Shigeru Sato ／ Professor ／ Graduate School of International Cultural Studies

Profile

Professor Shigeru Sato received his BA degree in linguistics and phonetics from Tokyo University of Foreign Studies. He then furthered his studies in language at the Research Institute of Electrical Communication, Tohoku University, focusing on the quest for the mechanism of speech/language generation and natural language processing which led him to a PhD degree in speech science from the School of Engineering, Tohoku University. From 1980 through 1992 he worked as an associate and a full professor at Tohoku Institute of Technology. Since 1993 he has been with the Graduate School of International Cultural Studies, Tohoku University as a professor in linguistics and language education. From 2002 through 2007 he was an active member in the 21st Century COE Program in Language, Brain and Cognition, whereby he expanded his research areas into the study of the multilingual brain using fMRI facilities.

Research Activities

The knowledge accumulated in DNA over the last several million years in the path toward *homo sapiens* and the ceaseless process of the evolution of the brain nervous system; these are the basis of the language we see today. Looking into the language development in a child, you would wonder at the accuracy of programming of temporal timing in expanding DNA information throughout the entire growth process. Simultaneously, this program is flexible enough to accommodate whatever type of language it has to deal with. This regularity in language acquisition and the seemingly endless diversity of its form have constantly attracted our interest and made us wonder about the mechanism of how it all works. Now, our globalized modern society awaits the application of the achievements reached in studies of language.

Recently we carried out investigations into the brain activities of trilingual speakers whose native language is Korean and second languages are English and Japanese, where the duration of English study has been more than twice that of Japanese. What we wanted to find out is whether there is any difference in understanding a sentence according to the degree of similarity in syntactic structures. We found that for English, the load is heavier, with a broader range of the brain activated despite the longer time spent learning it (see figure). Our hypothesis is: the more remote the structure, the more difficult the learning.

We also conducted a study on learning foreign words and phrases in two different modes: text-based and situation-based. Here we found that for native users of Japanese, Korean words learned in these two different learning modes are stored in separate regions of the brain, causing delays in retrieval time when retrieved in the other mode. That is, it takes time to transfer what has been memorized in one part of the brain over to the other. One may surmise from this that the foreign language expressions you memorized the day before an exam may be reflected in the test results but not necessarily in the actual setting of language use.

In our study of language learning we have put effort into cooperating with scholars in related disciplines: computer science and medical science, which has been an enormous help in model building based on mathematical modeling and, in the form of brain activities, visualization of grammatical phenomena like scrambling, passivization, lexical access, etc., especially in multilinguals. Supported by rapid development in brain imaging techniques, efforts in linguistic observation combined with modeling/simulation techniques will hopefully soon bear fruit in uncovering the substantial parts of the uniqueness and diversity of human language.

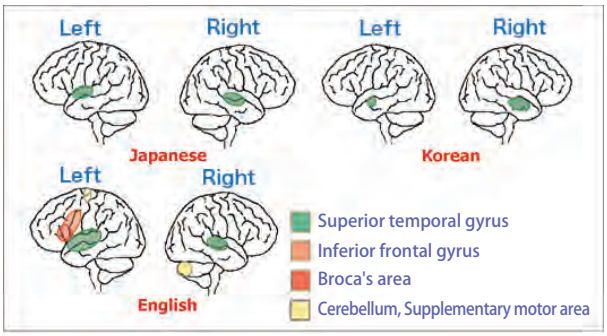

Figure : Brain areas activated in sentence comprehension by native speakers of Korean

Message

It was such a long time ago, but I recall it as if it were yesterday. I belong to the generation of the worldwide student riots of 1968-1970, during which period many university campuses were devastated. The season of student riots was also the time of the emergence of generative grammar and speech science based on acoustic theories of speech production. Those were the days when this field internationally attracted a lot of scholars and students wanting to investigate the human language. Today, in the midst of discussion with my students I sometimes feel I still keep track of the path I was on forty years ago; the old excitement immobilized and my problems unsolved after all these years. Whatever the problem you set up, I am sure that lasting concentration on what interests you in your younger days will guide you to a fruitful future.