

# Machine translation in perspective

John Hutchins sums up progress so far  
in new book

Review by Geoffrey Kingscott

*MACHINE TRANSLATION: Past, Present, Future, by W.J. Hutchins, published 1986 by Ellis Horwood Limited in their Computers and Their Applications series, distributed by John Wiley & Son, Baffins Lane, Chichester, PO19 1UD, UK, hardback, 382 pages, £39.95.*

Definitive is not a term which it is appropriate to apply to any work on Machine Translation (MT), since the theory and technology are still moving on at such a pace, and new information is constantly being generated. But as far as I can judge this work is the most successful attempt yet in putting the whole of MT into perspective.

John Hutchins, sub-librarian at the University of East Anglia, has been following developments in MT for many years, and this book is the fruit of reading and digesting practically everything published that is available in the West on the subject. The perspective is of course an Occidental one, since, although he covers developments in the Soviet Union and Japan, there is no telling how much work is going on behind the scenes.

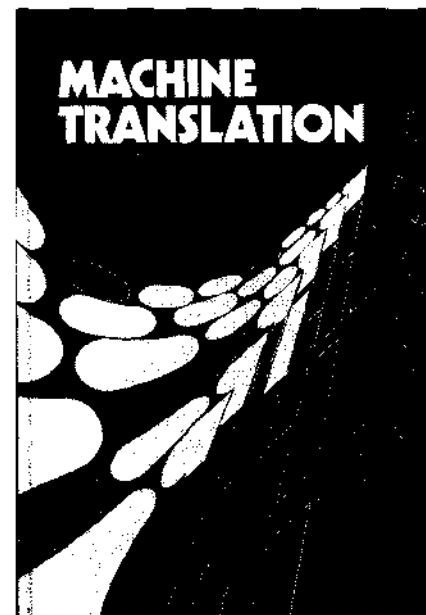
Indeed, this is probably an appropriate moment to bring out such a book, since during its first four decades MT has been largely in the hands of keen researchers, only too eager to communicate the results of their work. The future may change this situation, as the centre of gravity of MT progress moves out of the academic field and into large corporations (particularly in Japan).

I can state categorically that I find this book quite admirable. It is wide-ranging, well-researched, carefully structured, and above all, lucid. John Hutchins writes with a clarity of style which is often lacking among those who produce articles about linguistics or computer programs.

I have to make it clear, however, that I am no MT expert. For most of my

career I have been a simple translator, or organiser of translation work, who for some years now has seen MT beginning to loom up over the horizon, and has taken a layman's interest in the implications of this new phenomenon. I have picked up some inkling of the past history of MT and its implications from conferences I have attended, publications I have read, and people to whom I have talked, but I still have only the haziest notions of computational linguistics or computer programming. I am an interested but often bemused translator looking in on the MT world.

This book for me, then, fills out my sketchy knowledge, puts it into perspective, and makes many aspects clear that previously I had



not really understood. For anyone in my position, I cannot recommend the book too highly. For an MT specialist, who follows all the new developments in this field, the book may be less of a revelation. I suspect, however, that few will have read as widely on the subject as John Hutchins, or ever had the opportunity to assemble the information on all MT history and developments so far in such a well-structured fashion. Indeed a comment from someone much more involved in the field is that the work is scholarly but unobtrusively so and very fair in its judgements.

This is therefore a book which is going to be an essential work of reference on many bookshelves. It will be on the bookshelves of MT

specialists and enthusiasts, because it sets out the state of the art in such a well-ordered and accessible way (John Hutchins, it should not be forgotten, is by training a librarian and information scientist). And it will be on the bookshelves of many computer programmers, particularly those interested in the applications of Artificial Intelligence (AI), since it tells how researchers have tackled some of the more complex problems in computing. And it will be on the shelves of the more informed translators and large-scale users of translation, since they will want to get an idea of how their world may be going to develop.

My own view is that we are still, as it were, in the early days of the motor car. There were people who quickly became dewy-eyed about their machines, even though they spent more time under the bonnet than at the steering wheel; one suspects many of them enjoyed more being under the bonnet sorting out problems than actually getting from A to B. Most of the population was indifferent; the chances of them getting one of these new-fangled machines was so remote that they paid them little attention. Some, however, were scornful, while others considered the matter and found there was no economic advantage in replacing their trusty horses and well-established routines. But how quickly things changed.

At first, of course, it was only where there were major haulage applications where the internal combustion engine had obvious economic advantages, and petrol-driven buses and small lorries quickly displaced the horse-drawn vehicles and carrier's carts. In the same way I foresee the use of MT spreading down from large corporations with high text throughput and control of source language documentation (essential prerequisites in the current state of the art if MT is to make any commercial sense) down to smaller and smaller applications. The dewy-eyed enthusiasts will rush in first; but they will help to make the whole idea more economic, and more smoothly running, for the hard-headed realists who in time will follow suit.

John Hutchins has researched the history of the earliest attempts to use mechanical devices to overcome language barriers, including patents issued in Paris to a French engineer of Armenian extraction, Georges Artsrouni, in 1933, and in Moscow to

a Russian, Petr Petrovich Smirnov-Troyanskii, also in 1933. Troyanskii, he concludes, would have been the father of machine translation if the electronic digital calculator had been available and the necessary computer facilities had been ready.

But it was the development of computers during the second world war that made the whole thing possible. Here John Hutchins has quite a story to tell.

The first suggestion that electronic computers could be used to translate from one language into another seems to have been made during conversations in New York between Andrew D. Booth and Warren Weaver.

And he takes the story from there, recounting how the Englishman Booth and the American Weaver gave an impetus to research in their two countries. There were other influences, including that of computing pioneer Alan Turing, who thought that among the applications for computers could be the learning and translation of languages, and Richard H. Richens, who before meeting Booth had been experimenting with punched cards for storing information.

The idea of using punched cards for automatic translation arose as a spin-off, fuelled by my realisation as editor of an abstract journal (*Plant Breeding Abstracts*), that linguists conversant with the grammar of a foreign language and ignorant of the subject matter provided much worse translations than scientists conversant with the subject matter but hazy about the grammar.

This was an attitude that was to long prevail in MT, and has still not been wholly dispelled. Translators have made very little contribution to MT development: the impetus has come from computer specialists interested in extending the applications of the computer, from scientists who want information, and from linguists tackling the theoretical problems of language structure.

John Hutchins follows the story through chronologically, from the Weaver memorandum of 1949, which put the idea of MT about and led to some of the early experiments, to the vigorous research activities of the late 1950s.

Some of the early thinking, influenced by the early wartime use of computers in cryptography, saw language problems as a further development of cryptographic techniques. But it was Weaver, it seems, who first pointed to the possibility for the investigation of language universals.

Incidentally in his Introduction John Hutchins does a service to us all by laying to rest some of the myths about MT. His thorough research has even found the most likely source of the two most frequently quoted examples of the alleged literal-mindedness of MT, namely *Out of sight, out of mind* being translated as "Invisible idiot" and *The spirit is willing but the flesh is weak* being translated as "The whisky is all right but the meat has gone bad". The story, he concludes, is almost certainly apocryphal.

Another personality influential in the early history of MT, Yehoshua Bar-Hillel, came on the scene in 1951. One thing which might be useful for any future edition of this work is some sort of "cast list", with a summary of where each leading character came from, and his involvement. I do not know whether it would be possible but as so many projects arose from previous projects it might be useful to construct a sort of dynastic tree; I suspect however that the ramifications would be too complex to show it in a graphic form. John Hutchins does in fact provide a chronological table of the main projects and systems in text form.

The first conference on MT was held at the Massachusetts Institute of Technology in 1952, bringing together many of the pioneers. Many of the problems discussed are still those being discussed today. One was the possibility of using a "pivot language", an artificial language or "interlingua", rather than direct translation between two languages. Incidentally I could not find any reference in this book to a suggestion of a South American researcher, which has had a lot of newspaper publicity in recent years, that a South American Indian language called Aymara has a regularity and other characteristics making it eminently suitable to be an "interlingua". I would be glad to know whether any reader of *Language Monthly* has come across any academic paper (rather than newspaper items) on this subject.

Another question which is still discussed today is what level of MT output is acceptable to translation users. To the chagrin of language professionals users, particularly scientists, are frequently content with linguistically quite rudimentary output. It was even suggested that scientists could learn or be taught to read the admittedly linguistically poor "MT-ese", or MT pidgin, as it was sometimes called.

The chapter on the early story of MT ends with the first international conference in 1956, and John Hutchins then turns to questions of problems, methods and strategies, describing the linguistic questions - polysemy, semantics, homographic, morphological and syntactic analysis, transformational grammar, ambiguity, discourse relations - which face all MT researchers, and here I can honestly say that I understood some of these for the first time in the light of his explanations.

The years 1950 to 1966 were years of massive funding in the United States, and Chapter four describes in some detail the groups and projects involved with MT during those years, the University of Washington, the IBM Research Center, Georgetown University, the Rand Corporation, the University of Michigan, the Ramo-Wooldridge Corporation, the Massachusetts Institute of Technology, the National Bureau of Standards, Harvard University, the University of California at Berkeley, the Linguistics Research Center at Texas University, and Wayne State University. Just to list them indicates just how widespread the work was, compared with England, which had been much involved in the early days. Work went on at Birkbeck College, London (Booth's institution), at the National Physical Laboratory, Teddington, and at the Cambridge Language Research Unit, but not on the massive scale of the United States work. The author also looks at work during this period elsewhere in Europe, in the Soviet Union, and in Japan.

It was during this period that computer specialists, who had made much of the earlier running, were now coming together with experts in linguistics. This was particularly so at the Massachusetts Institute of Technology, where research was focused on advances in linguistic theory, particularly the theory of transformational grammar. This contrasted with the trial and error approach of some early researchers, ridiculed by Sydney M. Lamb at Berkeley as "trying to cook tiger stew without having caught the tiger".

Even laymen like myself have often heard the story of how the massive funding and the heady enthusiasm of those years were brought to a sharp halt by the ALPAC report in the mid-1960s, but Hutchins shows how

doubts and criticisms were voiced from inside the MT community well before that, in Bar Hillel's paper, *Report on the state of machine translation in the United States and Great Britain*, in 1959, and the book by Mortimer Taube, *Computers and Common Sense*, in 1961. Bar-Hillel's thesis was that what he called FAHQT (fully automatic high quality translation) was an unattainable goal.

As for operational MT he contended that researchers had either to sacrifice quality (low quality products were acceptable in many circumstances) or to acknowledge the necessity for post-editing. He advocated the latter aim, "high quality translation by a machine/post-editor partnership", as the most fruitful area of future MT development. The goal then should be partially automatic MT, commercially competitive with human translation, which should be gradually improved and refined with more and more of the post-editing operations carried out mechanically. This goal required however, the development of more reliable and flexible optical character readers, more attention to dictionary compilation, research on the efficiencies of different dictionary formats (full forms vs stems and endings), and investigation of the need for pre-editing of output.

However, a surprising number of projects survived the withdrawal of much funding following the ALPAC report, and these projects are detailed, before we move more towards the current situation, with descriptions of how some of the systems operating today, Systran, Logos, SPANAM, TAUM-METEO, SUSY, GETA, and METAL, came into being and what their characteristics are. Logos, for example, it recalls, was originally created at the time of the US involvement in Vietnam, and originally concentrated on English-Vietnamese.

The involvement of the European Communities in machine translation, which has been vital to its development, is told and useful information is given on how the EUROTRA project, still being developed, will operate.

Whatever the final outcome of the Eurotra project, there will probably be little doubt that it represents a milestone in MT research. There has been no previous project of such ambitions or of such complexity of organisation. No other project has had longer or more thorough preparations. No other project has brought together the linguistic and computational expertise of so many countries.

What the book does not provide is any survey of users of MT, any comparative study of MT systems in practice, and any indication of the economic costs and benefits of installing an MT system. The book is essentially a scholarly (in the best

sense of the term) publication, in that it is a distillation of published material on the subject, and the publishing of information is something which academic researchers do. What is now badly needed in MT, particularly now the time has come to make practical use of all this work, is for some independent research on actual costs and benefits. This should not be done by enthusiasts for MT, or by the companies marketing MT systems, but by some clear-eyed organisation, with commercial (as distinct from international institution) experience of organising translation work, and with a slightly cynical "Show me" attitude.

There is only the sketchiest indication of the ownership of the commercial companies, and no real details of who is behind them. Gachot S. A.'s involvement with the Systran system, for example, is not mentioned as far as I can see.

The book, as I have indicated, is a record of what has happened in MT, what is happening, and what is likely to happen.

It does not go beyond its brief. It does not wonder, for example, as I have often done, what would have happened if early research had been in the hands of translators.

Translators know that there is no single definitive way to translate a text. Even in technical translation an individual's style will show through. That is why most translators dislike revising someone else's work.

So if translators had been in charge they would have looked for ways of extending an individual translator's capability, not of having an automatically-generated translation. The speed at which a skilled translator can produce work will often be as fast as the speed at which a post-editor can revise automatically-generated text.

But then again perhaps the existing generation of experienced translators will be the last to generate individual translations.

The new generation will accept working with automatically generated text because it will seem the most natural way of working. To produce text oneself will come to seem as quaint as riding a horse to work instead of driving the car.