Communication Across Language Barriers*

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I AM not sure whether my proposal is properly classed as a "blue sky" development; perhaps it's only on the edge of the stratosphere. What I am seeking is some means of communicating a fairly limited set of ideas rapidly and unambiguously across language barriers. It should treat all languages on an equal footing (if it does not evade the use of words entirely), and it might be advantageous if it did not demand literacy. I want to indicate here why I think such a device would be useful, and some possible methods for determining its characteristics. I am not an electronics specialist, and I don't propose to present circuit diagrams and the contents of black boxes. I have spent a good deal of my life writing operational requirements, and it is an operational requirement which I am going to present now. Once convinced of the need, I think computer experts can supply the device.

One of the most difficult aspects of the situation to understand is that such devices are not in heavy demand and are not already in existence. In some respects they do exist, of course: international flag signals for use by ships, the agreed code of highway warning signs in Europe, the Morse SOS and the voice call MAYDAY for distress, the reasonably universal symbols of mathematics and engineering. But, as far as computers go, the emphasis seems to be on translating literary or scientific texts, principally from Russian into English, with involved problems of shades of meaning and grammatical word order. This is admirable and difficult and challenging, and remarkable results are being achieved. But the machines involved are far from portable, and they don't work in real time. It should not take a high-speed digital computer to transmit a military order, control international air traffic at a busy airport, or order a meal in Southeast Asia.

The ultimate operational requirement was expressed to me once by a Marine colonel in the following terms: "Look, Doc, I want a walkie-talkie and a set of coils. When I've got a Greek regiment on my flank, I put in the 'Greek' coil. Then I talk English and he hears Greek." That expresses one form of the need admirably, and if that particular form of realization is possible, I should think the "blue sky" designation would be appropriate. However, something considerably short of the ideal would be most valuable. Another military example of the need: the *London Economist* reported that the first tactical order to the multilingual United Nations Force after arrival in Suez took four hours to transmit. This would be a rather intolerable situation in the heat of battle.

With a stage set by these somewhat specific examples, let's consider in broader terms the situation which causes the need for communication across language barriers. It starts from the fact that, in regard to foreign languages, Americans are illiterate and provincial. "If those foreigners want to talk to us, let 'em learn English," regardless of the fact that in structure and spelling it is one of the more difficult languages to learn. This attitude did no great harm when the United States was isolated from the rest of the world, and when other nations mainly wanted things from us. But with the present resources of communication and transportation we are far from isolated, and we want (and desperately need) support from other nations in the cold war with a rival superstate. Precisely at this time, these other states are beginning to be aware of their own national entities (largely as a result of U. S. ideals of national self-determination), and are developing a feeling that their languages are just as good as ours. In a very real sense, the psychology of a nation is expressed through its language. The diplomatic consequences of American inability to speak foreign languages are evident in the daily papers, and everyone is aware of the stereotype of the American tourist who makes it obvious that inability to speak English is a sign of basic stupidity.

Another approach to this need is the universal language, such as Esperanto. This has been with us for decades without reaching any general acceptance, and I personally have strong doubts that it will do so even in the long run. The structure of proposed universal languages is in the Indo-European family of tongues, and there are a multitude of languages of importance to us, but outside this framework. Pei[1] gives a glimpse of some of them. As Whorf[2] has pointed out, some American Indian languages, such as Hopi, have a structure quite alien to the Indo-European grammar and word order. For example, the Hopi view of an event always includes both space and time, so that his language functions adequately without tenses for verbs. In any event, the present needs are too imperative to wait upon the slow progress of any of the universal languages. This is not to deny that the problem would largely vanish if a universal language were achieved. However, in the short term, we might hope for something nearer the situation of the written language in China. In all parts of China, the written ideographic language can be read, no matter

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[1] M. Pei, "The World's Chief Languages," S. F. Vanni, New York, N. Y.; 1946.

[2] B. L. Whorf, "Language, Thought, and Reality," J. B. Carroll, ed., Wiley-Technology Press, New York, N. Y., p. viii; 1956.

how widely the local dialects of the spoken language may vary. The sign language of the American Indians is another example.

I hope that you are convinced by now of the need for the proposed device. How should one set about getting it? Three or four years ago, when I first became interested in this question, I talked to some electronics people. None of them saw any great problem in constructing such a machine, providing they had a reasonable set of requirements from the user. So the first step would seem to be to collect a set of prospective users, and try to find out what their real needs for communication are, with a view to minimizing these requirements, rather than particularizing subtle shades of meaning. In a tactical military application, for example, it should be possible to assemble (perhaps at one of the War Colleges) a group of senior military officers with experience of field command, together with information theory specialists—maybe even advertising agents! This group would compile a vocabulary and grammar of the tactical orders and concepts which would need to be transmitted in situations involving the joint participation of U. S. and indigenous forces, with the requirement to keep these brief and unambiguous. Adequacy of the resulting lists might be tested with map exercises and war games involving foreign officers. The end result should be a body of tactical information of moderate size which is to be communicated across language barriers. A similar procedure might be used in other areas where the problem arises, such as airways control, ship handling, highway traffic regulation, and so on. I think basic English comes under my strictures against the universal language solution, but the underlying attempt to boil down English to a minimal structure which is still adequate for rudimentary communication is certainly a good precedent for the information groups to follow.

Once confronted with a manageable body of information to be processed, I feel sure the computer experts will be able to take it from there. The resulting equipment should certainly be portable and rugged enough to stand handling in the field. It would be nice to contemplate something as compact and personal as the present transistor pocket radios. For instance, is it possible to fit a device of this size with an indexed memory and some sort of transceiver so that a simple code transmission would cause the "radio" to repeat a particular selected command, *e.g.*, "Advance 100 yards at sunset," or "Mortar fire on Hill 209"? Or perhaps the memory device will be so bulky that it will be an adjunct to field telephone installations, receiving a coded signal and playing a message in the appropriate language. Note that this compression of stereotyped messages is already employed, for example, by Western Union in its canned greeting messages for birthdays or Christmas.

The vocal communication may not be the best for all situations. In many cases, communication by sketches, maps, or conventional signals (flag hoists, again) may be better adapted to the particular problem at hand. In aircraft control, one can operate directly on the pilot's instruments. For example, in the integrated cockpit display system sponsored by the Office of Naval Research (ONR), one could indicate a desired destination directly on the navigational plot, or put maneuver signals on the contact analog display. Indeed, the ability shown in the ONR project to get completely free of preconceptions about knobs and dials would be a necessary requirement for the designers of the communications equipment. The obsession with the spoken or written word may, in fact, be an unnecesssary handicap in approaching the problem. Certainly a miniaturized form of the facsimile transmission used to send weather maps would be a contribution to the basic problem.

It would be possible to develop at some length the advantages which might result from the type of device here proposed. Doubtless this audience can suggest many which have not occurred to me. But for the moment, it seems better to leave the problem fairly unadorned and let discussion bring out further points. It should be remarked in closing that the proposition is a "blue sky" one in an unexpected and frustrating sense—you have been presented with a suggestion for constructing a machine without having the basic design requirements formulated. I firmly believe that the essential first step is the conference of prospective users, and that the computer designers will have to wait in the wings until a specific body of information for communication has been proposed. So, in a sense, this paper is being given to the wrong audience. However, perhaps some of you have dual allegiance to requirements as well as to hardware; the rest of you probably have colleagues who should be prompted into the requirements type of activity. In any event, I hope there will be enough meat in this paper to persuade you to campaign for a set of requirements which will allow the computer experts to produce a useful and portable method for communicating across language barriers.