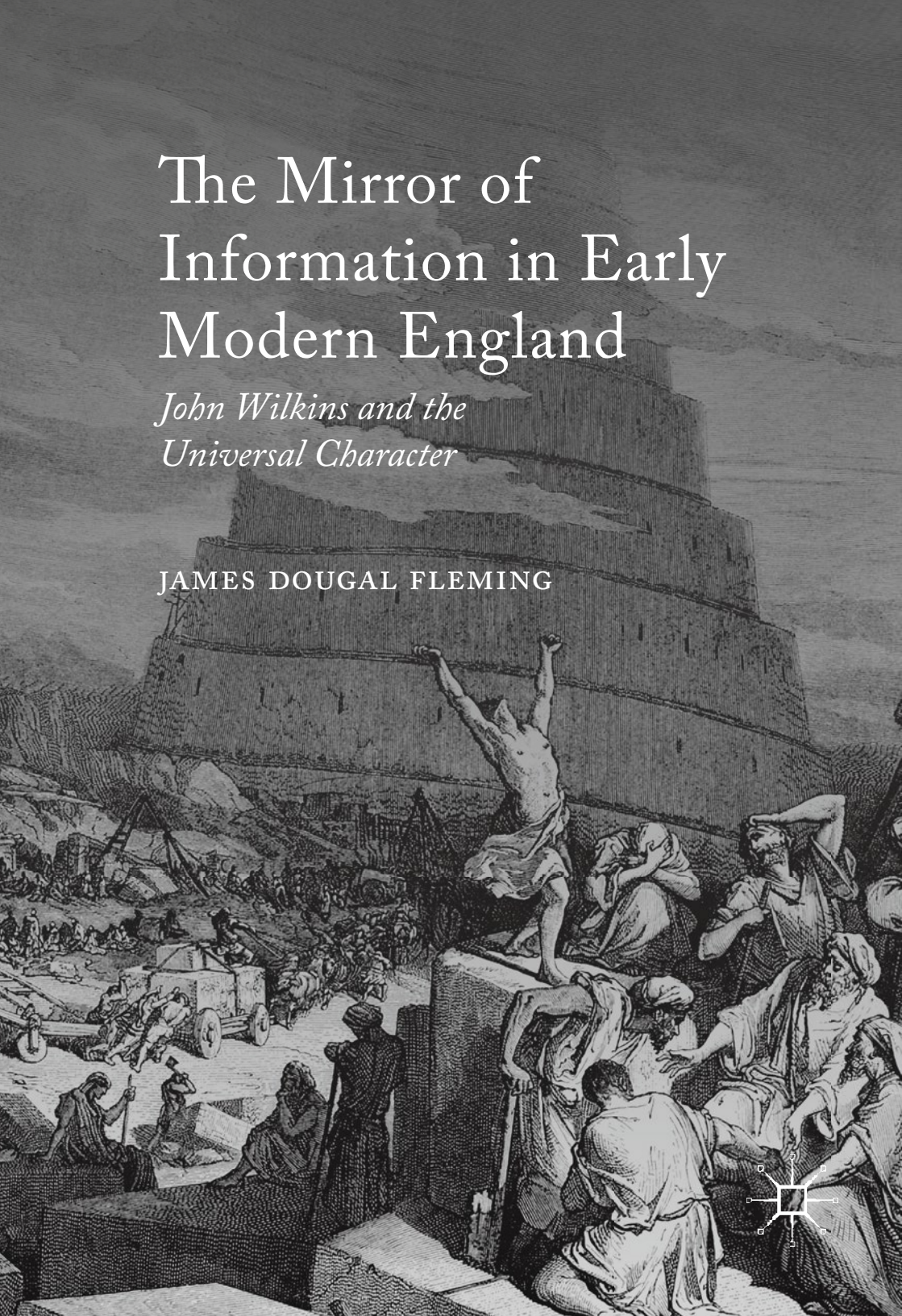
The Mirror of Information in Early Modern England

John Wilkins and the Universal Character

JAMES DOUGAL FLEMING



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For my family, always

Textual Note

This book is largely about John Wilkins's *An Essay towards a Real Character, and a Philosophical Language*, published in London by the Royal Society in 1668. Beginning in my fourth chapter, I'm going to be examining Wilkins's book in considerable detail. The nature of the book is that you really need to *see* it to grasp it, especially for the layout of Wilkins's Philosophical Tables, and the design of his real character. While I have included images of the pages that are most crucial for my discussion (see Figs. 1–4), including them all is impracticable. But lo: the infosphere comes to our aid. Wilkins's *Essay* is on Google Books. I strongly urge the reader who finds my paraphrases and descriptions of it confusing to open up an e-copy and follow along.

Acknowledgements

An awkward question is: How long have you been working on this book? The brief answer—a couple of years—is almost dishonest, but a full answer would be embarrassing. I started to think almost a decade ago that the concept of information was key to the epistemic differences between the early-modern period and our own. But it has taken the informational technologies that have emerged and matured during that decade—notably the internet and its associated networks—to render my inchoate thought at least somewhat utterable. Since then, it has all been a race of research and writing. Which I guess is the short answer.

An analogous, but more pleasant, conundrum: Whom do you want to thank? The academy; my high school history teacher; the inventors of wine and oil. But more narrowly, I can begin with Kevin Killeen and Peter Forshaw, whose 2004 conference on Biblical exegesis and early-modern science (Birkbeck, University of London) really got me thinking in new ways about these matters. Steve Matthews, whom I met for the first time on that occasion, has been a friend and co-laborer since. The delegates, plenary speakers, and supporters of the *Scientiae* conferences: All have my respect and gratitude, but I can especially mention Peter Harrison, Mario Biagioli, Stephen Clucas, Sachiko Kusukawa, Howard Hotson, Thomas Wallnig, Peter Dear, Anthony Grafton, Claire Preston, Jonathan Sawday, Per Landgren, and Sven Dupré. And, maybe even more loudly, the members of the conference's executive committee: David Beck, Vittoria Feola, James Lancaster, and Richard Raiswell, in addition to the aforementioned Matthews. I am very grateful to the staff of the Huntington, British, New York Public, Columbia, University of Toronto, Simon Fraser

University, and University of British Columbia (UBC) libraries; and to Jessica Wolfe, Reid Barbour, Steve Hindle, and Rhodri Lewis. Special thanks to Chelsea Shriver, Rare Books librarian and archivist at UBC library, for her invaluable help with page-images from Wilkins's *Essay*.

Here finally is where I get to thank my beautiful, brilliant, fabulous wife, Cynthia van Ginkel, and our unbelievably wonderful children: Lucas, Nica, Sage, and Troy. In their case, a full comment really is impossible to give.

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CHAPTER 1

Introduction: The Mirror of Information in Early Modern England

In *Gulliver's Travels* (1726), Jonathan Swift imagines a truly objective discourse:

> *An Expedient was therefore offered, that since Words are only Names for* Things, *it would be more convenient for all Men to carry about them, such* Things *as were necessary to express a particular Business they are to discourse on. And this Invention would certainly have taken Place, to the great Ease as well as Health of the subject, if the Women in conjunction with the Vulgar and Illiterate, had not threatened to raise a Rebellion, unless they might be allowed the Liberty to speak with their Tongues, after the manner of their Ancestors; such constant irreconcileable Enemies to Science are the common People. However, many of the most Learned and Wise adhere to the New Scheme of expressing themselves by* Things, *which hath only this Inconvenience attending it, that if a Man's Business be very great, and of various kinds, he must be obliged in Proportion to carry a greater Bundle of* Things *upon his Back, unless he can afford one or two strong Servants to attend him. I have often beheld two of those Sages almost sinking under the Weight of their Packs, like peddlers among us; who when they met in the Streets, would lay down their Loads, open their Saddles and hold Conversation for an Hour together.*

This book is about an early-modern method for communicating via things. Not, to be sure, in quite the manner of Swift's famous satire.[1] But some of the "most learned and wise" of the seventeenth century did imagine replacing human languages with a much more efficient and objective kind of intensional notation. For Bacon, Mersenne, Leibniz and others, the

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hallmarks of all human languages were inaccuracy, redundancy, ambiguity, and unreliability. Words distorted thought, impeded communication, and prevented knowledge. Yet the mind, *prior* to language, seemed to reflect the world; much as a mirror reflects the face that is before it. Therefore (it was thought), if you could craft a symbolism to *reflect the mind's reflections—without* falling back into "language"—you would, effectively, have a way of denoting things directly. This would be what the period called a *real character*: "real" from Latin *res*, thing. Writing down the notions of the mind, if that were possible, would amount to writing down the truth of the world.[2]

For Jonathan Swift (1667–1745), it offered only a way to write down a joke. But then, Swift found much that was funny, when he looked back on his own era. The Academy of Lagado, visited by Gulliver in the famous episode quoted above, clearly satirizes the Royal Society for the Improving of Natural Knowledge, founded in London in 1663. As a pioneering institution of what we now call natural science, the Royal Society looks to Swift like an easy target for satire. A measure of the historical distance between him and us. More recent satirists—think Christopher Hitchens, or Bill Maher—typically get their laughs *on behalf* of science, not at its expense. Anyway, the real-character project was closely associated with the early Royal Society, as a key component of the intellectual reforms envisioned by Sir Francis Bacon (1561–1626). Crafting a real character proved much more difficult than theorizing one. Nonetheless, the Baconian version of the real-character project culminated in the *Essay towards a Real Character, and a Philosophical Language* (1668): published by the Society, with contributions from a number of its associates, under the overall authorship of the intellectual impresario John Wilkins (1614–1672).

Despite its title, Wilkins's *Essay* was not just another theoretical sketch of the real-character idea. Rather, it offered the public a coherent, comprehensive, and usable version of an (allegedly) objective script. Six hundred and two massive folio pages long, complete with engravings, fold-out tables, and detailed user instructions, the *Essay* put a real real character on the desk of everybody who bought it. To be sure, achieving a usable character meant sacrificing some of its ideal potential. The "great undertaking" had not quite been completed, as Wilkins wrote, "with all the advantages of which such a design is capable." And yet it clearly tended toward "the Universal good of Mankind," with the potential to improve trade, unify religion, and increase scientific knowledge.[3] What we have here is the combination—perhaps more recognizable to the twenty-first century than

to the seventeenth—of hubris and humility in a moment of innovation. The *Essay towards a Real Character* was a best-possible application of cutting-edge knowledge, with the plausible goal of empowering people and improving their lives. More than a book, it amounted to a *device*.

Certainly Wilkins's admirers saw his real character as a game-changer. They learned it, corresponded in it, and sought to build upon it.[4] The historian John Webb, writing in 1669, expressed the serious expectation that Wilkins's work could overcome the obstacles to communication presented by the multiplicity of human languages.[5] A Latin translation of the *Essay*, to put the obsolescence of language on a pan-European basis, was being prepared by 1670.[6] The inventor and polymath Robert Hooke, who was devoted to Wilkins, said that his "Universal and Real Character" needed no amendment "to make it have the utmost perfection." Hooke used the character for a proof-text in one of his many public disputes over intellectual property, stating that he hoped thereby to "bring into use and practice that excellent Design."[7] And John Aubrey, gadfly of the early Royal Society, proposed an ideal academy where "Dr. Wilkin's cuts [prints] of the real character" would be placed in every student's room, and where the character would be used for writing out proverbs, for botanical field-work, and for the overall knowledge (as Aubrey rather compendiously puts it) of "things."[8] Annotations and corrections in surviving copies of the *Essay* indicate that the work was not only bought, but also closely studied.

And yet very few readers of the *Essay* seem to have become its users. A vector of adoption for Wilkins's work, if one got started among his admirers after 1668, seems to have gone nowhere. Aubrey's academy (as far as anyone knows) remained notional. Hooke's efforts to promote the character were lonely. The upgrades for which Wilkins's associates hoped, and on which they labored, never appeared. In 1708, thirty-six years after Wilkins's death, his scientific books were republished in the omnibus *Mathematical and Philosophical Works of the Right Reverend John Wilkins*. Here the reader can find Wilkins's Copernican treatise, *A Discourse Concerning a New World and Another Planet* (1640); his book on signals, *Mercury, or the Secret and Swift Messenger* (1641); and his work on mechanics, *Mathematical Magic* (1648): all reprinted in full. But not the *Essay*. Of this great work of the early Royal Society, which Wilkins called his "darling" and for which he expressed such high hopes, the 1708 editors print only an abstract; while commenting that Wilkins's "design of the Real Character" was now "wholly neglected."[9] By the early eighteenth century, it seems—even among people

who were genuinely interested in Wilkins's work—the project for a real character was barely worth remembering.

In that sense, it is actually quite odd that Swift, writing in the 1720s, carefully includes the real-character project among the satirical targets of *Gulliver's Travels*. True, he also seems to want the famous Academy of Lagado episode to invoke the philosophy of John Locke—a more recent, and more prominent, articulation of the view that words were only "Covers of Ignorance" for "the true Knowledge of Things."[10] But this is only an introductory note in a satirical episode that leads back almost to the year of Swift's birth. The Lagadans' belief that they can actually *reduce* words to their common objects, although alien to Locke's thinking, is an admissible caricature of Wilkins's. Their view that "in reality all things imaginable are but Nouns" is consistent with the account that Wilkins gives in what he calls his "Natural Grammar."[11] Gulliver tells us that thing-talk is supposed to function as a universal language[12]—a signature hope (as we will see) of the real-character project. Swift even places the "new scheme" on what he calls the "speculative" side of his pseudo-Royal Society. He makes that point, and uses that word, three times in his introduction of the episode.[13] "Speculative"—from Latin *speculum*, mirror—is opposed to "practical" knowledge in the early-modern period. It suggests, in a way that proved very important for the idea of a real character, the attempt to articulate and contemplate things just as they are.[14] As I have just suggested, it is unclear that Swift's contemporaries would have gotten any of this. Yet Swift is determined to satirize the real-character project anyway. Why?

Jonathan Swift was one of the very last people in the history of the West—until very recently—who could criticize the world envisioned by modern science and technology *without* taking up a Romantic position (of unreason, passionate feeling, productive chaos, etc.). According to the usual history of ideas, there isn't much that is modern, or scientific, or technological, about the seventeenth-century search for a real character. Its epistemology is faulty; its technical consciousness, poor; and it is saturated (as we will see) with Christianity. From this kind of perspective, Wilkins's *Essay* looks, at best, like a dim by-way of modern intellectual history. By contrast, Locke's *Essay Concerning Humane Understanding* (1690) looks like a canonical super-highway. Yet Swift seems to perceive the real character project as being on this same historical line. If anything, he seems keener to knock down Wilkins's ideas than Locke's. Swift evidently saw the previous century's visionaries of a real character as bona fide, and dangerous, prophets of modernity. Was he right?

I'm going to argue that he was. Specifically, I'm going to argue that Wilkins and his peers were prophets of what we now call *information*. I don't mean that term vaguely, as a mere label for communicable knowledge. Rather, I mean the specific form of communicable knowledge that is associated with modern telecoms and computing. Not, to be sure, at the technical level; the real character is not digital, or based on binary code, or (needless to say) electronic. But at a deeper level, having to do with its fundamental *management* of communication on the way to possible knowledge, I am going to argue that the real character manifests some important *shapes* of information. A modular semiotic operating in alienation from any natural language; the possibility of universal communication emerging from just that alienation; and a vision of corralling all knowledge into a single, commanding database: these are some of the facets in which Wilkins's mirror of the world seems to reflect, across the centuries, the information age.

It is striking that we now routinely participate in, and take entirely for granted, conversations that go way beyond the ones Swift satirizes in *Gulliver*. We don't just hold up things and point at them, while others do the same. We hold things up—or carry them, or wear them, or ingest them—that point at each other, processor to processor. Dropping out entirely, "language" is replaced by a code of electronic pulses that no human ear can process, no mouth speak. Swift, if he could have learned about such conversations, would (I think) have been horrified. But Wilkins would have been fascinated. Or so I would like to argue.

Now, mine is not the first book to talk about Wilkins's *Essay*—not by a long shot. But it is different from its neighbors on the library shelf, in three main ways. First, previous studies, especially those of a literary-historical bent, have been strongly contextualizing. Their authors have sought to situate Wilkins within his cultural and personal cohorts; and/or, to situate his *Essay* within its intellectual and informing currents. Both are extremely important, even necessary, agendas. So we learn a lot, on the one hand, about the early Royal Society, its correspondence networks, and scientific hopes.[15] On the other hand, we learn a lot about the widespread period fascination, especially in England, with the possibility of real or universal characters; which, in turn, opens up into broader European stories about language reform, cryptography, logic, and mnemonics.[16] On both hands we find superb studies (I hasten to state), without which the present book would be impossible. Nonetheless, the imperative always to trace historical circles around Wilkins's *Essay* has

left the latter somewhat neglected in the middle. No study focuses, in a sustained and (more-or-less) comprehensive way, on Wilkins's *Essay* as a topic in its own right: a transformative communications product, grounded in the seventeenth-century real-character movement, yet without parallel therein. Taking the time to give the *Essay* its due: that is part of what I am going to attempt in this book.

The second difference has to do with the nature of Wilkins's product—what we are supposed to notice, what makes it such a big deal. The *Essay*, per its full title, has to do with *a Real Character* and *a Philosophical Language* (my emphasis). Scholars, without exception, have approached it via the second part of that clause: subordinating Wilkins's written "character" to his oral "language," or frankly and even casually conflating the former with the latter. As I will argue, this is a way to miss the point of Wilkins's achievement. A real character is precisely *not* supposed to be reducible to a language, in early-modern terms—and not in post-modern ones, either. Rather, the character is supposed to be a non-linguistic, or perhaps para-linguistic, system for doing the kind of intensional and communicative work that is normally done by language. How we can understand such a relation is part of what we need to try to find out. To be sure, "character" and "language" are typically discussed together in the early-modern period. But—if we think about it—that is precisely how we can know that they are different. Abbott and Costello, let's say, are always seen together. That is how we know that the one is not the other. The real character, as such, and as *distinct* from "language," is the *point* of Wilkins's book. Accordingly, it will also be the point of this one. To a degree, and in a way, that no previous study has attempted (as far as I am aware), I am going to try to show how Wilkins's real character works.

The third difference is the one I have already indicated. I wish to read the *Essay* as an illuminating episode in the history of information—not in a general, but in a fairly specific, sense of that term. I am not proposing a genealogy, but an analogy. The late Paolo Rossi, in his great work *Logic and the Art of Memory*, describes the seventeenth-century synthesis of artificial mnemonics with hopes for "universal" learning, in a period that "has justifiably been called 'the age of manuals'." "The time was right," Rossi observes, "for the development of a conceptual mechanism which, once it was set in motion, could 'work' by itself, in a way which was relatively independent of the individual, until one arrived at a 'total knowledge'." Rossi has in mind the fully-fledged and semi-mystical art of memory, which, he wishes to point out, was in the eighteenth century "*erased* from

European culture" (the emphasis is his).[17] And no doubt he is right. Yet it is impossible today to read his book, originally dating from 1983, without constantly being reminded of the information-technological claims and agendas that have emerged since then—in what Luciano Floridi calls the "infosphere," Stephen Wolfram calls the "computational universe," Apple and Google and Microsoft just call theirs. The automation of knowledge, a dream of the early-modern world, is becoming a reality in the post-modern one. The time is right, therefore, to go back and see what was happening, while we were still asleep.

A number of humanities scholars have talked about "information" in the early-modern period. However, the concept of information *itself* has for the most part not been treated critically in these studies. It has just been used.[18] The problem with such an approach, as I will discuss in Chap. 2, is that information is an historically contingent concept *par excellence*. It is *only* because of technical developments in communications and computing, in the decades after the Second World War, that we talk about information as much as we do, benefit from information technology (IT), and live in an information age (recently upgraded, as we will discuss, to Floridi's "infosphere"). Therefore, to *assume* information as always-already "there" in the early-modern period is to risk anachronism. What I want to do, instead, is to construct Wilkins's real character as an emergent period *site* of what we now call information—on the basis of a prior, technical, explanation of the latter. *If* the construction is valid, we then may be in a position to learn something, from the period avatar, about the modern field.

Other humanists have mounted allegedly critical discussions of contemporary information theory and technology. All too often, however, "critical" work of this kind just means "finding occasion for literary or cultural comment or performance."[19] It means *deploying*, rather than examining, key concepts and claims of the digital age (such as machine intelligence, cyborgs, code, information itself); while connecting them, more or less formally, to this-or-that text, this-or-that theory, of the contemporary humanities. The result is a kind of exciting talk *within* the world of information, but not really about it.

To be sure, a fully technical account of the relevant issues would take us right into them, when all we want to do is gain a critical perspective on them. An interdisciplinary conundrum. Nonetheless, a number of philosophers, including John Searle, Hubert Dreyfus, and Albert Borgmann, have demonstrated how to perform the necessary balancing act.[20] I'm not really going to be able to do what they do; but I am going to try to report on it.

A final opening comment. This is a book primarily for students of the seventeenth century, especially those interested in the methodological and epistemological issues that tend to be raised by the period's emergent science and technology. At the same time, I will be engaging, on a much less secure basis, with several other disciplines, including information theory (in a fairly strict sense); the philosophy of information (Floridi and friends); and phenomenology, especially the philosophical hermeneutics of Hans-Georg Gadamer (1900–2002). The danger, of course, is that readers who come to this book from any of those latter areas will find its treatment of them jejune, its seventeenth-century discussions hard slogging. So I have tried to make the historical discussion accessible, the theoretical side acceptable. Which all but guarantees the countervailing danger: that seventeenth-century specialists will find my historical discussions (in places) elementary, my theoretical commentary opaque. If there is any hope of squaring these circles, it rests on an articulation of my central proposition: that Wilkins's *Essay towards a Real Character* can interestingly be read as an early-modern manifestation of an informational phenomenology.

In the bit-stream of information, at the machine level, John Wilkins and his peers would have recognized—I would like to argue—a wondrous version of what they called a real character: a para-linguistic, and non-ambiguous, script of things. The basis of this script in mathematics would have pleased Wilkins even more; and its reliance on binary code would have sent shivers down his spine. For Wilkins (as we will see in Chap. 2) prefigured this innovation, both in the *Essay*, and in earlier work.

So perhaps we have some reason to say that information is like the real character. Perhaps, conversely, the real character is like information. In the mirror of its past, maybe we can read some of the contours—and limits—of our informational future. I'm going to argue that we can. In fact, I'm now going to argue that we have to.

Critiques of the Infosphere: Getting to Oh

In 2001, the distinguished American philosopher Hubert Dreyfus published *On the Internet*. The book was the latest installment of work that Dreyfus had been doing throughout his career: debunking, from a pragmatic and phenomenological perspective, the hype surrounding new information technologies. The World Wide Web, a mass technology only since the early 1990s, was still very young at the turn of the twenty-first century—and it showed. "Surfing" the web was fun; but *searching* it, a

bore. Oh, as long as you knew what specific site you were after, things worked pretty well (connection speeds aside). We all kept careful lists of our doubleUdoubleUdoubleUs. But if you only knew what general *kind* of site you wanted, the millenial network was hopeless. An online attempt to find information about tortoises (in Dreyfus's bookish but accurate example) might lead you instead to sites on pre-Socratic metaphysics (because a tortoise features prominently in Zeno's famous Paradox). There were many so-called search engines, but none that actually worked very well.[21]

For Dreyfus, the search problem was rooted in the difference between syntax and semantics: that is, between the mere ordered form of a symbol (e.g., the sequence of letters in "TORTOISE SPEED"), and the intention it encoded (e.g., "I'd like to learn how quickly a tortoise can walk"). Pre-computing search platforms, exemplified by libraries, worked semantically: through meaningful categories organized by embodied humans for the benefit of each other's intentions. But a disembodied and non-intentional computer network could only work syntactically—which meant that it could scarcely organize information, let alone categorize it, at all. What was worse, the sheer *amount* of information available online was growing, and looked destined to grow, exponentially and incessantly. Before long, it seemed, the landscape of online search would become little more than a vast wilderness of tortoises—and whatever else you might care to name—each piece of it inextricably entangled with every other. "One thing is sure," Dreyfus concluded his first chapter, grimly: "As the Web grows, Net users who leave their bodies behind and become dependent on syntactic Web crawlers and search engines will have to be resigned to picking through heaps of junk in the hope of sometimes finding the information they desire."[22]

In 2009, Dreyfus brought out a second edition of *On the Internet*. The revised first chapter draws a big red line through the original. For as Dreyfus freely and fully acknowledges, his critique of less than a decade before had been undermined—in something like the etymological, fatal, sapper's sense of that word—even as he was writing it. There was this computer scientist at Stanford called Terry Winograd, Dreyfus recalls; and he had a couple of bright graduate students (Larry Page and Sergey Brin) working on the search problem. The young men realized that the meaningfulness of a given website for a specific search term, although subjective to the searcher, could nonetheless be quantified objectively by the searcher's clicks under that term. Even better, the larger and denser the online wilderness, the more relative significance would attach to groupings of

clicks within it. So, for example, if searches for "how fast is a tortoise" yielded many clicks on a given zoological website (among those on the initial hit list), that data counted as "votes" from the searching pages for the clicked-on page. The more votes a page received, the more "important" it was for the search term—raising its placement in subsequent hit lists. That kind of recursive (or self-reinforcing) effect would propagate at every point of the system. An online search organized along lines such as these would become more effective with every single execution.

Around these insights, the grad students built an algorithm. Around the algorithm, a program. Around the program, a search engine. Around the search engine, a multi-trillion-dollar global hegemonic corporation with the explicit and, astonishingly, plausible goal of using the internet to organize and categorize all of the world's information for everybody forever. Google became the latest name for the triumph of online IT—which makes it all the more remarkable that Dreyfus, in 2009, does not even try to incorporate it into any ongoing critique. If anything, the old phenomenologist tries to take a little bit of credit for this decisive technology of the computer age, by noting that Winograd had taught his students some Heidegger in response to Dreyfus's earlier work.[23] But other than that, the erstwhile critic of IT cheerleading just notes, blandly, that "pessimism has turned to optimism" in this area of computer science.[24] He even gives Page and Brin the last word in the chapter, to the effect that there is, after all, "a bright future for search."[25] The first chapter of *On the Internet*, second edition, presents a rare opportunity to watch a brilliant, accomplished, and highly polemical scholar, looking back over a portion of his own previous work—falsified by the very forces he had tried to describe—and saying: "Oh."

I come to optimize Dreyfus, not to devalue his page rank. Nonetheless, and by that very token, I find that his reversal by Page and Brin indicates the stakes in the confrontation between IT and—what? Not anything as narrow as "phenomenology," though a critique of IT is inevitably indebted to that philosophical field. But not anything as broad as "culture," either—a wishy-washy, hazy, vacuous term. We could try "humanism," but this is problematic: in the seventeenth century, which I'll be talking about a lot, it didn't mean anything like "the ism of the human," but rather "the study of secular, as opposed to sacred, literature." Perhaps we will have to settle, at least temporarily, for defining the kind of position taken up by Dreyfus and others (including me) negatively: it is an *info-skepticism*, a base unwillingness to go along with the more grandiose claims of contemporary information technologists; and an attempt

to articulate the validity of this unwillingness. Ultimately, the infoskeptic wants to be able to give a non-technical account of whether there need to be *limits* to the advance of IT. Whether this is even *prima facie* possible is part of what we need to (try to) find out.

On "IT" we can also do some opening definitional work. Dreyfus's target in 2001 was "the internet," but it is not clear this actually names anything anymore. This of course is not because the net has gone away, but because it has gone everywhere. Once upon a time, it *meant* something to point out that a computer was networked. But for a long time now, that has already been achieved as soon as one points out that something is a computer. And the same goes for phones, cameras, books, cars, clothes, TVs, shoes, farms, pets, forests, boats, armies, toasters, your keys, your wallet, your toothbrush, your kids—whatever, in sum, the IT industry has managed to implant with the requisite chips. And whatever it has not yet implanted, it is working on. The internet, which Dreyfus accurately gauged in 2001 as a final phase of technology, has also entered us into the *global* phase of information (and we need to define that word, too—but not yet).[26]

It is for the resulting networked totality, the whole world-as-ball-of-IT-wax, that the philosopher Luciano Floridi has adopted the term *infosphere*.[27] While I disagree with some aspects of Floridi's work, I like this usage, and will follow it. "Minimally," Floridi writes, the infosphere is

> the whole informational environment constituted by all informational entities, their properties, interactions, processes, and mutual relations. It is an environment comparable to, but different from, cyberspace, which is only one of its sub-regions... Maximally, infosphere is a concept that can also be used as synonymous with reality, once we interpret the latter informationally.[28]

Not the world as what gives us the net, but the net as what gives us the world. The infosphere approximates to our whole experience, insofar as IT comes to occupy *the first place* within it. As Floridi gently reminds us—those of us, I mean, who were already grown in 2001—people born thereafter have *always* been "onlife," which is why they always are. The young simply *do not think* of "the space of information as something one logs-in to and logs-out from."[29] Rather, they think of it as just what space is—also time, history, politics, and everything. The infosphere belongs to them; and they to it.

If one is infoskeptic (Floridi, for his part, isn't), one is likely to receive this kind of news with a feeling of distress. And it is easy, surveying the

current state of infospherical marketing, to make that feeling worse. Today we are being told—by very smart, well-funded, and diligent engineers—that our brains will soon be unnecessary. The infosphere itself will think, and will be better at it than we are.[30] Military robots, if they do not actually make war obsolete, will at least make it ethical—reducing the tangle of moral judgment to clear computation, and ushering in the best of all possible kill protocols.[31] Constant and real-time medical monitoring of our every bodily system and subsystem will replace the vague, quaint, and even irresponsible idea that we basically know when we are feeling healthy or ill.[32] And so on. Workers in the infosphere are articulating, whether they know it or not, an authoritarian tendency that has always been latent in modern science and technology—technoscience, for short. Precisely because technoscience is a unique force for human freedom, it has tacitly reserved the right, in some cases, to *overrule* the latter. For most of the last four centuries, this sudden reversal of polarities between science and ethics has occurred only intermittently, and as a kind of short circuit (e.g., in eugenics). But as we approach the first century of the information age, the hegemony of technoscience is starting to look like a rewiring.

And yet it is extremely difficult to say so: to offer a non-technical, but effective, critique of the infosphere. The primary evidence supporting this observation is the sheer number of such attempted critiques. Evgeny Morozov, Jaron Lanier, Albert Borgmann, and Nicholas Carr are just a few of the learned authors (apart from Dreyfus) who have published significant and much-discussed books about the disturbing implications—cognitive, social, psychological, economic, or what have you—of the always-developing internet and its associated information technologies.[33] Several of these authors, for that matter, have slain their infospherical dragons *more than once*, in big books, seriously reviewed in *Wired* and widely shared on Facebook. Here be something suspicious, not only in the repetition of these arguments, but also in their relationship with the forces they attack. Lanier, for example, has deftly parlayed his first career as IT's Polyanna into a second career as its Cassandra. Morozov would not be Morozov without the marginal excesses of contemporary IT; against which, for the most part, his arguments boil down to "gimme a break." Indeed, while the internet has had noticeable effects on the careers of its critics, the converse does not appear to be true. Nobody really believes that Lanier's smirks or Morozov's raspberries or Carr's handwringing has any power to turn back the advance of the online monster, or its aiding and abetting by citizens and policymakers. And thus the proliferation, and reiteration, of coffee-table critiques of

the infosphere. These arguments have to be repeated, or re-attempted, or re-envisioned, precisely because they *fail to work*.

This is due, I would argue, to a technical characteristic of the online phenomenon that is so basic it is hard to see. *The infosphere is unfinished*. And this in a radical, even a unique, way. True, any technology is unfinished insofar as it remains open to possible expansion of its capacities—that is, improvement. Even the simple, ancient hammer (the phenomenological ur-tool) can in principle still be made ever-lighter, stronger, more durable, and so on. However, expansions of this kind are *intensive*, not extensive: they are refinements of existing capacities, not the discovery of new ones. The hammer, we can confidently predict, will never be endowed with the ability to keep the rain off. For that, it needs to be integrated with other tools, in a *network*. The latter, in turn, needs to integrate with other networks. So the hammer integrates with the contents of the toolbox; the latter with the carpenters; the latter with the trades. The networks build a house. Like the individual tool, the network is typically open only to intensive improvement: the toolbox, like the hammer, will never be able to build a house by itself. But at some point, integration with other networks commences a genuinely *extensive* expansion of technological capacities. The latter, apparently, can go on indefinitely. By integration with the building code and the housing market and the electoral system and the media, the immediate networks of our little hammer achieve remarkable and far-flung results. It would be a foolish sage who examined the toolbox and pronounced that there was no reason to think it would ever lead to a neighborhood.

So perhaps a network of networks can be recognized as the extensive form of technology. If so, then perhaps we can say that the infosphere is *the* network of networks. Its limits, as Dreyfus already intimated of the internet, are only those of technology as a whole. And the infosphere races towards its limits at an ever-accelerating speed. As is already very evident, any and all sites of technological action can—and will—be integrated into the online infosphere, and accessed through its portals. For whatever is *not* online does not get accessed at all, as the non-networked world becomes coterminous with our intentional or private space (itself constantly diminishing). For everything else, there's an app; and the set of apps, as much as the set of networks that it replicates, is open. This means that the infosphere, *by definition*, undergoes a constant expansion—extensive, not just intensive—of its technological capacity. Another app is *always* coming online; another network being added to the infospherical roster. Thus by the time an infoskeptical critique can be published, its target has moved on.

Moreover, the multilateral integration of apps, an effect that is itself constantly expanding, consistently produces capabilities exceeding the sum of their parts. Voice-recognizing, Kasparov-defeating, car-driving, Jeopardy-question-answering and championship-winning: these are just a few of the stunning achievements, now clearly within the power of the informational network, that infoskeptics have in the recent past confidently placed beyond it. The implication—logically dubious, but not irrational—is that *all* skeptical markers will, in the end, be overwhelmed by the growth of the infosphere. "Oh" is the revision, or so it may seem, that awaits all attempts at non-technical critique in this area.

Into the Past

How, then, are we to proceed—we anxious, old, infoskeptics? For the beginnings of an answer, we can turn back to Dreyfus. Almost thirty years before *On the Internet*, in 1972, Dreyfus published a book called *What Computers Can't Do*. This was one of the first attempts by a philosopher to criticize the logical, epistemological, and metaphysical assumptions of computer science. In particular, Dreyfus took on two subfields that were at the leading edge of Nixon-era computing: Cognitive Simulation (CS), the attempt to create artificial and computable repositories of human knowledge; and Artificial Intelligence (AI), the attempt to build computers that could independently grasp, manipulate, and synthesize items in a CS database—in a word, think. Dreyfus showed, easily and compellingly, that the grandiose claims of CS and AI research (to say nothing of their echoes in pop culture and marketing) fell very far short of reality. Indeed, he was able to identify a *pattern* in well-funded CS/AI research programs. The pattern was: early and exciting success, quickly followed by devastating and terminal frustration. As the logician Yeshua Bar-Hillel (quoted by Dreyfus) put it: "the step from not being able to do something at all to being able to do it a little bit is very much smaller than the next step—being able to do it well."[34] CS/AI researchers had fooled themselves into thinking that *first steps* toward their goals made reaching them inevitable. But on that kind of logic, Dreyfus observed, "the first man to climb a tree could claim tangible progress toward reaching the moon."[35]

The power of Dreyfus's critique, although greeted with hostility by CS/AI researchers at the time, could be measured by the sound of their labs being cleared out during the 1970s and 1980s. A field that had seemed destined for sunny skies—think of the vision of *2001: A Space Odyssey,*

partly based on the work of Dreyfus's nemesis Martin Minsky—entered instead into the "AI winter" of the 1980s and 1990s. Since then, to be sure, AI has enjoyed a resurgence, and is in fact a key component of the twenty-first-century infosphere. But not AI as Dreyfus encountered it in the early 1970s—what is now called GOFAI (Good Old-Fashioned AI). Rather, new-fashioned AI is a much nimbler and more modest affair—operating around the edges, as it were, of Dreyfus's critique. A major desideratum of twenty-first-century robotics, for example, is the so-called "emergent" effect: intelligent or pseudo-intelligent behavior occurring, or seeming to occur, in the spontaneous interaction between the parts of a robotic system. The evidence, if one can call it that, for emergent behavior is precisely if the system's creator *can't quite explain it*. It is the AI equivalent of ghostbusting—a long way from the proactive confidence of GOFAI. In 1979, Dreyfus published an expanded (as *opposed* to "revised") edition of *What Computers Can't Do* (entitled *What Computers* Still *Can't Do*). This was further expanded in 1992; and the final version has never gone out of print.[36] The "fallacy of the first step" has become a canonical item of debates about AI, and Dreyfus's quip about climbing the tree has become its canonical expression.

How did Dreyfus, *in 1972*, manage to formulate a critique of then-cutting-edge IT that appears invulnerable (so far) to outflanking by subsequent expansion of the infosphere? Computer science, as a field, had emerged just after the Second World War, and so was only about 25 years old when Dreyfus was writing. In that sense, *What Computers Can't Do* looks extraordinarily prescient. But the CS and AI research programs were almost as old as computer science itself. They had already manifested, by the early 1970s, what Dreyfus identified as their characteristic trajectory. The latter, as we have noted, was precisely terminal: from first steps to a brick wall, from endless possibilities to none. CS/AI, whether or not its researchers saw it that way, was by 1972 already a story with an ending. Dreyfus perceived the ending, and told the story. This is not to take anything away from his achievement, but to note what *kind* of achievement it was. In 2001, Dreyfus would work prospectively: looking at the internet, as it then was, and proclaiming how it would go wrong. In 1972, by contrast, Dreyfus worked retrospectively: looking at CS and AI, as they *had been* already, and saying how they *had* gone wrong.

History, in a word, was the winning ground of *What Computers Can't Do*. And this, I would argue, is essential and relatively neglected ground for info-skepticism generally. If we can identify closed experiments and concluded

states of informational history, we may be able to articulate fallacies within them, along the lines of the "first step" fallacy, under conditions of analytical stability. Applying our results to the once and future infosphere is then, potentially, just a matter of scaling and analogy. The retrograde move has the potential to reverse the embarrassment that is so often suffered by infoskeptical prediction: it is not the skeptic, but the info, that has to say "oh" when history comes into play. We see elements of this sort of effect in several recent studies that challenge or qualify aspects of the computing age by charting its surprisingly ancient and complex heritage.[37] IT takes us to the future in a cloud of razzmattaz; taking it to the past, instead, leaves the confetti on the ground. It then becomes much easier to see *what* we have been dealing with, in dealing with some tendency or inertia of the infosphere.

But where? Or rather, when? History is not in short supply. Its superabundance, moreover, is especially problematic when juxtaposed with a concept like "information"—which can be construed broadly enough to include everything from satellite transmissions to Sumerian cartouches to organic stimuli. In this book, I will control for the second problem first, by defining and treating information narrowly. I will not be talking (*pace* Floridi) about any vague standard of meaningfulness, or communication, or data. Rather, I will be talking about the embodiment of messages in binary machine-language—the basic, essential technology of the computer age. Associated with Claude Shannon's seminal 1949 paper *The Mathematical Theory of Communication*, information in this sense can be specified as Shannon Information or (Floridi's usage) MTC information (MTCI). Yet specifying it, in a sense, is misleading; because it is only due to MTCI that we talk much about information, or have (had) an information age at all. Making this argument properly will be part of the work of Chap. 2 ("Mercurial messages"). There, I will also want to put MTCI through a phenomenological reduction: going beyond a merely technical account, to try to say what kind of epistemological and hermeneutic matrix the latter leaves us with. My hope and claim will be that submitting MTCI to such an analysis leaves us with more insight into what it is, not less.

The first problem, then—the problem of history—solves itself. To define information narrowly, as fundamentally MTCI, is to isolate it in history as a technological phenomenon *with a beginning* (if not yet an end). This also shows us how to *maximize* the critical advantage provided by historical analysis—taking the retrospective move to its logical conclusion. For the interpretative advantage provided by historical alienation increases as one traces something *back towards its origins*. In other words, the older, the stranger—and thus the more interesting. Obviously, one does not

want to take historical reduction too far; through sweeping and counterfactual proposals, let us say, that the digital age began with the invention of the alphabet, or numbers, or speech. But equally obviously, one can't just refuse the reduction. Information theory did not spring fully-formed from the head of Shannon (and/or Turing, or Wiener, or whomever) in the late 1940s. It had preconditions and precursors that were necessary to it; even, perhaps, sufficient for it. This is the kind of arrangement I am looking for: not wispy historical threads of information theory, but a recognizable early instance of the tapestry. Perhaps saying "this is as far back as it goes" will never really work. But one still gains tremendous leverage on the infosphere by finding it reflected, or manifested, as far back as one can.

In this book, I will follow a number of other studies, as well as my own training, in tracing the phenomenon of information pretty far back: to the Scientific Revolution of western Europe during the latter half of the seventeenth century. Information has been called "the new language of science," and in that sense it simply stands to reason that it began when modern science did.[38] But more to the point, the Scientific Revolution was experienced by its participants as an information age, both in the sense that they had a great deal of exciting new material to communicate, and in the sense that they were surrounded by thrilling new ways to do so. The printing press had long since made "information overload" part of the period's cultural and intellectual furniture, prompting numerous creative and even obsessive schemes for organizing and collating knowledge. Meanwhile, the colonial expansion of western nation-states, along with their internal political division and conflict, underwrote widespread and urgent period interest in cryptography, signals, and long-distance communication.[39]

To be sure, early-modern IT, if we can begin to speak of that, proceeds on technical platforms that are scarcely recognizable to us. But by that very token, if we *can* begin to recognize IT on the seventeenth-century platform, we stand to learn quite a bit. My goal, accordingly, is not to map the early-modern information age. Rather, my goal is to argue for a *specific* period avatar of information—both technology and theory—that allows a critical sketch of the informational idea, both then and now.

The Early-Modern Code

I will be working backwards from a foothold that historians of information have already placed in the seventeenth century. This is in the work of Gottfried Wilhelm Leibniz (1646–1716).[40] Two aspects of Leibniz's voluminous and eclectic thought are relevant. First, his mathematical

innovations—notably the invention of binary notation (on which all modern computing depends), and co-invention (with Newton) of the calculus. And second, his semiotic vision for a *characteristica universalis*: a universal notation or "character" of thought that would be based on an alphabet of logical simples, and would reduce all discourse to calculation. Here, it seems, is a prefiguration—tantalizing, if obscure—of MTCI. Computing historians have tended to privilege Leibniz's math over his semiotics—for a number of good reasons, including the relative underdevelopment of European mathematics prior to the seventeenth century, and its architectonic significance in modern natural science thereafter. Nonetheless, as intellectual historians of the seventeenth century know, it is the *characteristica* that situates Leibniz's information-theoretical work in its seventeenth-century context. And it is this context with which I propose to work.

Projects for a new, rational, and potentially universal sign system (or character) proliferated in the intellectual life of early-modern Europe. René Descartes, Marin Mersenne, Athanasius Kircher, Jan Comenius, Jacob Boehme, Isaac Newton and Francis Bacon were just a few of the period thinkers—some still household names, others familiar now only to seventeenth-century specialists—who commented or participated. Their motivations were, variously, to reunify western Christianity in the wake of the post-Reformation sectarian wars; to overcome the obstacles presented to international communication by the multiplicity of human languages; and to transcend the obstacles presented to scientific inquiry by the redundancy and ambiguity of any language whatever.[41]

Indeed, while it has become customary to speak of this seventeenth-century movement as being directed toward the creation of an artificial, philosophical, and potentially universal *language*, that common scholarly usage is somewhat misleading. A new character, as envisioned by Leibniz and others, would not really have been—by their lights—a "language" at all. True, it would have done the work that language normatively does: allowing and supporting intensional discourse (conversation, meaning, reference) about more-or-less anything under the sun (if worth talking about, anyway). And true, in at least some of the period schemes, the character would have been retrofitted with phonemes, becoming effable (speakable). Nonetheless, the whole *point* of the character—valid or not—is that it was *not supposed to count* as a language. Rather, it was supposed to offer a way of securing, even perfecting, the functionality of language; without the latter's persistent and apparently unavoidable malformations.

Explaining these matters properly will take quite a bit of work later on. For now, I can suggest very briefly that *the idea of the character is like the idea of information*—in a fairly strong, technical, MTCI-type sense. In both cases, we have a language that is (supposedly) *not* a language—but an un-language or ur-language, a phenomenologically prior code; a code that makes its claim of priority precisely as *pure writing*, rather than being a function of any normative or even residual orality; and a code that claims an alignment with something like the logic of being. In the seventeenth century, this last is the idea that a universal character would not only be able to articulate the universe—pointing out, naming, entities within it—but would also *explain* it, willy-nilly, because the nature of the universe would be coded right into the character. In modern information theory, especially as juxtaposed with theoretical physics, the analogous idea is that the universe *is* nothing other than the final description of the infosphere: the "it" that comes from the "bit" of MTCI.

If the character is informational, in a non-trivial sense, then a technology of the character is a technology of information (in a non-trivial sense). It ought therefore to be possible to read the seventeenth-century real-character project as just the kind of closed, indeed failed, experiment in IT that is recommended to infoskepticism by the historical perspective. Obviously, technical insights into twenty-first-century IT are not a likely output of such an approach. But pragmatic insights, I hope and claim, are. I want to see to what extent we can illuminate some of the major shapes of the infosphere—its assumptions, logics, fallacies and limits—via its seventeenth-century reflection. In my conclusions, I will draw together the results of this historical analysis into questions that may be posed to IT, now and in the future.

None of which, however, will be possible via Leibniz. Although a favorite project of the German philosopher's entire working life, his *characteristica* remained little more than a vague proposal. Perhaps Leibniz grasped *just how difficult it was* to achieve an ur-language of thought, which would ban, or render impossible, "chimerical notions," and would allow disputes to be resolved by a kind of calculation.[42] Descartes certainly got it: he wrote to Mersenne that, while a philosophical character would be very desirable, it would *presuppose* the perfection of knowledge that it was supposed to further, and therefore was likely to be met with only in "the world of novels."[43] For the most part, and especially on the continent, seventeenth-century attempts to bring the character into reality manifested a similar combination of incompleteness and wistfulness.