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Machine Translation: A Tale of Two Cultures

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Machine translation (hereafter MT) was the first imagined cultural – rather than strictly military – application of the arithmetic computing machines developed by the United States, the United Kingdom, and Germany for cryptanalysis and ballistics calculations during the Second World War. Although the mathematicians and engineers who dominated work on MT often insisted that they were working exclusively on practical problems, it is unlikely that they were entirely unfamiliar with the intellectual genealogy of their project, which stretched back at least to the final decline of Latin and the rise of philosophical rationalism in seventeenth-century Europe. During the second half of the seventeenth century, constructed universal taxonomic, arithmetic, or logical languages capable of replacing Latin and refining the communication of thought were imagined in different ways (and with different levels of both sincerity and sophistication) by Francis Lodwick, Thomas Urquhart, Cave Beck, George Dalgarno, Johann Joachim Becher, Athanasius Kircher, John Wilkins, and Gottfried Leibniz, among others. The profusion of international auxiliary languages that accompanied the late nineteenth-century period of European imperialism built on these earlier, more speculative efforts, in some cases developing active international communities of fluent speakers (notable examples include Volapük, Esperanto, and Ido). Many such projects emphasized both the potential universality of a rationally planned language, in itself, and its role in translation, mediating the difference of existing natural languages and ameliorating the conflict that difference creates. In this respect, at least, the postwar internationalism of early MT research can be situated squarely

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within a Euro-American or Euro-Atlantic intellectual tradition shaped by the historical concurrence of secularization, nationalism, and empire.

Mechanical or mechanizable translation *methods* were implied by both philosophical and practical auxiliary languages, the ideal of which was to restrict each single word to a single unambiguous meaning (thus John Hutchins [1986], for example, refers to the works of Beck, Kircher, and Becher as "mechanical dictionaries" [22]). By contrast, the "machine" in "machine translation" designates a non-human translating agent, designed to take the place of the human translator sooner or later, and ideally altogether, at least for some of the earliest researchers in the field. As in the field of artificial intelligence (AI), which like computational linguistics has its origin in early work on MT, the goal of fully automated natural-language processing – that it be sufficiently accurate to pass the "Turing test" by persuasively simulating the discourse of a human being – represents the cultural power of the speculative imagination in this work: from 1949 to 1966, both enthusiasts and skeptics described fully automated high-quality translation (FAHQT) in mythic terms, as a "holy grail." This goal structured debate across the entire field, pitting theoretical against pragmatic approaches (and optimistic and pessimistic assessments of work of each type), strongly influencing public perception of the research, and, in time, leading to collapse and retrenchment.

John Hutchins and Evgeny Lovtskii (2000) remind us that the first recorded proposal for the construction of a translating machine appeared in a patent granted to Petr Petrovich Troyanskii, a "forgotten pioneer" of MT, in the Soviet Union in 1933. Troyanskii imagined a labor-saving device usable by monolingual human operators ignorant of the source language to be translated – though he did insist that at least one human operator, whom he designated "the editor," would have to be fluent enough in both source and target languages to check and refine the machine's output. In addition to human "post-editing," this machine, which Troyanskii proposed would be useful in "translating from and into languages of minor nations of the Soviet Union," also relied on human "pre-editing" of the text, replacing word stems and endings with what he called "logical symbols" borrowed from the grammar of Esperanto (Hutchins and Lovtskii 2000, 196–98). But the rational idealism so typical of early MT work can be found here, too, in the emphasis Troyanskii placed on the relocation or displacement to the machine of the cultural labor of language learning and translation, and on the benefits it offered to a world culture in which genuinely bilingual or multilingual professional translators were extremely scarce (and whose time and labor capacities were finite). In a 1947 paper entitled "On a Translation Machine Built on the Basis of Monolingual Language-Translation Methodology," Troyanskii imagined a "universal logical make-up in all languages" accessible using "about 25 universal international symbols of logical parsing for all languages . . . capable of rendering without exception all relations and the slightest shades of human thought" and ensuring "absolutely exact translation into other languages without distortion of meaning" (Hutchins and Lovtskii 2000, 204).[1] He stressed the advantages, to the 99 percent of the world's population he saw as functionally monolingual,

of thus being able to translate "foreign journal articles and books into one's own language without knowing the language of the original" (2000, 204).

The idea of a logical interlingua manipulable by a machine resurfaced in the postwar writings of Warren Weaver, the mathematician and engineer who served as a director at the Rockefeller Foundation and the US Office of Scientific Research and Development (OSRD) during and after the war. (Weaver seems not to have been aware of Troyanskii's projects.) In discussions during 1946 with Andrew Donald Booth, then beginning work on the construction of computers at Birkbeck College, London, Weaver speculated about new applications for the Colossus code-breakers constructed during the war at Bletchley Park, suggesting that cryptanalytic techniques might be applied to the translation of natural languages. Weaver would pursue this approach for several years, writing in a 1947 letter to the cybernetics researcher Norbert Wiener: "When I look at an article in Russian, I say: this is really written in English, but it has been coded in some strange symbols. I will now proceed to decode" (Weaver 1955, 18).

The discouraging response Weaver received from figures like Wiener and the British literary critic I. A. Richards (a proponent of Basic English) was offset by the enthusiasm expressed by others (such as Vannevar Bush, former director of the OSRD and president of the Carnegie Institution for Science) and by Alan Turing's endorsement of MT in a 1948 report to the UK's National Physical Laboratory (Turing 1948, 9). The memorandum entitled "Translation" that Weaver distributed to his circle of acquaintances in July 1949 revisited this earlier discussion and correspondence, referring to the Sinologist Erwin Reifler's work on comparative semantics in English and Chinese and foregrounding a "war anecdote" related to Weaver by William Prager, a mathematician at Brown University. The German-born Prager, who had emigrated to Turkey during the war before arriving in the United States, had encoded a sentence in Turkish for one of his mathematical colleagues to practice a deciphering technique on. "The most important point" about the fact that his experiment succeeded, Weaver asserted in his memo, was "that the decoding was done by someone who did not know Turkish, and did not know that the message was in Turkish" (Weaver 1955, 16).

The conclusion Weaver drew from this, that a logical basis for all existing languages might be accessed with cryptanalytic techniques, was very quickly discredited. Still, its basic impulse, which one might call the neutralization of culture through the segregation of soluble engineering problems from potentially insoluble philosophical ones, pervaded subsequent work in MT as a constant temptation. In many ways, the story of MT is the story of an attempt to assert the independence of computation from culture and, at the same time, to assert computation's dominion over culture: a story in which applied science played a more aggressive and destructive role in the postwar university than C. P. Snow cared to recognize, in his polemic against the division of "two cultures" (Snow 1946). While the prominent role in MT work of German and Austrian Jewish refugees like Yehoshua Bar-Hillel, Erwin Reifler, and Hans Reichenbach no doubt reflects their first-hand experience of the Nazis' irrationalist "neue Kulturkampf" as much as a refugee's simple need to survive, it also reflects their intellectual roots in the positivist attack on philosophy in 1920s Berlin and Vienna.

In any case, the triumphalist culture of Anglo-American empiricism that sheltered them was already launching its own culture war. In their introduction to *Machine Translation of Languages: Fourteen Essays* (1955), an edited volume that included the full text of Weaver's 1949 memorandum, Booth and W. N. Locke defined MT as "the completely automatic substitution of a different language for the language of a given text, the ideas being kept unchanged." They stated their intention to

> leave aside, for the present, such philosophical points as the possibility of expressing any idea in written or spoken words, and the difficulties arising from the known fact that certain languages contain words descriptive of situations which have no parallel in other tongues. (Locke and Booth 1955, 1)

Admitting that one-to-one correspondence between word meanings in the source and target languages assumed an "ideal process" that is "by no means necessary, or even possible in general," they nevertheless preferred the practical advantages conferred by its "tacit" assumption, as a basis for experiment, and dismissed "philosophical" objections as finally irrelevant:

> So much for purely philosophical views of translation, which are hardly likely to find any general measure of agreement either among linguists or among students of ideas. We proceed to a more special consideration which is bounded on the one side by what is useful and on the other by what is practicable. (1955, 1)

Weaver placed the neutralization of culture in the service of an internationalist ideal, describing the multiplicity of human languages as a "world-wide translation problem" that "impedes cultural interchange between the peoples of the earth, and is a serious deterrent to international understanding" (Weaver 1955, 15). Speculating about "invariable properties" statistically common to all languages, Weaver invoked the philologist Max Müller and (apparently unaware of Müller's contempt for them) onomatopoetic-echoic "bow-wow" theories of the origin of human language, suggesting that all human beings had identical vocal organs producing similar ranges of sounds, "with minor exceptions, such as the glottal click of the African native" (1955, 16). Phonological and graphic correlations between words in English and Chinese had been demonstrated by Reifler, Weaver noted, while Reichenbach, a founder of the Berlin Circle who had "also spent some time in Istanbul, and, like many of the German scholars who went there . . . was perplexed and irritated by the Turkish language," had discovered common features of the basic logical structures of otherwise very different languages (1955, 17). Describing the "deep use of language invariants" as "the most promising approach of all" to MT, Weaver imagined languages as towers erected on a common foundation with an open basement, and translation as a traversal of that basement, rather than "shouting from tower to tower" (1955, 23).

Weaver's memorandum proved galvanizing. By the end of 1949, research groups had been formed at MIT, UCLA, and the University of Washington, where a team

was led by Reifler, the most prominent of a very few MT researchers whose training was in a discipline other than mathematics and engineering. (Hutchins notes that post-Bloomfieldian linguists were generally skeptical about this enthusiasm, especially the inordinate interest taken in statistical analysis and classification of logical and semantic universals across languages [1986, 30].) Early work focused on word-by-word dictionary translation, the results of which some pronounced "tantalizingly good" (Yngve 1955, 208), but which led others, such as Reifler, to conclude that human pre- and/or post-editing would be indispensable. Papers and reports published in the early 1950s dwelt on limited hardware storage capacity and access time as inhibiting progress, while divisions emerged between the theoretical and "perfectionist" approach of the MIT group, aimed at the long-term goal of high-quality translation, and the empirical and operational approach of Reifler's group at Washington, funded by grants from the Rockefeller Foundation and the US Air Force from 1952 onward (Hutchins 1986, 38, 61–62).

Starting in 1950, Reifler, who appears to have been the first to respond in writing to Weaver's memo (Micklesen 2000, 24), circulated a series of papers entitled "Studies in Mechanical Translation," using his credentials as a scholar of comparative semantics, a translator, and a teacher of Chinese and German as foreign languages to advocate for MT from a humanist perspective. Reifler would eventually set aside his early reservations about MT as a "new expansion of the empire of the machine," abandoning his claim for the necessity of pre- and/or post-editing and declaring the full automation of translation a practically achievable goal (Reifler 1955, 136, 143).

Insofar as it would have to handle polysemy and "intended nongrammatical meaning," fully automated translation, Reifler noted, could lead to "general-purpose translation machines, capable of translating even poems, as long as unconventional or even 'bad' prose is satisfactory" (Reifler 1955, 144). As the final frontier for computation and its ultimate test, the translation of literary language would become a kind of middle note of MT research, subtly yet insistently assertive in both the speculations of researchers themselves and in the popular press coverage that increased dramatically after a public demonstration of Russian-to-English MT on January 7, 1954, at IBM's Technical Computing Bureau in New York. Showcasing the work of a team at Georgetown University led by Léon Dostert, a professor of French who had served as Eisenhower's interpreter and organized language services for the Nuremberg trials, the "Georgetown demonstration" was the first working implementation to advance beyond word-by-word translation to incorporate some elements of grammar (Hutchins 1986, 37). Reactions ranged from euphoria to dismay, though not always in predictable ways or from predictable quarters: in memoirs of this period, Dostert's assistant Muriel Vasconcellos recalls the attacks of "language experts, particularly translators" on the authenticity of the Georgetown demonstration (Vasconcellos 2000, 94–95), while Anthony Oettinger, who after producing the first doctoral dissertation on MT would lead a research group at Harvard starting in 1954, recalls finding Dostert "a bit of a fraud" and the Georgetown demo "contrived" (Oettinger 2000, 79).

It would appear, indeed, that the acquired technocratic optimism of a humanist like Reifler was paralleled, all along, by the gradual disenchantment of some of the mathematicians and engineers working on MT. As early as 1951, Yehoshua Bar-Hillel, appointed that year to the first funded research position in MT, in MIT's Research Laboratory of Electronics, wrote that FAHQT was an unachievable short-term goal, noting in a paper presented at a four-day MT conference the following year that it would be possible for MT output to be grammatical and make sense, and therefore be accepted as a correct translation, "but still be dead wrong" (Bar-Hillel 1955, 191). William E. Bull, Charles Africa, and Daniel Teichroew cautioned that in such cases, "no translation at all would be less dangerous than a wrong or misleading one" (Bull et al. 1955, 95). Nevertheless, like Weaver's memo in 1949, the Georgetown demonstration clearly marked a surge forward: 1954 also saw the launch of Margaret Masterman's Cambridge Language Research Unit at Cambridge University and Oettinger's group at Harvard, along with the first issue of the journal *Mechanical Translation*, published at MIT, and the formation of the first Soviet research groups. It was the beginning of a golden age for MT, defined by major international conferences, a critical mass of important publications, and (in the United States) easy access to generous government, military, and private funding even before the Sputnik crisis of 1957.

The Golden Age, 1954–1960

Hutchins suggests that while this influx of funding after 1954 was driven mainly by Cold War geopolitical objectives, the cultural fascination with artificial intelligence, both among the public and among scientists themselves, may have helped boost support for MT research as well (1986, 58–59). Between 1954 and 1960, Reifler's group at Washington worked on a Russian-to-English system for the USAF's information-retrieval systems at Rome Air Development Center in New York; Noam Chomsky joined the MT lab at MIT, developing work on syntax that would influence the direction of subsequent work, though Chomsky himself would come to feel MT was "pointless" and "hopeless" (Hutchins 1986, 89, 181); and research groups formed in the Soviet Union, Italy, France, Belgium, West and East Germany, Czechoslovakia, Hungary, Romania, Japan, China, and Mexico, while expanding in the United States and the United Kingdom. Some MT researchers cautioned the public (and their own scientific colleagues) that MT would likely prove most useful in translating scientific and other technical prose, and that "the question of turning a masterpiece of literature written in a foreign language into a respectable translation is one of great difficulty," while insisting at the same time that it was "extreme" and "overpessimistic" to place such a goal entirely beyond the pale: granted sufficient hardware capacity, W. N. Locke and A. D. Booth observed, it seemed "not unreasonable to anticipate thoroughly literate translations of literary works," including poetry (Locke and Booth 1955, 14). Others more modestly proposed a goal of low-cost but

acceptable "poor translation" (Perry 1955, 182), while Oettinger stated unconditionally that

> [t]here would be no point in designing machinery to perform a certain task if the whole task had to be done first in order to design the machinery . . . this consideration . . . rules out the application of machines to literary works of art, since these often shine by virtue of their deviation from the statistical norm. (Oettinger 1955, 51)

Skepticism about MT research found journalistic expression in joking and mockery, such as the story retailed by Hutchins about the translation of two idioms, "Out of sight, out of mind" and "The spirit is willing but the flesh is weak," from English to Russian and back again. "According to some accounts," Hutchins notes,

> the first came back as *invisible insanity* and the second was *The whiskey is all right but the meat has gone bad*; according to others, however, the versions were *Invisible and insane* and *The vodka is good but the meat is rotten*; and yet others have given *invisible lunatics* and *the ghost is willing but the meat is feeble*. (Hutchins 1986, 16)

Occasionally, this was matched by a certain levity in the professional publications of MT researchers themselves. "A mechanical translator, like the sorcerer's apprentice," noted Booth and R. H. Richens,

> is unable to desist. It will continue to translate even when not required, as for example, when it encounters proper names. The context will almost certainly prevent misunderstanding, but the reader must be prepared for Tours to come out as *turn/tower (plural)* and for Mr. Kondo to appear as *Mr. near wisteria*. (Richens and Booth 1955, 35)

For the most part, speculation about MT of literary language was a motif in framing discussions, a way to probe public opinion (and perhaps bait campus humanists) with provocative conjecture. Some researchers suggested that MT might be applied in extending long since mechanized modes of literary study itself. *Mechanical Resolution of Linguistic Problems* (1958), a volume co-authored by Booth and two of his doctoral students at Birkbeck, Leonard Brandwood and J. P. Cleave, described their use of "digital calculators" in the stylistic analysis of Plato's dialogues as venturing "like Daniel, into the den of [their] colleagues in the Faculty of Arts" (Booth et al. 1958, v). Others followed with less trepidation, triumphantly announcing a "change in the climate of opinion among literary scholars" presaging a "revolution in literary studies" (Levison 1967, 193).

Decline and Fall: The ALPAC Report and its Aftermath

But storm clouds were gathering. By 1959, Bar-Hillel's drift from enthusiasm to "profound gloom" (Booth 1967, vii) had produced a report for the US Office of Naval

Research concluding that FAHQT was not only unachievable in the short term, but impossible regardless of the level of resources devoted to it. The report was republished in expanded form in 1960 in the journal *Advances in Computers*, which brought it to public attention (Hutchins 2000, 305–6). Reviewing half a million dollars' worth of MT research supported by federal funding during 1958, Bar-Hillel's discouraging assessment was a foreshadowing of things to come: Hutchins notes that "[t]here can be few other areas of research activity in which one publication has had such an impact" (1986, 157). Léon Dostert of Georgetown was forced to defend MT research at congressional hearings in 1960, but he did so successfully (Vasconcellos 2000, 94–95), and the US House of Representatives Committee on Science and Aeronautics endorsed MT's promise not only for science and military intelligence, but for "the exchange of cultural, economic, agricultural, technical, and scientific documents that will present the American way of life to people throughout the world" (in Hutchins 1986, 159–60). Still, at the NATO Advanced Summer Institute on Automatic Translation of Languages held in 1962, Bar-Hillel was publicly pessimistic, and it is possible that Mortimer Taube's attack on MT in *Computers and Common* Sense (1961) influenced public perception as well (Hutchins 1986, 161, 163). For his part, Oettinger recalls a culture at MIT that was "intolerant of deviationism," forcing him to grant Hubert Dreyfus and Joseph Weizenbaum "'political asylum' in my offices" to write their critiques of the intellectual premise of AI (Oettinger 2000, 82). By 1963, both Oettinger and Victor Yngve, Bar-Hillel's successor at MIT, were giving up on MT altogether, and the program at Georgetown shut down when the funding Dostert had successfully defended before Congress in 1960 was not renewed (Vasconcellos 2000, 94–95).

Oettinger's work at Harvard had begun in 1949, while he was still an undergraduate, and involved contacts with I. A. Richards, Roman Jakobson (then head of Harvard's Slavic Department), Carol Chomsky, and Warren Plath, brother of the poet Sylvia. Oettinger recalls that when he joined the Automatic Language Processing Advisory Committee (ALPAC) of the National Academy of Sciences, convened in 1964 to assess progress on MT,

> I knew that I was probably going to end up by taking my own research field "down the drain" but I already had the firm conviction that MT was not going anywhere and that it made no sense to perpetuate a fraudulent belief that something might be achieved. (Oettinger 2000, 83)

Oettinger describes a culture of casinoized grantsmanship, with both US and Russian researchers engaged in "a kind of amiable conspiracy to extract money from their respective governments, playing each other off with various 'experiments' and 'demonstrations' that sometimes bordered on fraud" (2000, 80). ALPAC's report, issued in 1966, was deeply skeptical of researchers' claims that MT was needed to help process Russian-language technical literature, observing that the present supply of human translators "greatly exceeds the demand" (ALPAC 1966, 11) and that "[t]here

is no emergency in the field of translation. The problem [of translation] is not to meet some nonexistent need through nonexistent machine translation" (1966, 16). It stated flatly that, to date, "without recourse to human translation or editing . . . there has been no machine translation of general scientific text, and none is in immediate prospect" (1966, 19), and observed that after eight years of work, the Georgetown group could still not produce output that was usable without post-editing. It described the Mark II system at Wright-Patterson Air Force Base in Dayton, Ohio (derived from Reifler's work for the Rome Air Development Center), as dependent on human post-editing, and noted that J. C. R. Licklider, then head of the US Advanced Research Projects Agency's Information Processing Techniques Office, had counseled IBM not to invest in MT product services (1966, 19). "Unedited machine output from scientific text," it concluded, "is decipherable for the most part, but it is sometimes misleading and sometimes wrong (as is postedited output to a lesser extent), and it makes slow and painful reading" (1966, 19). Finally, it noted that "in some cases it might be simpler and more economical for heavy users of Russian translations to learn to read the documents in the original language," adding that many US scientists already did just that, that instructional resources were available for those inclined to make use of them, and that acquiring basic reading facility in Russian was not likely to divert large quantities of a researcher's time (1966, 5).

The report's impact was devastating: by 1968, the Association for Machine Translation and Computational Linguistics had dropped "Machine Translation" from its name, as the ten US research groups active in 1963 dwindled to three, with research virtually shut down in the UK and significantly reduced in Japan and the USSR (Hutchins 1986, 167–69). Hutchins (1996) argues that ALPAC's assessments were selective and narrow in scope, and in some ways quite unfair; but subsequent developments suggest that the goals of much MT work to 1965 had never been as practical and philosophically circumspect as its proponents had claimed. By that point Yngve was ready to face what he called the "semantic barrier," admitting that

> [w]e have come face to face with the realization that we will only have adequate mechanical translations when the machine can "understand" what it is translating and this will be a very difficult task indeed. (Yngve 1967, 500)

But in their contribution to the same volume of essays, O. S. Kulagina and I. A. Mel'cuk were still speculating about conquest of the "gnostic-encyclopedic problem" by a new science capable of describing human knowledge of "extralinguistic . . . external world situations" in formal notation (Kulagina and Mel'cuk 1967, 146). It took ALPAC's destruction of the legitimacy of the grand narrative MT researchers had invented, along with the funding stream that sustained it, for work in the field to move finally and completely beyond the metaphysical objective of FAHQT, resigning itself to a durable human–computer symbiosis. Hutchins notes that it was only after the ALPAC report, in subsequent work on interactive human–computer translation workstations, that professional translators were invited to join MT research efforts

as translators (1986, 178), rather than as models for their computer surrogates or post-editors of their output.

Also shaping MT's fortunes after ALPAC were the genuine social, economic, and internal political needs of Canada and the members of the European Community, multilingual polities that recognized language plurality at the level of the state and embodied it in public policy. The Canadian and European situations stand in stark contrast to that of the United States, also a multilingual polity but one historically intolerant of public multilingualism. While the EC adopted an English-to-French Systran system in the mid-1970s and launched the development of its ambitious Eurotra multilingual system, the Traduction Automatique de l'Université de Montréal (TAUM) group produced METEO, a service for translating weather bulletins between English and French that operated until 2001. In the United States, MT development after 1965 was sustained by the Mormon Church's investments in Bible translation, which kept work going at Brigham Young University (Arnold et al. 1984, 14–15), and was otherwise left to the commercial sector.

MT Today

Writing in the mid-1980s, Hutchins described a decade of "realistic optimism" (1986, 12) in the new work on MT that emerged around 1975. Released from the dream of FAHQT, MT would find lasting if limited practical application, as well as recognition for its contributions to subsequent work in computational linguistics, natural-language processing in AI, and indexing and abstracting. Peter Toma's Russian–English Systran system, based on work at Georgetown, replaced the Mark II at Wright-Patterson Air Force Base in 1968 and was used by NASA during the Apollo–Soyuz project, while the English-to-French implementation developed for the EC was joined by French–English and English–Italian implementations between 1978 and 1981. In 2012, Systran, whose portfolio of product suites for home, business, and enterprise users offers translation in fifty-two language pairs, still provides services to the European Union. More projects would fail along the way: AVIATION, a TAUM project for translating aircraft maintenance manuals, was cut by the Canadian government in 1981 when it ran over cost, and development of the Eurotra system by a research consortium at the universities of Grenoble, Saarbrücken, Manchester, and Pisa was discontinued in 1994 after fifteen years of labor failed to produce a working prototype. Still, there is no doubting the vitality of what Makoto Nagao, leader of the Japanese government's Mu project during the early 1980s, called a "language industry" supported by the "language engineering" of postwar information societies (Nagao 1989, 4).

More recent defenses have revived the liberal internationalism of the postwar years, suggesting that MT provides speakers of minor languages with relief from domination by a lingua franca, allowing them to preserve their own languages and linguistic cultures (Arnold et al. 1994, 4). Observing that MT work achieved intellectual maturity

only when it relinquished the goal of FAHQT and resigned itself to the mediations of a human translator (1994, 12), the same authors noted that Carnegie Mellon University researchers working on "knowledge-based" MT have had to scale back goals originally formulated in the late 1980s, given very modest achievements to date (1994, 191). Such anecdotes suggest that the "gnostic-encyclopedic problem" has retained its temptations. Today, a Systran system is used by the familiar Babel Fish service provided by Yahoo! Inc. (formerly by AltaVista), and was used by Google Inc.'s Google Translate until 2007. Along with the amusingly (to some) mistranslated English-language signage now coloring public space in cities like Beijing, Tokyo, Moscow, and Istanbul, no-cost public access to crude but functional Web-based MT is reflected in the literary production of pseudo-avant-gardes like the "Flarf poets" who emerged in the United States in the mid-2000s. These culturalizations of the culture of computation we have been calling "MT" certainly support Hutchins's observation that

> [t]here is now a growing realization that for many recipients stylistic refinements are not necessary; it appears that on the whole users are more content with low quality texts than translators and post-editors. (1986, 331)

But they also give it something of a twist.

See also Chapter 5 (Munday), Chapter 8 (Shreve and Lacruz), Chapter 11 (Dunne)

Note

1 For the Russian original of Troyanskii's paper, see Bel'skaya et al. 1959, 5–27.

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