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LANGUAGE BEHAVIOUR AND THE BRAIN MECHANISMS

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ABSTRACT

The belief in the innateness of language is based on several arguments, and one of these is that all human languages obey some rules, and these are called universals. Universal rules of language show that they are built-in in the human genetic information because otherwise languages would diverge. The genetic information is based on deep and innate principles which can be found by serious exploration of a single language. Hence, it is important to determine which universals are a result of the fact that languages are means for communication among humans. In this article, we will determine whether or not the rules of Universal Grammar (UG) exist in all 'possible human languages'. For this purpose, we will explore: (*a*) the human brain and its functions in the process of language acquisition, (*b*) what are the rules that all languages obey and (*c*) if the same UG principles work in second language acquisition (L2A) which work in first language acquisition (L1A).

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What are Universal Principles

Uniformity in the pattern of acquiring different languages suggests that the children have 'genetic guidance' in producing different sounds and in constructing grammatical rules of their languages. These innate rules are universal principles in all languages. How do learners learn all these systems? Definitely, there is a covert system which helps them to act upon certain instructions produced by the brain. The question arises whether or not the brain sends different instructions in the case of L1A and L2A? For understanding human cognition, first we will explore the human brain.

Human Brain

The human brain appears over-endowed. The average adult human brain consists of some 12,000 to 15,000 million nerve cells (15,000,000,000). That is about three times the entire population of the earth.

The human nervous system, controlled by the brain, begins its development only 20 days after conception. Five weeks from conception brain development starts in earnest and after eight weeks the first of the two brains spurts begins. At this stage the brain represents half the total length of the foetus (still only ½ inch long). This is when the neuroblasts begin to grow. Neuroblasts are embryonic cells that will in turn become neurones, or brain nerve cells. They increase at the rate of several thousand a minute. Twelve weeks after conception, the tiny foetus is now adding neurones at the rate of 2,000 a second. Compare it with the brain of adult honeybee, which contains some 7,000 neurones. A bee can accomplish building and maintaining a honeycomb, calculating distance, signalling to its companions the direction of pollen sources, and recognising a course by sight and smell. All with the number of neurones the human foetus develops in under 3 seconds.

About twenty weeks after conception the human embryo has laid down its entire nervous system: 12-15 billion neurones. Twenty-eight weeks after conception (about ten weeks before

birth) each neurone starts to send out numerous thin fibres to make actual and potential connections with other neurones. The power of the brain is largely a function of the number of neurones and the richness of their connections. Since each neurone can itself make thousands of connections, the potential number of inter-connections in the brain runs into trillions. The most significant point to remember is that only some of these connections are made automatically. Most are made by using the brain. The more one's brain is stimulated, the richer the connections and the higher one's practical mental ability. Many of the basic interconnections are made before the age of five. By age five, the size of the child's skull will be 90% of adult size. Full adult size is, in fact, reached at about age ten. The brain now weighs about 3 lbs. That is about 2% of the body yet the brain requires 20% of the oxygen supply. Oxygen is equally vital to the brain before birth. The foetus of a woman who smokes receives less oxygen and the subsequent reading scores of such children are generally below those of non-smoking mothers.

The role of nutrition in brain development is as important in the early years after birth as it is before birth, since malnutrition will not only reduce the number of neurone cells but also the number of connections between nerve cells. So many experiments have been made on rats, even the famous behaviourist Skinner presented his theory of operant conditioning on rats experiments. The reason is that their nervous system is quite similar to that of the human. In studies on rats, it has been found that neurone connection can be reduced by 40% simply due to poor nutrition. This is another significant point to remember why the process of language acquisition in children differs from each other.

The neurones in the brain are fixed before birth. Unlike any other body, brain cells do not usually regenerate themselves. Different controversial theories of language acquisition are, in fact based on the fact that language cannot be learned after the critical age. What is that critical age? It is said that this period consists till the age of puberty, *i.e.* 14 years. My question to those linguists who say so is why not this critical period is based

on 10 years when the brain is complete, *i.e.* the same size of the adult brain, as language is directly linked with brain not with body. Then why do certain physical changes fix that critical period?

Of far greater significance is the fact that the number of connections between neurones continuously grows which means an improvement of mental ability with age. It shows that the concept of critical age stands nowhere. Body deteriorates but not the brain. Arteries become clogged as fat builds up inside the walls and people suffer diminution of blood supply, *i.e.* oxygen feeding the brain. If these arteries are cleaned, patients show a significant reduction of nervousness, mental distress and loss of mental ability.

Human brain hoards potentials so great that that they are just about unimaginable. Chomsky's Universal Grammar is just a part of it. The consistent conclusion is that the proportion of a human's potential brain power that he uses is probably nearer 4%. The 96% of the human mental potential lie unused.

The fundamental determinant of the brain's potential is the number of connections it can make. There have been five pre-historic landmarks in the use, rather than mere possession, of this vast potential intelligence; walking on two legs, increasing manual dexterity, tool-making, speech and writing.

Speech alone makes this two-legged amphibian creature Human. How does a human child acquire it? How does the human brain function in all this process which ultimately leads the child to the language acquisition?

Functions of Human Brain

The brain is the only organ that expands through use. Expand doesn't mean in size, but the more it is used, either to acquire facts or in the process of creativity, the more memory associations are formed. The more associations are formed, the easier it is to remember previously acquired information, and also to form new association, *i.e.* create new ideas and concepts.

At the early age when mind is not preoccupied with worldly affairs children mostly use their brain and learn quickly with the help of mental faculty or let me call it Universal Knowledge. Children try to make their own sounds, own sentence structures and make adults to understand those sound patterns or syntactic structures. How do they connect one word to the other, one idea to the other is still amazing and unresolved? This is how a man has, quite slowly, come to make an increasing practical use of a fraction of his mental capabilities, and probably will take thousands of years to learn to put to proper use if ever he exists.

The way most of the human beings live, they are trained to use their one side of the brain and the other side is used either less or it is used in such a way that there is no connection between the Left side and the Right side of the brain.

Left Brain / Right Brain

Two halves of the brain tend to have different functions and they are connected to each other by an incredibly complex network of up to 300 million nerve fibres called the Corpus Callosum. The left brain primarily appears to deal with language and mathematical processes and logical thought, sequences, analysis and all kind of academic pursuits. The right brain principally deals with music and visual, pictures, spatial; patterns, and colour recognition.

It is the left brain that is dominant. If both hemispheres are connected, the potential of the brain for learning and creativity can be increased tremendously. Leonardo De Vinci is often as probably the best example in history of the genus that can be liberated when left and right brain activities are fully combined. He was the most accomplished artist, mathematician and scientist, he could write simultaneously with his left and right hand.

Brain and its Function in Language Acquisition

Language is not imitation of patterns produced by people around us, rather it comes from inside just like emotions and feelings of love and hate. The internal love of parents for their

children does not come from outside neither it dies if the children go away for one reason or the other. It remains inside them. This is an inward process of right brain which is stimulated by external factors; a magnetic electronic current is passed through thousands of neurones to the brain. So is the case with a language.

Language is not what a person does, but it is what a person is doing, *i.e.* a complete unseen process which takes place in the left brain of the speaker — a process of getting ideas (acquiring) and turning them into sounds and words and letting them enter into the ears of hearer which get shapes and can be observed by the eyes of hearer. This is how an abstract object moves into the physical world and this relationship between as abstract and dynamic world is yet to be known.

Children just match the input with their language faculty and their output is not necessarily the result of a sentence or discourse that they have heard in the past.

As different flowers produce different smells, their output is the same but varies in the fragrance from flower to flower — the same thing can be seen in children learning their languages — at different stages of life, they almost produce similar kind of utterances which vary from child to child. As the fragrance of flowers is the natural process and no one can stop it, so the language, it comes automatically through innateness. Children formulate their own rules for communication.

The idea that bee has some innate qualities which help it to construct the honey comb in hexagonal structure is rejected by saying that it happens due to the equal pressure from all side. Right, what idea works behind all the procedure of getting message, measuring distance, sucking the elixir of a flower and storing it in the hive — who gives this training to each bee how to distribute different duties among themselves so that a complete harmony can be achieved?

How does a garden spider learn to construct a web? Climbing to the top of a twig, it sticks her abdomen comically

into the air. From its organs called 'spinnerets' she releases a stream of liquid which is instantly solidified into a silk strand one twenty-thousandth of an inch thick. When its end, wafts on the breeze, has stuck to a twig one or two feet away, she pulls the line taut with a leg to adhere her own end of it to the twig on which she stands. By means of her ingeniously formed bridge she fixes a sagging silk line between the twigs. Dangling on it acrobatically she joins its centre to a twig vertically. In this way she has an inverted triangle. Its apex becomes her web's hub. Then, working with utmost grace, round and round outwardly to the web's perimeter, she weaves a broad-spaced spiral.

It is a whole cognitive process which comes from within and that is its innate characteristic. If a bee or a spider, having 7,000 neurones only, can work without prior learning, why not a human child with 12-15,000 million neurones?

The Functions of Brain with Sound

Language is a mathematical subject which has its own symbols. These symbols reflect different ideas in mind as a cognitive idea or a psychological idea. Ideas are abstract, therefore, thoughts or ideas are transformed through symbols.

In the abstract world people can fly, but in the physical world a person cannot even imagine. This is a difficult task to bring a new language from the outer world into the inner world where a child can physically see a new language; from generative world into interpretative world of sound. Therefore both the speaker and the hearer are doing language. Former is making language and the latter is listening to it, *i.e.* sharing ideas. Ideas which come into the mind of the speaker are static, it means these ideas are perfect because anything in abstract shape has no error in it. Children hear not only the ideal language (static), but also the dynamic version of a language; language which is used in a real life, therefore, errors must be a part of that language.

Language is pseudo-mathematics, *i.e.* every child hears the same sound but handles it differently according to his

personality, cultural background, family ties to it, character, behaviour, aptitude etc. so the ratio of language acquisition differs from child to child.

Universals and Brain

Chomsky says that children are biologically endowed with innate language faculty which lies within the brain and which provides them with algorithm (set of procedures) for developing grammar on the basis of their linguistic experience (speech input and output). The theory of Universal Grammar (UG) has forced all linguists in the study of natural language as well as to the significant developments in the study of L1A and L2A. This change can easily be traced in linguistics which shifted the study 'behaviour or the products of behaviour to states of the mind/brain that enter into behaviour' (Chomsky, 1986).

Grammars within this framework are observed according to 'the state of the mind of the person who knows a particular language' (Chomsky, 1986). In the late eighties and early nineties a lot of research has been done on LA to isolate and specify the properties of the underlying competence necessary for language learning. It is taken seriously that UG is a theory about biologically programmed language faculty that characterises the initial state of the human organism (already discussed under the heading Brain).

UG is a theory of the essential properties of grammars as well as a theory of a specific domain of human cognition. It explains 'the richness and complexity of the system of grammars for human language' (Chomsky, 1981), and its rapid and uniform development in human brain in the process of learning LA. UG provides a system of principles, conditions and rules that are major elements of all human languages. UG tries to disclose the secrets of the mystery behind all those rules and principles that are uniformly attained in languages but are yet to discover. How certain parameters that specify dimensions of structural variation across all languages fixed by experience are gained in the language learning process, *e.g.*, word-order variation which is

found in natural language grammars and which can vary only along a small number of parameter (*i.e.* dimensions) and that each parameter is inherently binary (in the sense that it allows only two settings), verbs either raise or do not raise from V to I (Verb to Inflection), and auxiliaries either raise or do not raise from I to C (Inflection to Complement). The relevant parameters (*i.e.* dimensions of variation) are associated with the features of functional categories like I and C: each such feature is either strong or weak.

(*a*) Cierre usted la puerta! (Spanish)

Close you the door! (= close the door, will you!)

(*b*) Marcel aime pas les flics (colloquial French)

Marcel likes not the coppers (Marcel doesn't like coppers)

(*c*) Deutsch spreche ich nicht (German)

German speak I not (I don't speak German)

(Andrew Radford, 1997)

It may be that Spanish sentences such as (*a*) are derived in essentially the same way a Early Modern English imperative structures such as

'Fear you not! (Lorenzo, Merchant of Venice, V.i)

'Fear you not him! (Tranio, Taming of the Shrew, IV.iv)

Two successive applications of head movement, where by the verb moves from V to INFL to COMP. So it can be generalised to the word order properties of other languages that in Spanish sentence (*a*) the verb cierre 'close' moves from V to INFL to COMP. The fact that the verb aime in French (*b*) is positioned in front of the negative particle pas 'not suggests that the verb raises to INFL, essentially as in Early Modern English negative structures such as:

'I care not for her' (Thurio, Two Gentlemen of Verona, V.iv)

Thus, in principle we can deal with word order variation across languages in precisely the same way as we have dealt with word order variation between different historical stages in the evolution of English.

Intelligence comes through UG and wisdom comes through experience. UG must be stored in some form in the brain because grammatical competence lies in native speakers' intuitions about the grammaticality and ungrammaticality of words, phrases and sentences in their native language. Pre-school going children often produce words liked goed, wented, comed, buyed etc. and adult native speakers suddenly realize intuitively that such forms are ungrammatical. How do they come to know this difference? What is in the brain which tells them that sentence like (*b*) given below as ungrammatical?

(*a*) Where are you going?

(*b*) *Where you are going?

(*a*) I like syntax.

(*b*) *Like I syntax?

(*a*) I don't like syntax.

(*b*) *I no like syntax.

What kind of principles govern the formation in English to say 'Who did you see Mary with?' but not to say '*Who did you see Mary and?' what principles govern the interpretation which tell the learners of the language in use how to assign meaning to compound words say in English words like man-eater and man-made. What UG rules tell that in man-eater, the *man* is a patient on which an action is going to be performed and in man-made, the *man* is an agent who is going to act.

UG is a set of hypothesis about the nature of possible and impossible grammars of natural languages. The grammar of a particular language tells specification of parametric values of that language. As a theory of the biological endowment for language, UG 'provides a sensory system for the preliminary

analysis of linguistic data and a schematism that determines quite narrowly a certain class of grammars' (Chomsky, 1975).

"UG maps a course of experience into a particular grammar that constitutes the system of mature knowledge of a language, a relative steady state achieved at certain point in normal life." (Chomsky, 1980:65)

In UG the parameter values are always the same either head initial (*e.g.*, English: subject + verb + object) or head final (Urdu: subject + object + verb). Consider the head position in the following:

Jean drinks his coffee. (English)

(Subject + verb + object)

Jean boit son cafe. (French)

(Subject + verb + object)

Jean coffee peetah hai. (Urdu)

(Subject + object + verb)

Linguistic theory suggests that development in L2A is constrained by a number of universal principles, *e.g.*, structure adjacency and right roof constraint etc.

a book by Chomsky

Chomsky ki kitab (Urdu)

(by Chomsky a book)

a book about linguistics

about linguistics a book (Japanese)

In this connection the principle of phrase projection parameter in English is Head initial, whereas in Urdu and Japanese it is head final.

Natural Order Hypothesis (Krashen, 1985) shows that children acquire the rules of language in a predictable way, some rules tending to come early and others late. The order does not appear to be determined solely by formal simplicity and there is

evidence that it is independent of the order in which rules are taught in language classes.

Another structure dependency can be seen in the position of Adjective and Adverb phrases:

This is a nice book	V + A + O
Yeh kitab acchi hai	O + A + V
OR	
Yeh acchi kitab hai	A + O + V

In English adjectives always precedes objects, but in Urdu they can take their positions on both sides of the object.

He eats an apple.	V + O + A
Woh rozana saib khata hai.	A + O + V

The position of adverbs is fixed in Urdu language where as in English language they can be used even in the beginning of a sentence:

Next day, early in the morning he went ....

Another case where the grammar seems to go beyond the input is in yes, no questions. For example

(*a*) John is going there.

Is john going there?

It is not just movement but something more than that which can't be taught in language classes by giving rules.

If it said that it is the second word which is removed from I to COMP then

(*b*) The man is going there.

Is the man *t* going there?

In (*b*) the second word is man and it does not leave its position. Just assume that it is the first verb which changes its position:

(*c*) The man goes there every day.

*Goes the man *t* there every day?

It becomes ungrammatical. If it is assumed that it is the first word which makes yes, no question then

(*d*) The man who is tall is here.

*Is the man who *t* tall is here?

A child will never utter a sentence like 'Is John is going there?' The question comes into the mind how does he acquire this kind of knowledge about the word order rules?

In his daily life he has never encountered such kind of a sentence. Who gives him the information about what to say and what not. Definitely, there is a system working behind all this process which tells him about the construction of sentences other than his experience of this world (input). Another example is the well-known pair:

John is eager to please.

John is easy to please.

(Chomsky, 1965)

The two sentences seem to have the same structure, but their underlying structures are different. In the first John is claimed to please other people, in the second other people are claimed to please John. The sentences of English that the speaker has heard may be like; Mary is eager, This is easy, Is John eager to please? None of which differentiates the two structures. Such accidental and improbable occurrences cannot explain why children go through the same stages in acquiring 'eager/easy to please' and are successful at about the same age. (Cromer 1970)

With out any doubt, a child must have done so from some property of his mind if he has not learnt this distinction from his input. This principle about the property of brain is known as the poverty of stimulus which tells that a child knows things about language he could not have learnt from outside and moreover these aspects of language are not learnable. A child is not

generally aware of the rules that govern sentence interpretation in the language that he knows, nor is there anything to believe that the rules can be brought to consciousness. His performance provides evidence for the investigation of competence and it is quite difficult to find out how performance can be seriously studied except by formulating and analysing different hypothesis. All the different hypotheses studies done by Krashen, (1965), McNeill (1966), Corder (1967), Ritchie (1978), Raven (1978), Zobl (1980), Dulay and Burt (1983), Otsn and Naoi (1986), Chomsky (1986), Lightbown (1986), Odlin (1989), Sorace (1993), Cook (1993-94), give the solid proof that the language properties inherent in the human brain make up UG, which consists, not of particulate rules or of a particular grammar, but of a set of general principles that apply to all grammars and that leave certain parameters open. UG sets the limits within which human languages can vary, *e.g.*, pro-drop parameter which is the relation ship of government between subject and verb (Chomsky, 1981).

'The grammar of a language can be regarded as a particular set of values for these parameters, while the over all system of rules, principles and parameters is UG.' (Chomsky, 1982)

UG defines the notion 'possible human language'. Universals are properties that are showed by all languages. They are therefore extractable from any one language, *i.e.* human languages whose grammars incorporate the universals (certain innate properties of the human mind). It is on the basis of these properties a child begins to construct a grammar out of the utterances in his linguistics environment. UG is a part of brain, 'We may usefully think of the language faculty, the number faculty and others as 'mental organs' analogous to the heart or the visual system or the system of motor coordination and planning.' (Chomsky, 1980:39)

Universals grow in the child's brain just like the neuroblasts or embryonic cells which turn into neurones that grow at the rate of 2,000 per second to 12-15 billion to form a complete human brain. As this growth takes place within the body, in the same

way language grows inside the child's brain in a particular environment, but not from external input. Learning is the 'growth of cognitive structure along an internally directed course under the triggering and potentially shaping effect of the environment' (Chomsky, 1980). Language acquisition is the growth of language in the part of brain triggered by certain language experiences which are abstract representation of external stimuli. Let us analyze how this stimuli system works in ordinary life.

An Electro-chemical system deals to control the movement of the brain, *i.e.* a kind of digital system which works inside the body (communication between cells), and another system 'analog system' which works outside the body as stimulus. No one teaches a child to produce random noises which ultimately turn into aerodynamics, *i.e.* how to control the air flowing system and how to produce a specific pressure in the lungs and throw it out at a proper time by contracting certain muscles. This control is whether done by the lungs or by contracting muscles in the mouth. The brain simply gives the signal to produce certain sounds. Muscles communicate with each other all the time and it is on their part to check which muscle in the act of producing those particular sounds will take part. For example, there are eight muscles in the tongue. What is done by muscles cannot be done externally? This is not learnable. It is an automatic system. All muscles are connected to each other via nerves with spinal cord. This system is linked to each other as a whole. The flow can be on any direction. The function of one muscle is to tell the other muscle how it is getting on at a certain task/goal. The second function is the execution or doing the task. Third function is doing as the message says, *e.g.*, do a particular sound. This is the intelligence of muscles to know how to produce that sound. In doing so all muscles take part in different ratio. This system of knowing and arranging is called equation of constraint. These are the same kind of constraints which we find in subjacency, *i.e.* a constraint on possible operation which tells how to handle this system in a particular 'gesture'. The grammar construction goes beyond evidence from input:

(*a*) John believes [that it was stolen by Mary.]

(*b*) John believes [the claim [that it was stolen by M.]

(*c*) *Who does John believe [the claim [that it was stolen by it]]

Another case of subjacency, the 'right roof constraint':

(*a*) [That John had left was obvious]

(*b*) [It was obvious] that john had left

(*c*) [That it was obvious [that John had left] was disturbing]

This is done beyond the reach of learnability level, at the level of abstraction, *i.e.* at the static stage where

$2 + 2 = 4$

$3 + 2 = 5$

$7 + 4 = 11$

but how this level of abstraction can be achieved, no one knows. Instances of general concept, *i.e.* $X + Y = Z$ or generalisation in structure, *i.e.*

NP (Noun Phrase) = D + N

= the + table

= a + boy individual instances

This system is genetically endowed. Thus every child is born with some intrinsic knowledge which can't be taught. This system of intrinsic knowledge stimulated by extrinsic system gives particular positioning which is defined by equation of constraint. If any one tries to teach something a learner already knows creates problems:

CHILD: Nobody don't like me.

MOTHER: No, say 'nobody likes me.'

CHILD: Nobody don't like me.

[exchange repeated 8 times] finally

CHILD: Oh! Nobody don't likes me.

(McNeill, 1966)

The system of universals is already there which is a constraint in all languages. It helps all other extrinsic systems to co-ordinate with the intrinsic system so that they can work together.

There is another system which organises and controls the flow of information along these waves coming from the brain through spinal cord is known as 'Tuning'. Muscles send constant messages how much help is required. Just take the example of a centrally heating controlled building. There is already a control room for heating system and the thermostat in every room sends constant messages to that system so that the temperature can be checked. This system which tries to control the balance or equilibrium is hidden in messages which travels from muscle to muscle to co-ordinate. This signalling system makes equilibrium.

Innateness (an unknown device of the brain) sends signals to the lower system to perform certain language tasks, and that system which works at the lower level can be learned with the help of extrinsic knowledge.

The principles of structure dependence can't be learned but they form a part of the conditions for language learning at the lower level. Principles within a theory of UG constitute a part of the biological endowment for language. As in the process of the production of sounds, one muscle helps the other, in the same way, to acquire a particular language, a child also needs the evidence of that particular language so that he can fix the parameter for the order of S + V + O + A. This is known as markedness.

Given the intimate relation of UG to acquisition, it is easy to define markedness as 'a way that is exclusively related to learning' (Williams, 1981) which provides evidence that is required at the lower system to arrive at a language-particular feature of a grammar.

UG helps a child to devise a hypothesis. He listens to the input, matches it with his core grammar, formulates his own rules and then utters a sentence. Constraints are the limitations set for every human being beyond which no one has access.

This is the same kind of constraint which Wordsworth finds in his mystic experience of the higher world where both the physical and the abstract worlds are combined and he becomes a part of that new world, loses his own identity and becomes a dancing daffodil, or sometimes claims Child as the father of Man. His 'inward eye' takes him beyond the sensory boundaries. The same 'inward eye' shows Prince Hamlet his father's ghost, and makes Donne's soul to see from the highest mood of ecstasy into the depth of things where he could see his beloved's and his bodies lay dead the whole day communing in silence. What is that experience that changes Keats into a nightingale or makes him a loitering knight to kiss on the lips of Les Belle Dame Sans Merci. The constraints don't allow them to step beyond certain limitations.

These are the adult experiences which have evidence. The biological constraints for a child at critical age give positive evidence. These constraints (environment) set particular limits at a particular age and help the child fix the ways in which UG applies to that particular language he is learning. Much grammatical knowledge simply needs fixing at the particular lower level where language development interacts with cognition with the help of data provided by the core grammar. According to Chomsky's proposal human mind is equipped with a rich system of abstract principles due to its specific biological structure which constrains the class of possible natural grammars. This innate system of knowledge or UG constrains the empirical date set by child's linguistic experience.

Given these considerations, there is no question arises in the mind to suspect that there are no universal rules. Otherwise, adult learners would be unable to attain phonological, grammatical and semantic knowledge that arise only through

Universals if children and adult learners use different cognitive systems for language acquisition.

To sum up, L1 and L2 acquisition are governed by the same Universal principles which function throughout life. The art lies in finding those connections which are directly related to language behaviour and mechanisms from other billion and trillion neurone connections in the brain.

BIBLIOGRAPHY

Aitchison, J. (1990), All Paths Lead to the Mental Lexicon, '*Linguistic Theory in Second Language Acquisition*'.

Chomsky, N. (1968), *Language and Mind*. New York: Harcourt Brace World Inc.

Chomsky, N. (1975), *Reflections on Language*. New York: Pantheon Books.

Chomsky, N. (1980b), *On Cognitive Structures and Their Development*.

Chomsky, N. (1981b), *Principles and Parameters in Syntactic Theory*.

Chomsky, N. (1982), *Language and the Study of Mind*. Tokyo: Sansyusya Publishing Co. Ltd.

Chomsky, N. (1988), *Chomsky's Universal Grammar: An Introduction*. Oxford: Blackwell.

Chomsky, N. (1993), *Language and Thought*. Wakefield, RI: Moyer Bell.

Cook, V. J. (1993), *Chomsky's Universal Grammar and Second Language Learning*.

Dulay, H. C. and Burt (1973), 'Should we teach children syntax?' *Language Learning*, 23, pp. 235-52. New York.

Flynn, S. and Espinal, I. (1990), 'Head-initial/head-final Parameter in Adult L2 Acquisition of English' *Second Language Acquisition Research 1*.

Flynn, S. and Espinal, I. (1990), 'Introduction: Linguistic Theory' in *Second Language Acquisition*. Oxford: Blackwell.

Lust, B. (1986), *Studies in the Acquisition of Anaphora: Defining the Constraints*. Volume 1. Dordrecht and Boston: Reidel.

White, L. (1986), *Markedness and Parameter Setting: Some implications for a theory of adult second language acquisition*. Wirth, J. (eds.). New York: Plenum Press.

White, L. (1989), *Universal Grammar and Second Language Acquisition*. Amsterdam, John Benjamins.