# INTRODUCTION
## Roberto Busa, S.J., and the Emergence of Humanities Computing

On August 9, 2011, the Italian Jesuit scholar, Father Roberto Busa, S.J., died at the age of 97. Obituaries and online posts around the world celebrated him as the pioneer and founder of humanities computing and, by extension, of the more recent interdisciplinary field of digital humanities. A photograph on the *Forbes* website showed him smiling while holding an iPhone, implying a direct linear descent from his work to the latest technology of the present, the past of humanities computing meeting the present of ubiquitous mobile computers.[1] Most of the stories mentioned his signature contribution to scholarship, the *Index Thomisticus*, a massive (56 volumes in print), lemmatized concordance containing every word in the complete works of the thirteenth-century philosopher and theologian, St. Thomas Aquinas. (A lemmatized concordance is organized accord- ing to word-family, with all forms of a given word grouped under its dictionary entry or lemma.) The *Index*, in a web edition created by Eduardo Bernot and Enrique Alarcón, has by now been incorporated into the larger digital project of the *Corpus Thomisticum*, which also includes an electronic edition of the complete works of St. Thomas Aquinas with related works, an edition of his manuscripts, a bibliography, and a list of research tools.[2] This resource has its origins in Father Busa's tentative, experimental forays into creating the *Index*, beginning in the mid-1940s with his PhD research and extending to the use of punched-card machines starting with his first trip to North America in 1949.

Father Busa is an important symbol for the history of humanities computing and for digital humanities. The Alliance of Digital Humanities Organizations (ADHO) named its most prestigious award for him and presented him with the first instance of the Roberto Busa Prize in 1998. Since then, the prize has been awarded every three years. The official website (http://adho.org/awards/roberto-busa-prize) tells how Busa, "the first pioneer of humanities computing . . . in 1949 began experiments in linguistic automation, with the support of the IBM offices in New York and Milan, as part of his analytical research on the writings of Thomas Aquinas." The formal citation for his own award says that it was presented "in honor of the monumental achievement of the *Index Thomisticus*, the

commencement of which is generally regarded as marking the beginning of the field of computing in the humanities."[3]

In this account and others like it, the origin of using computers in humanities research is linked not only to Busa's *Index* but to his crossing the Atlantic to gain the support of the iconic American computer company, support he worked to maintain in some form for over forty years. Anyone who has followed humanities computing and digital humanities in recent decades will have heard a version of this founding narrative. Susan Hockey, a historian of humanities computing who was herself the recipient of the Busa Prize in 2004, summarizes it in this way:

> Unlike many other interdisciplinary experiments, humanities computing has a very well-known beginning. In 1949, an Italian Jesuit priest, Father Roberto Busa, began what even to this day is a monumental task: to make an index verborum of all the words in the works of St Thomas Aquinas and related authors, totaling some 11 million words of medieval Latin. Father Busa imagined that a machine might be able to help him, and, having heard of computers,went to visit Thomas J. Watson at IBM in the United States in search of support (Busa 1980). Some assistance was forthcoming and Busa began his work. The entire texts were gradually transferred to punched cards and a concordance program written for the project. The intention was to produce printed volumes, of which the first was published in 1974 (Busa 1974).[4]

Like other versions of this story, Hockey's is based largely on Father Busa's own accounts, especially as published in the influential article of 1980 she cites.[5] The key elements are all there: the priest and the CEO, two "founding fathers" (one a Jesuit father of the Catholic Church who is also taken as the father of humanities computing, the other the founder of the world's dominant computer company at the time), the start of a collaboration between European humanities and American global business, meanings and machines. It's a good story, and as Hockey says, "a very well-known beginning." And it has been taken by some as the beginning of digital humanities, as well, an interdisciplinary field which emerged in the past decade or so out of the longer tradition of humanities computing, with newly available government grants, new graduate programs, and new research centers. But leading digital humanities scholar Willard McCarty (recipient of the Busa

Award in 2013) cautions that, although Busa may be an "intellectual father-figure" who was there from the beginning of humanities computing,"[t]here are other beginnings on offer."[6] Despite this caution, the story of Father Busa's coming to IBM remains the dominant founding myth of humanities computing and digital humanities. Busa's own predilection for vivid symbolic illustrations surely contributed to making the myth.

My aim in this book is to complicate that myth with history. I pay close attention to that influential beginning and to the human story of Busa's project in historical context. To begin, although Busa has been called the founder of digital humanities, he was more properly helping to establish a viable form of early humanities computing, or, even more precisely, humanities data processing. I focus on the first decade of Busa's work, roughly 1949–1959, and how that early work led to the uneven emergence of more extensive use of computers in the humanities. The interdisciplinary field known as digital humanities came along decades later, in the midst of a flurry of debates about how to define it. To collapse humanities computing and digital humanities is to obscure much of what's most interesting about their related histories. Throughout this book, when I do connect something Father Busa did to some aspect of today's digital humanities, I do so explicitly, and it's usually to correct what I take to be a distorted view of his legacy. It's never because I think, as one critical theorist in digital humanities recently put it, that the "boundaries" of the field of digital humanities can or should be "circumscribe[d] to Father Busa and his punch cards."[7] Quite the contrary. My own digital humanities work in textual studies, media studies, and video games, for example, was undertaken in opposition to such rigid boundaries. But the myth of the priest and the CEO remains powerful in the field even as the history behind the myth remains obscure. More history is needed.

The complicated history behind the myth can be glimpsed even in Father Busa's own accounts. For example, his often-repeated story of the initial meeting at IBM contains witty, polished dialogue, complete with jokes and subtle allusions by both men, when the actual meeting was sure to have taken place with a certain formality, perhaps unavoidable awkwardness—especially given the fact that Father Busa's English was not yet fluent by that date. Anyway, it's likely that the meeting between the priest and the CEO was at first a kind of diplomatic courtesy, probably

not all that significant at the time to the Chairman or his huge company. It's clear that IBM took more convincing than Busa's entertaining and influential account from 1980 would suggest, requiring a testimonial or character reference from New York's Cardinal Spellman, for example, and H. Paul Tasman at IBM later said he thought he was expected to make the proposal "go away" (see Chapter 1). For his part, Father Busa was considering a range of possible technologies right up until an agreement was reached with IBM (as even his own published accounts indicate). In general, large forces were at work, institutional, political, and technological conditions that made that initial meeting a possibility and opened the way to further collaboration.

In what follows I attempt to fill in the picture, to detail some of those conditions, including the specific locations where the work took place and the particular technologies Busa used. From the archival record, we get a sense of Father Busa's lived experience in the 1950s: traveling on transatlantic ocean liners and merchant ships, living in New York City for months at a time almost every year, riding the elevated train, working on punched-card machines at IBM World Headquarters in Midtown and IBM World Trade Corporation near the new United Nations building, sending telegrams, and making visits to local universities, then going back to Italy, working at IBM Italia in Milan, negotiating with local industrialists to arrange for space in their buildings for his Center for Literary Data Processing in the town of Gallarate, again taking trains and holding meetings and staging experiments—all of this activity punctuated by key events, such as hosting a demonstration of his punched-card method in IBM's showroom at 590 Madison Avenue in 1952, or presenting his work to large crowds at the 1958 World Expo in Brussels. This is not a biography of Father Busa. But it is a kind of biography of his project in its first decade. That's when methods for humanities computing of this particular kind—a kind that has been extremely influential (even though it is not the only kind of humanities computing, let alone the only kind of digital humanities)—were first established from among the available possibilities.

Busa's work continued into the beginning of the twenty-first century, involving the use of powerful computers like the IBM 705 and the IBM 7090, for example, as well as personal computers, CD-ROMs, hypertext links, and the Internet. Those were the decades in which he became the eminent scholar with a worldwide reputation who lent his name to the ADHO Digital Humanities prize. Much of that

happened well after the initial decade that is the focus of this book. Even many who knew him in more recent years (alas, I did not) may not be aware of the details of the early period.

So my story begins at the very midpoint of the twentieth century. This was the era just after World War II that saw the rise of the Cold War, when for example Busa acted as liaison between linguistic work underway at Georgetown University and the European atomic energy center in Ispra, near his home in Lombardy; or when Paul Tasman's and Roberto Busa's work on the Dead Sea Scrolls, recently discovered in the Judean desert, led to at least the beginnings of a collaboration with philologists around the world. The story begins in 1949 in New York City, where one large-scale calculator—with walls of vacuum tubes, electromechanical relay switches, and paper tape drives as well as punched cards—had just been built under the direction of an IBM lab uptown at Columbia University and installed for working display at IBM's Midtown headquarters at 590 Madison Avenue. The machine captured the public imagination and signified "the future" for many. But much smaller black or gray metal punched-card machines, arranged in various suites and configurations for performing specialized tasks, were the actual present at the time, a time of data processing in offices all over town (and increasingly, worldwide—notably in Milan, for example). Commonly operated by women, some of whom were also trained to set up or "program" the machines by re-cabling them using matrix-based plug boards, this was office equipment associated with accounting, and operating it was generally treated as a specialized category of clerical work, more akin to skilled bookkeeping or stenography than to later software-based computer programming.

It was an age of data processing, and New York City was at the center of the age. We see this even in an iconic avant-garde painting of the 1940s, Jackson Pollock's *Stenographic Figure*, first shown to acclaim in 1943. Later in the decade, just as Father Busa was visiting New York for the first time, *LIFE* magazine published an illustrated article on Pollock as a representative American artist.[8] By then abstract expressionism had arrived and Pollock had begun to make his famous action paintings, but this earlier work was at least partly figurative (hence the punning title). And it contains scores of calligraphic markings, layered signs and symbols suggesting a world of ambient data—with what would appear to be shorthand and

numbers ("figures") among them—arrayed in multiple floating and overlapping dimensions (as was characteristic of Pollock's canvases), with what appear to be two human-like figures facing one another, even perhaps a secretary or stenographer taking dictation at a desk. This scene may represent an important aspect of the 1940s, especially in New York, the significance of "figures," seemingly cryptic data everywhere—in the air. Father Busa's own letters, documents, and photographs from 1949–1959 belong to the same moment and help to defamiliarize this mid-century milieu, with its culture of data-processing machinery and, within a few years in the new decade, the emergence of limited numbers of large-scale electromechanical calculators. Punched-card processing was part of a whole flood of data processing of various kinds at the time, almost none of it quite "computing" as we've come to know it. The application of this data-processing technology to linguistic research was really only proleptically and obliquely related to the humanities computing that would emerge (and be constructed) in the years that followed.

As late as 1971, Busa wrote from Venice to the New York academic, Professor Joseph Raben, editor of the first dedicated journal in the field, *Computers in the Humanities,* to question him about the definition in American English of the term "humanities."[9] Busa asked whether linguistics or psychology would be included, for example, under the category. In Italian, he said, "scienze umanistiche" had a broader "and less definitive comprehension"—in effect meaning "only the opposite [of] mathematics, physics, chemistry, medicine," etc. Raben replied—speaking pragmatically, as an editor—that it depended on the researcher's disciplinary and institutional affiliations, but also on "whether the philosophy of a particular project stresses the human qualities of the material and calls into play the human qualities of the investigator." For example, he says, an anthropologist performing a statistical study of physical types would not count as "humanities," but a cultural anthropologist analyzing folk tales (using computers) would. This disciplinary discussion—which sounds relatively fresh today in relation to debates about the digital humanities—reminds us that this so-called founder of humanities computing was himself still negotiating the meaning of key terms as he began the third decade of what would turn out to be over a half century of work in the field. It also reminds us of the sometimes complicated cross-cultural nature of that work, in

more than one sense—interdisciplinary, bilingual, transatlantic—even well after that first decade (the focus of this book).

That exchange with Joseph Raben is just one example of how much this book has depended on Busa's correspondence. The project would not have been possible without the Busa Archive at the Catholic University of the Sacred Heart in Milan, under the stewardship of Father Busa's former student and colleague, himself a computational linguist, Dr. Marco Passarotti, who serves as Coordinator of Research and Secretary of CIRCSE—the *Centro Interdisciplinare di Ricerche per la Computerizzazione dei Segni dell'Espressione* (Interdisciplinary Center for Research in the Computerization of Signs of Expression).[10] Busa's papers first came to the university starting in 2009 and they continued to arrive and be sorted and organized after his death in 2011. The collection is still being fully accessioned and catalogued as I write—some new materials arrived while I was working there in March 2015—but meanwhile Dr. Passarotti has generously given me and other researchers access to the collection as it stands.

Besides the Busa Archive, and of course published materials of various kinds, I've also consulted archival materials elsewhere, starting with the IBM Archives. Although I was not permitted to examine the corporate archives on site, I was sent a wide variety of materials over the course of a year, including valuable oral-history transcripts and additional photographs, by the company archivists, in particular, Reference Archivist Dawn Stanford, under the direction of Jamie Martin. I also consulted the papers of a former IBM engineer, A. Wayne Brooke, now at North Carolina State University. I viewed relevant papers at Columbia University in New York—while benefitting even more, perhaps, from the materials put online by Frank da Cruz at the Columbia University Computing History website[11]—and Fordham University. Both universities, in different ways, played crucial roles in Busa's early work in New York. On March 13, 2015, I was shown some of Father Busa's papers at another academic location, the former Jesuit college, the Aloisianum in Gallarate in Lombardy, where Father Busa taught and in the infirmary of which he was cared for in his final years. As I mentioned, some additional papers from the Aloisianum were donated to the Archive at CIRCSE while I was visiting to research this book in March 2015—a brown-paper packet tied in string was dropped off at the Director's office and she thoughtfully brought

it straight to the office where I was working. There are sure to be more such deliveries and discoveries in coming years. Among the materials already at CIRCSE that have not yet been thoroughly accessioned are those related to the Dead Sea Scrolls, which I discuss in Chapter 5. In addition, there remains the possibility that some of Father Busa's papers are still in storage in various locations and may be made public at a later date. I look forward to hearing more of the story of the earliest years of this work, as other scholars engage with the materials as they continue to become available.

The basic collection in the Busa Archive, now at CIRCSE, was first prepared under Father Busa's own supervision. The core of it consists of papers and other materials he saved, copies of his correspondence, press clippings, and over 900 photographs, usually taken professionally for the press or for the purposes of general publicity. Most of the illustrations in the book are drawn from these (additional photographs have been made available online with permission of the Busa Archive: http://priestandpunchedcards.tumblr.com). The Archive also contains Busa's own handwritten notes, business cards, massive numbers of punched cards and stacks of computer printout on accordion-fold continuous-feed paper, boxes of floppy disks, and magnetic tapes with data recorded on them. For some parts of the story, we have very little documentation besides Father Busa's own accounts—starting with that famous first meeting with Thomas J. Watson, Sr., at IBM (as I explain in detail in Chapter 1). Other papers on this event (and other events) may well surface in the future. Since my interest is in the first decade of Busa's work with IBM, for the most part I've mostly consulted the materials in English and Italian that directly pertain to that collaboration. There are many additional materials in the Busa Archive (and undoubtedly some beyond it, still), in multiple languages, including Latin, a reminder of the global reach and ambitions of Father Busa's work. There are many letters and documents from other people in the Archive, as well as edited and published materials of various kinds. Readers should keep in mind, however, that it's a pre-selected and in effect a self-curated collection.

A similar caveat applies to the use of the IBM Corporation Archives, a caveat which for obvious reasons would apply to any self-curated corporate archive, but also in this case including the fact that I was only able to work remotely, with materials sent to me by the Archivist based on emailed queries. Also, among the

published sources I cite are a few that count as "house organs" of IBM: *World Trade News* or *THINK*, for example. These usually serve as sources of factual reporting about internal matters, the dates of events, for example, but I also cite them as sources of the public rhetoric by which the company represented Busa's and Tasman's research or computing in general. Obviously they have to be understood as operating within a promotional mandate. Indeed, even some research publications, such as Paul Tasman's reports on literary data processing and on the Dead Sea Scrolls project, were published by IBM, and should be read as falling within a similar promotional mandate. For that matter, a parallel caveat applies to some of the Catholic publications I cite, or to Father Busa's own watershed publication, the *Varia Specimina Concordantiarum*, which was published by his home institution, the Aloisianum Jesuit college. All of these publications—of obvious historical importance and often demonstrating perfectly admirable intellectual integrity—are nonetheless by their very nature not quite fully peer-reviewed materials in the usual scholarly sense. I've tried wherever possible to confirm reports among multiple sources, comparing IBM-related documents in the collection of retired engineer A. Wayne Brooke, for example, and published accounts by former employees and others. Still, some portions of the story remain obscure: for example, the exact itinerary of Father Busa's initial visit to Canada and the U.S. in 1949, before his arrival in New York and the famous meeting at IBM, how precisely the arrangements were made for that meeting, and the specifics of the formal agreement he reached with the company (I mean contemporary documentation, rather than accounts from later years by the parties involved). Once again, papers may well come to light in the future that will enrich these and other aspects of the story.

I should add that, although I was not allowed to browse the IBM Archives directly, I'm very grateful for the generous expenditure of her time and effort by IBM Reference Archivist Dawn Stanford, under supervision of the IBM Corporation Archivist, Jamie Martin. I owe an enormous debt to Lilian S. Wu of IBM, for facilitating much of my access to IBM materials and for encouraging my research at various stages, as well as to my own Dean of the College of Arts and Sciences at Loyola University Chicago, Father Thomas Regan, S.J., for putting me in touch with Ms. Wu in the first place.

In terms of approach, wherever possible, I tell adjacent stories of technology and culture in shared contexts: of Father Busa's work in linguistics alongside IBM's punched-card business after the Second World War, for example; or of his presentation at the 1958 Expo in Brussels, the first major world's fair held after the war, literally adjacent to both IBM's RAMAC computer on display and a film by Eames Studios about the humanistic promise of computing, and as an immediate precursor to his leveraging of Cold War funds dedicated to machine-translation research, at Georgetown and at the European Atomic Energy Community at Ispra. The point is not only to place what Busa did (and didn't do) in historical and cultural contexts (which include specific technologies and institutions), but to sketch part of the general milieu within which he acted from 1949 to 1959, including roads he did not take and possibilities he could not realize, but which nevertheless add historical depth to our understanding of the research project as a whole.

From one vantage, this is a story about the history of technology. But technology does not "evolve," or "descend," in a linear way. It's worth recalling what Michel Foucault said of his own approach:

> Genealogy does not resemble the evolution of a species and does not map the destiny of a people. On the contrary, to follow the complex course of descent is to maintain passing events in their proper dispersion; it is to identify the accidents, the minute deviations—or conversely, the complete reversals—the errors, the false appraisals, and the faulty calculations that gave birth to those things that continue to exist and have value for us; it is to discover that truth or being does not lie at the root of what we know and what we are, but the exteriority of accidents.[12]

This book is not a Foucauldian genealogy. But my descriptions of punched-card and computing technology were inspired by recent theoretical discussions of media archaeology, an approach that owes something to Foucault's methodological suspicion. Like many media archaeologists, I've tried to write with an awareness of the inevitable discontinuities of history, the epistemic gaps that separate us from the past, no matter how assiduous our reconstructions or archival explorations. I pay special attention to marks in the record of "the exteriority of accidents," the

contingencies that have shaped history—as opposed to received myth, with its clean and direct lines of descent as destiny.

At every stage, I look for adjacent possibilities, alternative lines of descent and potential influence. For example, I shift attention in more than one instance to the women operators who often appear in the background of the main narrative (or literally in the visual background of documentary photographs). As I've said, the story is about two founding fathers, in more than one sense, and I try to read both of their stories critically, for example by placing the patriarchal roles played by Busa and Watson, then by Watson's familial and corporate heirs, in relation to the stories of some of the mostly anonymous and uncelebrated women with whom they worked. In many of the photographs in the Busa Archive, we see young women operating the punched-card machinery (interestingly, this is less the case once the photographs shift to large electronic calculators in the 1960s and after). Julianne Nyhan and Melissa Terras, of University College London, were the first to turn the spotlight on these young women, first in blog posts about the Busa Archive starting in 2013, and they have since begun to write accounts that place the formerly anonymous operators at the center of Busa's project.[13] I'm grateful to them for sharing the results of their research in progress while this book was also in progress. In Chapters 2 and 4, especially, I connect Busa's operators to the ambiguous feminization of computing, at the transitional moment in which Father Busa was establishing the first modern Center for Literary Data Processing. At the time, computing was obviously a male-dominated realm built on a foundation of mostly female labor. This became increasingly the case in the early 1960s, as the pragmatic arrangements made during World War II were left behind (and male veterans returning from the war were often given jobs that had been held by women before 1945). But this gendered dynamic is best understood through specific relations of power, specific skills, and particular job descriptions. The specifics are crucial to any general historical understanding of the role of women in computing—and in the accounting and data processing activities that preceded actual computing and continued for many years to overlap with it.

I've said I aim to demythologize Father Busa's story in favor of a more detailed sense of his lived history. This is not to deny that Busa was indeed among the first to imagine and institute in material form specific interdisciplinary methods for

humanities computing, from linguistic data processing to experiments with a wide variety of technological platforms, to founding the earliest dedicated humanities computing center. The founding myth expresses these real achievements and his very real historical influence. It's not my aim to debunk it, but only to provide a more complicated picture of its history, to fill in some of the rich contexts out of which the myth arose in the first place.

On the other hand, this is no hagiography. Father Busa emerges from the archival record (and I hope in these pages) as a deeply human scholar as well as a priest, a canny negotiator and a shrewd fundraiser, fully conscious of the risks and the stakes in the deals he brokered in order to accomplish his purposes (and of course the higher purpose he served). In 2014, the parody Twitter account, @DHDarkSider, tweeted: "Roberto Busa wasn't merely the first DH [Digital Humanities] enthusiast. He was the first in a long line of enthusiasts working for The Man." The tweet was meant sarcastically, but behind the mockery is a plain historical truth—which I'm sure Father Busa himself would not have disputed. Especially in the first decade, he assiduously and openly negotiated and collaborated with representatives of power and authority. As a Jesuit priest, he necessarily worked within the patriarchal hierarchy of his order and the Catholic Church. And as a "pioneer" who crossed the Atlantic from Europe, he collaborated with one of the iconic American corporations of the mid-twentieth century, which had continued to do business with Germany during the war, faced antitrust suits, and in the latter half of the century, for many, became synonymous with multinational capitalism and technocracy itself. The paper punched card, IBM's signature mid-century product, is very near to being a cultural cliché. It inspired the oppositional slogan of the Berkeley Free Speech Movement in the 1960s: "I am a human being; do not fold, spindle, or mutilate" (FSM stands for Fold, Spindle, or Mutilate as well as Free Speech Movement). At the end of that decade, IBM lent its name (transparently encrypted with one alphabetic shift) to the fictional, dystopian computer, HAL. It was famous for the corporate uniform of its sales force, and the image of Father Busa in his Roman collar, dark suit or long cassock, is met from the other side by all those IBMers in white shirts and navy-blue suits (and when he first arrived in New York, many still wearing fedoras).

The problematic nature of this collaboration with institutional power would not have been lost on anyone, even at the time, least of all on Father Busa himself. He

claimed that the alliance with big business pragmatically served to further the greater glory of God.[14] From a secular point of view, however, the @DHDarkSider tweet just states the obvious in comic terms: he was not exactly (or exclusively) "working for The Man," but Busa was working with forms of power that were in the most literal sense patriarchal. And aspects of the ideology and agenda of mid-century American business are interwoven with his own research agenda—from the general celebration of the power of data and data-processing machinery, including its applications within traditionally "humanistic" arenas, to his participation the 1958 World's Fair against the backdrop of the Cold War, to securing an actual contract for preparing Russian texts for experimental processing on behalf of the U.S. military-funded work in machine translation.

Beyond IBM, Father Busa actively sought the support of government agencies (especially in the U.S. but also in Italy), corporations (starting with local textile companies in his part of Northern Italy), and, just to point to one obvious example, cultivated the support of the well-known Cold Warrior, Francis Cardinal Spellman, who as Archbishop of New York vouched for him at the beginning of his project and attended his first important demos. Busa's collaborations with authority of various kinds are obvious and overdetermined, to say the least, and have to be taken as central to the history of his project. This is not the same as the history of all of humanities computing, or even less so, of the digital humanities, but it is at least a (celebrated) part of the history of both, a kind of tributary prehistory. Humanities computing, even relatively more than traditional humanities—given the internal tensions of its interdisciplinarity and the material basis of the technologies with which it engages—has depended on industry and government, for technology, for funding, and, more often than some humanities academics might like to admit, for intellectual impetus and research questions. Busa's arrangement with IBM changed over time, but it mostly involved the company's making machines and support available on a points system—free rent, basically, for machines and personnel at IBM locations in New York and Milan and (beginning in earnest in 1956) in the new Literary Data Processing Center in Gallarate (CAAL). By then Busa had also secured some financial support from business leaders in the area of Milan, mostly from the textile industry (one of them donated the use of the former factory that became the headquarters of CAAL). He also received some funds from the Italian government, and in the 1960s, CAAL

seems likely to have secured money from Euratom, the European Atomic Energy Community, as part of a deal he brokered bringing IBM and Georgetown linguists there for work in machine translation. Father Busa was a tireless fundraiser who worked pragmatically to create a worldwide network with many strong and weak ties connecting various centers of activity. His story, in the era following the Second World War and Vannevar Bush's famous call for intensive government funding for research,[15] illustrates how these dependencies and potential complicities have functioned in academic research in general and humanities computing in particular for the better part of a century.

In that context, by way of disclaimer: I have my own personal and professional connections to both IBM and the Jesuits. A member of my family is a long-time IBM employee and I teach at a Jesuit institution, Loyola University Chicago. I'm also a founding Director of the interdisciplinary Center for Textual Studies and Digital Humanities at Loyola (CTSDH). All of this undoubtedly shaped my interest in the topic in the first place. I'm anything but disinterested. I don't pretend to be able to rise above my own interests, but I've tried to keep them in the foreground and to write curiously, self-consciously, and critically about the entangled forces at work on all sides.

Another issue: I'm not Catholic, and because my take on the topic is a secular one—the humanities-computing aspect of Father Busa's work—this book may seem to some to distort his work. I hope not. Readers should remember that of course Father Busa saw his scholarship in linguistics as falling within his vocation and mission as a Jesuit priest. He sometimes wrote about the spiritual aspect of what he was doing, often in closing perorations of essays or lectures (I discuss some of these in what follows). But he also addressed different audiences with different emphases. I make an effort in the book to attend to relevant Catholic contexts for the research questions, models, and material resources that were made available to Father Busa. And at times the intellectual contexts of the work necessarily touch upon theological and philosophical questions.

In a 1962 essay, Father Busa acknowledged: "I was unaware of the fact that I was placed in the sequence of events by which the automation of accounting caused the worldwide evolution of the means of information."[16] Although his best-known

humanities computing publications rarely discuss it explicitly, he always understood developments in computing as part of a larger divinely ordered co-evolution of the world and humanity. Take the example of the essay I've just cited. Despite its religious framing, the evolution Busa describes is worldly in its causes and effects. In the postwar period after 1945, he says,

> The development of communications and organizing techniques allowed the great enlargement of firms that were able to operate worldwide. Equally rapid was the increase of the reciprocal influence of the markets, and between politics and the market. With such a development it has become indispensable for a manager to be able to review a great number of particulars and quickly synthesize them, and at the same time to check and perhaps modify the great masses of small and extensive peripheral phenomena. Calculators answered this need and provided economics with industrial and commercial accounting.[17]

His analysis mentions industry, defense, and the "deepening of the relationship between industrial production and scientific research," then cites as an example his own involvement in Euratom, which "has felt obliged to acquire for its own Centro [Center] of Ispra the IBM 7090 calculator, which costs about three million dollars, or about two thousand million lire."[18] In fact, Father Busa himself apparently arranged for the deal between Euratom and IBM, by way of Georgetown's center for linguistic research. Writing at the end of his first decade of intense collaboration with IBM, Busa sees the confluence of "production, trade, and defense" and the consequent "demand" for "the automation of 'information retrieval,' as "an opportune tracing system of useful knowledge."[19] Pragmatically, he sees an opportunity to leverage business and government interests in favor of intellectual (and spiritual) interests. While his intellectual interest in the translation experiments, or in Goethe's texts, or in the non-biblical Dead Sea Scrolls is evidently genuine, it's also clear that his anchor project remained though the decades the *Index Thomisticus*.

Busa's focus on the work of St. Thomas Aquinas is itself historically significant when we consider it in context. It can ultimately be seen as one result of the encyclical of Pope Leo XIII in 1879, *Aeterni Patris*, which called for Catholic philosophy to re-establish its foundation in medieval scholasticism, and

particularly in the work of St. Thomas Aquinas.[20] The document argues for the necessity of connecting faith and reason in a dialectical process, and observes that even the medieval scholastics were not opposed to science. This dialectical view of human knowledge, the idea of seeing the rational pursuit of scientific truth as a legitimate road to divine truth, is in keeping with Father Busa's own published work, which is often articulated in playful rather than homiletic tones, as in the following example (from the essay I cited above): "Aristotle, therefore, purposefully set about looking into language, and in its folds discovered metaphysics. . . . Even the good and gentle St.Thomas Aquinas stood and admired him, wondering, with his head in the clouds, at the power with which a pagan from this earth had been able to enter into heaven."[21] There's no question that Busa saw the enumerative study of words, his kind of linguistics, as contributing to a greater understanding of the logos, the metaphysics of presence. But in practice, his own published and publicly demonstrated research focused on human language and technology, and the peers who reviewed it were philologists and cyberneticists as often as they were Thomists (or theologians of any kind). His own humanistic focus when it came to his linguistic research helps to justify the secular and humanistic focus of the chapters that follow.

Another important papal encyclical, published at the very commencement of Busa's doctoral research, was Pope Pius XII's *Divino Afflante Spiritu* (1943). It called for new translations of the bible from source texts in Hebrew, Aramaic, and Greek (rather than only from the Latin Vulgate), and necessarily encouraged the kind of documentary textual criticism and analysis we associate with textual studies and modern philology. Busa's work on the Dead Sea Scrolls in the later 1950s, which amounted to data processing and analysis of those ancient source texts and their languages, followed directly from this call. (The CAAL production facility in a former textile factory in Gallarate was decorated with what I take to be puzzle-piece-shaped "fragments" inscribed with signs, some of which were recognizable as Greek or Hebrew letters). I argue in Chapter 5 that this work on the Dead Sea Scrolls is an example of what Busa called a "new philology," a computerized philology—and, given his calling, this too has to be read in the broader context of the 1943 encyclical. On the one hand, it may be a sign of his caution in this regard that Busa's Center worked only on the non-biblical scrolls (as he repeatedly specified). His computerized philology was never directly applied to

the bible. On the other hand, he publicly recognized as his "great ally" the Episcopal scholar, the Rev. John W. Ellison, who used the UNIVAC to build a concordance to the Revised Standard Edition of the bible at about the same time that Father Busa was working on the non-biblical Dead Sea Scrolls (and on a range of secular literary texts).

While I'm interested in the Catholic contexts in which Father Busa pursued his work on St. Thomas Aquinas and philology, and how he might have seen his work as enriching the dialogue between reason and faith, and even seen the collaboration with IBM as for the greater glory of God, it's not the aim of this book to focus on religion. Nor am I qualified to write about Thomistic theology (the topic of Father Busa's dissertation). At any rate, Busa's engagement with problems of language and computing (and the precursor to computing *per se*, data processing) was as intense and persistent as his theological pursuits—the worldly side of a long interdisciplinary career. He was committed to the idea of a dialectical relationship between science and faith, but in practice this means that he engaged fully in each side of the dialectic, on its own terms. For this book, the focus is on the scientific or humanistic side—on how his interests in data processing, cybernetics, and literary and linguistic analysis contributed to the emergence of at least one form of humanities computing. Nevertheless, it should be kept in mind that this way of defining the topic necessarily represents only one aspect of this remarkable scholar-priest's work.

Even within my defined topic, the religious aspect of the story is complicated in multiple ways, just considered institutionally. For example, the culture of the Jesuit order has historically characterized itself as facing outward, toward an engagement with the social and material world, often including the worlds of industry and government. The religious order's culture differs fundamentally from the culture of (public or private) secular universities with which Busa interacted for decades in conducting and presenting his research, not to mention the business and technical cultures with which he also interacted. The authority he ultimately recognized was his order and the Church, and he had to seek approval—turning inward to his Jesuit superiors—at every stage of his research career. The Archive illustrates his sense of being held accountable, both to the Jesuit hierarchy and to the worldwide scholarly community. But his sense of mission as outward-facing led him to engage with

business, government, technology, and scholarship. The engagement with IBM is therefore representative of this outward turn on the part of the scholar-priest.

When it comes to IBM, I focus in this book on selected parts of the story of the company between 1949 and 1959, not for the sake of business history in itself, but as a way to better understand the material and institutional contexts of the technologies and methods with which Father Busa worked. I'm interested in the way technology—and the culture that produced and marketed it—intersected with and shaped his humanistic research. As the record shows, the influence flowed in both directions.The most important IBMer in the story is not Thomas J. Watson, Sr., or one of his sons, though they authorized and continued to support the collaboration. It's the redoubtable H. Paul Tasman, a senior engineer in charge of a good deal of the nascent World Trade Corporation who became Busa's collaborator and friend until his death in 1988. Near the end of their first decade working together, Busa referred to him as "the ingenieur who was my great friend and the key of all our project."[22] Indeed, one could argue that Tasman, as much as Busa, helped to found a language-based humanities computing. From the day they met, he served as mediator between the priest and the punched-card machines. Tasman like to use the term "language engineering" to describe their collaborative work, and he may have helped to coin the term "literary data processing," presciently seeing its connection to the emerging field of information retrieval. Twenty years after their first meeting, he characterized his relationship with Busa as a kind of "mixed marriage," by which he seems to have meant a difficult union of two cultures, European and American, surely, but also a union of linguistics and engineering, humanities and computing. In this context, IBM's culture of data processing helped to orient emergent humanities computing, directing it towards the treatment of natural language as a source of data. The consequences of this orientation are still being felt today in the digital humanities, most recently in terms of the implications of so-called big data and the general "datafication" of humanities research.[23]

One subject of this book is in effect the prehistory of these implications, how humanities computing turned toward the processing of data in the first place. In a paper for the 2014 international Digital Humanities conference, Geoffrey Rockwell and Stéfan Sinclair briefly considered Father Busa's work along with other

examples of "the period of technology development around mainframe and personal computer text analysis tools, that has largely been forgotten with the advent of the web . . . ."[24] They advocated a media-archaeology approach as a way to question simple narratives of inevitable triumphal progress and to begin to "understand how differently data entry, output and interaction were thought through" in the mainframe era. In this regard, I follow their lead. My account of Father Busa and IBM, and of punched-card machines, large-scale calculators, and related technologies, is influenced by the perspective of media archaeology, shaped by what Lorie Emerson has called the "sobering conceptual friction" of that approach.[25] It's a suggestive coincidence that Siegfried Zielinski's media archaeology includes a close look at the inventions and designs of the Renaissance Jesuit polymath, Father Athanasius Kircher, S.J. (1602–1680), in the context of his world-wide "network of clients and patrons."[26] Much of what Zielinzki says of Father Kircher—"obviously an extremely industrious and gifted communicator"— applies as well to Father Busa, including the role played by Jesuit culture and its infrastructure in determining his use of technology:

> The operating method of the Societas Jesu in the seventeenth century can be described from a media-archaeological perspective as governed by two principles, which were also of decisive importance in Kircher's own work. These principles were the international network of a thoroughly hierarchical and centralistically structured system of religious faith, knowledge, and politics, combined with the development of advanced strategies for the mise-en-scène of their messages, including the invention and construction of the requisite devices and apparatus.[27]

Kircher was a polyglot linguist who studied hieroglyphics and cryptology, and even designed "combinatorial boxes," mechanical calculating machines based on narrow slats of wood on which "units of information" were "inscribed" for recombination[28]—among the many possible early ancestors of Jacquard's and Hollerith's punched-card mechanisms in the nineteenth century, and of twentieth-century punched-card data processing systems like those used by Father Busa. The parallels between Kircher and Busa are not accidental. They grow out of a shared Jesuit culture, even across the differences of three centuries, which encouraged the use of newly invented devices for education and research, and which organized

itself into far-flung centers of activity in a worldwide network (as I say in Chapter 4).

In my descriptions of punched-card and computing technology, I apply the related approach known as platform studies, as outlined by Nick Montfort and Ian Bogost for their series at MIT Press (to which I contributed a co-authored book in 2012).[29] Platform studies looks at specific technology platforms in their layered material particulars, examining relationships between hardware, software, interface, human agents, and cultural and historical contexts, at every level. It asks: how do technologies afford and constrain cultural practices and expressions, including in this case academic practices like humanities computing? But also: how are technologies shaped by, selected, and defined by those practices? Media archaeology, as seen in work by Zielinski, but also by Lorie Emerson or Jussi Parikka, for example, can provide a historical frame for the detailed analyses of platform studies. Together, these two complementary approaches inform key moments in my narrative, when I zoom in on machinery in detail, but always with an eye to wider contexts. Technical descriptions of specific platforms in cultural context help to particularize the history of technology, and help to challenge the myths of progress and the simplifications of official histories by calling attention to quirks and discontinuities as well as continuities between past and present, and to the abundant excess of platforms and devices that are excluded by most histories of technology.[30] To be sure, in this book I trace certain continuities, for example, Busa's treatment of verbal texts as data, which has come to the fore again in recent digital humanities work (and in IBM's Watson, for example). But, there are always multiple potential continuities, alternative histories, lines of descent in the history of technology and culture broken by chance or circumstance, which reappear from time to time as seemingly anachronistic or forgotten platforms and methods. Alternative possibilities provide an opportunity for better historical understanding. As Lorie Emerson puts it, the goal is not to "seek to reveal the present as an inevitable consequence of the past," but to "describe it as one possibility generated out of a heterogeneous past."[31]

Again, there are multiple possible genealogies for humanities computing and digital humanities. One line runs through film and media studies and includes video games, for example; another can be traced through hypertext theory in the

1990s and electronic literature (the production of scholarly editions or online text archives has been closely connected to this line); still another runs through the social sciences and public history, for example, with their use of maps, graphs, and trees long before they showed up in the analysis of textual corpora. Some lines of descent remain possibilities never fully realized. Alternative genealogies include supposedly outdated technologies that remained available and useable, even shaping developments just outside the spotlight, in lines that are orthogonal to the received story of technological progress but affected it in profound ways.

This is how I view punched-card data systems—with their plug-board setups, clacking machinery, and flurries of perforated rectangular cards—which coexisted for many years with electromechanical calculators and electronic computers, helping to define, delimit, and shape the possibilities for research applications, including humanities research applications like Father Busa's. Because these systems were connected to computers, they have become part of the story of humanities computing. But in many ways, the first decade of humanities *computing* can more accurately be described as an era of humanities *data processing*—in the historically specific sense, which applied to literature and linguistics, for example, the punched-card machines developed for business accounting and tabulating, and adapted for government censuses, defense calculations, archival management, and information processing of all kinds.

Because media archaeology looks at forgotten or discounted technologies (presumed to be superseded by what has come to dominate the present), and replaces a triumphal narrative of technological progress with messier stories, it can check and complement the laser focus of platform studies. Together, they allow for richer, more detailed views of the changing cultural and historical conditions within which technologies emerge and jostle for prominence. This is for me a fruitful approach for understanding the technologies with which Father Busa worked, as well as those from which he swerved away, technologies adjacent to his own program, but which, because of his awareness of them or even through the consequences of ruling them out, affected the trajectory of his research. The emergence of humanities computing in the mid-twentieth century involved many such adjacent possibilities, at various stages. It was never a simple application of the best tools, or a matter of simply solving clearly defined problems. Specific technology platforms, whether they were employed directly or not, afforded and

constrained human researchers, institutions, and communities in non-trivial ways. Humanities computing emerged in a complex cultural milieu at the midpoint of the twentieth century. Father Busa himself said that, although he was called by some "the pioneer of the computers in the humanities," there were a number of earlier examples of the idea of mechanizing humanities research. If he is to receive credit, he said, it should be for the hard work of "cultivating the idea." He suggests, "isn't it true that all new ideas arise out of a milieu when ripe, rather than from any one individual?"[32] It's a question worth keeping in mind in the case of this researcher so often cited as founding "father" and "pioneer." His work arose out of a milieu of its own, one that was anything but unified or linear in its organization.

The book spans roughly a decade and is organized chronologically, beginning in New York City in November 1949. Chapter 1 tells the story of Father Busa's legendary first meeting with Thomas J. Watson, Sr., CEO of IBM. As I explained above, it's a story often retold (almost always based on the same source, a text by Busa himself), but often with little attention to the contexts or detailed particulars of the visit. I trace Busa's preparations for his first trip to North America, then apply the metaphor of an "exploded view" of the meeting in order to explore the radiating contexts of postwar conditions, transatlantic travel, cultural references (including a poster Father Busa appropriated from IBM that turns out to have military origins), and punched-card technology. I look at the machines in detail, but also in the context of the larger data-processing culture. The result is to complicate the story of the legendary meeting in productive ways.

For Chapter 2 I step back a year, to the creation in 1948 of the IBM SSEC (Selective Sequence Electronic Calculator), a giant room-sized machine that for a short time, just before the more famous UNIVAC, signified "computer" in the public imagination. It was featured in magazine ads and starred in a film, and helped to inspire various cultural representations of computing—which was always part of its point, from IBM's perspective. It provides a useful example, as well, of the role of women in computing, a topic broached here and taken up again in Chapter 4's discussion of Busa's Literary Data Processing Center. The SSEC was on display at 590 Madison Avenue from 1948–1952, the exact years of Busa's initial deal with IBM and the development of his technique of literary data processing (demonstrated at IBM in 1952). Although he wasn't able to use it,

Father Busa had to have seen the large-scale calculator working in the IBM showroom during his early visits, and he and Paul Tasman used one of its successors, the IBM 705, in the mid-1950s. The SSEC is an early and vivid example of how what circumstance (and IBM) made available—technologies, material support, even ideas about and representations of computing—constituted the adjacent possible, determining the direction and shape of Father Busa's research, as well as how his research fit into a larger contexts of technology and culture.

Chapter 3 is about the first major humanities computing demonstration, held by Father Busa and Paul Tasman at IBM World Headquarters in June 1952 before an invited audience of academics from a number of institutions and multiple disciplines, as well as representatives from scholarly societies, IBM, and the Church. The event, which I refer to as "the mother of all humanities computing demos," was the climax of the start-up phase of what would turn out to be a multi-decade research program. Only in retrospect has the demo of the punched-card method for literary data processing come to seem quite so historically significant, but it illustrates the importance for Busa's early research of building institutional and social networks, and of what we now call scholarly communications.

Chapter 4 continues the theme of networking, the social and institutional support for Busa's founding of the first Literary Data Processing Center in Gallarate, Italy: CAAL or *Centro per L'Automazione dell'Analisi Letteraria*, in 1956. The center was in reality one node in a dynamic network made up of multiple centers of activity, created and maintained for varying periods. When it comes to understanding the history of humanities computing, these institutional and organizational precedents matter as much any specific technology or method. CAAL was influenced by Jesuit, business, and academic cultures. Industrially organized, it was also conceived of as a laboratory and a training school and production apprenticeship for mostly young women, who worked for two-year stints on scholarships, learning to process the punched cards on IBM machines in exchange for a certificate and help with job placement, including at the new Euratom atomic energy center at nearby Ispra, Another center but of a different kind, Euratom, it turns out, was deliberately connected by Father Busa to his own center (by way of Georgetown University and IBM), in ways that illustrate the complex and ambiguous entanglements and collaborations by which Busa's kind of

humanities computing emerged in the Cold War era. The chapter concludes with a look at another key demo by Father Busa, this time at the IBM Pavilion at the World Expo 58 in Brussels, the first major world's fair since the end of World War II. The fair itself provides illuminating contexts for the emergence of humanities computing (though it was not yet called that)—starting with the theme of the Expo, "a new humanism"—out of the technologies, institutions, and cultural representations of the period.

Finally, Chapter 5 focuses on Roberto Busa's and Paul Tasman's collaborative attempt starting in the late 1950s to apply their punched-card indexing methods to the texts of the newly discovered Dead Sea Scrolls. It was an intense and complicated effort that, unlike the *Index Thomisticus*, never resulted in publication —except for papers and presentations on the method itself—and it led Father Busa to what he himself called a "nervous breakdown" in the final year of the decade. I argue, however, that in retrospect this work was important as a process, as a set of experiments in computerized philology. In the 1950s and 1960s Busa repeatedly called for a new philology. The Dead Sea Scrolls work in the late 1950s (and continuing into the early 1960s) shows how a philological approach, the attempt to interpret microscopic materialities of language in relation to broad cultural contexts, more than simply being automated or made more efficient by the introduction of computing, was conceptually re-shaped, becoming an experiment in human–computer collaboration, thus opening up new dimensions for humanities research.

Father Busa began his work in the late 1940s along strictly instrumental lines. The machinery of automation was intended simply to increase the speed and efficiency of indexing. By the end of the 1950s, however, he had begun to speculate more widely about cybernetics and a new philology, and to suggest that computers could prompt (indeed, require) "new thinking" on the part of humanistic researchers, and reveal "new dimensions" in the cultural materials with which they worked. By 2004, he famously declared:

> Humanities computing is precisely the automation of every possible analysis of human expression (therefore, it is exquisitely a "humanistic" activity), in the

widest sense of the word, from music to the theater, from design and painting to phonetics, but whose nucleus remains the discourse of written texts.[33]

Looking closely at the first decade of Father Busa's work provides a better understanding of the mid-century emergence of humanities computing as something more than a merely instrumental or practical application of tools, as a set of institutional arrangements, self-representations, and practices engaging theoretical and methodological questions that remain important today.

A brief word about the place of physical and geographical settings in this book. Buildings and locations are not inert and neutral sites—they're extensions of the institutions and technologies that matter to this story. With that in mind, my research involved paying close attention to where things happened, as part of establishing context for Father Busa's work. So in March 2015, I stood with my guide on the quiet via G. Ferraris in Gallarate, Italy, outside the gate of the building that once housed a small textile factory, and was then converted into the headquarters for CAAL, arguably the first humanities computing center, referred to at the time as a Literary Data Processing Center. We confirmed the address plate (no. 2) and, although scaffolding obscured much of the structure, and the distinctive roof of factory-floor skylights had been replaced, when the lone construction worker on duty allowed us into the courtyard, I was able to identify the arched windows and decorative brackets under the eaves that I had seen in photographs. The building appeared to have been altered and rebuilt many times over the years, renovated in successive layers. But an old fireplace and tiled floor in the front room showed the building's true age. (Later in 2015, it was demolished.) This was the place where Father Busa organized CAAL at its peak at the end of the 1950s and the beginning of the 1960s, with a sizable team of trainee-operators on the floor, working in long lines to process punched cards containing linguistic data on the *Index Thomisticus*, the Dead Sea Scrolls, and various related projects in humanities computing.

I had come to Milan and Gallarate from New York City, where I was living for the year. Back in New York, I stood in the middle of 116th Street to take a cellphone picture of the building that had housed the Thomas J. Watson Scientific Computing Laboratory at Columbia University in the 1940s, when Father Busa first visited

New York. Now Columbia's Casa Hispanica, the tall townhouse stands in sight of the IRT subway stop at the main gate of the university on Broadway. As it happens, I had passed the building every day for years when I was a graduate student in the 1980s. But 65 years ago, a team of scientists, programmers, and keypunch operators worked there to design IBM's SSEC, the Selective Sequence Electronic Calculator, a room-sized machine that had captured the imagination of the public when Busa arrived at IBM World Headquarters for the first time in autumn 1949. The machine was installed in the ground floor showroom at 590 Madison Avenue in midtown Manhattan, where passersby could watch its tape drives and punched cards and blinking lights operating day and night. Father Busa would have walked past it on his way to his first appointment in that building with the CEO.

While working on this book I spent a good deal of time around that location at the intersection of 57th Street and Madison Avenue. Today IBM only leases space in the imposing building, but it's still known locally for its association with the company. The wedge-shaped glass and steel high-rise replaced an earlier brick and stone skyscraper that stood on the same spot, which was the IBM building that Busa visited. Thanks to photographs in the Busa Archive I know that the watershed demo in 1952 took place in the ground-floor showroom, adjacent to the room that housed the SSEC. One image shows principal guests listening to Paul Tasman (Father Busa stands around the circle to his left), sitting in a circle by the windows at the corner of Madison and 57th. Nowadays, that spot is occupied in the new building by a multistory atrium, a public space containing tall bamboo plants, large sculptures, and a mozzarella bar, standing almost exactly where the circle of chairs were arranged that the summer of 1952. Sitting by the bar in early 2015, I looked up at the "IBM building" towering above me, seeing it through the atrium's glass skylights, arranged in an accordion-fold series of peaks, not unlike the skylit roof of the former textile factory in Gallarate (and like similar roofs still visible everywhere in the light industrial area outside Milan). Upstairs in IBM's leased office space, I had seen vintage posters on the walls, some of them dating from Father Busa's time in that same geographical location.

On another afternoon I rode the subway up to Fordham University in the Bronx to examine papers in the library's Special Collections (on a previous visit I had found some early correspondence of Father Busa there). Taking a break later, I left the library and walked across the quad to the Jesuit residence where Busa had lived

during some of his extended visits to the city. I went around the building to look down the street toward the location of the former "El" stop he would have used to commute into Manhattan to work at IBM headquarters. On my own trip back into Midtown on the subway, I thought about that commute in the early 1950s and the many ways New York and the world in general have changed since then—and how difficult it is sometimes to really understand those changes.

I'm not a historian. But as someone who studies literature of the British Romantic period I'm used to working with 200-year-old texts, both printed books and archival manuscripts, and trying to place them in often elusive historical contexts. Of course specialists in Shakespeare or Medieval literature—not to mention classicists and ancient historians—deal with much older materials. 65 years is a relatively brief period of time in the scheme of things—less than a full lifetime. And yet, it's just long enough for many of the people who knew and worked with Father Busa, who played important roles in the story of his project, to be gone, now. I'm painfully aware of several just-missed opportunities in this regard, starting with the fact that, during my own work in humanities computing and digital humanities over many years I somehow never met Father Busa face to face. In one sense, the mid-twentieth century was only yesterday; in another sense, it was a long time ago, long enough for the losses of history to be felt. We collapse the distance of 65 years in our collective imagination at our peril. It's too easy to forget the strangeness of the technology and methods involved in the earliest years of humanities computing, the period when in fact such work was done without actual computers, when "computer" was still a job description and the dominant platform for calculation and data processing was electromechanical punched-card machinery. My descriptions of buildings and locations and modes of transportation, among the details of biography and history, are meant to place the punched-card platform in a suitably rich context in the first postwar decade, an era further away from our own ideas about computing and humanities computing than we often realize. To reimagine the culture and technology of that mid-century moment calls for self-consciousness about what we are sure to be missing, what we cannot recover, and this is true even for the diminishing number of witnesses who were there at the time.

My work on this book was made possible by a year's leave of absence from Loyola University Chicago, in support of a fellowship at the Advanced Research

included two side trips to Gallarate, one hosted by Busa's final secretary, Danila Chairati (as I described above and in Chapter 4), who very kindly drove me to key sites and confirmed details over the phone with Busa's first secretary, Gisa Crosta. Marco Passarotti's initiative and translating over the telephone made this connection possible. For my trip to the Aloisianum in Gallarate I was met at the station and driven to the college by local residents Signor and Signora Passarotti. Once there, I was met by the Archivist, Father Diego Brunello, S.J. As I've said, when I commenced my research, preliminary work in the newly accessioned Busa Archive in Milan had already begun by Julianne Nyhan and Melissa Terras of University College London. Nyhan's interviews with some of Busa's women punched-card operators and her general early reconnaissance of the Archive, both undertaken along with her colleague, Melissa Terras, have been invaluable for my research, as have the regular conversations with Nyhan to share our findings and compare notes.

For their gracious responses to my inquiries, I wish to thank the grandchildren of Paul Tasman, Ms. Amy Sklar and Professor Jordan Nash. Professor Nash shared photos of Paul Tasman's copy of the *Varia Specimina Concordantiarum* inscribed by Father Busa, as well as an interesting letter from Busa to Arthur K. Watson about God's approving the collaboration between the businessman and the priest. I quote from both the inscription and the letter with the permission of Professor Nash. At Routledge, I'm lucky to have been able to work again with Publisher and Editor, Erica C. Wetter, who, with the assistance of Simon Jacobs, made it seem easy (though of course it was not). I also owe a debt to four anonymous peer reviewers for their helpful feedback on the manuscript. Of course, no one I've mentioned here is responsible for any errors or limitations in the book. That responsibility is mine alone.

This project had its origin in the drinks line at a digital humanities conference reception at the University of Nebraska in 2013. Father Busa had recently died and I was discussing his work and its legacy with Stephen Ramsay, a leading digital humanities scholar whose own work can in part be seen as extending what Busa began (as I argue in this book). Waiting for our cocktails, we wondered about the fate of the *Index Thomisticus* punched cards themselves as material objects and historical artifacts, and we speculated about how a curious scholar might get to see them. Just over a year later, on a visit to Milan in October 2014, I was handed a

deck of those cards, held one up to the light, and squinted to see if I could make out the pattern of its punched holes. Days later, I began to draft this book.

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## Notes

[Publisher's page for the book: https://www.routledge.com/products/9781138186774. Related photos: http://priestandpunchedcards.tumblr.com.]

1 Roberto Bonzio, "Father Busa, Pioneer of Computing in Humanities with Index Thomisticus, dies at 98," *Forbes*, August 11, 2011, http://www.forbes.com/sites/robertobonzio/2011/08/11/father-busa-pioneer-of-computing-in-humanities-dies-at-98/#2715e4857a0b385a39ae75d0. (Busa was born November 28, 1913; he would have turned 98 in November, 2011.)

2 *Corpus Thomisticum*, http://www.corpusthomisticum.org/wintroen.html.

3 "The Roberto Busa Award Winners," European Association for Digital Humanities, http://eadh.org/awards/busa-award/busa-award-winners.

4 Susan Hockey, "The History of Humanities Computing," in *A Companion to Digital Humanities*, eds. Susan Schreibman, Ray Siemens, and John Unsworth (Oxford: Blackwell, 2004), http://www.digitalhumanities.org/companion.

5 Roberto Busa, "The Annals of Humanities Computing: The *Index Thomisticus*," *Computers and the Humanities* 14.2 (1980), 83–90.

6 Willard McCarty,"What doesTuring have to do with Busa?," in *Proceedings of the Third Workshop on Annotation of Corpora for Research in the Humanities* (ACRH-3, December 12, 2013), eds. Francesco Mambrini, Marco Passarotti, and

Caroline Sporleder (Sofia: Institute of Information and Communication Technologies, Bulgarian Academy of Sciences, 2013), 1–14; http://www.mccarty.org.uk/essays/McCarty,%20Turing%20and%20Busa.pdf.

7 Roopika Risam, "Revise and Resubmit: An Unsolicited Peer Review," blog, April 20, 2015, http://roopikarisam.com/2015/04/20/revise-and-resubmit-an-unsolicited-peer-review/. In the post Risam responds to an essay by Adeline Koh, "A Letter to the Humanities: DH Will Not Save You," *Hybrid Pedagogy* (April 19, 2015), http://www.hybridpedagogy.com/journal/a-letter-to-the-humanities-dh-will-not-save-you/, which she charges with limiting the definition of DH in this narrow way, to Busa and his machines only. The dispute behind these essays includes the question of what counts as the intellectual ancestry and central narrative of digital humanities. I emphatically do *not* claim an exclusive status for Father Busa or his research in this regard. I agree that there are multiple possible alternative narratives or lines of descent for the interdisciplinary practices called digital humanities today, some of them not at all focused on linguistics or the processing of verbal texts.

8 "Jackson Pollock: Is he the greatest living painter in the United States?," *LIFE*, August 8, 1949, 42–45. Although *Stenographic Figure* remained in the hands of Lee Krasner and only ended up at the Museum of Modern Art decades later, it was shown and admired by Piet Mondrian and others in 1943. See Sue Taylor, "The Artist and the Analyst: Jackson Pollock's 'Stenographic Figure'," *American Art* 17.3 (Autumn 2003), 52–71 (53). An image of the painting is available at the Museum of Modern Art website: http://www.moma.org/collection/works/79686?locale=en.

9 Letter from Roberto Busa to Joseph Raben, December 10, 1971, and reply from Raben to Busa, January 6, 1972, Busa Archive (Rel. Cult. USA 1 1952).

10 The present-day CIRCSE research center is in effect a descendant of CAAL, the *Centro per L'Automazione dell'Analisi Letteraria* (or, especially later, *Linguistica*): the Center for the Automation of Literary (or Linguistic) Analysis.

11 Frank da Cruz, Columbia University Computing History, http://www.columbia.edu/cu/computinghistory/index.html.

12 Michel Foucault, "Nietzsche, Genealogy, History," in *The Foucault Reader*, ed. Paul Rabinow (New York: Pantheon Books, 1984), 76–100 (81).

13 Melissa Terras, "For Ada Lovelace Day–Father Busa's Female Punch Card Operatives," blog, October 15, 2013, http://melissaterras.blogspot.com/2013/10/for-ada-lovelace-day-father-busas.html; Julianne Nyhan,"What is in the archive of Fr. Roberto Busa S.J. (1913–2011)?," Arche Logos blog, April 29, 2014, http://archelogos.hypotheses.org/127.

14 Copy of letter from Roberto Busa to Arthur K. ("Dick") Watson, October 30, 1960 (personal copy of Professor Jordan Nash), forwarded to Paul Tasman. Quoted by permission of Professor Jordan Nash. See Chapter 3.

15 Vannevar Bush, *Science, the Endless Frontier: A Report to the President* (Washington, D.C.: U.S. Government Printing Office, 1945), http://www.nsf.gov/about/history/vbush1945.htm.

16 Roberto Busa,"L'analisi linguistica nell'evoluzione mondiale dei mezzi d'informazione," in *Almanacco Letterario Bompiani 1962* (Milan: 1962), 103–107; trans. Philip Barras in Marco Passarotti, A. Ciula, and Julianne Nyhan, *One Origin of Digital Humanities: Fr Roberto Busa S.J in His Own Words* (forthcoming, Springer Verlag), 106.

17 Busa,"L'analisi linguistica nell'evoluzione mondiale dei mezzi d'informazione," 106.

18 Busa,"L'analisi linguistica nell'evoluzione mondiale dei mezzi d'informazione," 106.

19 Busa,"L'analisi linguistica nell'evoluzione mondiale dei mezzi d'informazione," 106.

20 The importance of this papal encyclical and the one from 1943, which I discuss below as contexts for Father Busa's work, was called to my attention by an anonymous peer reviewer, to whom I'm grateful.

21 Busa,"L'analisi linguistica nell'evoluzione mondiale dei mezzi d'informazione," 104.

22 Roberto Busa letter to William Le Saint, S.J., March 16, 1957, Busa Archive (Rel. Cult. 1940, USA tab).

23 Besides self-conscious reflections on data in digital humanities, published or presented in various fora by practitioners working in humanities data analysis, text mining, and visualization—such as Elijah Meeks, Miriam Posner, Geoffrey Rockwell, Scott B. Weingart, and Ted Underwood—see Christine L. Borgman, *Big Data, Little Data, No Data: Scholarship in the Networked World* (Cambridge, MA and London: MIT Press, 2015), esp. chapter 7; Johanna Drucker on data versus "capta" in "Humanities Approaches to Graphical Display," *DHQ* 5.1 (2011), http://www.digitalhumanities.org/dhq/vol/5/1/000091/000091.html; and Matthew L. Jockers, *Macroanalysis: Digital Methods & Literary History* (Urbana, Chicago, Springfield: University of Illinois Press, 2013). Jockers places his own work in relation to Busa's, especially at the beginning of chapter 3, "Tradition."

24 Geoffrey Rockwell and Stéfan Sinclair, "Past Analytical: Towards an Archaeology of Text Analysis Tools," Digital Humanities 2014 conference, Lausanne, Switzerland, October 7, 2014, http://www.researchgate.net/publication/ 273449857_Towards_ an_Archaeology_of_Text_Analysis_Tools. They cite Sigfried Zielinski in particular, *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means* (Cambridge, MA: MIT Press, 2008); I would add Jussi Parikka, *What Is Media Archaeology?* (Cambridge, UK: Polity, 2012); and Lorie Emerson, *Reading Writing Interfaces: From the Digital to the Bookbound* (Minneapolis: University of Minnesota Press, 2014)—and more generally Emerson's work at the Media Archeology Lab, http://loriemerson.net/media-archaeology-lab/.

25 Emerson, *Reading Writing Interfaces*, xii.

26 Zielinski, *Deep Time of the Media*, 101–57 (113).

27 Zielinski, *Deep Time of the Media*, 118.

28 Zielinski, *Deep Time of the Media*, 141.

29 Ian Bogost and Nick Montfort, "Platform Studies," http://platformstudies.com.

30 As pointed out by Sarah Werner and Matthew G. Kirschenbaum, "Digital Scholarship and Digital Studies: The State of the Discipline," *Book History* 17 (2014), 406–58: https://muse.jhu.edu/journals/bh/summary/v017/17.kirschenbaum.html. Their useful summary of media archaeology (434–38) connects it to the tradition of book history but also emphasizes, as I am doing, its affinity with platform studies.

31 Emerson, *Reading Writing Interfaces*, xiii.

32 Busa, "The Annals of Humanities Computing: The *Index Thomisticus*."

33 Roberto Busa, "Foreword: Perspectives on the Digital Humanities," in Susan Schreibman, Ray Siemens, John Unsworth, eds., *A Companion to Digital Humanities*, http://digitalhumanities.org/companion.