Letter From the Desk of David Challinor
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The human brain is an incredible organ. Studies of how it evolved have shifted from comparisons of its anatomy with the brains of other species to the molecular devices that control its development. The latter has broadened our understanding of the great differences among species in their use of the senses and in processing information. Our brains evolved by slowly adding elements to its components so that humans have developed larger brains for their size than other animals. An interesting and inexplicable anomaly is that human brains have become smaller since the time of the Neanderthals about 30,000 years ago. There is a cost to this apparent disproportionate brain size; the metabolic energy of a large brain such as ours requires a continuous high quality food supply, especially for infants who depend on adults for sustenance for a relatively long time. Even infant brains are extraordinarily active. For example, at seven weeks the neurons leading to the growing cerebellum are already insulated with myelin, enabling these long nerves to conduct and process information rapidly. This ability of infant brains is a crucial factor in enabling humans to master language and to speak intelligibly only a few months after uttering their first words. It appears that infants can master any language spoken to them (even before they can talk) because they can distinguish the sounds of spoken words in any language. The earlier a child is exposed to a language, the better he/she can speak it. A five- or six-month-old Japanese baby has no problem distinguishing between "road" and "load," but for some unknown reason this ability to differentiate sounds disappears before the child actually talks.

An infant's ability to receive and store in their memories sounds used only in certain languages was first demonstrated in September 1998 in a neurophysiological experiment involving spoken Estonian and Finnish. Estonian has a vowel "*" that is not found in Finnish, but there is an "ö" sound common to both tongues. By attaching electrodes to the scalps of six-month-old Estonian and Finnish babies, researchers could monitor the auditory cortex of their brains. They found that both groups of infants could distinguish between the two "o" sounds. However, six months later, the Finnish children lost the ability to tell them apart. Thus there seems to be a relatively narrow window of opportunity to become an accentless native speaker. Children are evidently born with an innate ability to distinguish sounds and at two or three months can store and keep separate specific intonations of each native speaking parent. When these children start talking, they have no trouble addressing each parent in his/her own tongue without accent. It is a clear case of "use it or lose it." Each parent, however, must address the child from birth regularly in his/her native language. A hiatus in using either language at this crucial time of brain development dooms the child to speak the neglected one with an accent.

By hearing a set of sounds over and over, the infant reinforces the word sounds in its memory. Eventually the infant brain capacity for storing language sounds can be reinforced no

more. Then the child has in its memory a kind of mental map for both languages so that its brain processes sounds to reproduce them correctly while speaking. The amazing aspect of the brain's

capacity to handle languages is that in childhood it is only necessary to hear another tongue. The developing brain seems to store a phonetic map of what it hears. The infant eventually has to learn proper grammar and syntax, but by merely listening to a tape recorder of another language, it will be able to speak it later more fluently and with a better accent than a child not so exposed.

What exactly is an infant's innate ability relative to language? Is it a process of learning language, or is it a built-in, genetically imprinted ability to speak grammatically even when the first language we learn might have been spoken to us ungrammatically? The jury is still out but Chomsky argues that we seem to be imprinted grammatically. He uses the analogy that children learn the language to which they are initially exposed "like flesh draped over a skeleton." He believes that we inherit a universal grammar just as we do all our other human characteristics. Although we learn or memorize words, there are no rules for putting sounds together as there are rules to structure a sentence grammatically.

Further support for the innate ability to use words grammatically arises when linguists compare two languages that never have had (as far as we can tell) an historical contact, yet both have the same structures and characteristics. Professor Cinque of the University of Venice found evidence of this universality in language when he analyzed 500 languages; he found that the order of adverbs in sentences, when isolated by meaning, did not vary. This uniformity applies to virtually all aspects of speaking. Thus the basic structure of sentences appears to be exactly the same in all languages. There is no obvious reason for uniform grammar except that it may be a consequence of our evolution, similar to our being bipedal.

Cinque's research was an enormous project and it demonstrated what had heretofore gone unnoticed -- this universality in language structure -- because research concentrated on the differences between languages rather than on the less obvious similarities. Nonetheless, some scholars still argue that grammar is not innate but must be learned. They believe that the similarities among languages are the result of built-in constraints in our neural systems that allow us to talk in the first place. With so many different speaking cultures having to solve the grammar problem, they all ended up with the same and perhaps the best and only solution. Thus the language similarities resulted from the thought processes that caused them to evolve, rather than grammar evolving as a hard-wired genetic characteristic. The two approaches to this problem may never be fully resolved. However we come to master our initial language, the process for learning an additional language as an adult is quite different.

When adults use a new language learned after infancy, their brains have to filter their natal tongue, causing the speaker to force the new language through that part of the brain that lets us talk. This extra effort often causes mispronunciation and accented speech. This was the case when Al Gore and George W. Bush campaigned in Spanish recently. In an interesting article in The New York Times of 5 August 1999, language experts evaluated the efforts of both politicians and not surprisingly found that each had made mistakes in grammar and

pronunciation. Campaigning in the U.S. has changed considerably over the years, as evidenced by two highly

visible candidates attempting a speech in Spanish. Their audience, I am sure, appreciated their efforts. Years ago John Davis Lodge, who was married to an Italian, used his fluency in that language to campaign successfully for Governor of Connecticut, and today a bilingual ability can be an important political asset. However, as adults it is wise to check with a native speaker before using an unfamiliar language in a major address. Many will recall the late President Kennedy addressing a crowd in Berlin when he went there to celebrate the successful airlift that broke the Soviet blockade of that city. Kennedy used the expression "Ich bin ein Berliner." Literally this means "I am a doughnut-like pastry (berliner)." To identify oneself as being from or of Berlin, one would say "Ich bin Berliner," leaving out the article. Politically he made his point, but there must have been some restrained chuckles in the audience.

Although infant-exposed and learned multilanguage maps seem virtually superimposed on each other in a specific part of the brain, languages acquired later in life tend to be handled in various areas of both brain lobes. The circumstances under which a second language is learned also influences how the brain processes it. If the second language is similar to the first, such as Spanish and Italian, the brain does not have to work nearly as hard as it would if the second language was a remote one like Chinese. The best way for an adult to master a new language is to move to the country where it is spoken. Short of that, Berlitz promotes a total immersion technique wherein the student listens to native speakers all day, every day, for about a week. Techniques for learning difficult languages are improving so that even adult native Japanese speakers are able to distinguish between "r" and "l" sounds. The Japanese students used a computer to manipulate the confusing words to make the two sounds as distinctive as possible. The listeners would strike the key of the sound they thought they heard. It did not take long for them to master the sound distinctions in the English words, even when they heard them spoken in a slurred manner.

The recent progress made in understanding how a new language is gained has become increasingly exploited in the nation's elementary schools. In California, Texas and Florida, the percentage of Spanish speakers has grown quickly. By taking advantage of the astounding facility of children to handle a second language, the country's school systems can exploit this heretofore neglected talent and possibly produce within a generation a significant bilingual population for the benefit of us all.

Even adults are not necessarily disadvantaged neurologically when learning a new tongue. Current language teaching techniques are enabling adults to lay out new language maps in their brains, and although we cannot yet replicate the process by which infants master language, we may find a hidden key to help us all. Although English is the globe's dominant language and its use is still expanding, especially through the internet, most of those for whom English is a second language feel possessive about their natal tongue. Not only is it a courtesy to your hosts to use their language if possible, but tangible and intangible benefits can accrue. For example, an

government, something no other foreign bank could do. He believes that his Iranian colleagues helped him because they respected him for conducting business in their language. Learn a new language! It is never too late and it can be a rewarding experience.

David Challinor
Phone: 202-673-4705
Fax: 202-673-4607
E-mail: ChallinorD@aol.com

P.S. Much of this material was gleaned from two articles from New Scientist, which appeared this summer.