Letters

Mechanical Translation: Two Views

If one reads the article "Mechanical translation and related language research" (8 May, p. 621) with care, it becomes apparent that mechanical translation has failed, and that the only remaining question is: How much money has been wasted in the process —ten million or tens of millions?

The game now is to justify this waste of funds—a waste which was predicted ten years ago by competent people—by alleging that out of the failure to achieve mechanical translation has come increased knowledge in the field of language research. This type of justification might also serve to justify research to build a perpetual motion machine, on the grounds that out of such research we might gain knowledge of how to build more efficient engines. The National Science Foundation and similar agencies, as well as science in America, would not need to fear the wrath of congressional investigations if mistakes as a price of free research were faced up to honestly instead of being justified in terms of byproducts of dubious value.

As a matter of fact, a good case can be made for the proposition that research in mechanical translation has distorted and held back developments in the field of linguistics. Certainly, it has been tremendously harmful in the field of information storage and retrieval and the problem of creating adequate vocabularies for such activities.

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R. See's survey of mechanical translation research reveals a failure to differentiate between presently attainable goals and long-term considerations. It is See's contention that "at present, computers cannot be programmed to produce output comparable to good, or even fair, human translation." For him, mechanical translation is a long-term goal to be sought through research into the elemental nature of language itself. There is unquestionably a need for such research, but there is also an immediate pressing need for automatic translation. The two should not be confused. The advent of large-scale mechanical translation cannot await the day when all, or nearly all, of the relevant linguistic problems are solved. For even if the language process were completely understood, it is still possible that such major stumbling blocks as the unrestricted resolution of semantic ambiguities would lie beyond the scope of computer application.

I contend that it is presently possible to design computer systems which will translate scientific, or other nonfiction, text from any of several languages into English. We have designed and operated a Russian-English mechanical translation system which produces output of the following quality:

/p/ the method of the control of activity against the tumors of animals is able to help to discover antitumorigenic substances in cultural liquids. however, this method isn't quantitative and furthermore requires much time. in order to to get a result quickly, was offered to try the action of substances on tumorous cells in ascitic liquid. this is a good test, but the inadequacy of its in that one, that the majority of toxic substances destroys cells in an ascitic liquid. it is very convenient, consequently, to have a method, that is not foreseeing the utilization of the tumorous cells, but which at the same time is quantitative. at present there is no such method, which would be able to substitute a method with the utilization of the tumors of animals. nevertheless there are several supplementary methods of the definition of antitumorigenic substances in the process of their isolation, but the value of every one from these methods depends on being investigated substance. (*1*).

Only a slight amount of post-editing would be required before this would be comparable to a good human translation.

The following short samples are careful simulations of output from computer systems presently being designed to translate Chinese, French, and Russian nonfiction text into English. The last of these is based on a new system which differs considerably from the one which produced the computer printout (above) of the same text; the emphasis that the new system places on English synthesis accounts for the greater readability of the simulation.

This enemy still has force, therefore, all revolutionary forces within each country must unite, revolutionary forces of all countries must unite, must organize anti-imperialistic united front with the Soviet Union as the leader, and obey correct policy, otherwise victory is not possible. (*2*)

The American Nautilus utilized uranium strongly enriched in uranium 235 as a fuel, and pressurized ordinary water as a moderator and extractor fluid of heat, but we were able to consider the use of natural uranium in replacing ordinary water by heavy water, that we were able to acquire in Norway, whereas it was not then possible to obtain from any producing country enriched uranium usable for the propulsion of a ship of war, and that its production in France was not envisagable for many years. (*3*)

The method of controlling the activity of tumors in animals can help to discover antitumorigenic substances in cultural liquids. However, this method is not quantitative and furthermore it requires much time. So that to get the result quickly, it was offered to try the action of substances on tumorous cells in ascitic liquid. This is a good test, but its inadequacy is in the fact, that the majority of toxic substances destroys cells in ascitic liquid. It is very convenient, consequently, to have a method, not foreseeing the utilization of tumorous cells, but which at the same time is quantitative. At present there is no such method, which would be able to substitute for the method with the utilization of tumors in animals. Nevertheless there are several supplementary methods of defining antitumorigenic substances in the process of their isolation but the value of every one of these methods depends on the substance being investigated. (*1*)

The quality of translation exemplified here may be attributed to the heavy reliance that each of these systems places on a relatively independent English-language synthesis. This is done in the belief that readability in the target language, not analysis of the source language, is the determining factor in deciding the quality of translation (*4*). Essentially the translation process involves the following: dictionary "look-up" including replacement of idioms, resolution of syntactic ambiguities in the source language, and rearrangement into the word order of the target lan-

guage, including resolution of semantic ambiguities and insertion or suppression of articles and auxilaries. A report on CHINSYN, a synthesis-oriented Chinese-English machine-translation system, will be presented at the second annual meeting of the Association for Machine Translation and Computational Linguistics (29–30 July).

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References

1. X. Umezava, *Antibiotiki* **7**, 561 (1962).
2. Mao Tse-Tung, *Mao Tse-Tung Hsüan Chi* (People's Publishing House, Peking, 1960), p. 1181.
3. F. Perrin, *Compt. Rend.* **1**, 33 (1959).
4. Though arrived at independently, a similar train of thought is expressed in Paper No. 30, Georgetown University Machine Translation Research Project (1963), p. 180.

Two Camps in Science

Your editorial of 31 January ("Ethical problems: an invitation," p. 435) invites confidential descriptions of situations that have posed real ethical problems. May I suggest that in the last two decades a situation has arisen which provides a background to the problem of ethics. There are now two camps in science: firstly, those for whom science is a way of life, to be practiced for its own sake and for the public good; and secondly, those for whom science, like many other activities, is a road to money and power.

I express no opinion about the relative merits of the two classes, but we shall indeed be foolish if we fail, while there is yet time, to face this fact of scientific life.

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Civil Defense Testimony Misread

H. A. Sawyer, Jr. (Letters, 24 Apr., p. 366), has grossly misinterpreted the testimony I gave last year before the Hébert subcommittee [in a hearing on a bill regarding fallout protection in new public buildings].

Noting that of 30 witnesses "with claim to some scientific competence" 25 were for the bill and 5 against it, Sawyer says that, according to his interpretation, except for the pyschiatrist the "anti" scientists objected to the bill because it did not go far enough. I was one of these four and, moreover, the one who gave the most extensive testimony and was questioned at greatest length by the subcommittee. Sawyer's interpretation of my opinion is entirely erroneous. I objected to the program, and still object to it, because it is essentially useless, while carrying the very serious danger that people may nevertheless come to believe they are protected, in some meaningful way, against nuclear war. I further objected to the program because its technical basis was faulty in the extreme. These points were very clearly made in my presentation. Since Sawyer came to such an incorrect conclusion on a matter so straightforward, I would suggest that your readers examine his other statements on civil defense with great care before being persuaded by them.

Lest your readers come to believe, from the lopsided ratio of "pro" witnesses to "anti's," that the American people are generally in favor of this program, it should be borne in mind that the subcommittee invited the Defense Department to procure witnesses. Generally, this practice tends to produce such an unbalanced witness list.

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Trevor Robinson believes it would have been "surprising" if any "dissent" on the value of civil defense had come from Department of Defense witnesses in the famous Hébert subcommittee hearings of 1963. Robinson's letter (22 May, p. 954) gives the impression—intended or not—that the hearings were rigged as a parade of favorable witnesses, and that Representative Hébert and his colleagues handled the matter in a most naive way.

The records of the hearings, and the early press coverage, give quite a different impression. The hearings began with a memorandum by the subcommittee's counsel in which a completely unfavorable picture of civil defense was presented. In the first few days of the hearings various "opposition" witnesses either appeared or were cited through their writings. Then the subcommittee took testimony from the then Assistant Secretary of Defense for Civil Defense, Steuart L. Pittman, and from a few members of his staff. After hearing this testimony, the subcommittee decided to invite other Department of Defense witnesses.

Among these witnesses were research personnel, who were able to explore the technicalities of the subject. The hearings, originally expected to take only a few days, then went on for several weeks. In the course of time the subcommittee's sentiment shifted from "anti" to "pro." However, the subcommittee was by no means passive, and it was not the kind of group that would be sold the Brooklyn Bridge.

Late in the hearings in July 1963, one of the Hébert group unofficially admitted that the original intention of the hearings had been to precipitate the demise of civil defense. . . . The subcommittee's reversal was quite honest. . . . Once they had been amply informed, they changed their minds. I do not recall that their hearings, which went on for at least two months, were ever closed to any witness who might have wanted to testify against the bill.

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Krebiozen and Retine

It has been brought to our attention that the activity of retine is adduced, in various quarters, as evidence for the alleged anti-cancer activity of Krebiozen. We want to state that, judged by the chemical properties of retine and the properties of Krebiozen, as so far published, the two have nothing in common.

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Superfluous Textbooks

As one of those who decry the present cost of scientific books, I would like to comment on Crowder's article "Scientific publishing" (8 May, p. 633).

I do not disagree with a cost estimate of say $15 to $20 for a report of a conference or a good review of the state of the art. I disagree violently with the idea that every book publisher must have a textbook on every subject. There has been no new development in elementary heat transfer in 20 years. Why do we need two new books every year for introduction to heat transfer? The same situation exists in mathematics and other introductory fields