Book Reviews

Early Years in Machine Translation:
Memoirs and Biographies of Pioneers

W. John Hutchins (editor)

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In the preface to this extensive collection of memoirs and biographies, the editor describes its purpose as follows:

> The aim when compiling this volume has been to hear from those who
> participated directly in the earliest years of mechanical translation, or
> 'machine translation' (MT) as it is now commonly known, and, in the
> case of those major figures already deceased, to obtain memories and
> assessments from people who knew them well. Naturally, it has not
> been possible to cover every one of the pioneers of machine trans-
> lation, but the principal researchers of the United States, the Soviet
> Union, and Europe (East and West) are represented here. (page vii)

The collection includes contributions by some 26 individuals who were involved in
MT in the 1950s and 1960s, augmented by an introduction and articles by the edi-
tor, John Hutchins, on Warren Weaver, Yehoshua Bar-Hillel, and Gilbert King. Along
with accounts of the origins and histories of their respective research projects, the au-
thors have provided numerous personal details and anecdotes as well as a number of
photographs, contributing significantly to the richness of the overall presentation.

In his introduction, "The First Decades of Machine Translation: Overview, Chronol-
ogy, Sources," Hutchins begins by noting the seminal significance of early MT work
for computational linguistics, natural language processing, and other areas, as well as
the wide variety of backgrounds, aims, and approaches of the pioneers. The overview
section contains a brief account of major features of and influences on MT work of the
period, including theoretical frameworks, technological constraints, funding sources,
and evolving goals. This is followed by the chronology section—a compact history
of MT from its beginnings to the mid-1970s—and the sources section, consisting of
three pages of bibliographic references. Taken as a whole, the introduction provides
the reader with valuable background material that is conducive to a fuller appreciation
of the articles that follow.

The articles are grouped geographically, beginning with U.S. pioneers and pro-
ceeding to those from the Soviet Union, the United Kingdom, Western and Eastern
Europe, and Japan. The U.S. group is further partitioned, roughly chronologically, into

three subgroups: first, the earliest pioneers (Warren Weaver, Erwin Reifler, Victor Yngve, and Anthony Oettinger); next, individuals with a connection to the Georgetown project (Leon Dostert, Paul Garvin, Michael Zarechnak, Tony Brown, and Peter Toma); and then a set of researchers who became active somewhat later (Winfred Lehmann, David Hays, Gilbert King, and Sydney Lamb).

The first article, "Warren Weaver and the Launching of MT: Brief Biographical Note," by the editor, is a biographical sketch focusing on Weaver's famous 1949 memorandum and its catalytic impact in launching the field. The second contribution, "Erwin Reifler and Machine Translation at the University of Washington," was written by Reifler's former colleague Lew R. Micklesen, a Slavic linguist. The first half of the article focuses on Reifler—his background in Europe and China, his early enthusiasm for MT, and his work on German and Chinese—while the remaining portion deals primarily with the author's own experiences in developing the original version of the Russian-English dictionary for the Rome Air Development Center, initially at the University of Washington under Reifler and later at IBM under Gilbert King.

"Early Research at M.I.T.: In Search of Adequate Theory," by Victor H. Yngve, provides a detailed account of the author's wide-ranging activities in the field of MT during its early years. The narrative highlights such contributions as his experiments on gap analysis and random generation, the development of the COMIT programming language, the cofounding and editing of the journal *MT*, and the formulation of the depth hypothesis. The author describes at some length Chomsky's outright rejection of the depth hypothesis and presents a vigorous countercritique of Chomsky's work and of abstract linguistics generally, labeling such approaches "unscientific" (page 68). He concludes the article by advocating what he calls "the new foundations of general linguistics" (page 69), which he has put forth in a textbook (Yngve 1996).

In "Machine Translation at Harvard," the last of the articles on the earliest U.S. pioneers, Anthony Oettinger recounts the history of the Harvard project, including his design and development of the Harvard Automatic Dictionary and the subsequent theoretical and applied work in the area of syntax. The article also includes interesting accounts of his personal experiences, especially in connection with his 1958 visit to the Soviet Union and his later participation as a junior member of the Automatic Language Processing Advisory Committee (ALPAC) of the National Academy of Sciences, whose 1966 report had as great an influence on the course of MT as did Weaver's 1949 memo.

The five articles relating to the Georgetown project are of interest both for their individual content and as a source of sometimes sharply divergent views of events and relationships. "The Georgetown Project and Leon Dostert: Recollections of a Young Assistant," by Muriel Vasconcellos, provides many colorful details on the career and personality of Dostert, the project director, as well as an account of the project's history and its organization into subgroups. The impression conveyed by Vasconcellos is of a well-structured and relatively smoothly functioning operation in which intergroup discussions only occasionally "got rather heated" (page 93). A less idyllic picture emerges from the next article, "Is FAHQ(M)T Possible? Memories of Paul L. Garvin and Other MT Colleagues," by Christine Montgomery, who describes the project as evolving into "a set of armed camps" (page 100) in which the weekly intergroup seminars were "characterized by a lack of harmony ... overlaid with a veil of secrecy and distrust" (page 102). The main focus of the article, however, is on Paul Garvin and what the author views as the present-day legacy of his empirically oriented approach to machine translation.

In "The Early Days of GAT-SLC," Michael Zarechnak describes the origins of the main Georgetown translation system, which he and his team developed for Russian-English MT. It consisted of GAT (general analysis technique), the linguistic component,

and SLC (simulated linguistic computer), the computational component developed by A. F. R. Brown. The article includes a detailed description of the linguistic approach, illustrated with numerous examples in transliterated Russian. The following contribution, "Machine Translation: Just a Question of Finding the Right Programming Language?" by Antony F. R. Brown, provides an account of the author's development of SLC, along with a sketch of his subsequent career. The final article in the group, "From SERNA to SYSTRAN," by Peter Toma, describes the author's somewhat turbulent career at Georgetown, followed by his subsequent rise to fame and fortune as the developer of SYSTRAN. Although some readers may be put off by the self-congratulatory tone of the presentation, it is nonetheless a compelling story of how an able and highly ambitious individual achieved MT's first commercial success.

The main body of "My Early Years in Machine Translation," by Winfred Lehmann, is an account of the history and research approach of the University of Texas project, which the author founded and led for many years. For this reviewer, however, the two most fascinating sections are "Previous Background" at the beginning (pages 147–149) and "Suspension of Research as a Result of the ALPAC Report" at the end (pages 160–162). The former describes the author's post–Pearl Harbor experiences in the Army translation program as it scrambled to catch up with a huge backlog of intercepted Japanese military and diplomatic messages—a situation eerily parallel to the current government's position vis-à-vis Arabic and Central Asian languages some 60 years later. The latter section contains a rather bitter denunciation of the ALPAC report (National Academy of Sciences 1966), including the remarkable assertion that none of the members of the committee, which included David Hays and Anthony Oettinger, "were prominent in the field" (page 161).

In contrast to the preceding article, "David G. Hays," by Martin Kay, is an enthusiastic summary of Hays's contributions to MT and computational linguistics, including his role in founding AMTCL (Association for Machine Translation and Computational Linguistics), ICCL (International Committee on Computational Linguistics), and the biennial COLING (Computational Linguistics) conferences. This is followed by "Gilbert W. King and the IBM-USAF Translator," by John Hutchins, and "Translation and the Structure of Language," by Sydney M. Lamb, the final two articles on American MT pioneers. Hutchins provides a brief account of King's oversimplified approach to translation, with its minimal linguistics and reliance on special-purpose hardware; Lamb describes the Berkeley translation project, emphasizing its lexical organization techniques and his evolving view of language as a network of relationships.

The five contributions by MT researchers from the former Soviet Union provide an interesting and diverse set of perspectives both on the technical approaches and achievements of their respective groups and on the political conditions under which they operated. The authors of the first three articles (Olga Kulagina, Igor Mel'čuk, and Tat'jana Mološnaja) were all associated with Ljapunov's group at the Institute of Applied Mathematics in Moscow, which began work on French-Russian and English-Russian MT in the mid-1950s. Raimund Piotrovskij, the author of the fourth article, was a member of Nikolaj Andreev's group at Leningrad State University, known for its emphasis on development of an intermediate language to facilitate translation. The final article in the group is by Jurij Marčuk, a former KGB officer who worked on English-Russian machine translation.

In "Pioneering MT in the Soviet Union," Kulagina describes the first-generation French-Russian system FR-I and its dependency tree–based successor FR-II against the backdrop of the rise and subsequent decline of Soviet activity in MT. She attributes the latter trend to a combination of ineffective state support and disenchantment due to the intrinsic difficulty of the problem, rather than to the impact of the ALPAC report.

This assessment stands in marked contrast to those of Mel'čuk and Piotrovskij, both of whom assert that the report led to termination of funding for many MT projects in the Soviet Union. The following article, "Machine Translation and Formal Linguistics in the USSR," by Mel'čuk, is based on the transcript of an extended interview with the editor in 1998. Beyond the value of its technical content, this article is an example of oral history at its best, offering an illuminating and engaging portrait of personalities, relationships, and political conditions as they affected the personal life and professional career of a talented linguist striving to cope with the handicap of his status as a Jew, and later an outright dissident, in the Soviet Union.

The third article in the group, "My Memoirs of MT in the Soviet Union," by Mološnaja, is a very brief piece, notable both for her warm recollections of former colleagues and for a sharp critique of the rival Moscow-based project at the Institute of Precise Mechanics and Computer Technology. In the final two articles, by Piotrovskij and Marčuk, the authors strongly advocate what they consider to be practical approaches to MT, while dismissing much of the work cited in the first three articles as misguided and counterproductive. Thus Piotrovskij, in "MT in the Former USSR and in the Newly Independent States (NIS): Pre-history, Romantic Era, Prosaic Time," criticizes the approach of his former mentor Andreev in Leningrad, as well as that of Mel'čuk and Kulagina, as having "driven us into deadlock" (page 235). Marčuk is even more pointed in his criticism, slipping in an apparent anti-Semitic slur: "In famous traditions of Bolshevism and the Talmud ("he who is not with us is against us") Mel'čuk and his supporters attacked all practical workers in the MT field. . . . Significantly, after fifty years of MT not a single practical MT system has appeared that uses the 'meaning-text' approach to any significant extent" (page 249).

"The Beginnings of MT," by Andrew D. Booth and Kathleen H. V. Booth, is the first of three articles relating to MT pioneers from the United Kingdom. The account begins with A. D. Booth's early contacts with Warren Weaver in 1946 and 1947 and continues with a brief description of the varied activities of the project that Booth headed at Birkbeck College of the University of London until 1962, enlivened by several anecdotes from that period. The authors go on to describe their administrative and MT research activities at Canadian universities in the 1960s and 1970s, which included large-scale dictionary building.

The next two articles deal with research activities at the Cambridge Language Research Unit (CLRU) dating from the mid-1950s, focusing on the contributions of the botanist R. H. Richens and on those of CLRU's founder and director, the redoubtable Margaret Masterman. In "R. H. Richens: Translation in the NUDE," Karen Sparck Jones reviews and analyzes Richens's key papers, tracing the development of his ideas concerning a semantically based interlingua to their culmination in NUDE: a structured representation conceived of as a semantic net of 'naked ideas'. The author describes how NUDE was used by the CLRU staff in their Italian dictionary and also figured in research in other areas such as thesaurus design. She notes, however, that the group never managed to use it successfully as a vehicle for translation, owing to a failure to deal adequately with syntax and its interaction with semantics, a failure that she largely lays at the doorstep of CLRU's director: "Masterman adopted, however, such an aggressively fundamentalist approach to this whole pattern determination operation, and so resolutely eschewed help from syntax, that she was never able to carry her ideas into effective computational practice" (page 276).

In "Margaret Masterman," Yorick Wilks, although not entirely uncritical, presents a much more favorable picture of Masterman's technical contributions, focusing more on what he views as her seminal ideas than on practical results. He credits her with being some 20 years ahead of her time in advocating such approaches as computational

lexicography and parsing by semantic methods, while providing a rather indulgent account of Masterman's more eccentric pursuits, such as her long-term attempts to partition texts on the basis of breath groups and rhetorical figures. The article includes a history of the CLRU, which Wilks considers to be Masterman's principal practical creation and a tribute to her persistence and enthusiasm. Throughout the article, he does an excellent job of bringing this unique character to life, noting at one point that "her ideas were notable ... for their sheer joyousness" (page 284).

The editor leads off the final segment on "researchers from elsewhere" with "Yehoshua Bar-Hillel: A Philosopher's Contribution to Machine Translation," which chronicles Bar-Hillel's progression from early enthusiast and promoter of MT, through his oft-cited later skepticism, to his ultimately more moderate (and less well-known) views regarding the possibility of high-quality results. Next comes "Silvio Ceccato and the Correlational Grammar," by Ceccato's former disciple Ernst von Glasersfeld. The piece begins with a description of the early attempt of Ceccato's project to construct a Russian-English MT system based on a representation of meaning as a network of operations linked by explicit and implicit connections called correlations. Glasersfeld then goes on to recount his own experiences in the years following the demise of the original project, when he left Italy and attempted to continue Ceccato's approach at the University of Georgia, ultimately using it in experiments with Lana the chimpanzee at the Yerkes Institute in Atlanta.

The next two articles relate to the two major MT projects initiated in France in the early 1960s: first, the short-lived Paris project under Aimé Sestier, and then the decades-long effort led by Bernard Vauquois at Grenoble. "Early MT in France," by Maurice Gross, presents only a very brief sketch of the Paris project, which focused on Russian-French translation and terminated early in 1963 after Sestier became convinced that the task was too difficult to pursue further. In contrast, Christian Boitet's article, "Bernard Vauquois' Contribution to the Theory and Practice of Building MT Systems: A Historical Perspective," provides a relatively detailed picture of both the Grenoble project and the accomplishments of its leader in his various roles as researcher, teacher, MT system builder, and international figure in computational linguistics.

The last three contributions to the collection deal respectively with early MT activities in Czechoslovakia, Bulgaria, and Japan. In "Pioneer Work in Machine Translation in Czechoslovakia," Zdeněk Kirschner recounts the experiences of the MT research group in Prague from the late 1950s into the 1980s as it coped with chronically primitive computing facilities and struggled to survive during the political repression that followed the "Prague Spring" of 1968. The author gives the main credit for the group's accomplishments to Petr Sgall, citing his technical leadership and managerial skills, as well as his personal courage in the face of intense political pressure.

"Alexander Ljudskanov," by Elena Paskaleva, is a highly laudatory account of the personal background and professional career of this Bulgarian pioneer, known more for his theoretical publications and international activities than for his project on Russian-Bulgarian translation. The latter work, in the author's view, might well have come to practical fruition were it not for Ljudskanov's untimely death at the age of 50.

In the final article, "Memoirs of a Survivor," Hiroshi Wada describes the work on English-Japanese MT that he initiated in 1957 at the Electrotechnical Laboratory of Japan. The account covers the varied activities of the project, including the design of computers and optical character recognition (OCR) systems, dictionary building, and translation algorithm development, which culminated a few years later in a capability to translate a range of simple English sentences into Japanese counterparts printed out as strings of kana characters. The article concludes with a brief mention of other MT-

related work of that era in Japan, with emphasis on OCR development and kana-kanji translation.

At the end of the book, the editor has included two separate indexes: an index of names, augmented in many instances by birth and (where appropriate) death dates, and an index of subjects. This bipartite organization provides added convenience for the reader who wishes to compare the variety of perspectives on specific persons and events that are offered by the contributors to the collection. This final touch is representative of the thoughtful design and careful editorial workmanship that are characteristic of the volume as a whole. Aside from a very few residual proofreading errors, the only flaw I noticed was the incorrect rendering of the name of the late Asher Opler as "Ashley Opler" (pages xii, 391).

In capturing and preserving this impressively wide-ranging collection of reminiscences, John Hutchins has made a huge and enormously valuable contribution to our understanding of the ideas, personalities, and external forces that shaped the early development of machine translation and computational linguistics and that set in motion many of the activities in those areas that are still ongoing today. I heartily recommend this book not only for readers engaged in those or related fields, but also for anyone with an interest in the history of science.

References

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