the university for the twenty-first century, say these voices. And in contradistinction to both these groups are those who defend a tradition of collegiate, residential learning and its celebration of humanist education over the endless accretion of research.[9] Finally, there are the democratic arguments. Following a tradition that extends from Thomas Jefferson's *Rockfish Gap Report* through William Harper Rainey's *The University and Democracy* to Martha Nussbaum's *Not for Profit*, these authors claim that the university should form democratic citizens.[10] The college model extends out to the formation of students for citizenship and civic responsibility by cultivating democratic virtues of sympathy, leadership, a work ethic, and respect for one's fellow citizens.

At their best, this array of arguments offers either incisive, sobering snapshots of contemporary universities or rousing exhortations about what universities could be, or could return to being. But few of them address a more basic question: What are we talking about when we talk about the modern research university? One of the few books that do address that question is Harvard Business School professor Clayton Christensen's *The Innovative University: Changing the DNA of Higher Education from the Inside Out*. His arguments are now regularly invoked by critics insisting that the university change now. Christensen applies his theory of "disruptive innovation"—innovations that threaten established providers by offering more affordable

alternatives—to higher education. For the first time since the introduction of the printed textbook, he writes, "there is a new, much less expensive technology for educating students: on-line learning."[11] In order to survive, universities will have to come to grips with new technologies or risk obsolescence. They will simply work themselves out of a job.

But Christensen, unlike some who embrace his theories of disruption, recognizes that the university is not simply another business for which scale and efficiency are paramount. Higher education should not be conflated with other media businesses that distribute information. The research university is not simply a content delivery device; it is an institution unique in its capacity to produce and transmit a knowledge that is distinct and carries with it the stamp of authority. The research university has its own cultural logic and normative structure that allow it to generate and transmit a certain type of authoritative knowledge. It has, as Christensen puts it, a "DNA" that, in the United States at least, has organized it since the late nineteenth century. Since Johns Hopkins was founded in 1871, the American research university has been committed to extricating meaning from knowledge. Daniel Coit Gilman, the first president of Johns Hopkins University, wrote that "with their trained observers, their methods of accurate work, their habit of publication, and especially their traditional principles of cooperative study," research universities acquire, conserve, refine, and distribute knowledge.[12] They belong in the same historical lineage of technologies which extends from the invention of writing and the codex to the printing press and the modern scientific lab. By the late nineteenth century, the research university had become the consummate technology for organizing knowledge. It had also come to stand in for a whole way of configuring, managing, and cultivating the impulse to know.

Like other university presidents in late nineteenth-century America, Gilman adopted and adapted a German university ideal. They may have built their own structures—for example, the departmental organization of the university. But they clearly also inherited a particular ethos that began to take shape around 1800 in Germany at a cultural moment very similar to our own. Our contemporary anxieties about new technologies, the fate of the university, and what counts as authoritative knowledge echo similar cultural anxieties among late eighteenth-century German intellectuals about print technologies and epistemic authority which eventually gave rise to the modern research university. These two moments can illuminate each other. The anxieties and aspirations around 1800 can help us better understand

our own situation and what is at stake in debates about the future of digital technologies, the university, and knowledge. And our contemporary situation can illuminate the history of the research university and help us better understand the norms, virtues, and purposes that have animated it for two centuries.

The ideal of the German research university was a response to a pervasive Enlightenment anxiety about *information overload*. This anxiety was particularly acute in late eighteenth-century Germany. Just as today we imagine ourselves to be engulfed by a flood of digital data, Germans of the late eighteenth century saw themselves as having been infested by a plague of books, circulating contagiously among the reading public. As in England and France, perceptions of information overload in Germany corresponded to a rapid increase in print titles in the last third of the eighteenth century, an increase of 125 percent from 1770 to 1800.[13] This growth corresponded to the broader proliferation of printed texts in Germany in the last third of the eighteenth century.[14]

In Germany, though, it was not just about the sheer numbers. The real issue concerned epistemological anxieties, and German intellectuals were unique in settling on the university as the solution. German-speaking intellectuals and writers were the first to connect in a systematic way the problem of overload with the institution that was the university.

Anticipating anxieties about information overload, technological change, and a crisis of the Enlightenment university in 1807, the German philosopher J. G. Fichte lambasted what he saw as the university's refusal to adapt to the new print environment. The first universities in Paris, Bologna, and Oxford, he wrote, had been an oral "*Ersatz*" for the general lack of texts.[15] More than two centuries after the invention of the printing press and the "overabundance of books" that followed it, however, the university's central pedagogical practice, the lecture, still consisted of professors reading the books of another, canonical scholar aloud, as if students could not read on their own. What was the purpose of the university in an age where print had reached a saturation point? If universities continued to present students "the entire world of books, which already lies printed before everyone's eyes," warned Fichte, they would soon become redundant.[16] Universities had not figured out how to respond to technological change, and if they could not distinguish themselves from printed books, they would fail.

For Fichte, the expansion of the book market had already altered the ways in which people could know and learn. If universities were to survive,

they would have to change with the times and transform themselves. Fichte's contemporaries disagreed, however, about how universities should do so. Some argued that universities should be replaced by specialized schools devoted to training students in skills specific to particular professions. Others, like Fichte, argued against what he and his fellow German Idealists called the "utility message" of the Enlightenment—its singular focus on the technical and practical utility of all knowledge.[17] The survival of the university depended on the extent to which it could distinguish itself from the broader culture as the unique institution devoted to what Germans called *Wissenschaft*, or science as a practice.[18]

The underlying ethos of the research university was brought forth under the cloud of a crisis. What was the purpose of the university? How could it advance knowledge without being redundant, simply reproducing what print did more efficiently? Then as now, anxieties about the impact of new technologies on the future of the university were not simply demands for the university to better incorporate print technologies. They expressed confusions about the authority and legitimacy of knowledge as such. Did students need to pay a premium to listen to a lecture in person, or could they just buy a book?

The research university was an institutional response to structural changes in the media environment of the eighteenth-century German Enlightenment. The fomenting of new media with old proved in the end hugely fruitful. Overwhelmed by all that the modern print market had to offer, the original proponents of the research university sought to institutionalize practices and technologies for the generation of knowledge. Such a university had little in common with the American college of the eighteenth and nineteenth centuries, seeking as it did to inculcate a traditional set of Protestant virtues and moral character. Although it inherited some of its forms from medieval universities—the four faculties, for example, or the ritual that is the lecture—it did not share their organizing structure. Medieval universities were unitary corporations of students and masters bound together, in the broadest sense, by Christian values and an appeal to the authority of the Church, both legally and financially. Although particular universities resisted certain Christian theological doctrines, by and large they were grounded in a canon of Christian learning. When, in the late seventeenth and early eighteenth centuries, Enlightenment critics began to question the conflation of the Church and the university, they turned to another ethical resource: the state. The purpose of the university, they argued, was not contemplation of the divine

or knowledge for knowledge's sake but rather service to the broader public and state. In the context of the history of the university, then, the modern research university's appeal to science, as a distinct research-oriented form of knowledge generation and dissemination, around 1800 was unprecedented.

Since its inception in Germany in the early nineteenth century and its reinvention in America later that same century, the research university has been the central institution of knowledge in the West. But now it finds itself confronted by the challenge of radical technological change; and because it does, its most ardent defenders need to be crystal clear about what they are defending. A particular institution? A commitment to knowledge in the abstract? Or merely their own place in a bureaucracy? The university's critics and defenders ought to focus not simply on fixing each university, one at a time, but rather on how universities overall can help us evaluate knowledge in an age of easily accessible information. The crisis of the university is part of a larger shift of epistemic authority in the modern digital age. The saturation of digital technologies, from *Wikipedia* to Google PageRank, is changing the ways by which humans create, store, distribute, and value knowledge in the twenty-first century. How today do we arrive at understanding? What constitutes authoritative or legitimate knowledge today? The future of the university will unfold in this context, as it did before.

In 2014 as in 1814, people find themselves compelled to decide which sources of knowledge to trust, and which not to, in environments of extraordinarily expanded production and unlimited access. It remains to be seen what practices, institutions, norms, and related technologies will ultimately emerge in our own digital age, but late eighteenth- and early nineteenth-century German intellectuals embraced the idea of the modern research university and its organizing ethic, disciplinarity. The "credentialized," disciplinary-based ordering of knowledge embodied in the research university was a new way of coping with a perceived proliferation of knowledge and the attendant crisis in epistemic authority.

The German Enlightenment is usually associated with a string of central concepts: *freedom*, *culture*, and the liberal *individual*. But, in its moment, Enlightenment also referred to an array of technologies—encyclopedias, dictionaries, taxonomies, philosophical systems—designed to manage the centrifugal experience of knowledge.

Yet the Enlightenment technologies designed to organize knowledge were not merely tools, material extensions of humans who controlled and determined their use. They were also value-laden metaphors for particular

orders of knowledge and ways of managing the desire to advance and control knowledge. Scholars used "the book," "the encyclopedia," and eventually "the university" to stand in for normative conceptions of how humans should generate knowledge and manage their desire to know. "Encyclopedia," for example, referred not only to a printed reference book organized alphabetically but also to an array of practices, habits, norms, and virtues that were inseparable from the physical object.

But because those technologies were thought to have failed, buckling under the pressure exerted upon them, many intellectuals sought to reimagine the university as a better way of achieving the same end. This new university should be the institutional home of the disciplinary—or, as early nineteenth-century German figures put it, *wissenschaftlich*—arrangement of knowledge. The splintering of knowledge which characterized the Enlightenment was to be dealt with by the specialized work of distinct disciplines. A disciplinary-based order of knowledge prevented knowledge from becoming too abstract and unmanageable. It filtered and authorized the necessarily constrained and partial forms of modern, specialized knowledge; it legitimated limited knowledge by tying it to the endless, unceasing pursuit of "research." And it put the research university at the center of a modern media and knowledge environment. Somewhat autologically, what was produced, organized, and transmitted by the university was true knowledge.

This new order of knowledge, however, was a turn away from an Enlightenment order that valued utility and popularity. As a structure internal to the university, the new disciplinary order was more insular, self-referential, and increasingly distinct from the broader culture. Science gradually became a more distinct system, replete with its own practices, internal goods, norms, and virtues.[19]

Organizing the Enlightenment is not an account of individual disciplines—these types of studies already abound—but a conceptual and historical account of how and why this novel intellectual architecture came into existence in the first place.[20] In describing how disciplinarity emerged as the last technology of the Enlightenment, I sketch not only the university's ethical logic but more fundamentally the epistemological anxieties that precipitated its formation. I should point out at the start that my account of "disciplinarity" is more like a prehistory, because the word itself was rarely used in the eighteenth century. And its cognate "discipline," denoting a specialized science, was not used in Germanic countries with any regularity until the nineteenth century. But although the precise term was absent, the concept

of disciplinarity was indeed present in a range of German concepts such as *Disziplin*, *Wissenschaft*, and *Enzyklopädistik*. The professionalization of the American research university in the late nineteenth century inherited the German invention of *Wissenschaft*, the key term I trace throughout this book. Examining its history will offer new insight into our current situation, as well as a better understanding of how and why the research university emerged. The story of the German research university, regularly upheld by American university presidents who cite Wilhelm von Humboldt, has given us not just the ideals of academic freedom and the unity of teaching and research; it has also lent us the logic of intellectual specialization that continues to form the contemporary university.[21] And while many critics have for two centuries decried intellectual specialization, I offer a defense of it.

Unlike medieval universities such as Paris or Oxford, and unlike the American college of the eighteenth and nineteenth centuries, from its inception in Germany the research university had as its primary purpose the pursuit of knowledge and the formation of those who engage in this enterprise. This is why the crisis of the contemporary university is not simply a moral one that pits liberal arts values against market values. It is rather a more fundamental ethical crisis concerning epistemic authority in the modern age. It is a crisis of the very means by which knowledge has been gleaned, distributed, and accorded worth from the nineteenth to the twenty-first centuries. And this raises several questions: Is the research university model worth defending? And what exactly would we be defending?[22]

The story of the research university is one not only of the generation of knowledge but also of the formation of a particular self, the development of a type of person. When I describe the solution to Enlightenment overload as "ethical," I mean that it was concerned with goods internal to the practice of science. The solution was a particular type of person, not a more comprehensive encyclopedia. Since its emergence in early nineteenth-century Germany, the research university has always been the bearer of practices with their own standards of excellence, ideals of conduct, and even virtues. And it was these upon which the university's epistemic authority was founded; it was these that enabled it to generate and transmit authoritative and legitimate knowledge. The following chapters recount how and why this ethic emerged in tandem with the research university, for which epistemology was always inextricable from ethics.

In 1798 Immanuel Kant described the university not as a place of Enlightenment or as an "exit from a self-incurred immaturity" but as a factory

organized according to the division of intellectual labor for the purposes of producing both books and authors.[23] American research universities inherited this orientation toward the formation of a particular self from their nineteenth-century German counterparts. After material technologies—from encyclopedias to periodicals—failed to deliver on the promise of universal knowledge, a synoptic account of all knowledge, thinkers turned toward ethically formative technologies and practices that formed a particular type of person. Science would be about not writing books but creating a "disciplinary self," a particular identity or way of being in the world crafted and molded by distinct practices of mind and body.[24] Expanding on the work of Michel Foucault and what he termed "technologies of the self," Pierre Hadot and his studies of ancient philosophy, and Lorraine Daston and Peter Galison and their work on the "scientific self," I trace the emergence of a particular kind of self that was first conceptualized and crafted around 1800 in Germany amid anxieties about information overload and fears for the future of the university.[25] This disciplinary self was always aspirational, an ideal to be pursued. Normative and descriptive accounts were consistently conflated. But this conflation underlines how central the formation into the ethos of science always was for the research university.[26] The university was to be home to this self. And knowledge was to be embodied not in an ever more exhaustive encyclopedia but instead in the character of the student. The university's claim to winnow through all the dross of knowledge came to rely essentially on the cultivation of a particular persona.

The appeal to the "disciplinary self" was made more urgent in 1800 by invoking the specter of too much information, and this goes to the heart of claims about overload and their broader cultural functions. In 2006, Kevin Kelly, senior editor at *Wired*, predicted the advent of a universal library in which all the world's books would become a "single liquid fabric of interconnected words and ideas." He envisaged the digitization efforts of Google Books resulting in a searchable library that would connect every book ever written. Ideas would flow seamlessly. Others are less sanguine, as we have seen. Either way it is vital that we realize that the situation we face is not unprecedented. In both the optimism of Kelly's predictions and the pessimism of those who fear that Google is "making us stupid" we can hear echoes of late Enlightenment debates in Germany about the necessity of rescuing people from the glut of knowledge.[27]

But, as historians have noted, complaints about "too many books" echo across the centuries. Practically speaking, what is the difference between try-

ing to read ten thousand books or ten million books?[28] Both are impossible tasks. What is most significant in these historical worries about excess, then, are the solutions inevitably offered to solve the purported problems.[29] Every shrill insistence brings with it a particular solution. The specific technologies we develop to manage information give us insight into not only how we organize, produce, and distribute knowledge but how we form ourselves. Historically, worries about "excess" have been fundamentally normative. They made particular claims not only about what was good or bad about print, for example, but about what constituted "true" knowledge. First, they presumed a normative level of information or, in the case of purported book plagues, some normative number of books. There are too many books; there is too much data. But compared to what? Second, such laments presumed the normative value of particular practices and technologies for dealing with all of this information. Every complaint about excess was followed by a proposal on how to fix the problem. To insist that there were too many books was to insist that there were too many books to be read or dealt with in a particular way and thus to assume the normative value of one form of reading over another. So I am concerned less with how empirically accurate such claims were—that is, the extent to which they corresponded to an actual, unique increase in printed material—than with the underlying cultural anxieties and attendant solutions. What do worries about, and the proffered solutions to, excess tell us about the historical modes of how knowledge was organized, produced, transmitted, and authorized? This book is, in part, a history of a cultural anxiety.

The sense of disconcertion at "information overload" holds sway only against a background assumption that we should know everything. If we do not assume that we should know everything, why would we mind not being able to appropriate all the information at our fingertips? This book is, then, preoccupied with the way the desire for universal knowledge has manifested itself over time. The eighteenth-century effort to achieve a unified account of knowledge by *capturing it in print* was very different from the attempt to unify knowledge institutionally in the form of the research university. When I refer to an Enlightenment information overload, then, I am referring less to a unique material condition—how many books were published in a particular year versus another year—and more to a complex of circumstances and motivations. Indeed, information overload refers to multiple projects, all of which were wrapped up with experiences of material conditions and technological change. "Overload," in my use, denotes experiences of excess.

Ann Blair distinguishes between information and knowledge and frames her interest in information management technologies in strictly functional terms. Information, she writes, is "distinct from data," which requires further processing to be meaningful, and from knowledge, which implies "an independent knower."[30] Information is "discrete and small-sized items that have been removed from their original contexts and made available as morsels ready to be articulated." Yet while these terms distinguish information and knowledge, they also obscure some nuances. First, "information" is a recent term and is thus very difficult to detach from contemporary uses. It was not introduced in its current use until 1948 in the context of Claude Shannon's mathematical work in the Bell Labs. Writing about an Enlightenment notion of information, then, will always run the risk of twentieth-century connotations overdetermining more historically specific concepts.

The more pressing concern is that sifting out knowledge from information is always normative; that is, it always entails historical and cultural assumptions about *what is worth knowing*. To identify X as information and thus not knowledge is to make a judgment about the value of X. Information is, after all, "mere" information. What amount of "original context," to use Blair's phrase, is sufficient to turn information into knowledge? How much "articulation" is required? But what then is knowledge—utility, wisdom, or something altogether different? As we shall see in the following chapters, the distinction between knowledge and information has its Enlightenment precedents in a range of distinctions: true and false learning, philosophical and historical knowledge, the aggregate and the whole. All of these distinctions were based on normative assumptions about what constituted true knowledge, as opposed to "mere" facts.

These historical debates concerning distinctions between knowledge and information revolved around knowledge as an honorific. To describe something as knowledge is to lend it a certain value. To claim that a belief constituted "true" knowledge was to claim that it met certain normative standards. Contemporary philosophers usually cite standards like justification, truth, warrant, coherence, or reliability. But during the late Enlightenment there were other standards governing the question of whether something was worth knowing. "True" knowledge ought to be nontrivial, worth the effort. Counting the blades of grass outside my window may be new knowledge (I currently don't know how many there are), but is it "worthwhile" knowledge? The demands for "true" knowledge in the late eighteenth century were tied to assumptions about the suspected triviality of scholarly

practice that *merely* accumulated historical facts. The following chapters trace these debates about the relevant criteria for distinguishing trivial from nontrivial knowledge.

These debates concerned epistemic authority, that is, what counted as *authoritative* knowledge. What legitimates one form of knowledge over another? Which sources of knowledge are to be trusted? Which not? What practices and scholarly habits, techniques, and institutions render knowledge authoritative or worthy? Questions about distilling knowledge rely on assumptions about its value. Throughout this book, I write of a crisis in epistemic authority, a moment of uncertainty and possible change concerning the technologies and institutions that have traditionally generated, transmitted, and evaluated knowledge. Around 1800 in Germany, the proliferation of print and its associated technologies posed a challenge to the university's claim to be the dominant institution of knowledge. Today, digital technologies from *Wikipedia* to blogs and social media pose a similar challenge to the authority that the research university has enjoyed and defended for almost two centuries. But what most of the debates about these changes in media miss is that the research university is not just another content delivery device; it was and continues to be a bestower of epistemic authority. The university does not just transmit knowledge. It legitimates and authorizes knowledge.

At the center of both of these moments of crisis were changes not only in technology but also in the very notion of technology. Throughout this book, I use "technology" to refer not only to physical tools but also to different forms of print media, institutions (like the university), and practices of the self and how they shape each other. My use of the term "technology," then, refers to particular artifacts, as well as the complex interaction of humans with their various tools and the interaction of technologies and media with each other. I track how these relationships change over time and how the boundaries between them are never absolute or fixed. In this sense, the forms of technological change that I describe are not, as Neil Postman puts it, "additive or subtractive," but rather "ecological."[31] The research university did not supplant print media, books, periodicals, encyclopedias, but its emergence did generate changes in how people interacted with print media, as well as in the very conception of print. I use the term "media ecology" to describe these interactions among various technologies and human agents and how they always shape each other in irreducibly complex ways. Technology refers to this complex environment of interactions, replete with its own norms, practices, and emergent properties.[32]

The last technology of the Enlightenment was the modern research university and its organizing concept—disciplinarity or specialized science. The following chapters take us back to a German context immediately preceding the founding of the University of Berlin in 1810 and trace the prehistory of disciplinarity by outlining a much broader shift in the orchestration and classification of knowledge over the course of the eighteenth century. The way knowledge resolved into disciplines became possible under the aegis of the research university. This reorganization was an attempt to come to terms with the fragmenting character of modern knowledge and to manage its proliferation in and as print.

My account of the emergence of the research university begins with the history of a particular concept: "science" [*Wissenschaft*]. Until the last third of the eighteenth century, the German words for "knowledge" [*Wissen*] and "science" were the same. They both denoted an individual-dependent form of knowledge as a property or a state of an individual mind. Science, as one early Enlightenment lexicon defined it, was a "particular insight or knowledge." It was idiomatic to say that a person had a "science" of some object or state of affairs. Only in the last decade of the eighteenth century did "science" begin to be used as a general concept to denote a body of shared knowledge and research practices designed to generate it.

The gradual shift in the meaning of "science" to a body of knowledge had two important consequences with respect to the emergence of the research university. On the one hand, as a body of knowledge, sciences addressed an abstract "general public." In principle, anyone could have access to it. On the other hand, as internally coherent epistemic practices with their own norms, particular sciences were distinct from other sciences, as well as from the "general public." They stood opposed, as Kant wrote, "to common knowledge." Once the unity of knowledge was grounded not in mental faculties common to all but in objectified systems of knowledge, general access could not be presumed. Instead, it had to be cultivated through institutionalized habits, practices, and disciplines. Particular scientific cultures emerged that distinguished between expert and the layman. Disciplinarity gradually arose in this context as a system for managing distinct sciences and the people who labored within those sciences.

But the conceptual twists and turns of "science" only make sense against the backdrop of eighteenth-century print technologies and the norms that guided people's interactions with them. Over the course of much of the eighteenth century, as the various forms of print proliferated—journals, peri-

odicals, encyclopedias, lexica—what was referred to as "aids to erudition" came to substitute in for knowledge itself. Scholars cultivated a broad cultural confidence in the capacity of print technologies to advance the sciences and bring about a universal, timeless knowledge. They attempted, as Adrian Johns puts it, "to invest" print with a capacity to transcend time and space.[33] They imagined an "empire of erudition" that was homogenous, complete, and easily accessible to all scholars, that is, to those who knew how to interact with print. In this virtual world, knowledge was imagined as an interconnected body of learning embodied in printed texts, what Novalis called a "chain of learning," and the impulse to understand led unavoidably to print.[34]

At the beginning of the eighteenth century, the Enlightenment gentleman scholar [*der Gelehrte*] exemplified this culture of knowledge. It was this man of letters, and not the expert, who reigned over an "empire of erudition." Christian Jöcher's *Universal Literature Lexicon* exemplified an early Enlightenment genre that reported "all the scholar's work" in one annual volume. This and related scholarly print aids were then consumed by a public that itself had not yet been sharply differentiated from the scholarly world.

Over the course of the eighteenth century, however, this empire of erudition gradually fractured into a world of specialized disciplines and concomitant experts under two parallel pressures. The first was an unrelenting attack on the very concept of erudition. Beginning in the early eighteenth century and continuing through the 1770s, many intellectuals, themselves members of the empire of erudition, sought to detach learning from the erudite, who had enjoyed the privileges of a distinct social class. Humankind stood in need of enlightenment; knowledge, it followed, ought to be liberated, made available to the whole of society.

The second, related pressure was ongoing changes in a print market trying desperately to cope with its radical expansion. Around midcentury, for example, new journals emerged catering to specialists. Now scholars could reimagine themselves as part of more limited communities consisting not of gentlemen scholars, all-rounders, or polymaths. Such specialization threw wide open the question of the presumed homogeneity and authority of the "empire of erudition." The polymath was replaced by the botanist, the philosopher, and the theologian, the specialized scientist.

But just as some scholars were realizing the popular potential of the bibliographic order of knowledge, others had become increasingly anxious that knowledge had been reduced to its print technologies. Print had been fe-

tishized. Intellectuals began to worry that the proliferation of print objects had outstripped people's capacities to interact with them. Readers, writers, and publishers had been overwhelmed with floods of journals, barraged by books, and they could no longer digest the material at their disposal. They did not know what to do with all the learning that had fallen into their lap, so to speak. The "plague of books" that swept German readers referred not only to the increasing circulation of texts but also to the increased chatter about these books and their print cousins. And this ultimately led to a trenchant critique of print as a distinct Enlightenment culture.

Worries about a glut of texts were not simply irrational fears, however. They were, in part, cultural responses to an actual increase in the production of printed texts over the last three decades of the eighteenth century. The catalogue of the Leipzig book fair, the center of Germany's book trade, gave a sense of this rapid growth. The number of titles listed per year went from 755 in 1740 to 1,144 in 1770 and then to 2,569 in 1800—an exponential increase of more than 240 percent in just sixty years.[35]

One of the most influential accounts of this cultural situation was given by Immanuel Kant. The writer of "What Is Enlightenment?" not only diagnosed the malaise of modern print culture but also presented a clear solution that paved the way for a reimagination of the university. Sharply critical of what he considered the fetishization of humanist print technologies, he feared that books were beginning to think, as he put it in 1784, for humans.[36] To counter this cultural trend, he proposed a critical philosophy that would better manage the excess of books by focusing on the moral integrity and formation of the person. The proliferation of print posed a threat not only to the imperative to educate oneself but also to the ethical integrity of the subject. And describing the problem in those terms meant that he created a void that no encyclopedia or lexicon could fill. In a world awash with words, only a reimagined institution that could sustain norms and practices that would form particular types of persons could fill that void.

Increased anxieties about epistemic authority coincided with the near implosion of the German Enlightenment university, which had come under increasing pressure to offer more practical training and to justify its very existence in the age of the proliferation of print. By 1800, enrollments had dropped 50 percent from midcentury peaks, and the calls for the abolition of these so-called scholastic guilds of privilege and social and economic irrelevance had become a mantra. It is certainly no coincidence that contemporary fears, however alarmist, about the impending collapse of the university or

demands that universities focus on training students for the job market are taking place at a similar moment of epistemic confusion and media surplus. In Germany between 1795 and 1810, Prussian scholars and civil bureaucrats addressed these anxieties and fears in a wide-ranging debate on the future of the university. For most commentators, the crisis of the university was directly related to the proliferation of print. How could the university not only accommodate new technologies but flourish in this new environment?

In this sense, the crisis of the university was another manifestation of the broader ethical crisis brought on by the proliferation of print and the attendant fragmentation of knowledge. At the University of Jena in 1803, the German philosopher F. W. J. Schelling opened his lectures on the methods of university study with a description of a young man who, upon arriving at the university, is thoroughly disoriented. Confronted with the dizzying array of subjects on offer, he finds himself at sea with no compass to guide him through the fragmented world of knowledge. Thus, either he dedicates himself to one particular field and forsakes any attempt at a knowledge of the whole, or he wanders among the various sciences and, as a result, becomes knowledgeable in none at all. For Schelling, information overload produced distracted, ethically unreflective people. It not only constrained the advancement of knowledge but also threatened the integrity of the human mind. The only sufficient response was a fundamentally different conception of the university's purpose. It had to be reconceived as not merely a more efficient or technologically capable institution but as the source and embodiment of a distinct way of life, namely, science. Only science as a practice with its own goods and ends—not better textbooks or more exhaustive encyclopedias—could address the effects of information overload. The task of the university was to form better people of knowledge who could navigate the oceans of print.

What figures like Schelling, Kant, and Fichte realized, however, was that the fundamental shifts in the media environment, combined with the atrophy of the theological basis of the medieval university, had forced the university to reimagine its justification. What normative resources could orient the university in a modern age in which the traditional authorities of knowledge—the church, the state, and humanist erudition—were dissipating?

In Prussia, these underlying questions provoked a range of responses, from bureaucrats and philosophers alike. They culminated in Wilhelm von Humboldt's plan for a new university devoted to science itself. While this

plan was in part concerned with the relationship of the university and the state, it was also about the relationship of the university to the new media environment. For Humboldt and others like Fichte and Schleiermacher, the task was not simply the conservative defense of a particular institution that had come under attack by a growing bourgeois public emboldened by print. It was more an attempt to discern what now constituted authoritative knowledge. The new university would have to embody a new order of knowledge which was self-organizing, internally coherent, and distinct. It would have to distinguish itself from the market and more public forms of information distribution. In this modern research university, the bibliographic order of knowledge would give way to a disciplinary order of knowledge with its distinctions between general reader and specialized scientist [*Wissenschaftler*]. This disciplinary order organized knowledge by forming those who produced it.

Humboldt envisioned an intellectual architecture for science as a way of life. Enlightenment solutions to information overload, such as lexica, encyclopedias, and books, had failed, he contended, because they had focused too strictly on the objective task of knowledge—its advancement through technologies—having neglected at their peril the formation of the student himself. The research university would meld the two by harmonizing the technologies themselves with the persons who interacted with them. Echoing his contemporaries, he embedded academic professionalization—the imperative to publish, division of intellectual labor according to specialization, a focus on details—in a set of ideals. Implicit in this was the claim that these institutional practices together constituted a distinct way of life. Specialization gave the student an orientation, a source of meaning, a ground of authority. By tying the logic of science to the institution of the university, science became a viable form of life replete with its own set of virtues, practices, and ends. And above all science stood for a devotion to something that exceeded the self.

Over the course of the nineteenth century, one discipline in particular came to embody the logic and practice of specialized science: classical philology. For generations of German scholars in every field, philology—not physics, chemistry, or biology—was the consummate discipline, exemplifying the virtues of modern science: industriousness, attention to detail, a devotion to method, precision, exactitude, a commitment and facility to open discussion, and a critical disposition.[37] And it pioneered the site where these virtues were

inculcated and ultimately crafted the modern disciplinary self—the *seminar*. It cultivated a set of virtues, those of specialized science or what we today call disciplinarity.

The ideal of the research university did not solve the problem of information overload, but its romantic and idealist advocates reimagined both the university and the very parameters and criteria of what counted as real, authoritative knowledge. They imagined a different way of conceiving of the problem of overload and epistemic authority. The research university emerged out of a particular moment of cultural anxiety about media surplus and a perception of a crisis in the authority of knowledge.

My focus on the history of cultural anxiety and the ethics of the modern research university is what distinguishes my story from two recent books to which I am deeply indebted. In his magisterial book on the history of the research university, William Clark ascribes the "shamelessly" political and economic roots of the modern university to universities in Halle and, especially, Göttingen, which translated Enlightenment notions of fame into institutional prestige, cash and credit, and the bureaucratic regime of a university oriented toward the state. Whereas Clark shines a detailed and exhaustive light on the rational structures of the modern research university, I focus on what he calls romanticism's substitution of a "cultural criterion" for the economic one.[38] Insofar as the research university combated the phenomenon of information overload, its advent cannot simply be reduced to the ineluctable march of a modern bureaucratic rationality.

Similarly, Ann Blair has recently given a detailed account of another age of information overload in which fifteenth- and sixteenth-century humanist scholars developed a range of print-based strategies—including cut-and-paste and note-taking techniques—to manage a daunting surfeit of information. I continue Blair's story through the eighteenth century and the Enlightenment to the point at which intellectuals and scholars began to criticize these forms of learning as merely technical solutions to a problem that had become ethical in nature. Improved print technologies or more efficient managerial skills could not solve the problem of fragmentation, both social and epistemic, that the proliferation of print had come to represent. My focus is on these cultural conditions and their ramifications for the emergence of the research university.

I draw on recent media theory, especially attempts to reconceptualize the relationship between humans and their technologies as inextricably bound to one another and to emphasize human interactions with (and not just use

of) technologies;[39] I rely on the exhaustive historical work of historians of the university[40] and historians of the book;[41] I extend the work of recent historians of science;[42] and, finally, I engage ethical theory, both normative and historical.[43] Part history and part theory of media, part institutional and book history, part history of science, and part ethical theory, this book tries to combine these different approaches in pursuit of a better understanding of the relationship among technological change, anxieties about epistemic authority, and the birth of new structures for organizing and cultivating the desire to know.

I consider the place of the disciplinary arrangement of the university and knowledge in our own digital age. The crisis of the contemporary university concerns its place in the generation and dissemination of knowledge. The modern variegated university was a historical institution that emerged to meet specific needs. Is this historical arrangement, with all its productive efficiencies and specialization, the most apposite for our current situation? More importantly, if the university's monopoly on knowledge has already ended, as critics suggest, then what distinguishes it from other sources of knowledge in an age of Google and *Wikipedia*? What is the purpose of the university in an age in which academic expertise has been eroded by the democratization of the tools for distributing knowledge?

My contention is that we can only answer these questions if we first recognize that the research university was from its beginnings in Berlin an institution designed to sustain a particular practice and its virtues, habits, and purposes. It was never merely a content delivery system. It was a source of epistemic authority in an age of media surplus and cultural anxiety about what counted as real knowledge. It was an institution devoted to science. This was its ethos. Only when we have acknowledged this reality can we move beyond the idealizations and recriminations that hamper current debates about the university's future. Only then can we begin to consider the future of the university and the future of knowledge.