

## Biological molecular legal linguistics in the organization of children's legal cells in line with acquittal or conviction by competent judicial authorities

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### Abstract

This article tries to combine the three sciences of legal linguistics, molecular biology in the framework of protecting human rights, especially children's rights, so that molecular legal linguistics biology can be practical and concrete for students of law, linguistics and biology fields. There should be an adaptation and finally the solutions for children's growth and upbringing will be formed in the channel of the above rule regarding the realization of rights and other individual and social rights of children. The theoretical framework of the research is in the form of Norman Fairclough's three levels of description, interpretation and explanation, which is implicitly hidden in the heart of the text and its layers so that it does not take on an amateurish state, and the research method is a combination of descriptive and correlational in the content, which tools Gathering information includes: observing the behaviors of law and language representation, library studies and reference bases of various sciences, which will eventually lead to such a specialization. Of course, surveys and other field studies are not effective in this field, and only independent and dependent variables have been used and explained, which are: main variable: legal linguistics along with two sub-variables which include: primary sub-variable, molecular linguistics and sub-variable The second is biolinguistics to establish correlation.

**Keywords:** Biological-Molecular legal Linguistics, Children's rights, Norman Fairclough, Law, Biology.

## 1- Introduction

The word biology (Sapolsky, 2017) is derived from the greek words /bios/ meaning /life/ and /logos/ meaning /study/ and is defined as the science of life and living organisms. An organism is a living entity consisting of one cell e.g. bacteria, or several cells e.g. animals, plants and fungi.

Aspects of biological science range from the study of molecular mechanisms in cells, to the classification and behaviour of organisms, how species evolve and interaction between ecosystems.

Biology often overlaps with other sciences; for example, biochemistry and toxicology with biology, chemistry, and medicine; biophysics with biology and physics; stratigraphy with biology and geography; astrobiology with biology and astronomy. Social sciences such as geography, philosophy, psychology and sociology can also interact with biology, for example, in administration of biological resources, developmental biology, biogeography, evolutionary psychology and ethics (Sapolsky, 2017).

Biology is a natural science discipline that studies living things. It is a very large and broad field due to the wide variety of life found on Earth, so individual biologists normally focus on specific fields. These fields are either categorized by the scale of life or by the types of organisms studied.

For example, (Sapolsky, 2017) the scale of biology can cover everything from genetics, biochemistry and molecular biology – studying the molecules of life inside our cells and how they help us function – to cell biology which focuses on the basic unit of life. There is also anatomy, physiology and other fields that focus on whole organisms, and to even larger scales such as animal behavior, population biology, and ecology and systematics that study groups and entire communities of organisms.

Other fields within biology focus on specific types of organisms such as bacteria and other microbes (microbiology), viruses (virology), plants (botany), animals (zoology), wildlife biology and marine biology. And often, biologists focus on both a particular scale and a particular organism, such as plant cell biology.

Many of the most interesting recent discoveries in biology (Sapolsky, 2017) have happened at the intersection with other disciplines such as biochemistry, biophysics, bioengineering, and computational (mathematical) biology and these intersections will be increasingly important in the future and also Biological molecular legal linguistics plays an important role in the bright future of linguistics.

Biology is also a foundation for other biology-based professions such as medicine, nursing and allied health, pharmacy and pharmacology, dentistry, and veterinary medicine and Biological molecular legal linguistics (Sapolsky, 2017).

(Systems Biology) Biology includes a wide range of topics and divisions from many topics and disciplines; Among the most important of these features, four interrelated features include the following, which can be called the basis of ancient biology:

- 1- Cells are the main unit of life. (cell theory)
- 2- New species and hereditary traits are the product of evolution.
- 3- Genes are the main unit of heredity.
- 4- Organisms maintain their internal environment to maintain a stable and constant state.

## Problem Statement

The goal of the problem is to create a close relationship between the two sciences of molecular-cellular biology and legal linguistics, and the importance of the problem is related to the compatibility of biological cases and legal linguistics.

**1- Cells :** The essential functions of the cell include: The cell provides support and structure to the body. It facilitates growth by mitosis. It helps in reproduction. Provides energy and allows the transport of substances. Cells can be compared to the law, which is the backbone of the framework of the laws of the states and countries through which they can be organized to have a society away from any kind of behavioral chaos and the commission of criminal offenses, which can be the fundamental particles of the formation of the system. Legislation should be implemented by the legislator, but in the first place, the first step is to choose the language of the law, which has its own characteristics and will be discussed in the following sections(Sapolsky, 2017).

**2- New species and hereditary traits are the product of evolution:** Evolution is the change in the heritable characteristics of biological populations over successive generations. It occurs when evolutionary processes such as natural selection and genetic drift act on genetic variation, resulting in certain characteristics becoming more or less common within a population over successive generations. The process of evolution has given rise to biodiversity at every level of biological organization and also Heredity is a process in which organisms acquire characteristics from their parents. These characteristics are called traits. Every individual is unique because they have a unique set of traits. The traits which are transmitted by the parent to its offspring during the process of fertilization are inherited traits. If we want to compare the evolution with the legal system and linguistics, we will notice the evolutionary changes in these two cases that different legal schools emerged and after that the language also found an evolutionary state that has been globally researched(Sapolsky, 2017).

**3- Genes are the main unit of heredity:** The basic unit of heredity passed from parent to child. Genes are made up of sequences of DNA and are arranged, one after another, at specific locations on chromosomes in the nucleus of cells. In the legal systems of the world, there are two main elements that make up the legal system of different countries, which act as the main building block of the legal system (inheritance): 1- Sharia, 2- Custom and finally lead to the creation of law(Sapolsky, 2017).

**4- Organisms maintain their internal environment to maintain a stable and constant state:** Although some organisms only have one cell or a small number of cells, the large organisms are structured at several levels: cells, tissues, organs, and organ systems. Cells are considered to be the basic units of life, but they also contain their own organization: parts that work together to achieve a goal. The role of people and various civil societies shows this importance(Sapolsky, 2017).

## 2- Research Questions:

### Main research question:

Why can Legal molecular biological linguistics correspond to biological science?

### Sub questions:

- 1) When will the comparative study between molecular biology and forensic linguistics be homogenized?
- 2) What factor has caused the creation of legal biological linguistics?

## 3- Research Hypotheses:

### Main research hypothesis:

So cells are made of molecules and sub consequently of atoms. In this section, the atom is the letters that are the result of word formation and the higher levels of creating speech, and the simple and syntactic layers of the language up to its macro levels can be compared to molecules that are formed on the basis of Chinese characters, but legal linguistics Our cell is considered to be made up of many molecules.

#### Sub-hypotheses:

- 1) This conclusion can be reached by examining their genetic structure.
- 2) Cells, New species and hereditary traits, evolution, Genes, Organisms In addition, law schools can be the cause of creating such a specialty.

#### 4- Research literature

Research has been done in this field, which include:

- 1) A research has been conducted under the title of Clarifying the Notion “Parameter” by Uriagereka, J. in 2007:

This article aims to reflect on linguistic architecture by re-examining language variation. Three progressively deeper forms of variation are suggested, each of which arguably contributes to this exercise in rather different ways. The discussion that unfolds will then lead to a new twist on the question of whether MP and OT are compatible.

- 2) A research has been conducted under the title of Natural Language And The Genetic Code: From The Semiotic Analogy To Biolinguistics by Enguix, G.B. and López, M.D.J. in *Proceedings of the 10<sup>th</sup> World Congress of the International Association for Semiotic Studies* in 2012:

With the discovery of the DNA structure (Watson and Crick, 1953), the idea of DNA as a linguistic code arose (Monod, 1970). Many researchers have considered DNA as a language, pointing out the semiotic parallelism between genetic code and natural language. This idea had been discussed, almost dismissed and somehow accepted. This paper does not claim that the genetic code is a linguistic structure, but it highlights several important semiotic analogies between DNA and verbal language. Genetic code and natural language share a number of units, structures and operations. The syntactic and semantic parallelisms between those codes should lead to a methodological exchange between biology, linguistics and semiotics. During the 20th century, biology has become a pilot science, so that many disciplines have formulated their theories under models taken from biology. Computer science has become almost a bioinspired field thanks to the great development of natural computing and DNA computing. Biology and semiotics are two different sciences challenged by the same common goal of deciphering the codes of the nature. Linguistics could become another «bio-inspired» science by taking advantage of the structural and «semantic» similarities between the genetic code and natural language. Biological methods coming from computer science can be very useful in the field of linguistics, since they provide flexible and intuitive tools for describing natural languages. In this way, we obtain a theoretical framework where biology, linguistics and computer science exchange methods and interact, thanks to the semiotic parallelism between the genetic code a natural language. The influence of the semiotics of the genetic code in linguistics is parallel to the need of achieving an implementable formal description of natural language. In this paper we present an overview of different bio-inspired methods — from theoretical computer science — that during the last years have been successfully applied to several linguistics issues, from syntax to pragmatics.

- 3) A research has been conducted under the title of Linguistic and Nonverbal Abilities over Time in a Child Case of 22q11 Deletion Syndrome by **Kambanaros, M. and Grohmann, K.K.** in 2017:

The aim of this study is to profile the cognitive–linguistic performance of a male child (P.I.) with 22q11 deletion syndrome (22q11DS). Specifically, receptive and expressive language performance and nonverbal IQ (NVIQ) are described at two different time points—when P.I. was 6 and 10 years of age, respectively. Using case-based methodology, P.I.’s NVIQ and performance on global and structured language tasks are compared to typically developing children of the same chronological age and school-aged children with specific language impairment (SLI). The results show no improvement in NVIQ or vocabulary, but his morphosyntactic abilities did improve over time. The findings are

discussed in relation to two hypotheses, either that the profile of language impairment in children with 22q11DS is distinctive to the syndrome or that there is co-morbidity with SLI. This is particularly important for speech–language therapists who have a primary role in diagnosing communication deficits and providing treatment.

4) A research has been conducted under the title of Language in Language Evolution Research: In Defense of a Pluralistic View by Waciewicz, S. et al. in 2021:

Many controversies in language evolution research derive from the fact that *language* is itself a natural language word, which makes the underlying concept fuzzy and cumbersome, and a common perception is that progress in language evolution research is hindered because researchers do not ‘talk about the same thing’. In this article, we claim that agreement on a single, top-down definition of language is not a *sine qua non* for good and productive research in the field of language evolution. First, we use the example of the notion FLN (‘faculty of language in the narrow sense’) to demonstrate how the specific wording of an important top-down definition of (the faculty of) language can—surprisingly—be inconsequential to actual research practice. We then review four approaches to language evolution that we estimate to be particularly influential in the last decade. We show how their breadth precludes a single common conceptualization of language but instead leads to a family resemblance pattern, which underwrites fruitful communication between these approaches, leading to cross-fertilisation and synergies.

5) A research has been conducted under the title of Revisiting the Case for ‘Feral’ Humans Under the Light of the Human Self-Domestication Hypothesis: Focusing on Language by Benítez-Burraco, A. in 2022:

Contemporary descriptions of ‘feral’ children generally preclude any insightful inference about the language deficits exhibited by these children, as well as the ultimate causes of their problems with language. However, they have been regularly used to support the view that language acquisition requires a proper social environment in order to occur. In this paper, we revisit the case for ‘feral’ children with the viewpoint that human evolution entailed a process of self-domestication that parallels what we find in domesticated animals. Because feralization commonly occurs in nature and because it entails a partial reversion of features of domestication, this self-domestication approach to the evolution of language reassesses the case for ‘feral’ children, particularly when compared with present-day conditions involving abnormal patterns of socialization, whether they are genetically-triggered as in autism spectrum disorder, or environmentally-triggered, as in reactive attachment disorder.

Three variables are used in this article, which are:

- 1- The main variable: legal linguistics
- 2- Two sub-variables: the first is related to molecular linguistics and the second one includes biological linguistics, and finally there are two sub-variables for me.

The relationship that cannot exist with the research literature topics in relation to the main variable is the process of forensic medicine and other cases related to criminal linguistics, and the commonality is only two sub-variables that have given it a biological-biological aspect. Of course, I only add legal linguistics to it to reach a favorable conclusion.

## 5- Theoretical Framework

According to Fairclough each of these dimensions requires a different kind of analysis 1) text analysis (description), 2) processing analysis (interpretation), 3) social analysis (explanation). But these three layers are studied implicitly and intermingled, not separately and amateurishly and it is worth mentioning that the basis of the current research is the connection of the two sciences of legal linguistics and molecular-biological method, which has been discussed in detail in the problem statement section.

## 6- Methodology

Descriptive research methods are very similar to situational description. In this method, accurate prediction is not made. Also, cause and effect are not determined, and in fact, what exists is described. There are three main types of descriptive methods: observation method, case study method and survey method. The purpose of descriptive research is to examine current issues and problems through the process of data collection, which enables the researcher to describe the situation more completely than what is possible without using this method, and I have used the method of collecting information by observing the representational behaviors of law and language, and it is not in the field, and on the other hand, the research method Correlation is also worthy of attention in this article; Because the relationship between the variables and the existing relationship, which is the result of cause and effect, I want to see it in the result. Of course, in the correlation research method, we do not look for quantity; Rather, it is a worthy description of quality and adding numbers does not advance the work, especially in the field of humanities and by using two other methods of collecting information; That is, it can be achieved through library studies and reliable reference websites.

Once again, I provide a description of the variables, which are:

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## Atoms in the typesetting format of legal documents

EU law (Galdia,2009) requires that Member States provide anyone who has been arrested or detained with a written document that explains their rights in simple and accessible language (a letter of rights). However, the quality of information being provided varies. In some countries, the letters consist of cut and pasted excerpts taken from complicated national laws. People who have been arrested, and who are in a vulnerable situation, often don't read these documents or don't understand them. As a result, they may not know their rights or how to exercise them (Whelan, 2018).

If you can't understand your rights and the language used in the justice system, you don't have meaningful access to justice. Documents should be clear enough (in wording, structure and design) for the intended audience to easily find, understand and use the information they need. Generally, there is limited awareness of the importance of plain language among criminal justice professionals. Clear communication, not only benefits suspects and defendants (who need to understand their rights in order to exercise them); it can also facilitate the work of law enforcement and increase public trust in justice (Galdia,2009).

The letter of the law and the spirit of the law (Galdia,2009) are two possible ways to regard rules, or laws. To obey the letter of the law is to follow the literal reading of the words of the law, whereas following the spirit of the law is to follow the intention of why the law was enforced. Although it is usual to follow both the letter and the spirit, the two are commonly referenced when they are in opposition. "Law" originally referred to legislative statute, but in the idiom may refer to any kind of rule. Intentionally following the letter of the law but not the spirit may be accomplished through exploiting technicalities, loopholes, and ambiguous language.



Violating the perceived intention of the law has been found to affect people's judgments of culpability above and beyond violations of the letter of the law such that (1) a person can violate the letter of the law (but not the spirit) and not incur culpability, (2) a person can violate the spirit of the law and incur culpability, even without violating the letter of the law, and (3) the greatest culpability is assigned when both the letter and the spirit of the law are violated (Galdia,2009).

## Shakespeare

William Shakespeare wrote (Galdia,2009) numerous plays dealing with the letter-versus-spirit antithesis, almost always coming down on the side of "spirit", often forcing villains (who always sided with the letter) to make concessions and remedy. In one of the best known examples, *The Merchant of Venice*, he introduces the quibble as a plot device to save both the spirit and the letter of the law. The moneylender Shylock has made an agreement with Antonio that if he cannot repay a loan, he will have a pound of flesh from him. When the debt is not repaid in time Portia at first pleads for mercy in a famous speech: "The quality of mercy is not strain'd, It droppeth as the gentle rain from heaven Upon the place beneath. It is twice blest: It blesseth him that gives and him that takes." (IV, i, 185). When Shylock refuses, she finally saves Antonio by pointing out that Shylock's agreement with him mentioned no blood, and therefore Shylock can have his pound of flesh only if he sheds no blood.

Below are examples of the letter and spirit of the law that we will address.

## U.S. Constitutional law

Interpretations of the U.S. Constitution have historically divided on the "letter versus spirit" debate. For example, at the founding, the Federalist Party argued for a looser interpretation of the Constitution, granting Congress broad powers in keeping with the spirit of the broader purpose of some of the Founding Fathers (notably including the Federalist founders' purposes). The Federalists would have represented the "spirit" aspect. In contrast, the Democratic-Republicans, who favored a limited federal government, argued for the strict interpretation of the Constitution, arguing that the federal government was granted only those powers enumerated in the Constitution, and nothing not explicitly stated; they represented the "letter" interpretation (Galdia,2009).

Modern constitutional interpretation also divides on these lines. Currently, Living Constitution scholars advocate a "spirit"-esque interpretative strategy, although one grounded in a spirit that reflects broad powers. Originalist or Textualist scholars advocate a more "letter"-based approach, arguing that the Amendment process of the Constitution necessarily forecloses broader interpretations that can be accomplished by passing an amendment (Galdia,2009).

## The Bible

The 1<sup>st</sup> century letter of Saint Paul (Galdia,2009) to the Corinthians (specifically 2 Corinthians 3:6) refers to the spirit and letter of the law. Though it is not quoted directly, the principle is applied using the words "spirit" and "letter" in context with the legalistic view of the Hebrew Bible. This is the first recorded use of the phrase.

In the New Testament (Galdia,2009), Pharisees are seen as people who place the letter of the law above the spirit (Mark 2:3–28, 3:1–6). Thus, "Pharisee" has entered the language as a pejorative for one who does so; the Oxford English Dictionary defines 'Pharisee' with one of the meanings as "A person of the spirit or character commonly attributed to the Pharisees in the New Testament; a legalist or formalist". Pharisees are also depicted as being lawless or corrupt (Matthew 23:38); the Greek word used in the verse means lawlessness, and the corresponding Hebrew word means fraud or injustice. However, the Hebrew word "Perushim" from which "Pharisee" is derived, actually means "separatists", referencing their focus on spiritual needs versus worldly pleasures.

In the Gospels, Jesus is often shown as being critical of Pharisees. Not all Pharisees, nor all Jews of that time, were legalistic. Though modern language has used the word Pharisee in the pejorative to describe someone who is legalistic and rigid, it is not an accurate description of all Pharisees. The argument over the "Spirit of the Law" vs. the "Letter of the Law" was part of early Jewish dialogue as well.

The Parable of the Good Samaritan (Luke 10:25–37) is one of the New Testament texts to address this theme. The passage concerns a dialogue between Jesus and an "expert in the law" or "lawyer". As described in verse 25 ("a certain lawyer stood up and tested Him saying, Teacher what must I do to inherit eternal life?," NKJV), the intent of the dialogue was to trap Jesus into making statements contrary to the law. Jesus responds by posing the question back to the lawyer, as already having knowledge of the law, ("What is written in the law?" verse 26) The lawyer quotes Deuteronomy 6:5 "You shall love the LORD your God with all your heart, with all your soul, with all your strength, and with all your mind and your neighbor as yourself," NKJV) and Leviticus 19:18. The question "Who is my neighbor?", that follows in verse 29, is described as being asked (Galdia,2009) with the goal of self-justification.

It is then that Jesus responds with the story of a man beaten by robbers who is ignored by a Priest and a Levite, but then rescued and compassionately cared for by a Samaritan. Priests and Levites were Israelites whose qualifications and duties were very meticulously set forth in Mosaic law, (Leviticus 10, and Numbers 5-8) while Samaritans were descended from Israelites who had intermarried with their Babylonian captives and had been forced to establish a sect with an alternative interpretation of the Law. In the story, both the Priest and Levite follow their prescribed regulations dutifully, yet do not help the injured traveler, even crossing to the other side of the road to avoid possible rule violations. The Samaritan, whose very existence is based on a refutation of Jewish law, (specifically those post-Pentateuchal biblical books that identify Mount Moriah as the proper place of worship specified in Deuteronomy 12; the Samaritans considered only the Pentateuch canon, and worshipped Yahweh in their temple on Mount Gerizim) goes above and beyond simply tending to the injured man. He takes him to an inn and gives money for the man's care, promises and then actually does return to inquire about the man, and pay any overage incurred. Jesus concludes by asking the lawyer which of the men was a "neighbor" to the beaten traveller, to which the reply was "the one who showed compassion". Then Jesus says to him "go and do likewise" (Galdia,2009).

According to Jeremiah (Galdia,2009), "the qualities of the new covenant expounded upon the old are: a) It will not be broken; b) Its law will be written in the heart, not merely on tablets of stone; c) The knowledge of God will deem it no longer necessary to put it into written words of instruction." According to Luke (Luke 22:20), and Paul, in the first epistle to the Corinthians (1 Corinthians 11:25), this prophecy was fulfilled only through the work of Jesus Christ, who said "This cup is the new covenant in my blood, which will be shed for you." Christ did not come to abolish the law but to fulfill it. His purpose was to encourage people to look beyond the "letter of the law" to the "spirit of the law"...the principles behind the commandments and the law's intention. Jesus quotes the book of Deuteronomy and Leviticus: "All the Law can be summed up in this: to love God with all your heart, all your mind and all your soul, and to love your neighbor as yourself" (paraphrased).

## Gaming the system

Gaming the system (Galdia,2009), also called "rules lawyering", is a pejorative phrase applied to someone who follows the letter of the law to obtain an outcome the speaker finds immoral or contrary to the spirit of the law. There are two reasons why this can be possible. A body of law may have been formulated in a way that permits ambiguity, or else there may be limitations in the law's scope or jurisdiction. For example, an offshore bank account can be used to reduce domestic tax obligations in some countries.



## Modern usage

During the COVID-19 pandemic, Singaporean Prime Minister Lee HsienLoong urged Singaporeans to comply not just with the letter of the Circuit Breaker rules, but the spirit behind why these rules had to be implemented (Galdia,2009).

"It is popular in some quarters to claim that the human brain is largely unstructured at birth; it is tempting to believe that our minds float free of our genomes. But such beliefs are completely at odds with everything that scientists have learned in molecular biology over the last decade. Rather than leaving everything to chance or the vicissitudes of experience, nature has taken everything it has developed for growing the body and put it towards the problem of growing the brain. From cell division to cell differentiation, every process that is used in the development of the body is also used in the development of the brain. Genes do for the brain the same things as they do for the rest of the body: they guide the fates of cells by guiding the production of proteins within those cells. The one thing that is truly special about the development of the brain—the physical basis of the mind—is its "wiring", the critical connections between neurons, but even there, genes play a critical role.

"This idea that the brain might be assembled in much the same way as the rest of the body—on the basis of the action of thousands of autonomous but interacting genes (shaped by natural selection)—is an anathema to our deeply held feeling that our minds are special, somehow separate from the material world. Yet at the same time, it is a continuation, perhaps the culmination, of a long trend, a growing-up for the human species that for too long has overestimated its own centrality in the universe. Copernicus showed us that our planet is not the center of the universe. William Harvey showed that our heart is a mechanical pump. John Dalton and the 19<sup>th</sup> century chemists showed that our bodies are, like all other matter, made up of atoms. Watson and Crick showed us how genes emerged from chains of carbon, hydrogen, oxygen, nitrogen and phosphorus. In the 1990s, the Decade of the Brain, cognitive neuroscientists showed that our minds are the product of our brains. Early returns from this century are showing that the mechanisms that build our brains are just a special case of the mechanisms that build the rest of our body. The initial structure of the mind, like the initial structure of the rest of the body, is a product of our genes.'

For a long time (Galdia,2009) the fields of biology and psychology have been quite separate, and only in the last few years people have started thinking about brain imaging and about how the brain and mind relate. But they haven't really thought that much about another part of biology: developmental biology. Brain imaging tells you something about how the brain works, but that doesn't tell you anything about how the brain gets to be the way that it is. Of course, we also have the human genome sequence and have made enormous advances in genetics and related fields, and what I've been trying to do in the last few years is to relate all of the advances in biology to what people have been finding out in cognitive development and language acquisition.

Here the question has always been, what's innate? What does the child start with? What do children have at birth? There have always been two sides to that debate, a nature side and a nurture side. The nativists say that there's lots of stuff built into the mind that is the product of adaptation and natural selection. Others say, no, you don't really need all that stuff; you just need some general ability to learn, because the world is a very rich place. We get lots of information from the world, and you don't need to have anything built in at all. I've always been closer to the nativist side, thinking that there probably are sophisticated mechanisms built in. I've been persuaded by scientists like Chomsky and Pinker that we start with something interesting in the mind. We don't just start with a blank slate.

But for me that's always left a question open: If there is something built in at birth, how does it get there? Obviously you have to turn to biology to answer that question. If you really want to understand what the child has at birth, one way to go is through psychological evidence. You can do experiments with babies, as I've done in my lab, and many other people like Liz Spelke have done in their labs, and you can see that babies are very sophisticated by the time they're seven months old. Some people have done newborn studies and have shown that children know something even as soon as they're born: for example, they can recognize the difference between a face and a scrambled version of a face. What's

been unsatisfying for me is that we haven't understood how the brain gets to be that way. How is it that we go from a fertilized egg to this complicated brain that at birth is already starting the process of language acquisition, and is already starting the problem of analyzing the world (Galdia,2009)?

Just in the last five years scientists have developed incredible new genetic techniques that allow them to do things like splice together genes. They can customize what individual genes do, or switch them on in a particular part of the brain and not somewhere else. These are just amazing techniques.

At the same time we now actually have a sequence to the human genome, which is something people wouldn't have imagined 20 years ago. We're well on our way to having a chimpanzee genome so if you want to understand what's special about language you can compare between the species. There's one gene, called FOXP2, that we've already identified as having a tiny but potentially important difference between a human version and a chimpanzee version. There's this enormous wealth of new biological data that's telling us something about how the brain is constructed, and it lets us get a new angle into these nature-nurture questions (Galdia,2009).

One thing that helps us understand is the level of precision. How much, or how precisely can you specify the development of the brain? Some people say that there are only 30,000 genes; we used to think there were 100,000. Does that make Chomsky's idea of a built-in language acquisition device three times more wrong than it was ever before? Of course not, it doesn't mean that at all.

The genome is really more like a compression scheme. It's not a blueprint that shows you this neuron goes here and this neuron goes there. It's like an MP3 file or a Zip file that can store a lot of information in a compact way. It stores a recipe for building the brain, and it turns out that the genome is capable of building the brain with enormous precision. Using these new techniques people have been able to do things like re-route particular individual neurons, making them go to different destinations. Essentially they've figured out—not for the whole brain, or the whole genome, but for parts of it—the particular code by which particular neurons connect themselves up. They've figured out the general form of a solution to the problem of how to get the precision that you need (Sapolsky, 2017).

At the same time there's a misapprehension about what the genome really does among researchers in psychology (and among the general public as well). Most people are conditioned into thinking that it's a blueprint. They think of the genome as giving dictation, as giving orders. Many people think that if there's something in the genome that controls our lives we're slaves to it.

This is the wrong way of thinking about genes. A gene is really not a dictator, but an opportunity, because each gene actually has two parts. Everybody knows a gene constructs a protein, but not everybody realizes that the other half of every gene is essentially what's called a regulatory region. It's essentially like an "if" in a computer program. Each gene is really like an if/then statement. There's a "then" that says, build this particular protein. It could be insulin in the pancreas, it could be hemoglobin in precursors to red blood cells, or it could be a particular protein for building a neuron in the brain (Sapolsky, 2017). But when it does that, it is controlled by the "if" part of each gene. So there's an "if" and a "then."

This seemingly very simple idea, a tiny little twist on the usual idea of thinking of a gene as coding for a particular protein, means that every gene has some kind of way it can respond to the environment, either inside the cell or outside the cell. So the "if" that controls whether a gene is turned on or not is responsive to chemical signals that are around a particular cell, and those chemical signals can be used for things like telling the cell where it is in the growing body so if it moves around it can adopt a new plan according to its new location. It also means that the external environment can, in principle, modify gene expression. Each gene becomes like a switch (Sapolsky, 2017).

For example the Bicyclus butterfly. The butterfly actually grows into two different forms depending on what season it's raised in. This butterfly is found in Africa, and in the summer, the rainy season, the butterfly will be green, shiny, and interesting, and in the fall it'll grow into a dull brown. It doesn't do this by looking around at the other butterflies, it just does this on the basis of the temperature. If you

take a single butterfly alone, raise it by itself in a lab, and control the temperature, you control which genetic switch gets turned on. So the butterfly will go this way in one environment and another way in another. The genome is giving the butterfly two different choices, two different opportunities. It's not dictating, "You must take this form"; it's saying, "If you're in this situation you can take this form, if you're in this other situation you can take this other form."

When you reflect on that, and think about human psychology, that means that our genes aren't dictating that we have to be a particular way. It's specifying different ways in which the environment might interact with us. One of the most interesting studies I read recently talks about a gene that can influence violence in some way. It turns out that people that have this gene are more prone to violence than people who lack it. This is maybe no big surprise, but what's really interesting is that it really seems to be a kind of predisposition that depends on a particular environment. If you're raised in an abusive family and you have this gene you tend to become more violent. If you're raised in a non-abusive family and you have this gene, you don't tend to become more violent. So you can actually think that maybe what's going on is that this gene is actually switching people to respond in environments in different ways. The adaptation here is not towards violence or towards being less aggressive—the adaptation is towards giving the organism ways of coping with different kinds of environments (Sapolsky, 2017).

Biolinguistics can be defined as the study of biology and the evolution of language. It is highly interdisciplinary as it is related to various fields such as biology, linguistics, psychology, anthropology, mathematics and neurolinguistics to explain the formation of language. It seeks to yield a framework by which we can understand the fundamentals of the faculty of language. This field was first introduced by Massimo Piattelli-Palmarini, professor of Linguistics and Cognitive Science at the University of Arizona. It was first introduced in 1971, at an international meeting at the Massachusetts Institute of Technology (MIT)-(Fujita et al., 2018).

Biolinguistics, also called the biolinguistic enterprise or the biolinguistic approach, is believed to have its origins in Noam Chomsky's and Eric Lenneberg's work on language acquisition that began in the 1950s as a reaction to the then-dominant behaviorist paradigm. Fundamentally, biolinguistics challenges the view of human language acquisition as a behavior based on stimulus-response interactions and associations. Chomsky and Lenneberg militated against it by arguing for the innate knowledge of language. Chomsky in 1960s proposed <sup>1</sup>(LAD) as a hypothetical tool for language acquisition that only humans are born with. Similarly, Lenneberg (1967) formulated the Critical Period Hypothesis, the main idea of which being that language acquisition is biologically constrained. These works were regarded as pioneers in the shaping of biolinguistic thought, in what was the beginning of a change in paradigm in the study of language (Fujita et al., 2018).

## Origins of biolinguistics

The investigation of the biological foundations of language is associated with two historical periods, namely that of the 19<sup>th</sup> century (primarily via Darwinian evolutionary theory) and the 20<sup>th</sup> century (primarily via the integration of the mathematical linguistics (in the form of Chomskyan generative grammar) with neuroscience.

### 19<sup>th</sup> century: Darwin's theory of evolution

Darwinism (Darwin, 1859) inspired many researchers to study language, in particular the evolution of language, via the lens of biology. Darwin's theory regarding the origin of language attempts to answer three important questions:

1. Did individuals undergo something like selection as they evolved?
2. Did selection play a role in producing the capacity for language in humans?

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<sup>1</sup> The Language Acquisition Device

3.If selection did play a role, was selection primarily responsible for the emergence of language, was it just one of the several contributing causes?

Dating back to 1821, German linguist August Scheilurer was the representative pioneer of biolinguistics, discussing the evolution of language based on Darwin's theory of evolution. Since linguistics had been believed to be a form of historical science under the influence of the Société de Linguistique de Paris, speculations of the origin of language were not permitted. As a result, hardly did any prominent linguist write about the origin of language apart from German linguist Hugo Schuchardt. Darwinism addressed the arguments of other researchers and scholars much as Max Müller by arguing that language use, while requiring a certain mental capacity, also stimulates brain development, enabling long trains of thought and strengthening power. Darwin drew an extended analogy between the evolution of languages and species, noting in each domain the presence of rudiments, of crossing and blending, and variation, and remarking on how each development gradually through a process of struggle.

### **20<sup>th</sup> century: Biological foundation of language**

The first phase in the development of biolinguistics (Fujita et al., 2018) runs through the late 1960s with the publication of Lennberg's Biological Foundation of Language (1967). During the first phase, work focused on:

- specifying the boundary conditions for human language as a system of cognition;
- language development as it presents itself in the acquisition sequence that children go through when they learn a language
- genetics of language disorders that create specific language disabilities, including dyslexia and deafness)
- language evolution.

During this period, the greatest progress was made in coming to a better understanding of the defining properties of human language as a system of cognition. Three landmark events shaped the modern field of biolinguistics: two important conferences were convened in the 1970s, and a retrospective article was published in 1997 by Lyle Jenkins.

- **1974:** The first official biolinguistic conference was organized by him in 1974, bringing together evolutionary biologists, neuroscientists, linguists, and others interested in the development of language in the individual, its origins and evolution.
- **1976:** another conference was held by the New York Academy of Science, after which numerous works on the origin of language were published.
- **1997:** For the 40th anniversary of transformational-generative grammar, Lyle Jenkins wrote an article titled "Biolinguistics: Structure development and evolution of language".

The second phase began in the late 1970s. In 1976 Chomsky formulated the fundamental questions of biolinguistics as follows: i) function, ii) structure, iii) physical basis, iv) development in the individual, v) evolutionary development. In the late 1980s a great deal of progress was made in answering questions about the development of language. This then prompted further questions about language design, function, and, the evolution of language. The following year, Juan Uriagereka, a graduate student of Howard Lasnik, wrote the introductory text to Minimalist Syntax, Rhyme and Reason. Their work renewed interest in biolinguistics, catalysing many linguists to look into biolinguistics with their colleagues in adjacent scientific disciplines. Both Jenkins and Uriagereka stressed the importance of addressing the emergence of the language faculty in humans. At around the same time, geneticists discovered a link between the language deficit manifest by the KE family members and the gene FOXP2. Although FOXP2 is not the gene responsible for language, this discovery brought many linguists and scientists together to interpret this data, renewing the interest of biolinguistics (Fujita et al., 2018).

Although many linguists have differing opinions when it comes to the history of biolinguistics, Chomsky believes that its history was simply that of transformational grammar. While Professor Anna Maria Di Sciullo claims that the interdisciplinary research of biology and linguistics in the 1950s-

1960s led to the rise of biolinguistics. Furthermore, Jenkins believes that biolinguistics was the outcome of transformational grammarians studying human linguistic and biological mechanisms. On the other hand, linguists Martin Nowak and Charles Yang argue that biolinguistics, originating in the 1970s, is distinct transformational grammar; rather a new branch of the linguistics-biology research paradigm initiated by transformational grammar (Fujita et al., 2018).

## Linguistic facet

### Chomsky's Theories

#### Universal Grammar and Generative Grammar

In *Aspects of the theory of Syntax*, Chomsky proposed that (Chomsky, 1969) languages are the product of a biologically determined capacity present in all humans, located in the brain. He addresses three core questions of biolinguistics: what constitutes the knowledge of language, how is knowledge acquired, how is the knowledge put to use? A great deal of ours must be innate, supporting his claim with the fact that speakers are capable of producing and understanding novel sentences without explicit instructions. Chomsky proposed that the form of the grammar may emerge from the mental structure afforded by the human brain and argued that formal grammatical categories such as nouns, verbs, and adjectives do not exist. The linguistic theory of generative grammar thereby proposes that sentences are generated by a subconscious set of procedures which are part of an individual's cognitive ability. These procedures are modeled through a set of formal grammatical rules which are thought to generate sentences in a language.

Chomsky focuses (Chomsky, 1969) on the mind of the language learner or user and proposed that internal properties of the language faculty are closely linked to the physical biology of humans. He further introduced the idea of <sup>1</sup>(UG) theorized to be inherent to all human beings. From the view of Biolinguistic approach, the process of language acquisition would be fast and smooth because humans naturally obtain the fundamental perceptions toward Universal Grammar, which is opposite to the usage-based approach. UG refers to the initial state of the faculty of language; a biologically innate organ that helps the learner make sense of the data and build up an internal grammar. The theory suggests that all human languages are subject to universal principles or parameters that allow for different choices (values). It also contends that humans possess generative grammar, which is hard-wired into the human brain in some ways and makes it possible for young children to do the rapid and universal acquisition of speech. Elements of linguistic variation then determine the growth of language in the individual, and variation is the result of experience, given the genetic endowment and independent principles reducing complexity. Chomsky's work is often recognized as the weak perspective of biolinguistics as it does not pull from other fields of study outside of linguistics.

#### Modularity Hypothesis

According to Chomsky, the human's brains consist of various sections which possess their individual functions, such as the language faculty, visual recognition (Chomsky, 1969).

#### Language Acquisition Device

The acquisition of language is a universal feat and it is believed we are all born with an innate structure initially proposed by Chomsky in the 1960s. The Language Acquisition Device (LAD) was presented as an innate structure in humans which enabled language learning. Individuals are thought to be "wired" with universal grammar rules enabling them to understand and evaluate complex syntactic structures. Proponents of the LAD often quote the argument of the poverty of negative

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<sup>1</sup> Universal Grammar



stimulus, suggesting that children rely on the LAD to develop their knowledge of a language despite not being exposed to a rich linguistic environment. Later, Chomsky exchanged this notion instead for that of Universal Grammar, providing evidence for a biological basis of language (Chomsky, 1969).

## Minimalist Program

The <sup>1</sup>(MP) was introduced by Chomsky in 1993, and it focuses on the parallel between language and the design of natural concepts. Those invested in the Minimalist Program are interested in the physics and mathematics of language and its parallels with our natural world. For example, Piatelli-Palmarini studied the isomorphic relationship between the Minimalist Program and Quantum Field Theory. The Minimalist Program aims to figure out how much of the Principles and Parameters model can be taken as a result of the hypothetical optimal and computationally efficient design of the human language faculty and more developed versions of the Principles and Parameters approach in turn provide technical principles from which the minimalist program can be seen to follow. The program further aims to develop ideas involving the economy of derivation and economy of representation, which had started to become an independent theory in the early 1990s, but were then still considered as peripherals of transformational grammar (Chomsky, 2014).

## Merge

The Merge operation is used by Chomsky to explain the structure of syntax trees within the Minimalist program. Merge itself is a process which provides the basis of phrasal formation as a result of taking two elements within a phrase and combining them. In A.M. Di Sciullo & D. Isac's *The Asymmetry of Merge* (2008), they highlight the two key bases of Merge by Chomsky (Chomsky, 1969);

- Merge is binary
- Merge is recursive

In order to understand this, take the following sentence: *Emma dislikes the pie*

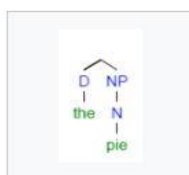
This phrase can be broken down into its lexical items:

[VP [DP Emma] [V' [V dislikes] [DP [D the] [NP pie]]]]

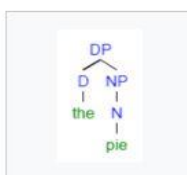
The above phrasal representation allows for an understanding of each lexical item. In order to build a tree using Merge, using bottom-up formation the two final elements of the phrase are selected and then combined to form a new element on the tree. In image a) you can see that the determiner *the* and the Noun Phrase *pie* are both selected. Through the process of Merge, the new formed element on the tree is the determiner Phrase (DP) which holds, *the pie*, which is visible in b).

The example of the mentioned case is given in the form of an infographic on the next page, which you can refer to.

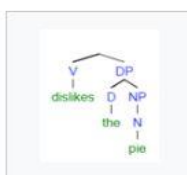
<sup>1</sup> The minimalist program



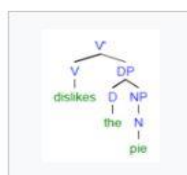
a) Selection of the final two element of the phrase



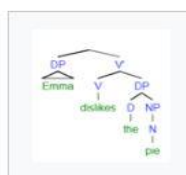
b) The two selected elements are then "merged" and they produce one new constituent, known as the Determiner Phrase (DP)



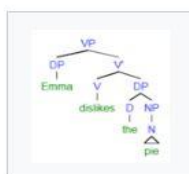
c) Selection of DP *the pie* with V *dislikes*



d) Merge operation has occurred, yielded new element on tree, V\* (V-bar)



e) Selection of V\* *dislikes the pie* and DP subject *Emma*



f) Merge operation has undergone, yielded new element on tree; VP

## Core components

In a minimalist approach (Chomsky, 2014), there are three core components of the language faculty proposed: biological requisites for language production and (NS). SM includes <sup>3</sup>(CI), and <sup>2</sup>(SM), <sup>1</sup> perception, such as articulatory organs, and CI meets the biological requirements related to inference, interpretation, and reasoning, those involved in other cognitive functions. As SM and CI are finite, the main function of NS is to make it possible to produce infinite numbers of sound-meaning pairs.

## Relevance of Natural Law

It is possible that the core principles of The Faculty of Language be correlated to natural laws (such as for example, the Fibonacci sequence— an array of numbers where each consecutive number is a sum of the two that precede it, see for example the discussion Uriagereka 1997 and Carnie and Medeiros 2005. According to the hypothesis being developed, the essential properties of language arise from nature itself: the efficient growth requirement appears everywhere, from the pattern of petals in flowers, leaf arrangements in trees and the spirals of a seashell to the structure of DNA and proportions of human head and body. Natural Law in this case would provide insight on concepts such as binary branching in syntactic trees and well as the Merge operation. This would translate to thinking it in terms of taking two elements on a syntax tree and such that their sum yields another element that falls below on the given syntax tree (Refer to trees above in *Minimalist Program*). By adhering to this sum of two elements that precede it, provides support for binary structures. Furthermore, the possibility of ternary branching would deviate from the Fibonacci sequence and consequently would not hold as strong support to the relevance of Natural Law in syntax (Chomsky, 1969).

<sup>1</sup> Sensory-Motor system

<sup>2</sup> Conceptual-Intentional system

<sup>3</sup> Narrow Syntax

## Biolinguistics: Challenging the Usage-Based Approach

As mentioned above (Fujita et al., 2018), biolinguistics challenges the idea that the acquisition of language is a result of behavior based learning. This alternative approach the biolinguistics challenges is known as the usage-based (UB) approach. UB supports that idea that knowledge of human language is acquired via exposure and usage. One of the primary issues that is highlighted when arguing against the Usage-Based approach, is that UB fails to address the issue of poverty of stimulus, whereas biolinguistics addresses this by way of the Language Acquisition Device.

## Lenneberg and the Role of Genes

Another major contributor to the field is Eric Lenneberg. In his book *Biological Foundation of Languages*, Lenneberg (1967) suggests that different aspects of human biology that putatively contribute to language more than genes at play. This integration of other fields to explain language is recognized as the *strong* view in biolinguistics while they are obviously essential, and while genomes are associated with specific organisms, genes do not store traits (or "faculties") in the way that linguists—including Chomskyans—sometimes seem to imply (Fujita et al., 2018).

Contrary to the concept of the existence of a language faculty (Fujita et al., 2018) as suggested by Chomsky, Lenneberg argues that while there are specific regions and networks crucially involved in the production of language, there is no single region to which language capacity is confined and that speech, as well as language, is not confined to the cerebral cortex. Lenneberg considered language as a species-specific mental organ with significant biological properties. He suggested that this organ grows in the mind/brain of a child in the same way that other biological organs grow, showing that the child's path to language displays the hallmark of biological growth. According to Lenneberg, genetic mechanisms plays an important role in the development of an individual's behavior and is characterized by two aspects:

- The acknowledgement of an indirect relationship between genes and traits, and;
- The rejection of the existence of 'special' genes for language, that is, the rejection of the need for a specifically linguistic genotype;

Based on this, Lenneberg goes on further to claim that no kind of functional principle could be stored in an individual's genes, rejecting the idea that there exist genes for specific traits, including language. In other words, that genes can contain traits. He then proposed that the way in which genes influence the general patterns of structure and function is by means of their action upon ontogenesis of genes as a causal agent which is individually the direct and unique responsible for a specific phenotype, criticizing prior hypothesis by Charles Goodwin.

## Recent Developments

### Generative Procedure Accepted At Present & Its Developments

In biolinguistics, language is recognised to be based on recursive generative procedure that retrieves words from the lexicon and applies them repeatedly to output phrases. This generative procedure was hypothesised to be a result of a minor brain mutation due to evidence that word ordering is limited to externalisation and plays no role in core syntax or semantics. Thus, different lines of inquiry to explain this were explored (Fujita et al., 2018).

The most commonly accepted line of inquiry to explain this is Noam Chomsky's minimalist approach to syntactic representations. In 2016, Chomsky and Berwick defined the minimalist program under the Strong Minimalist Thesis in their book *Why Only Us* by saying that language is mandated by efficient

computations and, thus, keeps to the simplest recursive operations. The main basic operation in the minimalist program is merge. Under merge there are two ways in which larger expressions can be constructed: externally and internally. Lexical items that are merged externally build argument representations with disjoint constituents. The internal merge creates constituent structures where one is a part of another. This induces displacement, the capacity to pronounce phrases in one position, but interpret them elsewhere (Fujita et al., 2018).

Recent investigations of displacement concur to a slight rewiring in cortical brain regions that could have occurred historically and perpetuated generative grammar. Upkeeping this line of thought, in 2009, Ramus and Fishers speculated that a single gene could create a signalling molecule to facilitate new brain connections or a new area of the brain altogether via prenatally defined brain regions. This would result in information processing greatly important to language, as we know it. The spread of this advantage trait could be responsible for secondary externalisation and the interaction we engage in. If this holds, then the objective of biolinguistics is to find out as much as we can about the principles underlying mental recursion.

### Human versus Animal Communication

Compared to other topics in linguistics (Fujita et al., 2018) where data can be displayed with evidence cross-linguistically, due to the nature of biolinguistics, and that it applies to the entirety of linguistics rather than just a specific subsection, examining other species can assist in providing data. Although animals do not have the same linguistic competencies as humans, it is assumed that they can provide evidence for some linguistic competence.

The relatively new science of evo-devo (Fujita et al., 2018) that suggests everyone is a common descendant from a single tree has opened pathways into gene and biochemical study. One way in which this manifested within biolinguistics is through the suggestion of a common language gene, namely FOXP2. Though this gene is subject to debate, there have been interesting recent discoveries made concerning it and the part it plays in the secondary externalization process. Recent studies of birds and mice resulted in an emerging consensus that FOXP2 is not a blueprint for internal syntax nor the narrow faculty of language, but rather makes up the regulatory machinery pertaining to the process of externalization. It has been found to assist sequencing sound or gesture one after the next, hence implying that FOXP2 helps transfer knowledge from declarative to procedural memory. Therefore, FOXP2 has been discovered to be an aid in formulating a linguistic input-output system that runs smoothly.

### The Integration Hypothesis

According to the Integration Hypothesis (Fujita et al., 2018), human language is the combination of <sup>1</sup>(E) component and <sup>2</sup>(L) component. At the level of words, the L component contains the concept and meaning that we want to convey. The E component contains grammatical information and inflection. For phrases, we often see an alternation between the two components. In sentences, the E component is responsible for providing the shape and structure to the base-level lexical words, while these lexical items and their corresponding meanings found in the lexicon make up the L component. This has consequences for our understanding of: (i) the origins of the E and L components found in bird and monkey communication systems; (ii) the rapid emergence of human language as related to words; (iii) evidence of hierarchical structure within compound words; (iv) the role of phrases in the detection of the structure building operation Merge; and (v) the application of E and L components to sentences. In this way, we see that the Integration Hypothesis can be applied to all levels of language: the word, phrasal, and sentence level.

<sup>1</sup> The Expressive

<sup>2</sup> The Lexical

## The Origins of the E and L systems in Bird and Monkey Communication Systems

Through the application of the Integration Hypothesis, it can be seen that the interaction between the E and L components enables language structure (E component) and lexical items (L component) to operate simultaneously within one form of complex communication: human language. However, these two components are thought to have emerged from two pre-existing, separate, communication systems in the animal world. The communication systems of birds and monkeys have been found to be antecedents to human language. The bird song communication system is made up entirely of the E component while the alarm call system used by monkeys is made up of the L component. Human language is thought to be the byproduct of these two separate systems found in birds and monkeys, due to parallels between human communication and these two animal communication systems (Fujita et al., 2018).

The communication systems of songbirds is commonly described as a system that is based on syntactic operations. Specifically, bird song enables the systematic combination of sound elements in order to string together a song. Likewise, human languages also operate syntactically through the combination of words, which are calculated systematically. While the mechanics of bird song thrives off of syntax, it appears as though the notes, syllables, and motifs that are combined in order to elicit the different songs may not necessarily contain any meaning. The communication system of songbirds' also lacks a lexicon that contains a set of any sort of meaning-to-referent pairs. Essentially, this means that an individual sound produced by a songbird does not have meaning associated with it, the way a word does in human language. Bird song is capable of being structured, but it is not capable of carrying meaning. In this way, the prominence of syntax and the absence of lexical meaning presents bird song as a strong candidate for being a simplified antecedent of the E component that is found in human language, as this component also lacks lexical information. While birds that use bird song can rely on just this E component to communicate, human utterances require lexical meaning in addition to structural operations a part of the E component, as human language is unable to operate with just syntactic structure or structural function words alone. This is evident as human communication does in fact consist of a lexicon, and humans produce combined sequences of words that are meaningful, best known as sentences. This suggests that part of human language must have been adapted from another animal's communication system in order for the L component to arise (Fujita et al., 2018).

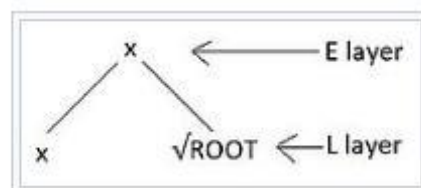
A well known study by Seyfarth et al. investigated the referential nature of the alarm calls of vervet monkeys. These monkeys have three set alarm calls, with each call directly mapping on to one of the following referents: a leopard, an eagle, or a snake. Each call is used to warn other monkeys about the presence of one of these three predators in their immediate environmental surroundings. The main idea is that the alarm call contains lexical information that can be used to represent the referent that is being referred to. Essentially, the entire communication system used by monkeys is made up of the L system such that only these lexical-based calls are needed to effectively communicate. This is similar to the L component found in human language in which content words are used to refer to a referent in the real world, containing the relevant lexical information. The L component in human language is, however, a much more complex variant of the L component found in vervet monkey communication systems: humans use many more than just 3 word-forms to communicate. While vervet monkeys are capable of communicating solely with the L component, humans are not, as communication with just content words does not output well-formed grammatical sentences. It is for this reason that the L component is combined with the E component responsible for syntactic structure in order to output human language (Fujita et al., 2018).



## The Rapid Emergence of Human Language

As traces of the E and L components (Fujita et al., 2018) have been found in nature, the integration hypothesis asserts that these two systems existed before human language, and that it was the combination of these two pre-existing systems that rapidly led to the emergence of human language. The Integration Hypothesis posits that it was the grammatical operator, Merge, that triggered the combination of the E and L systems to create human language. In this view, language emerged rapidly and fully formed, already containing syntactical structure. This is in contrast to the Gradualist Approach, where it is thought that early forms of language did not have syntax. Instead, supporters of the Gradualist Approach believe language slowly progressed through a series of stages as a result of a simple combinatory operator that generated flat structures. Beginning with a one-word stage, then a two-word stage, then a three-word stage, etc., language is thought to have developed hierarchy in later stages.

In the article, *The precedence of syntax in the rapid emergence of human language in evolution as defined by the integration hypothesis*, Nóbrega & Miyagawa outline the Integration Hypothesis as it applies to words. To explain the Integration Hypothesis as it relates to words, everyone must first agree on the definition of a 'word'. While this seems fairly straightforward in English, this is not the case for other languages. To allow for cross-linguistic discussion, the idea of a "root" is used instead, where a "root" encapsulates a concept at the most basic level. In order to differentiate between "roots" and "words", it must be noted that "roots" are completely devoid of any information relating to grammatical category or inflection. Therefore, "roots" form the lexical component of the Integration Hypothesis while grammatical category (noun, verb, adjective) and inflectional properties (e.g. case, number, tense, etc.) form the expressive component.



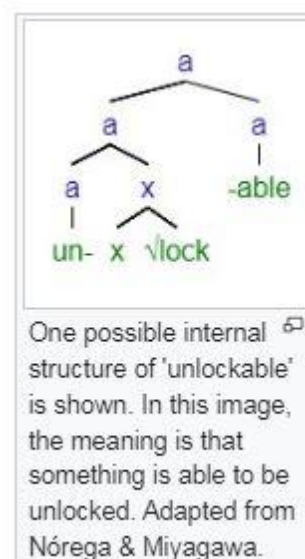
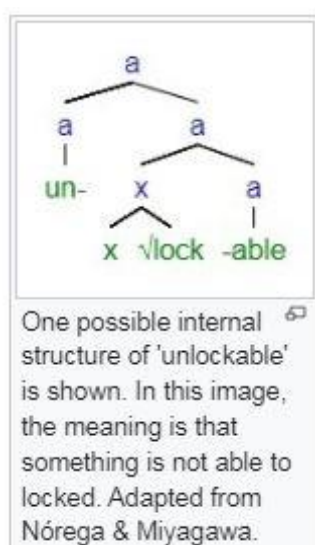
Thus, at the most basic level for the formation of a "word" in human language, there must be a combination of the L component with the E component. When we know a "word" in a language, we must know both components: the concept that it relates to as well as its grammatical category and inflection. The former is the L component; the latter is the E component. The Integration Hypothesis suggests that it was the grammatical operator Merge that triggered this combination, occurring when one linguistic object (L layer) satisfies the grammatical feature of another linguistic object (E layer). This means that L components are not expected to directly combine with each other.

Based on this analysis, it is believed that human language emerged in a single step. Before this rapid emergence, the L component, "roots", existed individually, lacked grammatical features, and were not combined with each other. However, once this was combined with the E component, it led to the emergence of human language, with all the necessary characteristics. Hierarchical structures of syntax are already present within words because of the integration of these two layers. This pattern is continued when words are combined with each other to make phrases, as well as when phrases are combined into sentences. Therefore, the Integration Hypothesis posits that once these two systems were integrated, human language appeared fully formed, and did not require additional stages.

## Evidence of Hierarchical Structure Within Compound Words

Compound words are a special point of interest with the Integration Hypothesis, as they are further evidence that words contain internal structure. The Integration Hypothesis, analyzes compound words differently compared to previous gradualist theories of language development. As previously

mentioned, in the Gradualist Approach, compound words are thought of as part of a proto-syntax stage to the human language. In this proposal of a lexical protolanguage, compounds are developed in the second stage through a combination of single words by a rudimentary recursive  $n$ -ary operation that generates flat structures. However, the Integration Hypothesis challenges this belief, claiming that there is evidence to suggest that words are internally complex. In English for example, the word 'unlockable' is ambiguous because of two possible structures within. It can either mean something that is able to be unlocked (unlock-able), or it can mean something that is not lockable (un-lockable). This ambiguity points to two possible hierarchical structures within the word: it cannot have the flat structure posited by the Gradualist Approach. With this evidence, supporters of the Integration Hypothesis argue that these hierarchical structures in words are formed by Merge, where the L component and E component are combined. Thus, Merge is responsible for the formation of compound words and phrases. This discovery leads to the hypothesis that words, compounds, and all linguistic objects of the human language are derived from this integration system, and provides contradictory evidence to the theory of an existence of a protolanguage.



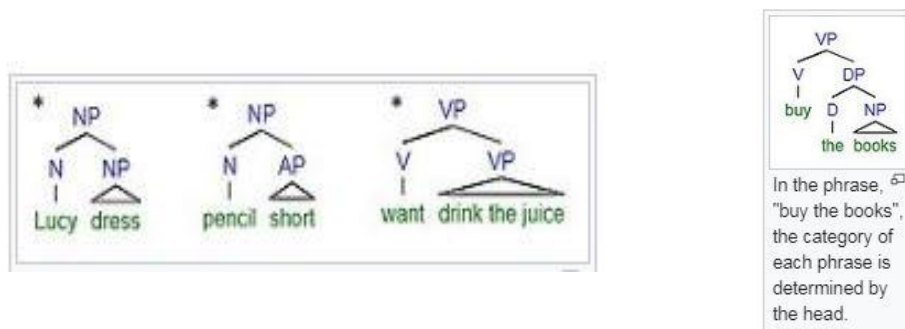
In the view of compounds as "living fossils", Jackendoff alleges that the basic structure of compounds does not provide enough information to offer semantic interpretation. Hence, the semantic interpretation must come from pragmatics. However, Nórega and Miyagawa noticed that this claim of dependency on pragmatics is not a property of compound words that is demonstrated in all languages. The example provided by Nórega and Miyagawa is the comparison between English (a Germanic language) and Brazilian Portuguese (a Romance language). English compound nouns can offer a variety of semantic interpretations. For example, the compound noun "car man" can have several possible understandings such as: a man who sells cars, a man who's passionate about cars, a man who repairs cars, a man who drives cars, etc. In comparison, the Brazilian Portuguese compound noun "peixe-espada" translated as "sword fish", only has one understanding of a fish that resembles a sword. Consequently, when looking at the semantic interpretations available of compound words between Germanic languages and Romance languages, the Romance languages have highly restrictive meanings. This finding presents evidence that in fact, compounds contain more sophisticated internal structures than previously thought. Moreover, Nórega and Miyagawa provide further evidence to counteract the claim of a protolanguage through examining exocentric VN compounds. As defined, one of the key components to Merge is the property of being recursive. Therefore, by observing recursion within exocentric VN compounds of Romance languages, this proves that there must be an existence of an internal hierarchical structure which Merge is responsible for combining. In the data collected by Nórega and Miyagawa, they observe recursion occurring in several occasions within different languages. This happens in Catalan, Italian, and Brazilian Portuguese where a new VN compound is created when a nominal exocentric (Fujita et al., 2018) VN compound is the complement of a verb. For example, referring to the Catalan translation of "windshield wipers", [*neteja*[*para-brises*]] lit. clean-stop-breeze, we can identify recursion because [*para-brises*] is the complement of [*neteja*]. Additionally, we can also note the occurrence of recursion when the noun of a VN

compound contains a list of complements. For example, referring to the Italian translation of "rings, earrings, or small jewels holder", [*porta[anelli, orecchini o piccoli monili]*] lit. carry-rings-earrings-or-small-jewels, there is recursion because of the string of complements [*anelli, orecchini o piccoli monili*] containing the noun to the verb [*porta*].

The common claim (Fujita et al., 2018) that compounds are fossils of language often complements the argument that they contain a flat, linear structure. However, Di Sciullo provided experimental evidence to dispute this. With the knowledge that there is asymmetry in the internal structure of exocentric compounds, she uses the experimental results to show that hierarchical complexity effects are observed from processing of NV compounds in English. In her experiment, sentences containing object-verb compounds and sentences containing adjunct-verb compounds were presented to English speakers, who then assessed the acceptability of these sentences. Di Sciullo has noted that previous works have determined adjunct-verb compounds to have more complex structure than object-verb compounds because adjunct-verb compounds require merge to occur several times. In her experiment, there were 10 English speaking participants who evaluated 60 English sentences. The results revealed that the adjunct-verb compounds had a lower acceptability rate and the object-verb compounds had a higher acceptability rate. In other words, the sentences containing the adjunct-verb compounds were viewed as more "ill-formed" than the sentences containing the object-verb compounds. The findings demonstrated that the human brain is sensitive to the internal structures that these compounds contain. Since adjunct-verb compounds contain complex hierarchical structures from the recursive application of Merge, these words are more difficult to decipher and analyze than the object-verb compounds which encompass simpler hierarchical structures. This is evidence that compounds could not have been fossils of a protolanguage without syntax due to their complex internal hierarchical structures.

## Interactions Between E and L Components in Phrases of Human Language

As previously mentioned, human language is interesting because it necessarily requires elements from both E and L systems - neither can stand alone. Lexical items, or what the Integration Hypothesis refers to as 'roots', are necessary as they refer to things in the world around us. Expression items, that convey information about category or inflection (number, tense, case etc.) are also required to shape the meanings of the roots. It becomes more clear that neither of these two systems can exist alone with regards to human language when we look at the phenomenon of 'labeling'. This phenomenon refers to how we classify the grammatical category of phrases, where the grammatical category of the phrase is dependent on the grammatical category of one of the words within the phrase, called the head. For example, in the phrase "buy the books", the verb "buy" is the head, and we call the entire phrase a verb-phrase. There is also a smaller phrase within this verb-phrase, a determiner phrase, "the books" because of the determiner "the". What makes this phenomenon interesting is that it allows for hierarchical structure within phrases. This has implications on how we combine words to form phrases and eventually sentences.

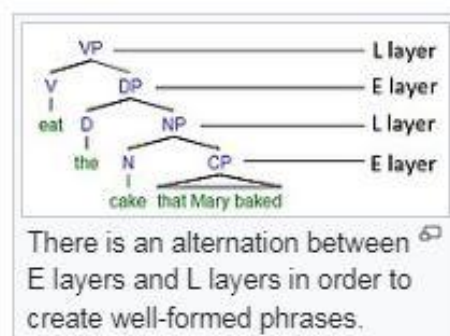


This labelling phenomenon has limitations however. Some labels can combine and others cannot. For example, two lexical structure labels cannot directly combine. The two nouns, "Lucy" and "dress" cannot directly be combined. Likewise, neither can the noun "pencil" be merged with the adjective "short", nor can the verbs, "want" and "drink" cannot be merged without anything in

between. As represented by the schematic below, all of these examples are impossible lexical structures. This shows that there is a limitation where lexical categories can only be one layer deep. However, these limitations can be overcome with the insertion of an expression layer in between. For example, to combine "John" and "book", adding a determiner such as "-s" makes this a possible combination.

Another limitation regards the recursive nature of the expressive layer. While it is true that CP and TP can come together to form hierarchical structure, this CP TP structure cannot repeat on top of itself: it is only a single layer deep. This restriction is common to both the expressive layer in humans, but also in birdsong. This similarity strengthens the tie between the pre-existing E system posited to have originated in birdsong and the E layers found in human language (Fujita et al., 2018).

Due to these limitations in each system, where both lexical and expressive categories can only be one layer deep, the recursive and unbounded hierarchical structure of human language is surprising. The Integration hypothesis posits that it is the combination of these two types of layers that results in such a rich hierarchical structure. The alternation between L layers and E layers is what allows human language to reach an arbitrary depth of layers. For example, in the phrase "Eat the cake that Mary baked", the tree structure shows an alternation between L and E layers. This can easily be described by two phrase rules: (i)  $LP \rightarrow L EP$  and (ii)  $EP \rightarrow E LP$ . The recursion that is possible is plainly seen by transforming these phrase rules into bracket notation. The LP in (i) can be written as  $[L EP]$ . Then, adding an E layer to this LP to create an EP would result in  $[E [L EP]]$ . After, a more complex LP could be obtained by adding an L layer to the EP, resulting in  $[L [E [L EP]]]$ . This can continue forever and would result in the recognizable deep structures found in human language (Fujita et al., 2018).

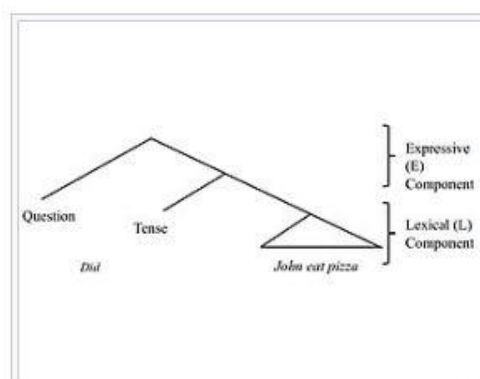


## The Operation of E and L Components in the Syntax of Sentences

The E and L components (Fujita et al., 2018) can be used to explain the syntactic structures that make up sentences in human languages. The first component, the L component, contains content words. This component is responsible for carrying the lexical information that relays the underlying meaning behind a sentence. However, combinations consisting solely of L component content words do not result in grammatical sentences. This issue is resolved through the interaction of the L component with the E component. The E component is made up of function words: words that are responsible for inserting syntactic information about the syntactic categories of L component words, as well as morphosyntactic information about clause-typing, question, number, case and focus. Since these added elements complement the content words in the L component, the E component can be thought of as being applied to the L component. Considering that the L component is solely composed of lexical information and the E component is solely composed of syntactic information, they do exist as two independent systems. However, for the rise of such a complex system as human language, the two systems are necessarily reliant on each other. This aligns with Chomsky's proposal of duality of semantics which suggests that human language is composed of these two distinct components. In this way, it is logical as to why the convergence of these two components was necessary in order to enable the functionality of human language as we know it today.

Looking at the following example taken from the article *The integration hypothesis of human language evolution and the nature of contemporary languages* by Miyagawa et al., each word can be identified as either being either an L component or an E component in the sentence: *Did John eat pizza?*

The L component words of this sentence are the content words *John*, *eat*, and *pizza*. Each word only contains lexical information that directly contributes to the meaning of the sentence. The L component is often referred to as the base or inner component, due to the inwards positioning of this constituent in a phrase structure tree. It is evident that the string of words ‘John eat pizza’ does not form a grammatically well-formed sentence in English, which suggests that E component words are necessary to syntactically shape and structure this string of words. The E component is typically referred to as the outer component that shapes the inner L component as these elements originate in a position that orbits around the L component in a phrase structure tree. In this example, the E component function word that is implemented is *did*. By inserting this word, two types of structures are added to the expression: tense and clause typing. The word *did* is a word that is used to inquire about something that happened in the past, meaning that it adds the structure of the past tense to this expression. In this example, this does not explicitly change the form of the verb, as the verb *eat* in the past tense still surfaces as *eat* without any additional tense markers in this particular environment. Instead the tense slot can be thought of as being filled by a null symbol ( $\emptyset$ ) as this past tense form does not have any phonological content. Although covert, this null tense marker is an important contribution from the E component word *did*. Tense aside, clause typing is also conveyed through the E component. It is interesting that this function word *did* surfaces in the sentence initial position because in English, this indicates that the string of words will manifest as a question. The word *did* determines that the structure of the clause type for this sentence will be in the form of an interrogative question, specifically a yes–no question. Overall, the integration of the E component with the L component forms the well-formed sentence, *Did John eat pizza?*, and accounts for all other utterances found in human languages (Fujita et al., 2018).



Linguistic laws (Galdia, 2009) refer to statistical patterns shared across human languages. Investigation of these patterns has been extended to a range of biological systems, from molecules to organisms to ecosystems, with the number of studies increasing in recent years. Linguistic laws and established concepts in different fields of biology may describe similar, or even identical, patterns, providing an opportunity for unification of natural and language sciences.

This potential to develop new theory for understanding the natural world will only be realised through cross-fertilisation of ideas between researchers working in diverse disciplines and focussed on different levels of biological organization (Galdia, 2009).

Linguistic laws (Galdia, 2009), the common statistical patterns of human language, have been investigated by quantitative linguists for nearly a century. Recently, biologists from a range of disciplines have started to explore the prevalence of these laws beyond language, finding patterns



consistent with linguistic laws across multiple levels of biological organisation, from molecular (genomes, genes, and proteins) to organismal (animal behaviour) to ecological (populations and ecosystems). I propose a new conceptual framework for the study of linguistic laws in biology, comprising and integrating distinct levels of analysis, from description to prediction to theory building. Adopting this framework will provide critical new insights into the fundamental rules of organisation underpinning natural systems, unifying linguistic laws and core theory in biology.

## Alternative Theoretical Approaches

Stemming from the usage-based approach, the Competition Model, developed by Elizabeth Bates and Brian MacWhinney, views language acquisition as consisting of a series of competitive cognitive processes that act upon a linguistic signal. This suggests that language development depends on learning and detecting linguistic cues with the use of competing general cognitive mechanisms rather than innate, language-specific mechanisms (Fujita et al., 2018).

From the side of biosemiotics, there has been a recent claim that meaning-making begins far before the emergence of human language. This meaning-making consists of internal and external cognitive processes. Thus, it holds that such process organisation could not have only given a rise to language alone. According to this perspective all living things possess these processes, regardless of how wide the variation, as a posed to species-specific (Fujita et al., 2018).

## Over-Emphasised Weak Stream Focus

When talking about biolinguistics there are two senses that are adopted to the term: strong and weak biolinguistics. The weak is founded on theoretical linguistics that is generativist in persuasion. On the other hand, the strong stream goes beyond the commonly explored theoretical linguistics, oriented towards biology, as well as other relevant fields of study. Since the early emergence of biolinguistics to its present day, there has been a focused mainly on the weak stream, seeing little difference between the inquiry into generative linguistics and the biological nature of language as well as heavily relying on the Chomskyan origin of the term.

As expressed by research professor and linguist Cedric Boeckx, it is a prevalent opinion that biolinguistics need to focus on biology as to give substance to the linguistic theorizing this field has engaged in. Particular criticisms mentioned include a lack of distinction between generative linguistics and biolinguistics, lack of discoveries pertaining to properties of grammar in the context of biology, and lack of recognition for the importance broader mechanisms, such as biological non-linguistic properties. After all, it is only an advantage to label propensity for language as biological if such insight is used towards a research.

David Poeppel, a neuroscientist and linguist, has additionally noted that if neuroscience and linguistics are done wrong, there is a risk of "inter-disciplinary cross-sterilization," arguing that there is a *Granularity Mismatch Problem*. Due to this different levels of representations used in linguistics and neural science lead to vague metaphors linking brain structures to linguistic components. Poeppel and Embick also introduce the *Ontological Incommensurability Problem*, where computational processes described in linguistic theory cannot be restored to neural computational processes. A recent critique of biolinguistics and 'biologism' in language sciences in general has been developed by Prakash Mondal who shows that there are inconsistencies and categorical mismatches in any putative bridging constraints that purport to relate neurobiological structures and processes to the logical structures of language that have a cognitive-representational character (Fujita et al., 2018).

## Other Relevant Fields

Topic	Description	Relevance to Biolinguistics
Neurolinguistics	The study of how language is represented in the brain; closely tied to psycholinguistics, language acquisition, and the localisation of the language process.	Physiological mechanisms by which the brain processes information related to language.
Language Acquisition	The way in which humans learn to perceive, produce and comprehend language; guided by Universal Grammar proposed by Chomsky; children's ability to learn properties of grammar from impoverished linguistic data.	Language growth and maturation in individuals; evolutionary processes that led to the emergence of language; poverty of the stimulus.
Linguistic Typology	The analysis, comparison, and classification of languages according to their common structural features;	Identifies similarities and differences in the languages of the world; suggests Languages may not be completely random.
Syntax	The rules that govern the grammatical organization of words and phrases.	Generative grammar; poverty of the stimulus; structure dependency whereby a sentence is influenced its structure and not just the order of words.
Artificial Grammar Learning	The intersection between cognitive psychology and linguistics	Humans' cognitive processes and pattern-detection in a language learning context; how humans learn and interpret grammar.

## Legal molecular biological linguistics

### Biology of law

In order to examine the history of legal schools (Galdia, 2009), the history of natural law schools and the positivist school as the most important legal schools are explained and analyzed separately. Biology is a part of the seven sciences that examines the species and way of life of living beings.

In this section, we discuss the emergence of various legal schools and their origins, which are from several legal philosophers who played a significant role in the synergy of common law, <sup>1</sup>Roman-Germanic and Islamic (Roman-Germanic) legal systems, which is the biology of linguistics. It is called legal and in it, the interaction of different ideas with each other can create the stability and strengthening of a special civil society with a legal-linguistic foundation and, first of all, the law (Galdia, 2009).

This knowledge (Galdia, 2009) takes a look at the characteristics and behavior of thinkers, the origin, evolution and how the types of legal systems and people (population) appear, and also at the interaction of the opinions of legal scholars with each other and their surrounding environment, which may create a utopia.

## 1. Natural Law School

Some jurists believe that (Galdia, 2009) the origin of the belief in natural rights goes back to the thoughts of Pythagoras, and this point of view was later the basis of Aristotle's work. Socrates is also one of the scientists who defended the natural rights in its true sense and believed that natural laws should be discovered and the administration of affairs should be based on these laws. Plato, following his teacher, had the same view. But for the first time the Stoics coherently interpreted natural rights. The Stoics believed that there is a natural law that governs all human beings. Cicero writes in the third book of the Republic, chapter 32, that there is only one natural law that does not change under the influence of time and place.

In the 3<sup>rd</sup> and 4<sup>th</sup> centuries until the 13th century AD, Christian thinkers (Galdia, 2009) considered natural rights as subordinate to divine rights. But in the 16<sup>th</sup> and 17<sup>th</sup> centuries, anti-religious interests and the Renaissance caused natural rights to return to their previous definition. But this time we are talking about the right that reason and not nature or religion gives to man. Writers and thinkers of the 17<sup>th</sup> and 18<sup>th</sup> centuries spread their thoughts about natural rights among the people with admirable persistence.

With the spread of the market, positivism of natural rights was associated almost throughout the 19<sup>th</sup> century because positivists believed that natural rights could not be proven. World War II and the revival of ideas based on natural rights caused the supporters of this school to turn to the relativity of values. They consider natural rights as a force that guides the evolution and transformation of subject rights, and in fact, their theory is based on skepticism about a static ideal without mobility, the relativity of values and the flow of progress. In the end, it should be said that in the past, natural rights seemed to be just a belief based on a religious or supernatural attitude, but as time progressed, it distanced itself from that realm and gradually became an effective weapon against political and legal ideologies (Galdia, 2009).

## 2. Positivist school of law

After the emergence of the bourgeois social class in opposition to the church and the emergence of Protestantism and the renaissance (Galdia, 2009), the belief in the separation of this world and the hereafter and the removal of religion from the social scenes, enlightenment and rationalism appeared. Against this current, the empiricist current arose within the Enlightenment, which insisted that sensory experience is always one of the necessary elements. Although the 17<sup>th</sup> and 18<sup>th</sup> centuries in the West were associated with the authority of rationalist philosophers, gradually the positivists or empiricists were also infiltrating and dominating the West. Eighteenth century philosophers, such as Montesquieu, Voltaire, and Rousseau, who were heavily influenced by sensualists, especially Locke, voted to reject the religion of revelation and sometimes all religions in general, fearing the church's opposition and hostility to scientific advances. Gradually, science, which had lost its intuitive and rational foundations, fell into the abyss of skepticism after it could not hold sensory experience.

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<sup>1</sup> The other name is Civil law.

From the 19<sup>th</sup> century onwards, due to the dominance of empiricist epistemology, sensory science was introduced as the only way to know and communicate with the outside world. Based on this, only scientific knowledge will be obtained through sense, or at least it can be proved or disproved through sense, or it can be confirmed through this way. This meaning of science became popular from the second half of the 19<sup>th</sup> century to the second half of the 20<sup>th</sup> century, and according to it, philosophical, religious, mythological and ideological knowledges were considered non-scientific. Therefore, the positivist school of law was born (Galdia, 2009).

The supporters of this group believed that (Galdia, 2009) scientists, relying on their positive knowledge, know what is good and what is bad for society, and based on this, they call people to do their collective duty and suppress any inherent legal thought in them. Gradually and with the domination of empiricism, the ways of ideologies were lost and the positivist and status rights denied the validity of the laws and left the status of values to the will of people. It should be added that legal positivism differentiates between the nuclear and Legal description should deal with what is, not what should be.

### **Natural law and positivist school**

According to the origin of validity and requirement of legal rules, different tendencies can be divided into two schools of natural law and positivist law. Each of these two schools has had its own fans in different periods of time and one has prevailed over the other (Galdia, 2009).

#### **1. School of natural law**

A large group of writers have accepted that there are higher laws than the will of the legislator, and they refer to them as natural rights. They usually use the term "natural rights" against "objective rights" to show that, in contrast to the rules that govern at a certain time and their implementation is guaranteed by the government, there are also fixed rules that are superior to the will of the government and the desirable end of man and the legislator. He should try to find them and set them as his example. Natural rights mean the values and freedoms inherent in human nature. The criterion of the validity of this type of rights is the right that can originate from the truth of human existence, or nature, or the creator of this nature (Galdia, 2009).

The laws of nature are coercive and inviolable, and just as following these laws provides the basis for natural punishment and compensation, failure to respond to them also results in punishment and natural disaster. Proponents of natural rights believe that we should be aware of natural laws, because our awareness and knowledge speak to us in the language of nature, and this is enough to find the path we need. And finally, people are forced to adhere to the law, even if they did not create it themselves, because the rule of law is the reason for the safety and survival of the individual and the community, and there is no escaping it (Galdia, 2009).

The modern school of natural law is based on a level definition of natural law and human rights by emphasizing the issue of reason instead of nature, that is, human reason as the base of natural law is the origin of rights. In fact, reason is a means of measuring deficiencies and excesses, with the explanation that everything must be in the form of nature to stay healthy, and man has the ability to understand this nature through his intellect, however, the evolution of thoughts about the source and purpose of these great rules has three main stages. has traveled Religious era, rationalism era, experimental era (Galdia, 2009).

#### **a) religious era**

Before the 17<sup>th</sup> century (Galdia, 2009), natural rights were said to be high and desirable rules that were ruled by human reason. The dominance of rationalists by accepting the ability of reason to find rules and also the influence of the religion of Christ promoted such thinking; As the age of Thomas and human and innate or natural, Daken had divided the laws into three divine categories.

In this era, sovereignty belongs to God, and good and bad, permissible and forbidden are his will. In other words, law and religion are intermingled and every rule is implemented within the framework of religious beliefs, and as a result, the validity of the legal rule is due to the will of God and is therefore immune to any criticism and discussion.

#### **b) rationalist era**

In the 17<sup>th</sup> and 18<sup>th</sup> centuries (Galdia, 2009), natural rights gradually lost their religious and divine roots in Europe. The leader of this movement should be the Dutch Grosius, but after him the German Pufendorf and the French Descartes also considered natural rights to be the product of human reason and derived from the nature of things, and Kant, in his analysis of reason, considered rights to be among the orders of practical reason.

The concept of natural rights in this period and among the rationalists is different from the religious era in several ways:

- 1- The source of natural rights is man, not God; Natural rights are so mixed with human nature that no factor can separate it from him or transfer it to others.
- 2- The purpose of natural rights is to protect individual rights;
- 3- Freedom is the highest value; In most of the philosophical works of this era, freedom is the essence of life and the most important desirable ideal of man and the most precious values.

#### **c) Experimental era**

In the 19<sup>th</sup> and 20<sup>th</sup> centuries (Galdia, 2009), people turned to experience and finding the cause of events replaced idealism and rational analysis. As a result, the school of natural law was criticized from various aspects and the ability of human reason to deduce the best legal rules was denied. In this era, the advocates of natural rights tried to insulate at least some natural or innate concept of rights, in order to preserve ideals and values against the power of the state. However, to achieve this common goal, each group went their separate ways. A group of writers confirmed the traditional concept of natural rights, limited it to a few general and self-evident rules, and considered other rules to be changeable and caused by the government's will and the result of social changes. Others abandoned the stability of natural rights and considered the subject of its rules to be different in each era.

A group has also followed the path that nature only shows the path of natural movement towards justice. They have considered the concept of natural rights to be the same as the sense of justice and have considered justice as the basis of legal and moral rules (Galdia, 2009).

Therefore, the source of natural or innate rights is God's will, and its purpose is to implement His will, i.e. to establish justice and kindness. Therefore, natural or innate rights are unchangeable and universal, and the change of time and place does not affect its validity and power (Galdia, 2009).

The main difference between natural rights followers and positivists is that the latter group sees rights as nothing more than a legal system dependent on a certain society, while the first group considers rights as a common goal of human societies. Of course, human perception of moral values differs in different times and places. It should be noted that the followers of this school do not deny this either, but they believe that the ideal of law, which is to establish an order that is affordable to the good, remains intact despite these changes (Galdia, 2009).

Therefore, the following three characteristics can be found in all the various interpretations of natural rights that have been proposed so far:

universality; That is, its principles are the same in all times and places.



Necessity; It means that observing it is required by the rational nature of man.

Stability; That is, it is not dependent on any human authority.

## 2. Positivist school of law

The term "positivist" (Galdia, 2009) is a general description to describe some of the popular schools in the philosophy of law, whose only similarity is apparently the opposition to natural and innate rights.

Therefore, it seems difficult to explain the works and tools of legal positivism in discussions about the foundations, sources and goals of law and to explain its relationship with philosophical positivism, and to achieve this goal, it is necessary to present a precise classification of schools of positivism. Brimo's effort to classify the mentioned schools should be evaluated in this regard. According to him, schools of positivism are divided into five categories: mercantile schools, schools of positivism in a special sense, Marxist schools, social schools and normative schools.

Now, if we consider the criteria for applying the description of positivist to the above schools to be their reliance on empirical knowledge and their opposition to referring to reason to discover legal rules, we can only call empiricists and some social positivists, and perhaps with a little development, historians as positivists; Because although other schools are against the use of reason to discover legal rules, the need to refer to empirical knowledge in this case is not accepted by them either, and perhaps it is denied as much as referring to reason. But if we consider the criterion of applying the positivist description to these schools as their opposition to idealism and their belief in the equality of rights with the written law and the practice of the courts. Only those who support the unity of law and government and legal positivists can be considered worthy of this description.

The word positive is taken from the Latin word *positio*, which means a real and non-illusory entity, and as it is quoted from Comte, it means real, useful, accurate, certain, relative and organic. Therefore, it can be said that all legal positivists in the general sense of the word law wanted or knew that they had such attributes. According to them, rights are objective, immoral, unnatural, impersonal and relative, or should be so. The above five attributes can be explained as follows:

1. The objectivity of rights has two different meanings according to positivists. According to some positivists, the objectivity of rights means the reliance of rights on real matters or the necessity of such a thing, while according to others, it means the objectivity of the method of identifying legal rules.
2. According to positivists, the meaning of the immorality of rights is not the unethicity of rights, but rather the negation of propositions, which speaks of the productive relationship between moral and legal propositions in the causative form and puts the moral matter beyond the legal matter.
3. What is meant by the unnaturalness of rights is the negation of nature and natural affairs as a basis for rights; This means that statements indicating the physical, mental or psychological structure of a person or his natural abilities are not the basis for rights and should not be considered.
4. According to all schools of positivism, on the one hand, the goal of law is to establish order, and on the other hand, either individuals do not have a personality independent from the group and cannot be considered a subject for rights, or society has an undisputed superiority over the individual. Therefore, all legal rules refer to typical situations and ordinary people, or should be so.
5. According to all positivists, relativity is one of the attributes of legal rules; Because the range of legal rules in different ages and eras is very wide and there are many differences between them, so that the numerical plurality of these rules and the differences between them cannot be submitted to unity. Therefore, trying to provide a dogmatic basis for rights that is trans-spatial and trans-temporal is considered a futile effort.

According to the above explanations, the views of the positivists regarding the foundations and goals of law and its sources, as well as the methods of reading and understanding the said sources are more or less clarified. Paying attention to these issues shows that positivists have the same opinion only about the purpose of rights and consider it to provide order and discipline and manage the society, and in three of the above four matters, they did not follow the same pattern and presented different ideas.

History, the greatest benefit for the greatest number of people in society, social expediency, social rules or some special examples such as cooperation and solidarity and the will of the government are things that are considered as the basis of rights by positivists. In the field of law sources, some people have considered the importance of the custom and others of the written law or judicial procedure. As in the field of interpretation, hands are tight on trying to discover the intention of the legislator, while others consider the law as an entity independent of the legislator and have encouraged the judges to use the scientific method and interpret the law in the direction of the society's demands.

Explaining the relationship between legal positivism, in the general sense of the word, and philosophical positivism is also very important. In this regard, it seems that contrary to the opinion of some thinkers in the field of legal philosophy, there is not a strong connection between the ideas of philosophical positivism and legal positivism; What, as it has been said, legal positivism schools, in the general sense of the word, do not agree on the need to refer to empirical knowledge in the field of law, and this only applies to some schools of positivism, such as the experimental school and social positivism, and more broadly, the historical school. It is true. Nevertheless, it seems that the expansion of the studies of scientists in experimental sciences and its shocking discoveries, on the one hand, and the extreme emphasis on natural rights during the eighteenth century and the Age of Enlightenment, which provoked the reaction of conservatives, on the other hand, probably in the expansion of the positivist view. It has not been ineffective in law; Especially since the works of early positivists include attacks on laws based on natural rights. The French revolutionaries compiled and propagated it in the form of the Universal Declaration of Human and Citizen Rights, and the American revolutionaries accepted similar rules as part of their constitution (Galdia, 2009).

## Molecular Biology of Law in Children's rights

Children as well as adults (Fujita et al., 2018) have human rights. As well as the human rights that are laid out in the Universal Declaration of Human Rights, children and young people are entitled to additional rights which recognise that young people have special needs to help them survive and develop to their full potential. Children also have the right to special protection because of their vulnerability to exploitation and abuse. The specific rights of children are laid out in the Convention on the Rights of the Child.

The Convention on the Rights of the Child is an international human rights agreement (also known as a human rights treaty) that outlines the specific rights that children and young people can claim (Fujita et al., 2018).

By signing up to the Convention, national governments commit to protecting these rights in their countries. Nearly every country in the world has committed to the Convention, making it the most widely supported human rights treaty.

The Convention was agreed to by the United Nations General Assembly and came into force in September 1990. For example Australia ratified the Convention in December 1990. By ratifying - or in other words, formally approving - the Convention, Australia committed to ensuring that all children in Australia enjoy the rights set out in the treaty.

To make sure that nations are upholding their responsibilities to children under the Convention, the United Nations also created the **Committee on the Rights of the Child**. The Committee is a group of 18 independent experts who review the performance of countries who have signed the Convention every 5 years (Fujita et al., 2018).

Only one country in the United Nations has not ratified the Convention on the Rights of the Child - the United States of America.

The Convention on the Rights of the Child covers a whole range of different human rights - civil, political, economic, social and cultural - and sets out the specific ways these rights should be achieved for children and young people. The Convention defines everyone under the age of 18 as a child.

Some of the rights that are contained in the Convention include (Galdia, 2009):

- the right to be treated fairly
- the right to have a say about decisions affecting you
- the right to live and grow up healthy
- the right to be safe no matter where you are
- the right to get an education
- the right to play and have fun!

## Law; Children's guide

States should: do their utmost to minimise the number of children coming into conflict with the law. They should establish comprehensive and child-friendly juvenile justice systems, complying with international standards, which aim to rehabilitate children and divert them away from criminalisation and detention (Galdia, 2009).

Children (Galdia, 2009) in conflict with the law suffer multiple and severe forms of violence both inside and outside the juvenile justice system. Violence includes: beatings, rape, humiliating and degrading treatment, torture, and extra-judicial killings. A range of law enforcement authorities, detention centre personnel, and other adults perpetrate this violence, as well as some children and young people themselves (e.g. members of organised gangs). Children often face harmful and inappropriate punishments. This includes detention in adult prisons, which is a direct violation of the child's rights.

Very often when a child comes into conflict with the law it represents a fundamental failure to fulfil that child's rights to adequate care and protection at an earlier point in their lives. Such failures expose children to significant risks of violence and exploitation.

Once having entered the justice system children (Galdia, 2009) are often held in detention for long periods awaiting trial. This makes them vulnerable to further violence and abuse. Furthermore, the vast majority of the one million children in prison today are there for petty offences and/or because of their efforts to survive in the absence of proper support for themselves and their families. This evidence suggests the need for community-based protection systems and juvenile justice systems that place children's best interests at their core. This in turn means diverting children from the formal justice system (wherever possible) and reintegrating them back into their communities.

Diversion options should be seen as the priority response to children coming into conflict with the law. Community-based rehabilitation schemes are the best ways to respond to children in conflict with the law. These options might involve: mentoring by community representatives; counselling; or a programme of constructive public service (Galdia, 2009).

Juvenile justice measures should be child-friendly, and operate within a broader national child protection system. For example, representatives from the police, judiciary, and welfare and education departments should work together to provide the most appropriate response to each child. They should operate in ways that are sensitive to children's rights and that reflect international standards for

administering juvenile justice. There should be a policy of zero tolerance with respect to violence towards children who come into conflict with the law.

## Rights of children in the criminal process

Section 33 of the *Human Rights Act 2019* says that(Galdia, 2009):

- 1.An accused child who is detained, or a child that is detained without charge, must be segregated from all detained adults.
- 2.An accused child must be brought to trial as quickly as possible.
- 3.A child who has been convicted of an offence must be treated in a way that is appropriate for the child's age

The Human Rights Act details special protections for children involved in criminal processes. It provides that an accused child must not be detained with adults and must be brought to trial as quickly as possible. It also says that a convicted child must be treated in a way that is appropriate for their age (Galdia, 2009).

These rights are based on articles 10(2)(b) and 10(3) of the International Covenant on Civil and Political Rights. Australia ratified this treaty in 1980. They are also based on articles 37 and 40 of the Convention on the Rights of Child, which Australia ratified in 1990.

Section 33 applies only to children in the criminal process. As human beings, children are entitled to all the rights in the Act (unless those rights have an eligibility condition they don't meet, like the right to vote under section 23).

Other rights protected in the Human Rights Act (Galdia, 2009) that apply more generally to people involved in the criminal process include:

- Protection from torture and cruel, inhuman or degrading treatment or punishment (section 17);
- Right to liberty and security of person (section 29);
- Humane treatment when deprived of liberty (section 30);
- Right to a fair hearing (section 31);
- Rights in criminal proceedings (section 32);
- Right not to be tried or punished more than once (section 34);
- Retrospective criminal laws (section 35).

## Scope of the right

Section 33 recognises (Galdia, 2009) that children are entitled to special protections because of their age. It only applies to criminal process, unlike section 30 which applies to someone detained regardless of the purpose of the detention.

Like all rights in the Act, the rights of children in the criminal process can be limited, but only where it is reasonable and demonstrably justified in a free and democratic society based on human dignity, equality and freedom.

The Human Rights Act (Galdia, 2009) amends the *Youth Justice Act 1992* to clarify that when decisions are made under that Act in relation to the segregation of convicted and non-convicted children, the following additional factors can be considered in addition to human rights obligations:

- The safety and wellbeing of a child on remand and other detainees; and
- The chief executive's responsibilities and obligations under section 263 of that Act, which relates to the management of detention centres.

### **Right to be segregated from all detained adults**

Any child (Galdia, 2009) who is detained as part of a criminal process must be held separately to any detained adults, preferably in a separate juvenile facility. As with adults, accused children on remand must also be segregated from convicted prisoners serving their sentences (section 30(2) of the Act).

The law recognises that children, because of their age, are more vulnerable. When housed in adult prisons, or other adult facilities, children's basic safety and well-being may be compromised. So might their ability to reintegrate into society, or avoid becoming involved in further criminal activity. That is why there must be separate facilities for children, with different policies and practices, to cater for their developmental needs.

The only permitted exception to the separation of children from adults is where it is not in the child's best interests. This would only be in exceptional circumstances. For example, the child's best interest may require greater priority for family contact than for separation from detained adults. This might lead to the child being detained with a parent or close to home, even if detention is in a facility shared with adults (Galdia, 2009).

### **Right to be brought to trial as quickly as possible**

Every child arrested and charged must be brought before a court as quickly as possible. This requirement is similar to the one which applies to everyone (sections 29(5) and 32(2)(c) of the Act), but is more onerous. This reinforces that timing can be critical when a child is kept in detention. It recognises that a child should be detained for the shortest appropriate time.

It is not sufficient to cite the absence of proper resources as reason for any delay. A prosecuting authority has a responsibility to ensure that all agencies are adequately supported, and that proper consideration is given to the speed of criminal cases involving children (Galdia, 2009).

### **Right to be treated in a way that is appropriate to the child's age**

This right must be applied, observed and respected throughout the entire process. This means from the first contact with the child by law enforcement agencies through to the implementation of any sentence.

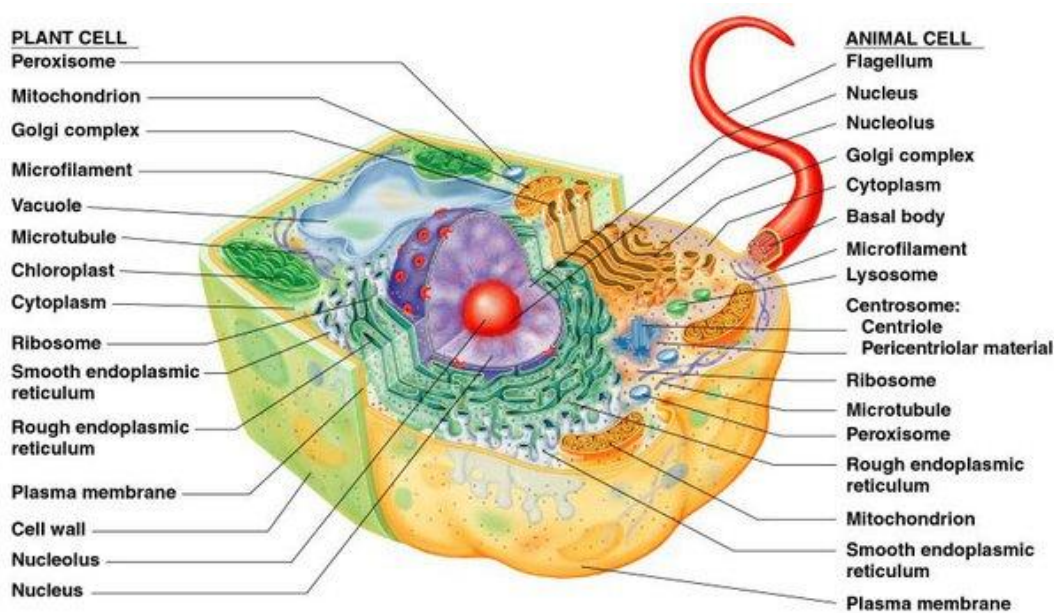


## 7- Results

### When this right could be relevant

Section 33 (Galdia, 2009) could be relevant to laws, policies, acts or decisions that:

- enable children to be detained for any length of time;
- authorise the holding of children in amenities that have limited facilities or services for the care and safety of children;
- enable people to undertake personal searches of a detained child;
- impacts on the environmental design of detention centres or conditions under which children are detained;
- establish or alter programs in prisons, youth training centres or residential centres;
- affects the speed at which a child may be brought to trial;
- create or amend procedures and the law of evidence applicable to children charged with criminal offences, including the investigation and prosecution of offences; or
- amend the law relating to children in criminal proceedings, including bail, adjournments and sentencing.



**(a) Highly schematic diagram of a composite eukaryotic cell, half plant and half animal**

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### Explanations of Good Government and Unique Child (In Both of Plant and Animal Cell) :

**1. Peroxisome** = Good societies have high levels of employment, they are richer, more politically stable, and healthier. Creating more and better jobs is a major challenge for governments. Society plays a multifaceted role in child development, encompassing cultural, educational, social, and emotional dimensions. By fostering a supportive and inclusive environment, society can positively influence the growth, well-being, and potential of each child.

**2. Mitochondria** = The proper role of the parent is to provide encouragement, support, and access to activities that enable the child to master key developmental tasks. A child's learning and socialization are most influenced by their family since the family is the child's primary social group. Happy parents raise happy children.

**3. The Golgi complex** = Governments provide the parameters for everyday behavior for citizens, protect them from outside interference, and often provide for their well-being and happiness.

**4. Microfilament** = Learning centers also foster independence and decision-making skills. Children can make choices within each center, set goals, and explore at their own pace. This autonomy nurtures their decision-making abilities, problem-solving skills, and self-regulation, all essential for their development.

**5. Vacuole** = Random preventive patrol is one of the roles of police agencies used in crime prevention. In this role, police are supposed to be on patrol for the purpose of preventing criminal activities in a given area. The presence of police in patrol creates confidence in people and instills fear to criminals.

**6. Microtubule** = A healthy child's personality can include the influences of parents, peers, temperament, a moral compass, a strong sense of self, and sometimes critical life experiences such as parental divorce. Social and personality development encompasses these and many other influences on the growth of the person.

**7. Chloroplast** = Children are more vulnerable than adults to environmental risks: Children are constantly growing. They breathe more air, consume more food, and drink more water than adults do, in proportion to their weight. These agents are created under the control of the health and treatment and environmental protection organization and are the administrators of the above organizations.

**8. Cytoplasm** = relationships and networks improves a child's development. In terms of parenting, social relationships. of key importance include those between a child and their parents, but also a child and other adults. (e.g. teachers, other children's parents) and other children (including their siblings). If these things are properly used by children and within the framework of healthy rules, they can help guide them properly.

**9. Ribosome** = A series of social factors shape children's personality, which include: genetic factors (family history of mental illness), environmental factors (exposure to trauma or abuse), and stress (from schools or family issues). It's important to note that not all children who experience these factors will go on to develop mental health issues. If they are used in the right situation, the child will remain healthy in terms of mental health.

**10. Smooth endoplasmic reticulum** = Basically, with the science of crime prevention in the branch of criminal law, children can be protected from toxic and polluted environments where unethical behaviors are rampant in these places, and the role of judicial systems and crime prevention organizations to detect crimes. Identifying the criminal, dealing with the charge and ultimately convicting or acquitting him play an important role in this field.

**11. Rough endoplasmic reticulum** = Target Hardening. Making your property harder for an offender to access. Target Removal. Ensuring that a potential target is out of view. Reducing the Means.

Reducing the Payoff. Access Control. Surveillance. Environmental Change. Rule setting. Increase the Chances of Being Caught. Deflecting Offenders.

**12. Plasma membrane** = A prison is a place where convicts whose sentence has been decided are kept for a certain period of time or permanently in order to endure the punishment, with the purpose of professional training, rehabilitation and reintegration.

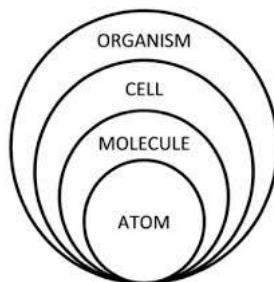
**13. Cell wall** = The duties of the three powers that govern the country can provide a strong wall against any violation of children's rights, and this is possible with the cooperation of the three powers and by maintaining their independence.

**14. Nucleolus** = Proper behavioral guidance of children according to international health standards to prevent their misbehavior in the future, which may harm the society, if controllability is not done by the family.

**15. Nucleus** = The task of preserving children's energy and guiding them properly to remove excess energy should be done with healthy educational, cultural and social programs by various associations so that the child does not go astray.

## 8- Conclusion

In the conclusion section, when comparing the role of the judiciary and competent judicial authorities for the acquittal or conviction of children from the point of view of molecular biological legal linguistics, we must reach this goal that when it comes to the atom, from my point of view, who is the author, and other participating authors In this paper; Language, law, child and rights each alone can be considered an atomic element that when linked with other elements including; The family, as the primary society and then the adult society, can show various chemical reactions, which either play a role as free radicals or are effective as antioxidants, but when the imbalance in these two states get messed up, they produce oxidative stress which can create a destructive role in the optimization of the society and children with unhealthy behavior and from the heart of the society become criminals who have damaged their mental and physical health and this issue It can be 90% derived from the lack of informing children correctly through social media networks and channels, and various criminal crimes occur more in child criminals than in private law.



If children grow and develop in a healthy cultural, educational, social and political environment, they can create a bright future for themselves. Children can effectively implement their abundant and free energy within the framework of effective rules, which of course, by taking advantage of the correct behavior of adults, including; From birth, their parents form their existence in terms of literary and linguistic principles that lead to a unique citizen, and they obey the form and content of the laws with this, and this molecule should be a valuable different structure of character building. the child will gain in the future at the cellular level and otherwise such a result cannot be achieved.

When a child establishes a healthy social-legal relationship with others that they meet in adult environments, they can leave behind a healthy organism without causing irreparable harm to others and first of all to themselves. The figure below shows the contents explained by me and the participating authors in this article.

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