Evolution of Language and Mind

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Chapter 1

Origin of Language

The origin of language (spoken and signed, as well as language-related technological systems such as writing), its relationship with human evolution, and its consequences have been subjects of study for centuries. Scholars wishing to study the origins of language must draw inferences from evidence such as the fossil record, archaeological evidence, contemporary language diversity, studies of language acquisition and comparisons between human language and systems of communication existing among animals (particularly other primates). Many argue that the origins of language probably relate closely to the origins of modern human behavior, but there is little agreement about the facts and implications of this connection.

The shortage of direct, empirical evidence has caused many scholars to regard the entire topic as unsuitable for serious study; in 1866, the Linguistic Society of Paris banned any existing or future debates on the subject, a prohibition which remained influential across much of the Western world until late in the twentieth century. Various hypotheses have been developed about how, why, when, and where language might have emerged. Still, little more has been universally agreed upon today than a hundred years ago, when Charles Darwin's theory of evolution by natural selection provoked a surge of speculation on the topic. Since the early 1990s, however, a number of linguists, archaeologists, psychologists, anthropologists, and others have attempted to address this issue with new, modern methods.

Approaches

One can sub-divide approaches to the origin of language according to some underlying assumptions:

- "Continuity theories" build on the idea that language exhibits so much complexity that one cannot imagine it simply appearing from nothing in its final form; therefore it must have evolved from earlier pre-linguistic systems among humans' primate ancestors.
- "Discontinuity theories" take the opposite approach—that language, as a unique trait which cannot be compared to anything found among non-humans, must have appeared fairly suddenly during the course of human evolution.
- Some theories consider language mostly as an innate faculty—largely genetically encoded.
- Other theories regard language as a mainly cultural system—learned through social interaction.

A majority of linguistic scholars as of 2018 believe continuity-based theories, but they vary in how they hypothesize language development. Among those who consider language as mostly innate, some—notably Steven Pinker—avoid speculating about specific precursors in nonhuman primates, stressing simply that the language faculty must have evolved in the usual gradual way. Others in this intellectual camp—notably IbUlbæk—hold that language evolved not from primate communication but from primate cognition, which is significantly more complex.

Those who consider language as learned socially, such as Michael Tomasello, consider it developing from the cognitively controlled aspects of primate communication, these being mostly gestural as opposed to vocal. Where vocal precursors are concerned, many continuity theorists envisage language evolving from early human capacities for song.

Noam Chomsky, a proponent of discontinuity theory, argues that a single chance mutation occurred in one individual in the order of 100,000 years ago, installing the language faculty (a hypothetical component of the mid-brain) in "perfect" or "near-perfect" form.

Transcending the continuity-versus-discontinuity divide, some scholars view the emergence of language as the consequence of some kind of social transformation that, by generating unprecedented levels of public trust, liberated a genetic potential for linguistic creativity that had previously lain dormant. "Ritual/speech coevolution theory" exemplifies this approach. Scholars in this intellectual camp point to the fact that even chimpanzees and bonobos have latent symbolic capacities that they rarely—if ever—use in the wild.

Objecting to the sudden mutation idea, these authors argue that even if a chance mutation were to install a language organ in an evolving bipedal primate, it would be adaptively useless under all known primate social conditions. A very specific social structure—one capable of upholding unusually high levels of public accountability and trust—must have evolved before or concurrently with language to make reliance on "cheap signals" (words) an evolutionarily stable strategy.

Since the emergence of language lies so far back in human prehistory, the relevant developments have left no direct historical traces; neither can comparable processes be observed today. Despite this, the emergence of new sign languages in modern times—Nicaraguan Sign Language, for example—may potentially offer insights into the developmental stages and creative processes necessarily involved. Another approach inspects early human fossils, looking for traces of physical adaptation to language use.

In some cases, when the DNA of extinct humans can be recovered, the presence or absence of genes considered to be language-relevant—FOXP2, for example—may prove informative. Another approach, this time archaeological, involves invoking symbolic behavior (such as repeated ritual activity) that may leave an archaeological trace—such as mining and modifying ochre pigments for body-painting—while developing theoretical arguments to justify inferences from symbolism in general to language in particular.

The time range for the evolution of language or its anatomical prerequisites extends, at least in principle, from the phylogenetic divergence of *Homo* (2.3 to 2.4 million years ago) from *Pan* (5 to 6 million years ago) to the emergence of full behavioral modernity some 50,000–150,000 years ago. Few dispute that *Australopithecus* probably lacked vocal communication significantly more sophisticated than that of great apes in general, but scholarly opinions vary as to the developments since the appearance of *Homo* some 2.5 million years ago. Some scholars assume the development of primitive language-like systems (*proto-language*) as early as *Homo habilis*, while others place the development of symbolic

communication only with *Homo erectus* (1.8 million years ago) or with *Homo heidelbergensis* (0.6 million years ago) and the development of language proper with *Homo sapiens*, currently estimated at less than 200,000 years ago.

Using statistical methods to estimate the time required to achieve the current spread and diversity in modern languages, Johanna Nichols—a linguist at the University of California, Berkeley—argued in 1998 that vocal languages must have begun diversifying in the human species at least 100,000 years ago. A further study by Q. D. Atkinson suggests that successive population bottlenecks occurred as human African ancestors migrated to other areas, leading to a decrease in genetic and phenotypic diversity. Atkinson argues that these bottlenecks also affected culture and language, suggesting that the farther away a particular language is from Africa, the fewer phonemes it contains. By way of evidence, Atkinson claims that today's African languages tend to have relatively large numbers of phonemes, whereas languages from areas in Oceania (the last place to which humans migrated), have relatively few. Relying heavily on Atkinson's work, a subsequent study has explored the rate at which phonemes develop naturally, comparing this rate to some of Africa's oldest languages. The results suggest that language first evolved around 50,000–150,000 years ago, which is around the time when modern *Homo sapiens* evolved. Estimates of this kind are not universally accepted, but jointly considering genetic, archaeological, palaeontological and much other evidence indicates that language probably emerged somewhere in sub-Saharan Africa during the Middle Stone Age, roughly contemporaneous with the speciation of *Homo sapiens.*

Language origin hypotheses

Early speculations

I cannot doubt that language owes its origin to the imitation and modification, aided by signs and gestures, of various natural sounds, the voices of other animals, and man's own instinctive cries.

- *— Charles Darwin, 1871. The Descent of Man, and Selection in Relation to Sex*

In 1861, historical linguist Max Müller published a list of speculative theories concerning the origins of spoken language:

- *Bow-wow.* The *bow-wow* or *cuckoo* theory, which Müller attributed to the German philosopher Johann Gottfried Herder, saw early words as imitations of the cries of beasts and birds.
- *Pooh-pooh.* The *pooh-pooh* theory saw the first words as emotional interjections and exclamations triggered by pain, pleasure, surprise, etc.
- *Ding-dong.* Müller suggested what he called the *ding-dong* theory, which states that all things have a vibrating natural resonance, echoed somehow by man in his earliest words.
- *Yo-he-ho.* The *yo-he-ho* theory claims language emerged from collective rhythmic labor, the attempt to synchronize muscular effort resulting in sounds such as *heave* alternating with sounds such as *ho.*
- *Ta-ta.* This did not feature in Max Müller's list, having been proposed in 1930 by Sir Richard Paget.

According to the *ta-ta* theory, humans made the earliest words by tongue movements that mimicked manual gestures, rendering them audible.

Most scholars today consider all such theories not so much wrong—they occasionally offer peripheral insights—as naïve and irrelevant. The problem with these theories is that they are so narrowly mechanistic. They assume that once human ancestors had discovered the appropriate ingenious *mechanism* for linking sounds with meanings, language automatically evolved and changed.

Problems of reliability and deception

From the perspective of signalling theory, the main obstacle to the evolution of language-like communication in nature is not a mechanistic one. Rather, it is the fact that symbols—arbitrary associations of sounds or other perceptible forms with corresponding meanings—are unreliable and may well be false. As the saying goes, "words are cheap". The problem of reliability was not recognized at all by Darwin, Müller or the other early evolutionary theorists.

Animal vocal signals are, for the most part, intrinsically reliable. When a cat purrs, the signal constitutes direct evidence of the animal's contented state. The signal is trusted, not because the cat is inclined to be honest, but because it just cannot fake that sound. Primate vocal calls may be slightly more manipulable, but they remain reliable for the same reason—because they are hard to fake. Primate social intelligence is "Machiavellian"—self-serving and unconstrained by moral scruples. Monkeys and apes often attempt to deceive

each other, while at the same time remaining constantly on guard against falling victim to deception themselves. Paradoxically, it is theorized that primates' resistance to deception is what blocks the evolution of their signalling systems along language-like lines. Language is ruled out because the best way to guard against being deceived is to ignore all signals except those that are instantly verifiable. Words automatically fail this test.

Words are easy to fake. Should they turn out to be lies, listeners will adapt by ignoring them in favor of hard-to-fake indices or cues. For language to work, then, listeners must be confident that those with whom they are on speaking terms are generally likely to be honest. A peculiar feature of language is "displaced reference", which means reference to topics outside the currently perceptible situation. This property prevents utterances from being corroborated in the immediate "here" and "now". For this reason, language presupposes relatively high levels of mutual trust in order to become established over time as an evolutionarily stable strategy. This stability is born of a longstanding mutual trust and is what grants language its authority. A theory of the origins of language must therefore explain why humans could begin trusting cheap signals in ways that other animals apparently cannot (see signalling theory).

The 'mother tongues' hypothesis

The "mother tongues" hypothesis was proposed in 2004 as a possible solution to this problem. W. Tecumseh Fitch suggested that the Darwinian principle of 'kin selection'—the convergence of genetic interests between relatives—might be

part of the answer. Fitch suggests that languages were originally 'mother tongues'. If language evolved initially for communication between mothers and their own biological offspring, extending later to include adult relatives as well, the interests of speakers and listeners would have tended to coincide. Fitch argues that shared genetic interests would have led to sufficient trust and cooperation for intrinsically unreliable signals—words—to become accepted as trustworthy and so begin evolving for the first time.

Critics of this theory point out that kin selection is not unique to humans. So even if one accepts Fitch's initial premises, the extension of the posited 'mother tongue' networks from close relatives to more distant relatives remains unexplained. Fitch argues, however, that the extended period of physical immaturity of human infants and the postnatal growth of the human brain give the human-infant relationship a different and more extended period of intergenerational dependency than that found in any other species.

The 'obligatory reciprocal altruism' hypothesis

IbUlbæk invokes another standard Darwinian principle—'reciprocal altruism'—to explain the unusually high levels of intentional honesty necessary for language to evolve. 'Reciprocal altruism' can be expressed as the principle that *if you scratch my back, I'll scratch yours*. In linguistic terms, it would mean that *if you speak truthfully to me, I'll speak truthfully to you.* Ordinary Darwinian reciprocal altruism, Ulbæk points out, is a relationship established between frequently interacting individuals. For language to prevail across an entire community, however, the necessary reciprocity

would have needed to be enforced universally instead of being left to individual choice. Ulbæk concludes that for language to evolve, society as a whole must have been subject to moral regulation.

Critics point out that this theory fails to explain when, how, why or by whom 'obligatory reciprocal altruism' could possibly have been enforced. Various proposals have been offered to remedy this defect. A further criticism is that language does not work on the basis of reciprocal altruism anyway. Humans in conversational groups do not withhold information to all except listeners likely to offer valuable information in return. On the contrary, they seem to want to advertise to the world their access to socially relevant information, broadcasting that information without expectation of reciprocity to anyone who will listen.

The gossip and grooming hypothesis

Gossip, according to Robin Dunbar in his book *Grooming, Gossip and the Evolution of Language*, does for group-living humans what manual grooming does for other primates—it allows individuals to service their relationships and so maintain their alliances on the basis of the principle: *if you scratch my back, I'll scratch yours*. Dunbar argues that as humans began living in increasingly larger social groups, the task of manually grooming all one's friends and acquaintances became so time-consuming as to be unaffordable. In response to this problem, humans developed 'a cheap and ultra-efficient form of grooming'—*vocal grooming*. To keep allies happy, one now needs only to 'groom' them with low-cost vocal sounds, servicing multiple allies simultaneously while keeping both

hands free for other tasks. Vocal grooming then evolved gradually into vocal language—initially in the form of 'gossip'. Dunbar's hypothesis seems to be supported by the fact that the structure of language shows adaptations to the function of narration in general.

Critics of this theory point out that the very efficiency of 'vocal grooming'—the fact that words are so cheap—would have undermined its capacity to signal commitment of the kind conveyed by time-consuming and costly manual grooming. A further criticism is that the theory does nothing to explain the crucial transition from vocal grooming—the production of pleasing but meaningless sounds—to the cognitive complexities of syntactical speech.

Ritual/speech coevolution

The ritual/speech coevolution theory was originally proposed by social anthropologist Roy Rappaport before being elaborated by anthropologists such as Chris Knight, Jerome Lewis, Nick Enfield, Camilla Power and Ian Watts. Cognitive scientist and robotics engineer Luc Steels is another prominent supporter of this general approach, as is biological anthropologist and neuroscientist Terrence Deacon.

These scholars argue that there can be no such thing as a 'theory of the origins of language'. This is because language is not a separate adaptation but an internal aspect of something much wider—namely, human symbolic culture as a whole. Attempts to explain language independently of this wider context have spectacularly failed, say these scientists, because they are addressing a problem with no solution. Language

would not work outside a specific array of social mechanisms and institutions. For example, it would not work for a nonhuman ape communicating with others in the wild. Not even the cleverest nonhuman ape could make language work under such conditions.

Lie and alternative, inherent in language … pose problems to any society whose structure is founded on language, which is to say all human societies. I have therefore argued that if there are to be words at all it is necessary to establish *The Word*, and that The Word is established by the invariance of liturgy.

> — *Roy Rappaport*

Advocates of this school of thought point out that words are cheap. As digital hallucinations, they are intrinsically unreliable. Should an especially clever nonhuman ape, or even a group of articulate nonhuman apes, try to use words in the wild, they would carry no conviction. The primate vocalizations that do carry conviction—those they actually use—are unlike words, in that they are emotionally expressive, intrinsically meaningful and reliable because they are relatively costly and hard to fake.

Language consists of digital contrasts whose cost is essentially zero. As pure social conventions, signals of this kind cannot evolve in a Darwinian social world—they are a theoretical impossibility. Being intrinsically unreliable, language works only if one can build up a reputation for trustworthiness within a certain kind of society—namely, one where symbolic cultural facts (sometimes called 'institutional facts') can be established and maintained through collective social endorsement. In any hunter-gatherer society, the basic

mechanism for establishing trust in symbolic cultural facts is collective *ritual*. Therefore, the task facing researchers into the origins of language is more multidisciplinary than is usually supposed. It involves addressing the evolutionary emergence of human symbolic culture as a whole, with language an important but subsidiary component.

Critics of the theory include Noam Chomsky, who terms it the 'non-existence' hypothesis—a denial of the very existence of language as an object of study for natural science. Chomsky's own theory is that language emerged in an instant and in perfect form, prompting his critics in turn to retort that only something that does not exist—a theoretical construct or convenient scientific fiction—could possibly emerge in such a miraculous way. The controversy remains unresolved.

Tool culture resilience and grammar in early Homo

While it is possible to imitate the making of tools like those made by early Homo under circumstances of demonstration, research on primate tool cultures show that non-verbal cultures are vulnerable to environmental change. In particular, if the environment in which a skill can be used disappears for a longer period of time than an individual ape's or early human's lifespan, the skill will be lost if the culture is imitative and non-verbal. Chimpanzees, macaques and capuchin monkeys are all known to lose tool techniques under such circumstances. Researchers on primate culture vulnerability therefore argue that since early Homo species as far back as Homo habilis retained their tool cultures despite many climate change cycles at the timescales of centuries to millennia each, these species had sufficiently developed

language abilities to verbally describe complete procedures, and therefore grammar and not only two-word "proto-language".

The theory that early Homo species had sufficiently developed brains for grammar is also supported by researchers who study brain development in children, noting that grammar is developed while connections across the brain are still significantly lower than adult level. These researchers argue that these lowered system requirements for grammatical language make it plausible that the genus Homo had grammar at connection levels in the brain that were significantly lower than those of Homo sapiens and that more recent steps in the evolution of the human brain were not about language.

Humanistic theory

The humanistic tradition considers language as a human invention. Renaissance philosopherAntoine Arnauld gave a detailed description of his idea of the origin of language in Port-Royal Grammar. According to Arnauld, people are social and rational by nature, and this urged them to create language as a means to communicate their ideas to others. Language construction would have occurred through a slow and gradual process. In later theory, especially in functional linguistics, the primacy of communication is emphasised over psychological needs.

The exact way language evolved is however not considered as vital to the study of languages. Structural linguistFerdinand de Saussure abandoned evolutionary linguistics after having come to the firm conclusion that it would not be able to provide any

further revolutionary insight after the completion of the major works in historical linguistics by the end of the 19th century. Saussure was particularly sceptical of the attempts of August Schleicher and other Darwinian linguists to access prehistorical languages through series of reconstructions of proto-languages.

Evolutionary research had many other critics, too. The Paris linguistic society famously banned the topic of language evolution in 1866 because it was considered as lacking scientific proof. Around the same time, Max Müller ridiculed popular accounts to explain language origin. In his classifications, the 'bow-wow theory' is the type of explanation that considers languages as having evolved as an imitation of natural sounds.

The 'pooh-pooh theory' holds that speech originated from spontaneous human cries and exclamations; the 'yo-he-ho theory' suggests that language developed from grunts and gasps evoked by physical exertion; while the 'sing-song theory' claims that speech arose from primitive ritual chants.

Saussure's solution to the problem of language evolution involves dividing theoretical linguistics in two. Evolutionary and historical linguisticsare renamed as diachronic linguistics. It is the study of language change, but it has only limited explanatory power due to the inadequacy of all of the reliable research material that could ever be made available. Synchronic linguistics, in contrast, aims to widen scientists' understanding of language through a study of a given contemporary or historical language stage as a system in its own right.

Although Saussure paid much focus to diachronic linguistics, later structuralists who equated structuralism with the synchronic analysis were sometimes criticised of ahistoricism. According to structural anthropologistClaude Lévi-Strauss, language and meaning—in opposition to "knowledge, which develops slowly and progressively"—must have appeared in an instant.

Structuralism, as first introduced to sociology by Émile Durkheim, is nonetheless a type of humanistic evolutionary theory which explains diversification as necessitated by growing complexity. There was a shift of focus to functional explanation after Saussure's death. Functional structuralists including the Prague Circle linguists and André Martinet explained the growth and maintenance of structures as being necessitated by their functions. For example, novel technologies make it necessary for people to invent new words, but these may lose their function and be forgotten as the technologies are eventually replaced by more modern ones.

Chomsky's single step theory

According to Noam Chomsky's single mutation theory, the emergence of language resembled the formation of a crystal; with digital infinity as the seed crystal in a super-saturated primate brain, on the verge of blossoming into the human mind, by physical law, once evolution added a single small but crucial keystone. Thus, in this theory, language appeared rather suddenly within the history of human evolution. Chomsky, writing with computational linguist and computer scientist Robert C. Berwick, suggests that this scenario is completely compatible with modern biology. They note "none of

the recent accounts of human language evolution seem to have completely grasped the shift from conventional Darwinism to its fully stochastic modern version—specifically, that there are stochastic effects not only due to sampling like directionless drift, but also due to directed stochastic variation in fitness, migration, and heritability—indeed, all the "forces" that affect individual or gene frequencies … All this can affect evolutionary outcomes—outcomes that as far as we can make out are not brought out in recent books on the evolution of language, yet would arise immediately in the case of any new genetic or individual innovation, precisely the kind of scenario likely to be in play when talking about language's emergence."

Citing evolutionary geneticist Svante Pääbo they concur that a substantial difference must have occurred to differentiate *Homo sapiens* from Neanderthals to "prompt the relentless spread of our species who had never crossed open water up and out of Africa and then on across the entire planet in just a few tens of thousands of years. … What we do not see is any kind of 'gradualism' in new tool technologies or innovations like fire, shelters, or figurative art." Berwick and Chomsky therefore suggest language emerged approximately between 200,000 years ago and 60,000 years ago (between the appearance of the first anatomically modern humans in southern Africa, and the last exodus from Africa, respectively). "That leaves us with about 130,000 years, or approximately 5,000–6,000 generations of time for evolutionary change. This is not 'overnight in one generation' as some have (incorrectly) inferred—but neither is it on the scale of geological eons. It's time enough—within the ballpark for what Nilsson and Pelger (1994) estimated as the time required for the full evolution of a

vertebrate eye from a single cell, even without the invocation of any 'evo-devo' effects."

The single mutation theory of language evolution has been directly questioned on different grounds. A formal analysis of the probability of such a mutation taking place and going to fixation in the species has concluded that such a scenario is unlikely, with multiple mutations with more moderate fitness effects being more probable. Another criticism has questioned the logic of the argument for single mutation, and puts forward that from the formal simplicity of Merge, the capacity Berwick and Chomsky deem the core property of human language that emerged suddenly, one cannot derive the (number of) evolutionary steps that led to it.

The Romulus and Remus hypothesis

The Romulus and Remus hypothesis, proposed by neuroscientist Andrey Vyshedskiy, seeks to address the question as to why the modern speech apparatus originated over 500,000 years before the earliest signs of modern human imagination. This hypothesis proposes that there were two phases that led to modern recursive language. The phenomenon of recursion occurs across multiple linguistic domains, arguably most prominently in syntax and morphology. Thus, by nesting a structure such as a sentence or a word within themselves, it enables the generation of potentially (countably) infinite new variations of that structure. For example, the base sentence [Peter likes apples.] can be nested in irrealisclauses to produce [Mary said [Peter likes apples.]], [Paul believed [Mary said [Peter likes apples.]]] and so forth.

The first phase includes the slow development of non-recursive language with a large vocabulary along with the modern speech apparatus, which includes changes to the hyoid bone, increased voluntary control of the muscles of the diaphragm, the evolution of the FOXP2 gene, as well as other changes by 600,000 years ago. Then, the second phase was a rapid Chomskian Single Step, consisting of three distinct events that happened in quick succession around 70,000 years ago and allowed for the shift from non-recursive to recursive language in early hominins.

- A genetic mutation that slowed down the Prefrontal Synthesis (PFS) critical period of at least two children that lived together;
- This allowed these children to create recursive elements of language such as spatial prepositions;
- Then this merged with their parent's non-recursive language to create recursive language.

It is not enough for children to have a modern Prefrontal Cortex (PFC) to allow for the development of PFS; the children must also be mentally stimulated and have recursive elements already in their language to acquire PFS. Since their parents would not have invented these elements yet, the children would have had to do it themselves, which is a common occurrence among young children that live together, in a process calledcryptophasia. This means that delayed PFC development would have allowed for more time to acquire PFS, and develop recursive elements.

Delayed PFC development also comes with negative consequences, such as a longer period of reliance on one's

parents to survive, and lower survival rates. For modern language to have occurred, PFC delay had to have an immense survival benefit in later life, such as PFS ability. This suggests that the mutation that caused PFC delay and the development of recursive language and PFS occurred simultaneously, which lines up with evidence of a genetic bottleneck around 70,000 years ago. This could have been the result of a few individuals who developed PFS and recursive language which gave them significant competitive advantage over all other humans at the time.

Gestural theory

The gestural theory states that human language developed from gestures that were used for simple communication.

Two types of evidence support this theory.

- Gestural language and vocal language depend on similar neural systems. The regions on the cortex that are responsible for mouth and hand movements border each other.
- Nonhuman primates can use gestures or symbols for at least primitive communication, and some of their gestures resemble those of humans, such as the "begging posture", with the hands stretched out, which humans share with chimpanzees.

Research has found strong support for the idea that verbal language and sign language depend on similar neural structures. Patients who used sign language, and who suffered from a left-hemisphere lesion, showed the same disorders with their sign language as vocal patients did with their oral

language. Other researchers found that the same left-hemisphere brain regions were active during sign language as during the use of vocal or written language.

Primate gesture is at least partially genetic: different nonhuman apes will perform gestures characteristic of their species, even if they have never seen another ape perform that gesture. For example, gorillas beat their breasts. This shows that gestures are an intrinsic and important part of primate communication, which supports the idea that language evolved from gesture.

Further evidence suggests that gesture and language are linked. In humans, manually gesturing has an effect on concurrent vocalizations, thus creating certain natural vocal associations of manual efforts. Chimpanzees move their mouths when performing fine motor tasks. These mechanisms may have played an evolutionary role in enabling the development of intentional vocal communication as a supplement to gestural communication. Voice modulation could have been prompted by preexisting manual actions.

From infancy, gestures both supplement and predict speech. This addresses the idea that gestures quickly change in humans from a sole means of communication (from a very young age) to a supplemental and predictive behavior that is used despite the ability to communicate verbally. This too serves as a parallel to the idea that gestures developed first and language subsequently built upon it.

Two possible scenarios have been proposed for the development of language, one of which supports the gestural theory:

- Language developed from the calls of human ancestors.
- Language was derived from gesture.

The first perspective that language evolved from the calls of human ancestors seems logical because both humans and animals make sounds or cries. One evolutionary reason to refute this is that, anatomically, the centre that controls calls in monkeys and other animals is located in a completely different part of the brain than in humans. In monkeys, this centre is located in the depths of the brain related to emotions. In the human system, it is located in an area unrelated to emotion. Humans can communicate simply to communicate—without emotions. So, anatomically, this scenario does not work. This suggests that language was derived from gesture (humans communicated by gesture first and sound was attached later).

The important question for gestural theories is why there was a shift to vocalization. Various explanations have been proposed:

- Human ancestors started to use more and more tools, meaning that their hands were occupied and could no longer be used for gesturing.
- Manual gesturing requires that speakers and listeners be visible to one another. In many situations, they might need to communicate, even without visual contact—for example after nightfall or when foliage obstructs visibility.
- A composite hypothesis holds that early language took the form of part gestural and part vocal mimesis (imitative 'song-and-dance'), combining modalities

because all signals (like those of nonhuman apes and monkeys) still needed to be costly in order to be intrinsically convincing. In that event, each multi-media display would have needed not just to disambiguate an intended meaning but also to inspire confidence in the signal's reliability. The suggestion is that only once community-wide contractual understandings had come into force could trust in communicative intentions be automatically assumed, at last allowing *Homo sapiens* to shift to a more efficient default format. Since vocal distinctive features (sound contrasts) are ideal for this purpose, it was only at this point—when intrinsically persuasive body-language was no longer required to convey each message—that the decisive shift from manual gesture to the current primary reliance on *spoken* language occurred.

A comparable hypothesis states that in 'articulate' language, gesture and vocalisationare intrinsically linked, as language evolved from equally intrinsically linked dance and song.

Humans still use manual and facial gestures when they speak, especially when people meet who have no language in common. There are also a great number of sign languages still in existence, commonly associated with deaf communities. These sign languages are equal in complexity, sophistication, and expressive power, to any oral language. The cognitive functions are similar and the parts of the brain used are similar. The main difference is that the "phonemes" are produced on the outside of the body, articulated with hands, body, and facial expression, rather than inside the body articulated with

tongue, teeth, lips, and breathing. (Compare the motor theory of speech perception.)

Critics of gestural theory note that it is difficult to name serious reasons why the initial pitch-based vocal communication (which is present in primates) would be abandoned in favor of the much less effective non-vocal, gestural communication. However, Michael Corballis has pointed out that it is supposed that primate vocal communication (such as alarm calls) cannot be controlled consciously, unlike hand movement, and thus it is not credible as precursor to human language; primate vocalization is rather homologous to and continued in involuntary reflexes (connected with basic human emotions) such as screams or laughter (the fact that these can be faked does not disprove the fact that genuine involuntary responses to fear or surprise exist).Also, gesture is not generally less effective, and depending on the situation can even be advantageous, for example in a loud environment or where it is important to be silent, such as on a hunt. Other challenges to the "gesture-first" theory have been presented by researchers in psycholinguistics, including David McNeill.

Tool-use associated sound in the evolution of language

Proponents of the motor theory of language evolution have primarily focused on the visual domain and communication through observation of movements. The *Tool-use sound hypothesis* suggests that the production and perception of sound also contributed substantially, particularly *incidental sound of locomotion* (*ISOL*) and *tool-use sound* (*TUS*). Human bipedalism resulted in rhythmic and more predictable *ISOL.*

That may have stimulated the evolution of musical abilities, auditory working memory, and abilities to produce complex vocalizations, and to mimic natural sounds. Since the human brain proficiently extracts information about objects and events from the sounds they produce,

TUS, and mimicry of *TUS*, might have achieved an iconic function. The prevalence of sound symbolism in many extant languages supports this idea. Self-produced TUS activates multimodal brain processing (motor neurons, hearing, proprioception, touch, vision), and *TUS* stimulates primate audiovisual mirror neurons, which is likely to stimulate the development of association chains. Tool use and auditory gestures involve motor-processing of the forelimbs, which is associated with the evolution of vertebrate vocal communication. The production, perception, and mimicry of *TUS* may have resulted in a limited number of vocalizations or protowords that were associated with tool use. A new way to communicate about tools, especially when out of sight, would have had selective advantage. A gradual change in acoustic properties, meaning, or both could have resulted in arbitrariness and an expanded repertoire of words. Humans have been increasingly exposed to *TUS* over millions of years, coinciding with the period during which spoken language evolved.

Mirror neurons and language origins

In humans, functional MRI studies have reported finding areas homologous to the monkey mirror neuron system in the inferior frontal cortex, close to Broca's area, one of the language regions of the brain. This has led to suggestions that human

language evolved from a gesture performance/understanding system implemented in mirror neurons. Mirror neurons have been said to have the potential to provide a mechanism for action-understanding, imitation-learning, and the simulation of other people's behavior. This hypothesis is supported by some cytoarchitectonic homologies between monkey premotor area F5 and human Broca's area.

Rates of vocabulary expansion link to the ability of children to vocally mirror non-words and so to acquire the new word pronunciations. Such speech repetition occurs automatically, quickly and separately in the brain to speech perception. Moreover, such vocal imitation can occur without comprehension such as in speech shadowing and echolalia. Further evidence for this link comes from a recent study in which the brain activity of two participants was measured using fMRI while they were gesturing words to each other using hand gestures with a game of charades—a modality that some have suggested might represent the evolutionary precursor of human language.

Analysis of the data using Granger Causality revealed that the mirror-neuron system of the observer indeed reflects the pattern of activity of in the motor system of the sender, supporting the idea that the motor concept associated with the words is indeed transmitted from one brain to another using the mirror system.

Not all linguists agree with the above arguments, however. In particular, supporters of Noam Chomsky argue against the possibility that the mirror neuron system can play any role in the hierarchical recursive structures essential to syntax.

Putting-down-the-baby theory

According to Dean Falk's "putting-down-the-baby" theory, vocal interactions between early hominid mothers and infants began a sequence of events that led, eventually, to human ancestors' earliest words. The basic idea is that evolving human mothers, unlike their counterparts in other primates, could not move around and forage with their infants clinging onto their backs. Loss of fur in the human case left infants with no means of clinging on. Frequently, therefore, mothers had to put their babies down. As a result, these babies needed to be reassured that they were not being abandoned. Mothers responded by developing 'motherese'—an infant-directed communicative system embracing facial expressions, body language, touching, patting, caressing, laughter, tickling and emotionally expressive contact calls. The argument is that language somehow developed out of all this.

In *The Mental and Social Life of Babies*, psychologist Kenneth Kaye noted that no usable adult language could have evolved without interactive communication between very young children and adults. "No symbolic system could have survived from one generation to the next if it could not have been easily acquired by young children under their normal conditions of social life."

From-where-to-what theory

The from where to what model is a language evolution model that is derived primarily from the organization of language processing in the brain and two of its structures: the auditory dorsal stream and the auditory ventral stream. It hypothesises

seven stages of language evolution (see illustration). Speech originated for the purpose of exchanging contact calls between mothers and their offspring to find one another in the event they became separated (illustration part 1). The contact calls could be modified with intonations in order to express either a higher or lower level of distress (illustration part 2). The use of two types of contact calls enabled the first question-answer conversation. In this scenario, the child would emit a low-level distress call to express a desire to interact with an object, and the mother would respond with either another low-level distress call (to express approval of the interaction) or a high-level distress call (to express disapproval) (illustration part 3). Over time, the improved use of intonations and vocal control led to the invention of unique calls (phonemes) associated with distinct objects (illustration part 4). At first, children learned the calls (phonemes) from their parents by imitating their lip-movements (illustration part 5). Eventually, infants were able to encode into long-term memory all the calls (phonemes). Consequentially, mimicry via lip-reading was limited to infancy and older children learned new calls through mimicry without lip-reading (illustration part 6). Once individuals became capable of producing a sequence of calls, this allowed multi-syllabic words, which increased the size of their vocabulary (illustration part 7). The use of words, composed of sequences of syllables, provided the infra structure for communicating with sequences of words (i.e., sentences).

The theory's name is derived from the two auditory streams, which are both found in the brains of humans and other primates. The auditory ventral stream is responsible for sound recognition, and so it is referred to as the auditory *what* stream. In primates, the auditory dorsal stream is responsible

for sound localization. It is a so-called auditory *where* stream. Only in humans (in the left hemisphere), is it also responsible for other processes associated with language use and acquisition, such as speech repetition and production, integration of phonemes with their lip movements, perception and production of intonations, phonological long-term memory (long-term memory storage of the sounds of words), and phonological working memory (the temporary storage of the sounds of words). Some evidence also indicates a role in recognising others by their voices. The emergence of each of these functions in the auditory dorsal stream represents an intermediate stage in the evolution of language.

A contact call origin for human language is consistent with animal studies, as like human language, contact call discrimination in monkeys is lateralised to the left hemisphere. Mice with knock-out to language related genes (such as FOXP2 and SRPX2) also resulted in the pups no longer emitting contact calls when separated from their mothers. Supporting this model is also its ability to explain unique human phenomena, such as the use of intonations when converting words into commands and questions, the tendency of infants to mimic vocalisations during the first year of life (and its disappearance later on) and the protruding and visible human lips, which are not found in other apes. This theory could be considered an elaboration of the putting-down-the-baby theory of language evolution.

Grammaticalisation theory

'Grammaticalisation' is a continuous historical process in which free-standing words develop into grammatical

appendages, while these in turn become ever more specialised and grammatical. An initially 'incorrect' usage, in becoming accepted, leads to unforeseen consequences, triggering knock-on effects and extended sequences of change. Paradoxically, grammar evolves because, in the final analysis, humans care less about grammatical niceties than about making themselves understood. If this is how grammar evolves today, according to this school of thought, similar principles at work can be legitimately inferred among distant human ancestors, when grammar itself was first being established.

In order to reconstruct the evolutionary transition from early language to languages with complex grammars, it is necessary to know which hypothetical sequences are plausible and which are not. In order to convey abstract ideas, the first recourse of speakers is to fall back on immediately recognizable concrete imagery, very often deploying metaphors rooted in shared bodily experience. A familiar example is the use of concrete terms such as 'belly' or 'back' to convey abstract meanings such as 'inside' or 'behind'. Equally metaphorical is the strategy of representing temporal patterns on the model of spatial ones. For example, English speakers might say 'It is going to rain', modelled on 'I am going to London.' This can be abbreviated colloquially to 'It's gonna rain.' Even when in a hurry, English speakers do not say 'I'mgonna London'—the contraction is restricted to the job of specifying tense. From such examples it can be seen why grammaticalisation is consistently unidirectional—from concrete to abstract meaning, not the other way around.

Grammaticalisation theorists picture early language as simple, perhaps consisting only of nouns. Even under that extreme

theoretical assumption, however, it is difficult to imagine what would realistically have prevented people from using, say, 'spear' as if it were a verb ('Spear that pig!'). People might have used their nouns as verbs or their verbs as nouns as occasion demanded. In short, while a noun-only language might seem theoretically possible, grammaticalisation theory indicates that it cannot have remained fixed in that state for any length of time.

Creativity drives grammatical change. This presupposes a certain attitude on the part of listeners. Instead of punishing deviations from accepted usage, listeners must prioritise imaginative mind-reading. Imaginative creativity—emitting a leopard alarm when no leopard was present, for example—is not the kind of behaviour which, say, vervet monkeys would appreciate or reward. Creativity and reliability are incompatible demands; for 'Machiavellian' primates as for animals generally, the overriding pressure is to demonstrate reliability. If humans escape these constraints, it is because in their case, listeners are primarily interested in mental states.

To focus on mental states is to accept fictions—inhabitants of the imagination—as potentially informative and interesting. An example is metaphor: a metaphor is, literally, a false statement. In Romeo and Juliet, Romeo declares "Juliet is the sun!". Juliet is a woman, not a ball of plasma in the sky, but human listeners are not (or not usually) pedants insistent on point-by-point factual accuracy. They want to know what the speaker has in mind. Grammaticalisationis essentially based on metaphor. To outlaw its use would be to stop grammar from evolving and, by the same token, to exclude all possibility of expressing abstract thought.

A criticism of all this is that while grammaticalisation theory might explain language change today, it does not satisfactorily address the really difficult challenge—explaining the initial transition from primate-style communication to language as it is known as of 2021. Rather, the theory assumes that language already exists. As Bernd Heine and Tania Kutevaacknowledge: "Grammaticalisation requires a linguistic system that is used regularly and frequently within a community of speakers and is passed on from one group of speakers to another". Outside modern humans, such conditions do not prevail.

Evolution-Progression Model

Human language is used for self-expression; however, expression displays different stages. The consciousness of self and feelings represents the stage immediately prior to the external, phonetic expression of feelings in the form of sound, i.e., language. Intelligent animals such as dolphins, Eurasian magpies, and chimpanzees live in communities, wherein they assign themselves roles for group survival and show emotions such as sympathy. When such animals view their reflection (mirror test), they recognise themselves and exhibit self-consciousness. Notably, humans evolved in a quite different environment than that of these animals. Human survival became easier with the development of tools, shelter, and fire, thus facilitating further advancement of social interaction, self-expression, and tool-making, as for hunting and gathering. The increasing brain size allowed advanced provisioning and tools and the technological advances during the Palaeolithic era that built upon the previous evolutionary innovations of bipedalism and hand versatility allowed the development of human language.

Self-domesticated ape theory

According to a study investigating the song differences between white-rumpedmunias and its domesticated counterpart (Bengalese finch), the wild munias use a highly stereotyped song sequence, whereas the domesticated ones sing a highly unconstrained song. In wild finches, song syntax is subject to female preference—sexual selection—and remains relatively fixed. However, in the Bengalese finch, natural selection is replaced by breeding, in this case for colourful plumage, and thus, decoupled from selective pressures, stereotyped song syntax is allowed to drift.

It is replaced, supposedly within 1000 generations, by a variable and learned sequence. Wild finches, moreover, are thought incapable of learning song sequences from other finches. In the field of bird vocalisation, brains capable of producing only an innate song have very simple neural pathways: the primary forebrain motor centre, called the robust nucleus of arcopallium, connects to midbrain vocal outputs, which in turn project to brainstem motor nuclei. By contrast, in brains capable of learning songs, the arcopallium receives input from numerous additional forebrain regions, including those involved in learning and social experience. Control over song generation has become less constrained, more distributed, and more flexible.

One way to think about human evolution is that humans are self-domesticated apes. Just as domestication relaxed selection for stereotypic songs in the finches—mate choice was supplanted by choices made by the aesthetic sensibilities of bird breeders and their customers—so might human cultural

domestication have relaxed selection on many of their primate behavioural traits, allowing old pathways to degenerate and reconfigure. Given the highly indeterminate way that mammalian brains develop—they basically construct themselves "bottom up", with one set of neuronal interactions preparing for the next round of interactions—degraded pathways would tend to seek out and find new opportunities for synaptic hookups. Such inherited de-differentiations of brain pathways might have contributed to the functional complexity that characterises human language. And, as exemplified by the finches, such de-differentiations can occur in very rapid time-frames.

Speech and language for communication

A distinction can be drawn between speech and language. Language is not necessarily spoken: it might alternatively be written or signed. Speech is among a number of different methods of encoding and transmitting linguistic information, albeit arguably the most natural one.

Some scholars view language as an initially cognitive development, its 'externalisation' to serve communicative purposes occurring later in human evolution. According to one such school of thought, the key feature distinguishing human language is recursion, (in this context, the iterative embedding of phrases within phrases). Other scholars—notably Daniel Everett—deny that recursion is universal, citing certain languages (e.g. Pirahã) which allegedly lack this feature.

The ability to ask questions is considered by some to distinguish language from non-human systems of communication. Some captive primates (notably bonobos and chimpanzees), having learned to use rudimentary signing to communicate with their human trainers, proved able to respond correctly to complex questions and requests. Yet they failed to ask even the simplest questions themselves. Conversely, human children are able to ask their first questions (using only question intonation) at the babbling period of their development, long before they start using syntactic structures. Although babies from different cultures acquire native languages from their social environment, all languages of the world without exception—tonal, non-tonal, intonational and accented—use similar rising "question intonation" for yes–no questions. This fact is a strong evidence of the universality of question intonation. In general, according to some authors, sentence intonation/pitch is pivotal in spoken grammar and is the basic information used by children to learn the grammar of whatever language.

Cognitive development and language

One of the intriguing abilities that language users have is that of high-level reference (or deixis), the ability to refer to things or states of being that are not in the immediate realm of the speaker. This ability is often related to theory of mind, or an awareness of the other as a being like the self with individual wants and intentions. According to Chomsky, Hauser and Fitch (2002), there are six main aspects of this high-level reference system:

- Theory of mind

- Capacity to acquire non-linguistic conceptual representations, such as the object/kind distinction
- Referential vocal signals
- Imitation as a rational, intentional system
- Voluntary control over signal production as evidence of intentional communication
- Number representation

Theory of mind

Simon Baron-Cohen (1999) argues that theory of mind must have preceded language use, based on evidence of use of the following characteristics as much as 40,000 years ago: intentional communication, repairing failed communication, teaching, intentional persuasion, intentional deception, building shared plans and goals, intentional sharing of focus or topic, and pretending.

Moreover, Baron-Cohen argues that many primates show some, but not all, of these abilities. Call and Tomasello's research on chimpanzees supports this, in that individual chimps seem to understand that other chimps have awareness, knowledge, and intention, but do not seem to understand false beliefs.

Many primates show some tendencies toward a theory of mind, but not a full one as humans have.

Ultimately, there is some consensus within the field that a theory of mind is necessary for language use. Thus, the development of a full theory of mind in humans was a necessary precursor to full language use.

Number representation

In one particular study, rats and pigeons were required to press a button a certain number of times to get food. The animals showed very accurate distinction for numbers less than four, but as the numbers increased, the error rate increased. Matsuzawa (1985) attempted to teach chimpanzees Arabic numerals. The difference between primates and humans in this regard was very large, as it took the chimps thousands of trials to learn 1–9 with each number requiring a similar amount of training time; yet, after learning the meaning of 1, 2 and 3 (and sometimes 4), children easily comprehend the value of greater integers by using a successor function (i.e. 2 is 1 greater than 1, 3 is 1 greater than 2, 4 is 1 greater than 3; once 4 is reached it seems most children suddenly understand that the value of any integer n is 1 greater than the previous integer). Put simply, other primates learn the meaning of numbers one by one, similar to their approach to other referential symbols, while children first learn an arbitrary list of symbols (1, 2, 3, 4…) and then later learn their precise meanings. These results can be seen as evidence for the application of the "open-ended generative property" of language in human numeral cognition.

Linguistic structures

Lexical-phonological principle

Hockett (1966) details a list of features regarded as essential to describing human language. In the domain of the lexical-

phonological principle, two features of this list are most important:

- Productivity: users can create and understand completely novel messages.
- New messages are freely coined by blending, analogizing from, or transforming old ones.
- Either new or old elements are freely assigned new semantic loads by circumstances and context. This says that in every language, new idioms constantly come into existence.
- Duality (of Patterning): a large number of meaningful elements are made up of a conveniently small number of independently meaningless yet message-differentiating elements.

The sound system of a language is composed of a finite set of simple phonological items. Under the specific phonotactic rules of a given language, these items can be recombined and concatenated, giving rise to morphology and the open-ended lexicon.

A key feature of language is that a simple, finite set of phonological items gives rise to an infinite lexical system wherein rules determine the form of each item, and meaning is inextricably linked with form. Phonological syntax, then, is a simple combination of pre-existing phonological units. Related to this is another essential feature of human language: lexical syntax, wherein pre-existing units are combined, giving rise to semantically novel or distinct lexical items.

Certain elements of the lexical-phonological principle are known to exist outside of humans. While all (or nearly all) have

been documented in some form in the natural world, very few coexist within the same species. Bird-song, singing nonhuman apes, and the songs of whales all display phonological syntax, combining units of sound into larger structures apparently devoid of enhanced or novel meaning. Certain other primate species do have simple phonological systems with units referring to entities in the world. However, in contrast to human systems, the units in these primates' systems normally occur in isolation, betraying a lack of lexical syntax. There is new evidence to suggest that Campbell's monkeys also display lexical syntax, combining two calls (a predator alarm call with a "boom", the combination of which denotes a lessened threat of danger), however it is still unclear whether this is a lexical or a morphological phenomenon.

Pidgins and creoles

Pidgins are significantly simplified languages with only rudimentary grammar and a restricted vocabulary. In their early stage, pidgins mainly consist of nouns, verbs, and adjectives with few or no articles, prepositions, conjunctions or auxiliary verbs. Often the grammar has no fixed word order and the words have no inflection.

If contact is maintained between the groups speaking the pidgin for long periods of time, the pidgins may become more complex over many generations. If the children of one generation adopt the pidgin as their native language it develops into a creole language, which becomes fixed and acquires a more complex grammar, with fixed phonology, syntax, morphology, and syntactic embedding. The syntax and

morphology of such languages may often have local innovations not obviously derived from any of the parent languages.

Studies of creole languages around the world have suggested that they display remarkable similarities in grammar and are developed uniformly from pidgins in a single generation. These similarities are apparent even when creoles do not have any common language origins. In addition, creoles are similar, despite being developed in isolation from each other. Syntactic similarities include subject–verb–object word order. Even when creoles are derived from languages with a different word order they often develop the SVO word order. Creoles tend to have similar usage patterns for definite and indefinite articles, and similar movement rules for phrase structures even when the parent languages do not.

Evolutionary timeline

Primate communication

Field primatologists can give useful insights into great ape communication in the wild. An important finding is that nonhuman primates, including the other great apes, produce calls that are graded, as opposed to categorically differentiated, with listeners striving to evaluate subtle gradations in signallers' emotional and bodily states. Nonhuman apes seemingly find it extremely difficult to produce vocalisations in the absence of the corresponding emotional states. In captivity, nonhuman apes have been taught rudimentary forms of sign language or have been persuaded to use lexigrams—symbols that do not graphically resemble the

corresponding words—on computer keyboards. Some nonhuman apes, such as Kanzi, have been able to learn and use hundreds of lexigrams.

The Broca's and Wernicke's areas in the primate brain are responsible for controlling the muscles of the face, tongue, mouth, and larynx, as well as recognizing sounds. Primates are known to make "vocal calls", and these calls are generated by circuits in the brainstem and limbic system.

In the wild, the communication of vervet monkeys has been the most extensively studied. They are known to make up to ten different vocalizations. Many of these are used to warn other members of the group about approaching predators. They include a "leopard call", a "snake call", and an "eagle call". Each call triggers a different defensive strategy in the monkeys who hear the call and scientists were able to elicit predictable responses from the monkeys using loudspeakers and prerecorded sounds. Other vocalisationsmay be used for identification. If an infant monkey calls, its mother turns toward it, but other vervet mothers turn instead toward that infant's mother to see what she will do.

Similarly, researchers have demonstrated that chimpanzees (in captivity) use different "words" in reference to different foods. They recorded vocalisations that chimps made in reference, for example, to grapes, and then other chimps pointed at pictures of grapes when they heard the recorded sound.

Ardipithecusramidus

A study published in *HOMO: Journal of Comparative Human Biology* in 2017 claims that *Ardipithecusramidus*, a hominin

dated at approximately 4.5Ma, shows the first evidence of an anatomical shift in the hominin lineage suggestive of increased vocal capability. This study compared the skull of *A. ramidus* with 29 chimpanzee skulls of different ages and found that in numerous features *A. ramidus* clustered with the infant and juvenile measures as opposed to the adult measures. Significantly, such affinity with the shape dimensions of infant and juvenile chimpanzee skull architecture, it was argued, may have resulted in greater vocal capability. This assertion was based on the notion that the chimpanzee vocal tract ratios that prevent speech are a result of growth factors associated with puberty—growth factors absent in *A. ramidus* ontogeny. *A. ramidus*was also found to have a degree of cervical lordosis more conducive to vocal modulation when compared with chimpanzees as well as cranial base architecture suggestive of increased vocal capability.

What was significant in this study was the observation that the changes in skull architecture that correlate with reduced aggression are the same changes necessary for the evolution of early hominin vocal ability. In integrating data on anatomical correlates of primate mating and social systems with studies of skull and vocal tract architecture that facilitate speech production, the authors argue that paleoanthropologists to date have failed to understand the important relationship between early hominin social evolution and language capacity.

While the skull of *A. ramidus*, according to the authors, lacks the anatomical impediments to speech evident in chimpanzees, it is unclear what the vocal capabilities of this early hominin were. While they suggest *A. ramidus*—based on similar vocal tract ratios—may have had vocal capabilities equivalent to a

modern human infant or very young child, they concede this is obviously a debatable and speculative hypothesis. However, they do claim that changes in skull architecture through processes of social selection were a necessary prerequisite for language evolution. As they write:

We propose that as a result of paedomorphic morphogenesis of the cranial base and craniofacial morphology *Ar. ramidus* would have not been limited in terms of the mechanical components of speech production as chimpanzees and bonobos are. It is possible that *Ar. ramidus* had vocal capability approximating that of chimpanzees and bonobos, with its idiosyncratic skull morphology not resulting in any significant advances in speech capability. In this sense the anatomical features analysed in this essay would have been exapted in later more voluble species of hominin. However, given the selective advantages of pro-social vocal synchrony, we suggest the species would have developed significantly more complex vocal abilities than chimpanzees and bonobos.

Early *Homo*

Anatomically, some scholars believe that features of bipedalism developed in the australopithecines around 3.5 million years ago. Around this time, these structural developments within the skull led to a more prominently L-shaped vocal tract. In order to generate the sounds modern homo sapiens are capable of making, such as vowels, it is vital that Early Homo populations must have a specifically shaped voice track and a lower sitting larynx. Opposing research previously suggested that Neanderthals were physically incapable of creating the full range of vocals seen in modern humans due to the differences

in larynx placement. Establishing distinct larynx positions through fossil remains of Homo sapiens and Neanderthals would support this theory; however, modern research has revealed that the hyoid bone was indistinguishable from the two populations. Though research has shown a lower sitting larynx is important to producing speech, another theory states it may not be as important as once thought. Cataldo, Migliano, &Vinicius (2018) stated that speech may have emerged due to an increase in trade and communication between different groups. Another view by Cataldo states that speech was evolved to enable tool-making by the Neanderthals.

Archaic *Homo sapiens*

Steven Mithen proposed the term *Hmmmmm* for the pre-linguistic system of communication posited to have been used by archaic *Homo*, beginning with *Homo ergaster* and reaching the highest sophistication in the Middle Pleistocene with *Homo heidelbergensis* and *Homo neanderthalensis*. *Hmmmmm* is an acronym for *h*olistic (non-compositional), *m*anipulative (utterances are commands or suggestions, not descriptive statements), *m*ulti-*m*odal (acoustic as well as gestural and facial), *m*usical, and *m*imetic.

Homo heidelbergensis

Homo heidelbergensis was a close relative (most probably a migratory descendant) of *Homo ergaster*. Some researchers believe this species to be the first hominin to make controlled vocalisations, possibly mimicking animal vocalisations, and that as *Homo heidelbergensis* developed more sophisticated

culture, proceeded from this point and possibly developed an early form of symbolic language.

Homo neanderthalensis

The discovery in 1989 of the (Neanderthal) Kebara 2 hyoid bone suggests that Neanderthals may have been anatomically capable of producing sounds similar to modern humans. The hypoglossal nerve, which passes through the hypoglossal canal, controls the movements of the tongue, which may have enabled voicing for size exaggeration (see size exaggeration hypothesis below) or may reflect speech abilities.

However, although Neanderthals may have been anatomically able to speak, Richard G. Klein in 2004 doubted that they possessed a fully modern language. He largely bases his doubts on the fossil record of archaic humans and their stone tool kit. Bart de Boer in 2017 acknowledges this ambiguity of a universally accepted Neanderthal vocal tract; however, he notes the similarities in the thoracic vertebral canal, potential air sacs, and hyoid bones between modern humans and Neanderthals to suggest the presence of complex speech. For two million years following the emergence of *Homo habilis*, the stone tool technology of hominins changed very little. Klein, who has worked extensively on ancient stone tools, describes the crude stone tool kit of archaic humans as impossible to break down into categories based on their function, and reports that Neanderthals seem to have had little concern for the final aesthetic form of their tools. Klein argues that the Neanderthal brain may have not reached the level of complexity required for modern speech, even if the physical apparatus for speech production was well-developed. The issue of the

Neanderthal's level of cultural and technological sophistication remains a controversial one.

Based on computer simulations used to evaluate that evolution of language that resulted in showing three stages in the evolution of syntax, Neanderthals are thought to have been in stage 2, showing they had something more evolved than proto-language but not quite as complex as the language of modern humans.

Some researchers, applying auditory bioengineering models to computerised tomography scans of Neanderthal skulls, have asserted that Neanderthals had auditory capacity very similar to that of anatomically modern humans. These researchers claim that this finding implies that "Neanderthals evolved the auditory capacities to support a vocal communication system as efficient as modern human speech."

Homo sapiens

Anatomically modern humans begin to appear in the fossil record in Ethiopia some 200,000 years ago. Although there is still much debate as to whether behavioural modernity emerged in Africa at around the same time, a growing number of archaeologists nowadays invoke the southern African Middle Stone Age use of red ochre pigments—for example at Blombos Cave—as evidence that modern anatomy and behaviour co-evolved. These archaeologists argue strongly that if modern humans at this early stage were using red ochre pigments for ritual and symbolic purposes, they probably had symbolic language as well.

According to the recent African origins hypothesis, from around 60,000 – 50,000 years ago a group of humans left Africa and began migrating to occupy the rest of the world, carrying language and symbolic culture with them.

The descended larynx

The *larynx* or *voice box* is an organ in the neck housing the vocal folds, which are responsible for phonation. In humans, the larynx is *descended.* The human species is not unique in this respect: goats, dogs, pigs and tamarins lower the larynx temporarily, to emit loud calls. Several deer species have a permanently lowered larynx, which may be lowered still further by males during their roaring displays. Lions, jaguars, cheetahs and domestic cats also do this. However, laryngeal descent in nonhumans (according to Philip Lieberman) is not accompanied by descent of the hyoid; hence the tongue remains horizontal in the oral cavity, preventing it from acting as a pharyngeal articulator.

Despite all this, scholars remain divided as to how "special" the human vocal tract really is. It has been shown that the larynx does descend to some extent during development in chimpanzees, followed by hyoidal descent. As against this, Philip Lieberman points out that only humans have evolved permanent and substantial laryngeal descent in association with hyoidal descent, resulting in a curved tongue and two-tube vocal tract with 1:1 proportions. Uniquely in the human case, simple contact between the epiglottis and velum is no longer possible, disrupting the normal mammalian separation of the respiratory and digestive tracts during swallowing. Since this entails substantial costs—increasing the risk of choking

while swallowing food—we are forced to ask what benefits might have outweighed those costs. The obvious benefit—so it is claimed—must have been speech. But this idea has been vigorously contested.

One objection is that humans are in fact not seriously at risk of choking on food: medical statistics indicate that accidents of this kind are extremely rare. Another objection is that in the view of most scholars, speech as it is known emerged relatively late in human evolution, roughly contemporaneously with the emergence of *Homo sapiens*.

A development as complex as the reconfiguration of the human vocal tract would have required much more time, implying an early date of origin. This discrepancy in timescales undermines the idea that human vocal flexibility was initially driven by selection pressures for speech, thus not excluding that it was selected for e.g. improved singing ability.

The size exaggeration hypothesis

To lower the larynx is to increase the length of the vocal tract, in turn lowering formant frequencies so that the voice sounds "deeper"—giving an impression of greater size. John Ohala argues that the function of the lowered larynx in humans, especially males, is probably to enhance threat displays rather than speech itself. Ohala points out that if the lowered larynx were an adaptation for speech, adult human males would be expected to be better adapted in this respect than adult females, whose larynx is considerably less low. In fact, females invariably outperform males in verbal tests, falsifying this whole line of reasoning. W. Tecumseh Fitch likewise argues

that this was the original selective advantage of laryngeal lowering in the human species.

Although (according to Fitch) the initial lowering of the larynx in humans had nothing to do with speech, the increased range of possible formant patterns was subsequently co-opted for speech. Size exaggeration remains the sole function of the extreme laryngeal descent observed in male deer. Consistent with the size exaggeration hypothesis, a second descent of the larynx occurs at puberty in humans, although only in males. In response to the objection that the larynx is descended in human females, Fitch suggests that mothers vocalising to protect their infants would also have benefitted from this ability.

Phonemic diversity

In 2011, Quentin Atkinson published a survey of phonemes from 500 different languages as well as language families and compared their phonemic diversity by region, number of speakers and distance from Africa. The survey revealed that African languages had the largest number of phonemes, and Oceania and South America had the smallest number.

After allowing for the number of speakers, the phonemic diversity was compared to over 2000 possible origin locations. Atkinson's "best fit" model is that language originated in central and southern Africa between 80,000 and 160,000 years ago. This predates the hypothesized southern coastal peopling of Arabia, India, southeast Asia, and Australia. It would also mean that the origin of language occurred at the same time as the emergence of symbolic culture.

History

In religion and mythology

The search for the origin of language has a long history rooted in mythology. Most mythologies do not credit humans with the invention of language but speak of a divine language predating human language. Mystical languages used to communicate with animals or spirits, such as the language of the birds, are also common, and were of particular interest during the Renaissance.

Vāc is the Hindu goddess of speech, or "speech personified". As Brahman's "sacred utterance", she has a cosmological role as the "Mother of the Vedas". The Aztecs' story maintains that only a man, Coxcox, and a woman, Xochiquetzal, survived a flood, having floated on a piece of bark.

They found themselves on land and had many children who were at first born unable to speak, but subsequently, upon the arrival of a dove, were endowed with language, although each one was given a different speech such that they could not understand one another.

In the Old Testament, the Book of Genesis (11) says that God prevented the Tower of Babel from being completed through a miracle that made its construction workers start speaking different languages. After this, they migrated to other regions, grouped together according to which of the newly created languages they spoke, explaining the origins of languages and nations outside of the Fertile Crescent.

Historical experiments

History contains a number of anecdotes about people who attempted to discover the origin of language by experiment. The first such tale was told by Herodotus (*Histories* 2.2). He relates that Pharaoh Psammetichus (probably Psammetichus I, 7th century BC) had two children raised by a shepherd, with the instructions that no one should speak to them, but that the shepherd should feed and care for them while listening to determine their first words. When one of the children cried "bekos" with outstretched arms the shepherd concluded that the word was Phrygian, because that was the sound of the Phrygian word for "bread". From this, Psammetichus concluded that the first language was Phrygian. King James V of Scotland is said to have tried a similar experiment; his children were supposed to have spoken Hebrew.

Both the medieval monarch Frederick II and Akbar are said to have tried similar experiments; the children involved in these experiments did not speak. The current situation of deaf people also points into this direction.

History of research

Modern linguistics did not begin until the late 18th century, and the Romantic or animist theses of Johann Gottfried Herder and Johann Christoph Adelung remained influential well into the 19th century. The question of language origin seemed inaccessible to methodical approaches, and in 1866 the Linguistic Society of Paris famously banned all discussion of the origin of language, deeming it to be an unanswerable problem. An increasingly systematic approach to historical

linguistics developed in the course of the 19th century, reaching its culmination in the Neogrammarian school of Karl Brugmann and others.

However, scholarly interest in the question of the origin of language has only gradually been rekindled from the 1950s on (and then controversially) with ideas such as universal grammar, mass comparison and glottochronology.

The "origin of language" as a subject in its own right emerged from studies in neurolinguistics, psycholinguistics and human evolution. The *Linguistic Bibliography* introduced "Origin of language" as a separate heading in 1988, as a sub-topic of psycholinguistics. Dedicated research institutes of evolutionary linguistics are a recent phenomenon, emerging only in the 1990s.

Chapter 2

Language and Thought

The study of how language influences thought has a long history in a variety of fields. There are two bodies of thought forming around this debate. One body of thought stems from linguistics and is known as the Sapir–Whorf hypothesis. There is a strong and a weak version of the hypothesis which argue for more or less influence of language on thought.

The strong version, linguistic determinism, argues that without language there is and can be no thought while the weak version, linguistic relativity, supports the idea that there are some influences from language on thought. And on the opposing side, there are 'language of thought' theories (LOTH) which believe that public language is inessential to private thought (though the possibility remains that private thought *when infused with inessential language* diverges in predilection, emphasis, tone, or subsequent recollection). LOTH theories address the debate of whether thought is possible without language which is related to the question of whether language evolved *for* thought. These ideas are difficult to study because it proves challenging to parse the effects of culture versus thought versus language in all academic fields.

The main use of language is to transfer thoughts from one mind, to another mind. The bits of linguistic information that enter into one person's mind, from another, cause people to entertain a new thought with profound effects on his world knowledge, inferencing, and subsequent behavior. Language neither creates nor distorts conceptual life. Thought comes

first, while language is an expression. There are certain limitations among language, and humans cannot express all that they think.

Language of thought

Language of thought theories rely on the belief that mental representation has linguistic structure. Thoughts are "sentences in the head", meaning they take place within a mental language. Two theories work in support of the language of thought theory. Causal syntactic theory of mental practices hypothesizes that mental processes are causal processes defined over the syntax of mental representations. Representational theory of mind hypothesizes that propositional attitudes are relations between subjects and mental representations. In tandem, these theories explain how the brain can produce rational thought and behavior. All three of these theories were inspired by the development of modern logical inference. They were also inspired by Alan Turing's work on causal processes that require formal procedures within physical machines.

LOTH hinges on the belief that the mind works like a computer, always in computational processes. The theory believes that mental representation has both a combinatorial syntax and compositional semantics. The claim is that mental representations possess combinatorial syntax and compositional semantic—that is, mental representations are sentences in a mental language. Alan Turing's work on physical machines implementation of causal processes that require formal procedures was modeled after these beliefs.

Another prominent linguist, Stephen Pinker, developed this idea of a mental language in his book *The Language Instinct* (1994). Pinker refers to this mental language as *mentalese*. In the glossary of his book, Pinker defines mentalese as a hypothetical language used specifically for thought. This hypothetical language houses mental representations of concepts such as the meaning of words and sentences.

Scientific hypotheses

- The Sapir–Whorf hypothesis in linguistics states that the grammatical structure of a mother language influences the way we perceive the world. The hypothesis has been largely abandoned by linguists as it has found very limited experimental support, at least in its strong form, linguistic determinism. For instance, a study showing that speakers of languages lacking a subjunctive mood such as Chinese experience difficulty with hypothetical problems has been discredited. Another study did show that subjects in memory tests are more likely to remember a given color if their mother language includes a word for that color; however, these findings do not necessarily support this hypothesis specifically. Other studies concerning the Sapir-Whorf hypothesis can be found in the "studies" section below.
- Chomsky's independent theory, founded by Noam Chomsky, considers language as one aspect of cognition. Chomsky's theory states that a number of cognitive systems exist, which seem to possess

distinct specific properties. These cognitive systems lay the groundwork for cognitive capacities, like language faculty.

- Piaget's cognitive determinism exhibits the belief that infants integrate experience into progressively higher-level representations. He calls this belief constructivism, which supports that infants progress from simple to sophisticated models of the world through a change mechanism that allows an infant to build on their lower-level representations to create higher-level ones. This view opposes nativist theories about cognition being composed of innate knowledge and abilities.

- Vygotsky's theory on cognitive development, known as Vygotsky's theory of interchanging roles, supports the idea that social and individual development stems from the processes of dialectical interaction and function unification. Lev Vygotsky believed that before two years of age, both speech and thought develop in differing ways along with differing functions. The idea that relationship between thought and speech is ever-changing, supports Vygotsky's claims. Vygotsky's theory claims that thought and speech have different roots. And at the age of two, a child's thought and speech collide, and the relationship between thought and speech shifts. Thought then becomes verbal and speech then becomes rational.

- According to the theory behind **cognitive therapy**, founded by Aaron T. Beck, our emotions and behavior are caused by our internal dialogue. We can change ourselves by learning to challenge and refute

our own thoughts, especially a number of specific mistaken thought patterns called "cognitive distortions". Cognitive therapy has been found to be effective by empirical studies.

- In **behavioral economics**, according to experiments said to support the theoretical availability heuristic, people believe events that are more vividly described are more probable than those that are not. Simple experiments that asked people to imagine something led them to believe it to be more likely. The mere exposure effect may also be relevant to propagandistic repetition like the Big Lie. According to prospect theory, people make different economic choices based on how the matter is framed.

Studies concerning the Sapir-Whorf Hypothesis

Counting

Different cultures use numbers in different ways. The Munduruku culture for example, has number words only up to five. In addition, they refer to the number 5 as "a hand" and the number 10 as "two hands". Numbers above 10 are usually referred to as "many".

Perhaps the most different counting system from that of modern Western civilisation is the "one-two-many" system used by the Pirahã people. In this system, quantities larger than two are referred to simply as "many". In larger quantities, "one" can also mean a small amount and "many" a larger amount.

Research was conducted in the Pirahã culture using various matching tasks. These are non-linguistic tasks that were analyzed to see if their counting system or more importantly their language affected their cognitive abilities. The results showed that they perform quite differently from, for example, an English speaking person who has a language with words for numbers more than two. For example, they were able to represent numbers 1 and 2 accurately using their fingers but as the quantities grew larger (up to 10), their accuracy diminished. This phenomenon is also called the "analog estimation", as numbers get bigger the estimation grows. Their declined performance is an example of how a language can affect thought and great evidence to support the Sapir-Whorf Hypothesis.

Orientation

Language also seems to shape how people from different cultures orient themselves in space. For instance, people from the Australian Aboriginal community Pormpuraaw define space relative to the observer. Instead of referring to location in terms like "left", "right", "back" and "forward", most Aboriginal Nations, such as the KuukThaayorre, use cardinal-direction terms – north, south, east and west. For example, speakers from such cultures would say "There is a spider on your northeast leg" or "Pass the ball to the south southwest". In fact, instead of "hello", the greeting in such cultures is "Where are you going?" and sometimes even "Where are you coming from?" Such greeting would be followed by a directional answer "To the northeast in the middle distance". The consequence of using such language is that the speakers need to be constantly oriented in space, or they would not be able to express

themselves properly, or even get past a greeting. Speakers of such languages that rely on absolute reference frames have a much greater navigational ability and spatial knowledge compared to speakers of languages that use relative reference frames (such as English). In comparison with English users, speakers of languages such as KuukThaayorre are also much better at staying oriented even in unfamiliar spaces – and it is in fact their language that enables them to do this.

Color

Language may influence color processing. Having more names for different colors, or different shades of colors, makes it easier both for children and for adults to recognize them. Research has found that all languages have names for black and white and that the colors defined by each language follow a certain pattern (i.e. a language with three colors also defines red, one with four defines green OR yellow, one with six defines blue, then brown, then other colors).

Other schools of thought

- **General semantics** is a school of thought founded by engineer Alfred Korzybski in the 1930s and later popularized by S.I. Hayakawa and others, which attempted to make language more precise and objective. It makes many basic observations of the English language, particularly pointing out problems of abstraction and definition. General semantics is presented as both a theoretical and a practical system whose adoption can reliably alter human

behavior in the direction of greater sanity. It is considered to be a branch of natural science and includes methods for the stimulation of the activities of the human cerebral cortex, which is generally judged by experimentation. In this theory, semantics refers to the total response to events and actions, not just the words. The neurological, emotional, cognitive, semantic, and behavioral reactions to events determines the semantic response of a situation. This reaction can be referred to as semantic response, evaluative response, or total response.

- **E-prime** is a constructed language identical to the English language but lacking all forms of "to be". Its proponents claim that dogmatic thinking seems to rely on "to be" language constructs, and so by removing it we may discourage dogmatism.

- **Neuro-linguistic programming**, founded by Richard Bandler and John Grinder, claims that language "patterns" and other things can affect thought and behavior. It takes ideas from General Semantics and hypnosis, especially that of the famous therapist Milton Erickson. Many do not consider it a credible study, and it has no empirical scientific support.

- Advocates of **non-sexist language** including some feminists say that the English language perpetuates biases against women, such as using male-gendered terms such as "he" and "man" as generic. Many authors including those who write textbooks now conspicuously avoid that practice, in the case of the previous examples using words like "he or she" or "they" and "human race".

- Various other schools of **persuasion** directly suggest using language in certain ways to change the minds of others, including oratory, advertising, debate, sales, and rhetoric. The ancient sophists discussed and listed many figures of speech such as enthymeme and euphemism. The modern public relations term for adding persuasive elements to the interpretation of and commentary on news is called spin.

Popular culture

The Sapir–Whorf hypothesis is the premise of the 2016 science fiction film *Arrival*. The protagonist explains that "the Sapir–Whorf hypothesis is the theory that the language you speak determines how you think".

General semantics

General semantics is concerned with how events translate to perceptions, how they are further modified by the names and labels we apply to them, and how we might gain a measure of control over our own responses, cognitive, emotional, and behavioral. It can serve as an antidote to certain kinds of delusional thought patterns in which necessarily incomplete and possibly warped mental constructs are projected onto the world and treated as reality itself. After partial launches under the names *human engineering* and *humanology*, Polish-American originator Alfred Korzybski (1879–1950) fully launched the program as *general semantics* in 1933 with the

publication of *Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics.*

In *Science and Sanity*, general semantics is presented as both a theoretical and a practical system whose adoption can reliably alter human behavior in the direction of greater sanity.

In the 1947 preface to the third edition of *Science and Sanity*, Korzybski wrote: "We *need not* blind ourselves with the old dogma that 'human nature cannot be changed', for we find that it *can be changed*." However, in the opinion of a majority of psychiatrists, the tenets and practices of general semantics are not an effective way of treating patients with psychological or mental illnesses. While Korzybski considered his program to be empirically based and to strictly follow the scientific method, general semantics has been described as veering into the domain of pseudoscience.

Starting around 1940, university English professor S. I. Hayakawa (1906–1992), speech professor Wendell Johnson, speech professor Irving J. Lee, and others assembled elements of general semantics into a package suitable for incorporation into mainstream communications curricula.

The Institute of General Semantics, which Korzybski and co-workers founded in 1938, continues today. General semantics as a movement has waned considerably since the 1950s, although many of its ideas live on in other movements, such as neuro-linguistic programming and rational emotive behavior therapy.

Overview

"Identification" and "the silent level"

In the 1946 "Silent and Verbal Levels" diagram, the arrows and boxes denote ordered stages in human neuro-evaluative processing that happens in an instant. Although newer knowledge in biology has more sharply defined what the text in these 1946 boxes labels "electro-colloidal", the diagram remains, as Korzybski wrote in his last published paper in 1950, "satisfactory for our purpose of explaining briefly the most general and important points".

General semantics postulates that most people "identify," or fail to differentiate the serial stages or "levels" within their own neuro-evaluative processing. "Most people," Korzybski wrote, "*identify in value* levels I, II, III, and IV and react *as if* our verbalizations about the first three levels were 'it.' Whatever we may say something 'is' obviously *is not* the 'something' on the silent levels."

By making it a 'mental' habit to find and keep one's bearings among the ordered stages, general semantics training seeks to sharpen internal orientation much as a GPS device may sharpen external orientation. Once trained, general semanticists affirm, a person will act, respond, and make decisions more appropriate to any given set of happenings. Although producing saliva constitutes an appropriate response when lemon juice drips onto the tongue, a person has inappropriately identified when an imagined lemon or the word "l–e–m–o–n" triggers a salivation response.

"Once we differentiate, differentiation becomes the denial of identity," Korzybski wrote in *Science and Sanity*. "Once we discriminate among the objective and verbal levels, we learn 'silence' on the unspeakable objective levels, and so introduce a most beneficial neurological 'delay'—engage the cortex to perform its natural function." British-American philosopher Max Black, an influential critic of general semantics, called this neurological delay the "central aim" of general semantics training, "so that in responding to verbal or nonverbal stimuli, we are aware of what it is that we are doing".

In the 21st century, the physiology underlying identification and the neurological delay is thought to involve autoassociative memory, a neural mechanism crucial to intelligence. Briefly explained, autoassociative memory retrieves previously stored representations that most closely conform to any current incoming pattern (level II in the general semantics diagram) arriving from the senses. According to the memory-prediction model for intelligence, if the stored representations resolve the arriving patterns, this constitutes "understanding", and brain activity shifts from evaluation to triggering motor responses. When the retrieved representations do *not* sufficiently resolve newly arrived patterns, evaluating persists, engaging higher layers of the cortex in an ongoing pursuit of resolution. The additional time required for signals to travel up and down the cortical hierarchy constitutes what general semantics calls a "beneficial neurological delay".

Abstracting and consciousness of abstracting

Identification prevents what general semantics seeks to promote: the additional cortical processing experienced as a

delay. Korzybski called his remedy for identification "consciousness of abstracting." The term "abstracting" occurs ubiquitously in *Science and Sanity.* Korzybski's use of the term is somewhat unusual and requires study to understand his meaning. He discussed the problem of identification in terms of "confusions of orders of abstractions" and "lack of consciousness of abstracting". To be conscious of abstracting is to differentiate among the "levels" described above; levels II–IV being abstractions of level I (whatever level I "is"—all we really get are abstractions). The techniques Korzybski prescribed to help a person develop consciousness of abstracting he called "extensional devices".

Extensional devices

Satisfactory accounts of general semantics extensional devices can be found easily. This article seeks to explain briefly only the "indexing" devices. Suppose you teach in a school or university. Students enter your classroom on the first day of a new term, and, if you identify these new students to a memory association retrieved by your brain, you under-engage your powers of observation and your cortex. Indexing makes explicit a differentiating of students$_{\text{this term}}$ from students$_{\text{prior terms}}$. You survey the new students, and indexing explicitly differentiates student$_1$ from student$_2$ from student$_3$, etc. Suppose you recognize one student—call her Anna—from a prior course in which Anna either excelled or did poorly. Again, you escape identification by your indexed awareness that Anna$_{\text{this term, this course}}$ is different from Anna$_{\text{that term, that course}}$. Not identifying, you both expand and sharpen your apprehension of "students" with an awareness rooted in fresh silent-level observations.

Language as a core concern

Autoassociative memory in the memory-prediction model describes neural operations in mammalian brains generally. A special circumstance for humans arises with the introduction of language components, both as fresh stimuli and as stored representations. Language considerations figure prominently in general semantics, and three language and communications specialists who embraced general semantics, university professors and authors Hayakawa, Wendell Johnson and Neil Postman, played major roles in framing general semantics, especially for non-readers of *Science and Sanity.*

The science

Many recognized specialists in the knowledge areas where Korzybski claimed to have anchored general semantics—biology, epistemology, mathematics, neurology, physics, psychiatry, etc.—supported his work in his lifetime, including Cassius J. Keyser, C. B. Bridges, W. E. Ritter, P. W. Bridgman, G. E. Coghill, William Alanson White, Clarence B. Farrar, David Fairchild, and Erich Kähler. Korzybski wrote in the preface to the third edition of *Science and Sanity* (1947) that general semantics "turned out to be an empirical natural science".

But the type of existence, if any, of universals and abstract objects is an issue of serious debate within metaphysical philosophy. So Black summed up general semantics as "some hypothetical neurology fortified with dogmatic metaphysics". And in 1952, two years after Korzybski died, American skeptic

Martin Gardner wrote, "[Korzybski's] work moves into the realm of cultism and pseudo-science."

Former Institute of General Semantics executive director Steve Stockdale has compared GS to yoga. "First, I'd say that there is little if any benefit to be gained by just *knowing* something about general semantics. The benefits come from maintaining an awareness of the principles and attitudes that are derived from GS and applying them as they are needed. You can sort of compare general semantics to yoga in that respect... knowing about yoga is okay, but to benefit from yoga you have to *do* yoga." Similarly, Kenneth Burke explains Korzybski's kind of semantics contrasting it, in *A Grammar of Motives*, with a kind of Burkean poetry by saying "*Semantics* is essentially scientist, an approach to language in terms of knowledge, whereas poetic forms are kinds of action".

History

Early attempts at validation

The First American Congress for General Semantics convened in March 1935 at the Central Washington College of Education in Ellensburg, Washington. In introductory remarks to the participants, Korzybski said:

General semantics formulates a new experimental branch of natural science, underlying an empirical theory of human evaluations and orientations and involving a definite neurological mechanism, present in all humans. It discovers direct neurological methods for the stimulation of the activities

of the human cerebral cortex and the direct introduction of beneficial neurological 'inhibition'....

He added that general semantics "will be judged by experimentation". One paper presented at the congress reported dramatic score improvements for college sophomores on standardized intelligence tests after six weeks of training by methods prescribed in Chapter 29 of *Science and Sanity.*

Interpretation as semantics

General semantics accumulated only a few early experimental validations. In 1938, economist and writer Stuart Chase praised and popularized Korzybski in *The Tyranny of Words*. Chase called Korzybski "a pioneer" and described *Science and Sanity* as "formulating a genuine science of communication. The term which is coming into use to cover such studies is 'semantics,' matters having to do with signification or meaning." Because Korzybski, in *Science and Sanity*, had articulated his program using "semantic" as a standalone qualifier on hundreds of pages in constructions like "semantic factors," "semantic disturbances," and especially "semantic reactions," to label the general semantics program "semantics" amounted to only a convenient shorthand.

Hayakawa read *The Tyranny of Words,* then *Science and Sanity*, and in 1939 he attended a Korzybski-led workshop conducted at the newly organized Institute of General Semantics in Chicago. In the introduction to his own *Language in Action*, a 1941 Book of the Month Club selection, Hayakawa wrote, "[Korzybski's] principles have in one way or another influenced almost every page of this book...." But, Hayakawa followed

Chase's lead in interpreting general semantics as making communication its defining concern. When Hayakawa co-founded the Society for General Semantics and its publication *ETC: A Review of General Semantics* in 1943—he would continue to edit *ETC.* until 1970—Korzybski and his followers at the Institute of General Semantics began to complain that Hayakawa had wrongly coopted general semantics. In 1985, Hayakawa gave this defense to an interviewer: "I wanted to treat general semantics as a subject, in the same sense that there's a scientific concept known as gravitation, which is independent of Isaac Newton. So after a while, you don't talk about Newton anymore; you talk about gravitation. You talk about semantics and not Korzybskian semantics."

Lowered sights

The regimen in the Institute's seminars, greatly expanded as team-taught seminar-workshops starting in 1944, continued to develop following the prescriptions laid down in Chapter XXIX of *Science and Sanity.* The structural differential, patented by Korzybski in the 1920s, remained among the chief training aids to help students reach "the silent level," a prerequisite for achieving "neurological delay". Innovations in the seminar-workshops included a new "neuro-relaxation" component, led by dancer and Institute editorial secretary Charlotte Schuchardt (1909–2002).

But although many people were introduced to general semantics—perhaps the majority through Hayakawa's more limited 'semantics'—superficial lip service seemed more common than the deep internalization that Korzybski and his co-workers at the Institute aimed for. Marjorie Kendig (1892–

1981), probably Korzybski's closest co-worker, director of the Institute after his death, and editor of his posthumously published *Collected Writings: 1920–1950*, wrote in 1968:

I would guess that I have known about 30 individuals who have in some degree adequately, by my standards, mastered this highly general, very simple, very difficult system of orientation and method of evaluating—reversing as it must all our cultural conditioning, neurological canalization, etc.... To me the *great error* Korzybski made—and I carried on, financial necessity— and for which we pay the price today in many criticisms, consisted in not restricting ourselves to training very thoroughly *a very few people* who would be competent to utilize the discipline in various fields and to train others. We should have done this before encouraging anyone to popularize or spread the word (horrid phrase) in societies for general semantics, by talking *about* general semantics instead of learning, using, etc. the methodology to *change* our essential epistemological assumptions, premises, etc. (unconscious or conscious), i.e. the *un*-learning basic to learning to learn.

Yes, large numbers of people do enjoy making a philosophy of general semantics. This saves them the pain of rigorous training so simple and general and limited that it seems obvious when *said*, yet so difficult.

Successors at the Institute of General Semantics continued for many years along the founders' path. Stuart Mayper (1916–1997), who studied under Karl Popper, introduced Popper's principle of falsifiability into the seminar-workshops he led at the Institute starting in 1977. More modest pronouncements gradually replaced Korzybski's claims that general semantics

can change human nature and introduce an era of universal human agreement. In 2000, Robert Pula (1928–2004), whose roles at the Institute over three decades included Institute director, editor-in-chief of the Institute's *General Semantics Bulletin*, and leader of the seminar-workshops, characterized Korzybski's legacy as a "contribution toward the improvement of human evaluating, to the amelioration of human woe...."

Hayakawa died in 1992. The Society for General Semantics merged into the Institute of General Semantics in 2003. In 2007, Martin Levinson, president of the Institute's Board of Trustees, teamed with Paul D. Johnston, executive director of the Society at the date of the merger, to teach general semantics with a light-hearted *Practical Fairy Tales for Everyday Living.* The Institute currently offers no training workshops.

Other institutions supporting or promoting general semantics in the 21st century include the New York Society for General Semantics, the European Society for General Semantics, the Australian General Semantics Society, and the Balvant Parekh Centre for General Semantics and Other Human Sciences (Baroda, India).

The major premises

- *Non-Aristotelianism*: While Aristotle wrote that a true definition gives the essence of the thing (defined in Greek *to tîeneinai*, literally "the what it was to be"), general semantics denies the existence of such an 'essence'. In this, general semantics purports to represent an evolution in human evaluative

orientation. In general semantics, it is always possible to give a *description* of empirical facts, but such descriptions remain just that—*descriptions*—which necessarily leave out many aspects of the objective, microscopic, and submicroscopic events they describe. According to general semantics, language, natural or otherwise (including the language called 'mathematics') can be used to *describe* the taste of an orange, but one cannot *give* the taste of the orange using language alone. According to general semantics, the *content of all knowledge is structure*, so that language (in general) and science and mathematics (in particular) can provide people with a structural 'map' of empirical facts, but there can be no 'identity', only structural similarity, between the language (map) and the empirical facts as lived through and observed by people as humans-in-environments (including doctrinal and linguistic environments).

- *Time binding*: The human ability to pass information and knowledge from one generation to the next. Korzybski claimed this to be a unique capacity, separating people from animals. This *distinctly human* ability for one generation to start where a previous generation left off, is a consequence of the uniquely human ability to move to higher and higher levels of abstraction *without limit*. Animals may have multiple levels of abstraction, but *their abstractions must stop at some finite upper limit*; this is not so for humans: humans can have 'knowledge about knowledge', 'knowledge about knowledge about knowledge', etc., without any upper limit. Animals

possess knowledge, but each generation of animals does things pretty much in the same way as the previous generation, limited by their neurology and genetic makeup. For example, at one time most human societies were hunter-gatherers, but now more advanced means of food production (growing, raising, or buying) predominate. Except for some insects (for example, ants), all animals are still hunter-gatherer species, even though many have existed longer than the human species. For this reason, animals are regarded in general semantics as *space-binders* (doing **space-binding**), and plants, which are usually stationary, as *energy-binders* (doing **energy-binding**).

- *Non-elementalism and non-additivity*: The refusal to separate verbally what cannot be separated empirically, and the refusal to regard such verbal splits as evidence that the 'things' that are verbally split bear an additive relation to one another. For example, space-time cannot empirically be split into 'space' + 'time', a conscious organism (including humans) cannot be split into 'body' + 'mind', etc., therefore, people should never speak of 'space' and 'time' or 'mind' and 'body' in isolation, but always use the terms space-time or mind-body (or other organism-as-a-whole terms).

- *Infinite-valued determinism*: General semantics regards the problem of 'indeterminism vs. determinism' as the failure of pre-modern epistemologies to formulate the issue properly as the failure to consider or include all factors relevant to a particular prediction, and failure to adjust our

languages and linguistic structures to empirical facts. General semantics resolves the issue in favor of determinism of a special kind called 'infinite-valued' determinism which always allows for the possibility that relevant 'causal' factors may be 'left out' at any given date, resulting in, if the issue is not understood at that date, 'indeterminism', which simply indicates that our ability to predict events has broken down, not that the world is 'indeterministic'. General semantics considers all human behavior (including all human decisions) as, in principle, fully determined once all relevant doctrinal and linguistic factors are included in the analysis, regarding theories of 'free will' as failing to include the doctrinal and linguistic environments *as environments* in the analysis of human behavior.

Connections to other disciplines

The influence of Ludwig Wittgenstein and the Vienna Circle, and of early operationalists and pragmatists such as Charles Sanders Peirce, is particularly clear in the foundational ideas of general semantics. Korzybski himself acknowledged many of these influences.

The concept of "silence on the objective level"—attributed to Korzybski and his insistence on consciousness of abstracting—are parallel to some of the central ideas in Zen Buddhism. Although Korzybski never acknowledged any influence from this quarter, he formulated general semantics during the same years that the first popularizations of Zen were becoming part of the intellectual currency of educated speakers of English.

On the other hand, later Zen-popularizer Alan Watts was influenced by ideas from general semantics.

General semantics has survived most profoundly in the cognitive therapies that emerged in the 1950s and 1960s. Albert Ellis (1913–2007), who developed rational emotive behavior therapy, acknowledged influence from general semantics and delivered the Alfred Korzybski Memorial Lecture in 1991. The Bruges (Belgium) center for solution-focused brief therapy operates under the name Korzybski Institute Training and Research Center. George Kelly, creator of personal construct psychology, was influenced by general semantics. Fritz Perls and Paul Goodman, founders of Gestalt therapy are said to have been influenced by Korzybski Wendell Johnson wrote "People in Quandaries: The Semantics of Personal Adjustment" in 1946, which stands as the first attempt to form a therapy from general semantics.

Ray Solomonoff (1926–2009) was influenced by Korzybski. Solomonoff was the inventor of algorithmic probability, and founder of algorithmic information theory (a.k.a. Kolmogorov complexity).

Another scientist influenced by Korzybski (verbal testimony) is Paul Vitanyi (born 1944), a scientist in the theory of computation.

During the 1940s, 1950s, and 1960s, general semantics entered the idiom of science fiction. Notable examples include the works of A. E. van Vogt, *The World of Null-A* and its sequels. General semantics appear also in Robert A. Heinlein's work, especially *Gulf*. Bernard Wolfe drew on general semantics in his 1952 science fiction novel *Limbo*. Frank Herbert's novels

Dune and *Whipping Star* are also indebted to general semantics. The ideas of general semantics became a sufficiently important part of the shared intellectual toolkit of genre science fiction to merit parody by Damon Knight and others; they have since shown a tendency to reappear in the work of more recent writers such as Samuel R. Delany, Suzette Haden Elgin and Robert Anton Wilson.

In 2008, John Wright extended van Vogt's Null-A series with *Null-A Continuum.* William Burroughs references Korzybski's time binding principle in his essay The Electronic Revolution, and elsewhere. Henry Beam Piper explicitly mentioned general semantics in *Murder in the Gunroom*, and its principles, such as awareness of the limitations of knowledge, are apparent in his later work. A fictional rendition of the *Institute of General Semantics* appears in the 1965 French science fiction film, Alphaville, directed by Jean-Luc Godard.

Neil Postman, founder of New York University's media ecology program in 1971, edited *ETC.: A Review of General Semantics* from 1976 to 1986. Postman's student Lance Strate, a co-founder of the Media Ecology Association, served as executive director of the Institute of General Semantics from 2007 to 2010.

E-Prime

E-Prime (short for English-Prime or English Prime, sometimes denoted É or E′) refers to a version of the English language that excludes all forms of the verb *to be*, including all conjugations, contractions and archaic forms.

Some scholars advocate using E-Prime as a device to clarify thinking and strengthen writing. A number of other scholars have criticized E-Pri

History

D. David Bourland Jr., who had studied under Alfred Korzybski, devised E-Prime as an addition to Korzybski's general semantics in the late 1940s. Bourland published the concept in a 1965 essay entitled "A Linguistic Note: Writing in E-Prime" (originally published in *General Semantics Bulletin*). The essay quickly generated controversy within the general semantics field, partly because practitioners of general semantics sometimes saw Bourland as attacking the verb '*to be*' as such, and not just certain usages.

Bourland collected and published three volumes of essays in support of his innovation. The first (1991), co-edited by Paul Dennithorne Johnston, bore the title: *To Be or Not: An E-Prime Anthology*. For the second, *More E-Prime: To Be or Not II*, published in 1994, he added a third editor, Jeremy Klein. Bourland and Johnston then edited a third book, *E-Prime III: a third anthology*, published in 1997.

Different functions of "to be"

In the English language, the verb 'to be' (also known as the *copula*) has several distinct functions:

- identity, of the form "noun*copuladefinite*-noun" *[The cat is my only pet]*; *[The cat is Garfield]*

- class membership, of the form "*definite-nouncopulanoun*" *[Garfield is a cat]*
- class inclusion, of the form "*nouncopulanoun*" *[A cat is an animal]*
- predication, of the form "*nouncopulaadjective*" *[The cat is furry]*
- auxiliary, of the form "*nouncopulaverb*" *[The cat is sleeping]*; *[The cat is being bitten by the dog]*. The examples illustrate two different uses of 'be' as an auxiliary. In the first, 'be' is part of the progressive aspect, used with "-ing" on the verb; in the second, it is part of the passive, as indicated by the perfect participle of a transitive verb.
- existence, of the form "there *copulanoun*" *[There is a cat]*
- location, of the form "*nouncopulaplace-phrase*" *[The cat is on the mat]*; *[The cat is here]*

Bourland sees specifically the "identity" and "predication" functions as pernicious, but advocates eliminating all forms for the sake of simplicity. In the case of the "existence" form (and less idiomatically, the "location" form), one might (for example) simply substitute the verb "exists". Other copula-substitutes in English include *taste*, *feel*, *smell*, *sound*, *grow*, *remain*, *stay*, and *turn*, among others a user of E-prime might use instead of *to be*.

Examples

Words not used in E-prime include:*be, being, been, am, is, isn't, are, aren't, was, wasn't, were,* and *weren't*.

Contractions formed from a pronoun and a form of *to be* are also not used, including: *I'm*, *you're*, *we're*, *they're*, *he's*, *she's*, *it's*, *there's*, *here's*, *where's*, *how's*, *what's*, *who's*, and *that's*. E-Prime also prohibits contractions of *to be* found in nonstandard dialects of English, such as *ain't*.

The different functions of "to be" could be rewritten as follows:

- "The cat is my only pet": "I have only a pet cat".
- "The cat is Garfield": "I call my cat Garfield".
- "Garfield is a cat": "I call my cat Garfield".
- "A cat is an animal": "Cat denotes an animal".
- "The cat is furry": "The cat feels furry".
- "The cat is sleeping": "The cat sleeps".
- "The dog is chasing the cat": "The dog chases the cat".
- "There is a cat": "I can see a cat".
- "The cat is on the mat": "The cat sits on the mat".
- "The cat is here": "I can see the cat".

Rationale

Bourland and other advocates also suggest that use of E-Prime leads to a less dogmatic style of language that reduces the possibility of misunderstanding or conflict.

Kellogg and Bourland describe misuse of the verb *to be* as creating a "deity mode of speech", allowing "even the most ignorant to transform their opinions magically into god-like pronouncements on the nature of things".

Psychological effects

While teaching at the University of Florida, Alfred Korzybski counseled his students to

eliminate the infinitive and verb forms of "to be" from their vocabulary, whereas a second group continued to use "I am," "You are," "They are" statements as usual. For example, instead of saying, "I am depressed," a student was asked to eliminate that emotionally primed verb and to say something else, such as, "I feel depressed when ..." or "I tend to make myself depressed about ..."

Korzybski observed improvement "of one full letter grade" by "students who did not generalize by using that infinitive".

Albert Ellis advocated the use of E-Prime when discussing psychological distress to encourage framing these experiences as temporary (see also Solution focused brief therapy) and to encourage a sense of agency by specifying the subject of statements. According to Ellis, rational emotive behavior therapy "has favored E-Prime more than any other form of psychotherapy and I think it is still the only form of therapy that has some of its main books written in E-Prime". However, Ellis did not always use E-Prime because he believed it interferes with readability.

Works written in E-Prime

- *Laws of Form* by G. Spencer-Brown, 1969 (except for one statement)

- *Quantum Psychology*, by Robert Anton Wilson (1990)
- *Worlds of Wonder: How to Write Science Fiction & Fantasy* by David Gerrold has a chapter about (and written in) E-Prime
- *The New American Standard Bible in E-Prime*, composed by Dr. David F. Maas
- *Scoundrel Days: A Memoir*, 2017 Brentley Frazer
- An Insider's Guide to Robert Anton Wilson by Eric Wagner

Criticisms

Many authors have questioned E-Prime's effectiveness at improving readability and reducing prejudice (Lakoff, 1992; Murphy, 1992; Parkinson, 1992; Kenyon, 1992; French, 1992, 1993; Lohrey, 1993).

These authors observed that a communication under the copula ban can remain extremely unclear and imply prejudice, while losing important speech patterns, such as identities and identification. Further, prejudices and judgments that are made are more difficult to notice or refute. James D. French, a computer programmer at the University of California, Berkeley, summarized ten arguments against E-Prime (in the context of general semantics) as follows:

- The elimination of a whole class of sentences results in fewer alternatives and is likely to make writing less, rather than more, interesting. One can improve bad writing more by reducing use of the verb 'to be' than by eliminating it.

- "Effective writing techniques" are not relevant to general semantics as a discipline, and therefore should not be promoted as general semantics practice.

- The context often ameliorates the possible harmful effects from the use of the is-of-identity and the is-of-predication, so it is not necessary to eliminate all such sentences. For example, "George is a Judge" in response to a question of what he does for a living would not be a questionable statement.

- *To be* statements do not only convey identity but also asymmetrical relations ("X is higher than Y"); negation ("A is not B"); location ("Berlin is in Germany"); auxiliary ("I am going to the store") etc., forms we would also have to sacrifice.

- Eliminating *to be* from English has little effect on eliminating identity. For example, a statement of apparently equal identification, "The silly ban on copula continues," can be made without the copula assuming an identity rather than asserting it, consequently hampering our awareness of it.

- Identity-in-the-language is not the same thing as the far more important identity-in-reaction (identification). General semantics cuts the link between the two through the practice of silence on the objective levels, adopting a self-reflexive attitude, e.g., "as I see it" "it seems to me" etc., and by the use of quotation marks—without using E-Prime.

- The advocates of E-Prime have not proven that it is easier to eliminate the verb *to be* from the English language than it is to eliminate just the is-of-identity

and the is-of-predication. It may well be easier to do the latter for many people.

- One of the best languages for time-binding is mathematics, which relies heavily on the notion of equivalence and equality. For the purposes of time-binding, it may be better to keep *to be* in the language while only cutting the link between identity-in-the-language and identification-in-our-reactions.

- E-Prime makes no distinction between statements that cross the principles of general semantics and statements that do not. It lacks consistency with the other tenets of general semantics and should not be included into the discipline.

According to an article (written in E-Prime and advocating a role for E-Prime in ESL and EFL programs) published by the Office of English Language Programs of the Bureau of Educational and Cultural Affairs in the State Department of the United States, "Requiring students to avoid the verb to be on every assignment would deter students from developing other fundamental skills of fluent writing."

Neuro-linguistic programming

Neuro-linguistic programming (NLP) is a pseudoscientific approach to communication, personal development, and psychotherapy created by Richard Bandler and John Grinder in California, United States, in the 1970s. NLP's creators claim there is a connection between neurological processes (*neuro-*), language (*linguistic*) and behavioral patterns learned through experience (*programming*), and that these can be changed to

achieve specific goals in life. Bandler and Grinder also claim that NLP methodology can "model" the skills of exceptional people, allowing anyone to acquire those skills. They claim as well that, often in a single session, NLP can treat problems such as phobias, depression, tic disorders, psychosomatic illnesses, near-sightedness, allergy, the common cold, and learning disorders. NLP has been adopted by some hypnotherapists and also by companies that run seminars marketed as leadership training to businesses and government agencies.

There is no scientific evidence supporting the claims made by NLP advocates, and it has been discredited as a pseudoscience. Scientific reviews state that NLP is based on outdated metaphors of how the brain works that are inconsistent with current neurological theory and contain numerous factual errors. Reviews also found that all of the supportive research on NLP contained significant methodological flaws and that there were three times as many studies of a much higher quality that failed to reproduce the "extraordinary claims" made by Bandler, Grinder, and other NLP practitioners.

Early development

According to Bandler and Grinder, NLP comprises a methodology termed *modeling*, plus a set of techniques that they derived from its initial applications. Of such methods that are considered fundamental, they derived many from the work of Virginia Satir, Milton Erickson and Fritz Perls.

Bandler and Grinder also drew upon the theories of Gregory Bateson, Alfred Korzybski and Noam Chomsky (particularly

transformational grammar), as well as ideas and techniques from Carlos Castaneda. Bandler and Grinder claim that their methodology can codify the structure inherent to the therapeutic "magic" as performed in therapy by Perls, Satir and Erickson, and indeed inherent to any complex human activity, and then from that codification, the structure and its activity can be learned by others. Their 1975 book, *The Structure of Magic I: A Book about Language and Therapy*, is intended to be a codification of the therapeutic techniques of Perls and Satir.

Bandler and Grinder say that they used their own process of *modeling* to model Virginia Satir so they could produce what they termed the *Meta-Model*, a model for gathering information and challenging a client's language and underlying thinking. They claim that by challenging linguistic distortions, specifying generalizations, and recovering deleted information in the client's statements, the transformational grammar concepts of *surface structure* yield a more complete representation of the underlying *deep structure* and therefore have therapeutic benefit. Also derived from Satir were *anchoring*, *future pacing* and *representational systems*.

In contrast, the *Milton-Model*—a model of the purportedly hypnotic language of Milton Erickson—was described by Bandler and Grinder as "artfully vague" and metaphoric. The Milton-Model is used in combination with the Meta-Model as a softener, to induce "trance" and to deliver indirect therapeutic suggestion.

Psychologist Jean Mercer writes that Chomsky's theories "appear to be irrelevant" to NLP. Linguist Karen Stollznow describes Bandler's and Grinder's reference to such experts as

namedropping. Other than Satir, the people they cite as influences did not collaborate with Bandler or Grinder. Chomsky himself has no association with NLP whatsoever; his original work was intended as theory, not therapy. Stollznow writes, "[o]ther than borrowing terminology, NLP does not bear authentic resemblance to any of Chomsky's theories or philosophies—linguistic, cognitive or political."

According to André Muller Weitzenhoffer, a researcher in the field of hypnosis, "the major weakness of Bandler and Grinder's linguistic analysis is that so much of it is built upon untested hypotheses and is supported by totally inadequate data." Weitzenhoffer adds that Bandler and Grinder misuse formal logic and mathematics, redefine or misunderstand terms from the linguistics lexicon (*e.g.*, nominalization), create a scientific façade by needlessly complicating Ericksonian concepts with unfounded claims, make factual errors, and disregard or confuse concepts central to the Ericksonian approach.

More recently (circa 1997), Bandler has claimed, "NLP is based on finding out what works and formalizing it. In order to formalize patterns I utilized everything from linguistics to holography…The models that constitute NLP are all formal models based on mathematical, logical principles such as predicate calculus and the mathematical equations underlying holography."

However, there is no mention of the mathematics of holography nor of holography in general in McClendon's, Spitzer's, or Grinder's account of the development of NLP.

On the matter of the development of NLP, Grinder recollects:

My memories about what we thought at the time of discovery (with respect to the classic code we developed—that is, the years 1973 through 1978) are that we were quite explicit that we were out to overthrow a paradigm and that, for example, I, for one, found it very useful to plan this campaign using in part as a guide the excellent work of Thomas Kuhn (*The Structure of Scientific Revolutions*) in which he detailed some of the conditions which historically have obtained in the midst of paradigm shifts.

For example, I believe it was very useful that neither one of us were qualified in the field we first went after—psychology and in particular, its therapeutic application; this being one of the conditions which Kuhn identified in his historical study of paradigm shifts.

The philosopher Robert Todd Carroll responded that Grinder has not understood Kuhn's text on the history and philosophy of science, *The Structure of Scientific Revolutions*. Carroll replies: (a) individual scientists never have nor are they ever able to create *paradigm shifts* volitionally and Kuhn does not suggest otherwise; (b) Kuhn's text does not contain the idea that being unqualified in a field of science is a prerequisite to producing a result that necessitates a *paradigm shift* in that field and (c) *The Structure of Scientific Revolutions* is foremost a work of *history* and not an instructive text on *creating* paradigm shifts and such a text is not possible—extraordinary discovery is not a formulaic procedure.

Carroll explains that a *paradigm shift* is not a planned activity, rather it is an outcome of scientific effort within the current (dominant) paradigm that produces data that can't be

adequately accounted for within the current paradigm—hence a *paradigm shift*, i.e. the adoption of a new paradigm.

In developing NLP, Bandler and Grinder were not responding to a paradigmatic crisis in psychology nor did they produce any data that caused a paradigmatic crisis in psychology. There is no sense in which Bandler and Grinder caused or participated in a paradigm shift. "What did Grinder and Bandler do that makes it impossible to continue doing psychology...without accepting their ideas? Nothing," argues Carroll.

Commercialization and evaluation

By the late 1970s, the human potential movement had developed into an industry and provided a market for some NLP ideas. At the center of this growth was the Esalen Institute at Big Sur, California. Perls had led numerous Gestalt therapy seminars at Esalen. Satir was an early leader and Bateson was a guest teacher. Bandler and Grinder claimed that in addition to being a therapeutic method, NLP was also a study of communication and began marketing it as a business tool, claiming that, "if any human being can do anything, so can you."

After 150 students paid $1,000 each for a ten-day workshop in Santa Cruz, California, Bandler and Grinder gave up academic writing and produced popular books from seminar transcripts, such as *Frogs into Princes,* which sold more than 270,000 copies. According to court documents relating to an intellectual property dispute between Bandler and Grinder, Bandler made more than $800,000 in 1980 from workshop and book sales.

A community of psychotherapists and students began to form around Bandler and Grinder's initial works, leading to the growth and spread of NLP as a theory and practice. For example, Tony Robbins trained with Grinder and utilized a few ideas from NLP as part of his own self-help and motivational speaking programmes. Bandler led several unsuccessful efforts to exclude other parties from using NLP.

Meanwhile, the rising number of practitioners and theorists led NLP to become even less uniform than it was at its foundation. Prior to the decline of NLP, scientific researchers began testing its theoretical underpinnings empirically, with research indicating a lack of empirical support for NLP's essential theories. The 1990s were characterized by fewer scientific studies evaluating the methods of NLP than the previous decade. Tomasz Witkowski attributes this to a declining interest in the debate as the result of a lack of empirical support for NLP from its proponents.

Main components and core concepts

NLP can be understood in terms of three broad components and the central concepts pertaining to those:

- ***Subjectivity.*** According to Bandler and Grinder:
- We experience the world subjectively thus we create subjective representations of our experience. These subjective representations of experience are constituted in terms of five senses and language. That is to say our subjective conscious experience is in terms of the traditional senses of vision, audition, tactition, olfaction and gustation such that when

we—for example—rehearse an activity "in our heads", recall an event or anticipate the future we will "see" images, "hear" sounds, "taste" flavours, "feel" tactile sensations, "smell" odours and think in some (natural) language. Furthermore it is claimed that these subjective representations of experience have a discernible structure, a pattern. It is in this sense that NLP is sometimes defined as *the study of the structure of subjective experience.*

- Behavior can be described and understood in terms of these sense-based subjective representations. Behavior is broadly conceived to include verbal and non-verbal communication, incompetent, maladaptive or "pathological" behavior as well as effective or skillful behavior.

- Behavior (in self and others) can be modified by manipulating these sense-based subjective representations.

- **Consciousness.** NLP is predicated on the notion that consciousness is bifurcated into a conscious component and an unconscious component. Those subjective representations that occur outside of an individual's awareness comprise what is referred to as the "unconscious mind".

- **Learning.** NLP utilizes an imitative method of learning—termed *modeling*—that is claimed to be able to codify and reproduce an exemplar's expertise in any domain of activity. An important part of the codification process is a description of the sequence of the sensory/linguistic representations of the subjective experience of the exemplar during execution of the expertise.

Techniques or set of practices

According to one study by Steinbach, a classic interaction in NLP can be understood in terms of several major stages including establishing rapport, gleaning information about a problem mental state and desired goals, using specific tools and techniques to make interventions, and integrating proposed changes into the client's life. The entire process is guided by the non-verbal responses of the client. The first is the act of establishing and maintaining rapport between the practitioner and the client which is achieved through pacing and leading the verbal (*e.g.*, sensory predicates and keywords) and non-verbal behavior (*e.g.*, matching and mirroring non-verbal behavior, or responding to eye movements) of the client.

Once rapport is established, the practitioner may gather information (*e.g.*, using the Meta-Model questions) about the client's present state as well as help the client define a desired state or goal for the interaction. The practitioner pays particular attention to the verbal and non-verbal responses as the client defines the present state and desired state and any "resources" that may be required to bridge the gap. The client is typically encouraged to consider the consequences of the desired outcome, and how they may affect his or her personal or professional life and relationships, taking into account any positive intentions of any problems that may arise (i.e. ecological check). Fourth, the practitioner assists the client in achieving the desired outcomes by using certain tools and techniques to change internal representations and responses to stimuli in the world. Finally, the changes are "future paced" by helping the client to mentally rehearse and integrate the

changes into his or her life. For example, the client may be asked to "step into the future" and represent (mentally see, hear and feel) what it is like having already achieved the outcome.

According to Stollznow (2010), "NLP also involves fringe discourse analysis and "practical" guidelines for "improved" communication. For example, one text asserts "when you adopt the "but" word, people will remember what you said afterwards. With the "and" word, people remember what you said before and after."

Applications

Alternative medicine

NLP has been promoted with claims it can be used to treat a variety of diseases including Parkinson's disease, HIV/AIDS and cancer. Such claims have no supporting medical evidence. People who use NLP as a form of treatment risk serious adverse health consequences as it can delay the provision of effective medical care.

Psychotherapeutic

Early books about NLP had a psychotherapeutic focus given that the early models were psychotherapists. As an approach to psychotherapy, NLP shares similar core assumptions and foundations in common with some contemporary brief and systemic practices, such as solution focused brief therapy. NLP has also been acknowledged as having influenced these practices with its reframing techniques which seeks to achieve

behavior change by shifting its *context* or *meaning*, for example, by finding the positive connotation of a thought or behavior.

The two main therapeutic uses of NLP are: (1) as an adjunct by therapists practicing in other therapeutic disciplines; (2) as a specific therapy called Neurolinguistic Psychotherapy which is recognized by the United Kingdom Council for Psychotherapy with accreditation governed at first by the Association for Neuro Linguistic Programming and more recently by its daughter organization the Neuro Linguistic Psychotherapy and Counselling Association. Neither Neuro-Linguistic Programming nor Neuro-Linguistic Psychotherapy are NICE-approved.

According to Stollznow (2010) "Bandler and Grinder's infamous *Frogs into Princes* and their other books boast that NLP is a cure-all that treats a broad range of physical and mental conditions and learning difficulties, including epilepsy, myopia and dyslexia.

With its promises to cure schizophrenia, depression and Post Traumatic Stress Disorder, and its dismissal of psychiatric illnesses as psychosomatic, NLP shares similarities with Scientology and the Citizens Commission on Human Rights (CCHR)." A systematic review of experimental studies by Sturt *et al* (2012) concluded that "there is little evidence that NLP interventions improve health-related outcomes." In his review of NLP, Stephen Briers writes, "NLP is not really a cohesive therapy but a ragbag of different techniques without a particularly clear theoretical basis…[and its] evidence base is virtually non-existent." Eisner writes, "NLP appears to be a superficial and gimmicky approach to dealing with mental

health problems. Unfortunately, NLP appears to be the first in a long line of mass marketing seminars that purport to virtually cure any mental disorder…it appears that NLP has no empirical or scientific support as to the underlying tenets of its theory or clinical effectiveness. What remains is a mass-marketed serving of psychopablum."

André Muller Weitzenhoffer—a friend and peer of Milton Erickson—wrote, "Has NLP really abstracted and explicated the essence of successful therapy and provided everyone with the means to be another Whittaker, Virginia Satir, or Erickson?…[NLP's] failure to do this is evident because today there is no multitude of their equals, not even another Whittaker, Virginia Satir, or Erickson.

Ten years should have been sufficient time for this to happen. In this light, I cannot take NLP seriously…[NLP's] contributions to our understanding and use of Ericksonian techniques are equally dubious. *Patterns I* and *II* are poorly written works that were an overambitious, pretentious effort to reduce hypnotism to a magic of words."

Clinical psychologist Stephen Briers questions the value of the NLP maxim—a *presupposition* in NLP jargon—"there is no failure, only feedback". Briers argues that the denial of the existence of failure diminishes its instructive value. He offers Walt Disney, Isaac Newton and J.K. Rowling as three examples of unambiguous acknowledged personal failure that served as an impetus to great success. According to Briers, it was "the crash-and-burn type of failure, not the sanitised NLP Failure Lite, i.e. the failure-that-isn't really-failure sort of failure" that propelled these individuals to success. Briers contends that

adherence to the maxim leads to self-deprecation. According to Briers, personal endeavour is a product of invested values and aspirations and the dismissal of personally significant failure as mere feedback effectively denigrates what one values. Briers writes, "Sometimes we need to accept and mourn the death of our dreams, not just casually dismiss them as inconsequential." Briers also contends that the NLP maxim is narcissistic, self-centered and divorced from notions of moral responsibility.

Other uses

Although the original core techniques of NLP were therapeutic in orientation their generic nature enabled them to be applied to other fields. These applications include persuasion, sales, negotiation, management training, sports, teaching, coaching, team building, and public speaking.

Scientific criticism

In the early 1980s, NLP was advertised as an important advance in psychotherapy and counseling, and attracted some interest in counseling research and clinical psychology.

However, as controlled trials failed to show any benefit from NLP and its advocates made increasingly dubious claims, scientific interest in NLP faded.

Numerous literature reviews and meta-analyses have failed to show evidence for NLP's assumptions or effectiveness as a therapeutic method.

While some NLP practitioners have argued that the lack of empirical support is due to insufficient research testing NLP, the consensus scientific opinion is that NLP is pseudoscience and that attempts to dismiss the research findings based on these arguments "[constitute]s an admission that NLP does not have an evidence base and that NLP practitioners are seeking a post-hoc credibility."

Surveys in the academic community have shown NLP to be widely discredited among scientists.

Among the reasons for considering NLP a pseudoscience are that evidence in favor of it is limited to anecdotes and personal testimony, that it is not informed by scientific understanding of neuroscience and linguistics, and that the name "neuro-linguistic programming" uses jargon words to impress readers and obfuscate ideas, whereas NLP itself does not relate any phenomena to neural structures and has nothing in common with linguistics or programming. In fact, in education, NLP has been used as a key example of pseudoscience.

As a quasi-religion

Sociologists and anthropologists—amongst others—have categorized NLP as a quasi-religion belonging to the New Age and/or Human Potential Movements. Medical anthropologist Jean M. Langford categorizes NLP as a form of folk magic; that is to say, a practice with symbolic efficacy—as opposed to physical efficacy—that is able to effect change through nonspecific effects (*e.g.*, placebo). To Langford, NLP is akin to a syncretic folk religion "that attempts to wed the magic of folk practice to the science of professional medicine". Bandler and

Grinder were (and continue to be) influenced by the shamanism described in the books of Carlos Castaneda. Several ideas and techniques have been borrowed from Castaneda and incorporated into NLP including so-called *double induction* and the notion of "stopping the world" which is central to NLP modeling. Tye (1994) characterizes NLP as a type of "psycho shamanism". Fanthorpe and Fanthorpe (2008) see a similarity between the mimetic procedure and intent of NLP modeling and aspects of ritual in some syncretic religions. Hunt (2003) draws a comparison between the concern with lineage from an NLP guru—which is evident amongst some NLP proponents—and the concern with guru lineage in some Eastern religions.

In Aupers and Houtman (2010) Bovbjerg identifies NLP as a New Age "psycho-religion" and uses NLP as a case-study to demonstrate the thesis that the New Age psycho-religions such as NLP are predicated on an instrinsically religious idea, namely concern with a transcendent "other". In the world's monotheistic faiths, argues Bovbjerg, the purpose of religious practice is communion and fellowship with a transcendent 'other', i.e. a God. With the New Age psycho-religions, argues Bovbjerg, this orientation towards a transcendent 'other' persists but the *other* has become "the other in our selves", the so-called *unconscious*: "[t]he individual's inner life becomes the intangible focus of [psycho-]religious practices and the subconscious becomes a constituent part of modern individuals' understanding of the Self." Bovbjerg adds, "[c]ourses in personal development would make no sense without an unconscious that contains hidden resources and hidden knowledge of the self." Thus psycho-religious practice revolves around ideas of the conscious and unconscious self

and communicating with and accessing the hidden resources of the unconscious self—the transcendent *other*. According to Bovbjerg the notion that we have an unconscious self underlies many NLP techniques either explicitly or implicitly. Bovbjerg argues, "[t]hrough particular practices, the [NLP practitioner *qua*] psycho-religious practitioner expects to achieve self-perfection in a never-ending transformation of the self."

Bovbjerg's secular critique of NLP is echoed in the conservative Christian perspective of the New Age as represented by Jeremiah (1995) who argues that, "[t]he 'transformation' recommended by the founders and leaders of these business seminars [such as NLP] has spiritual implications that a non-Christian or new believer may not recognise. The belief that human beings can change themselves by calling upon the power (or god) within or their own infinite human potential is a contradiction of the Christian view. The Bible says man is a sinner and is saved by God's grace alone."

Intellectual property disputes

By the end of 1980, the collaboration between Bandler and Grinder ended. On 25 September 1981, Bandler instituted a civil action against Grinder and his company, seeking injunctive relief and damages for Grinder's commercial activity in relation to NLP. On 29 October 1981, judgement was made in favor of Bandler. As part of a settlement agreement Bandler granted to Grinder a limited 10-year license to conduct NLP seminars, offer certification in NLP and use the NLP name on the condition that royalties from the earnings of the seminars be paid to Bandler. In July 1996 and January 1997, Bandler instituted a further two civil actions against Grinder and his

company, numerous other prominent figures in NLP and 200 further initially unnamed persons. Bandler alleged that Grinder had violated the terms of the settlement agreement reached in the initial case and had suffered commercial damage as a result of the allegedly illegal commercial activities of the defendants. Bandler sought from *each*defendant damages no less than US$10,000,000.00. In February 2000, the Court found against Bandler, stating that "Bandler has misrepresented to the public, through his licensing agreement and promotional materials, that he is the exclusive owner of all intellectual property rights associated with NLP, and maintains the exclusive authority to determine membership in and certification in the Society of NLP."

On this matter Stollznow (2010) comments, "[i]ronically, Bandler and Grinder feuded in the 1980s over trademark and theory disputes. Tellingly, none of their myriad of NLP models, pillars, and principles helped these founders to resolve their personal and professional conflicts."

In December 1997, Tony Clarkson instituted civil proceedings against Bandler to have Bandler's UK trademark of NLP revoked. The Court found in favor of Clarkson; Bandler's trademark was subsequently revoked.

By the end of 2000, Bandler and Grinder entered a release where they agreed, amongst other things, that "they are the co-creators and co-founders of the technology of Neuro-linguistic Programming" and "mutually agree to refrain from disparaging each other's efforts, in any fashion, concerning their respective involvement in the field of NeuroLinguistic Programming."

As a consequence of these disputes and settlements, the names *NLP* and *Neuro-linguistic Programming* are not owned by any party and there is no restriction on any party offering NLP certification.

Associations, certification, and practitioner standards

The names *NLP* and *Neuro-linguistic Programming* are not owned by any person or organisation, they are not trademarked intellectual property and there is no central regulating authority for NLP instruction and certification. There is no restriction on who can describe themselves as an *NLP Master Practitioner* or *NLP Master Trainer* and there are a multitude of certifying associations; this has led Devilly (2005) to describe such training and certifying associations as *granfalloons*, i.e. proud and meaningless associations of human beings.

There is great variation in the depth and breadth of training and standards of practitioners, and some disagreement between those in the field about which patterns are, or are not, actual NLP. NLP is an open field of training with no "official" best practice. With different authors, individual trainers and practitioners having developed their own methods, concepts and labels, often branding them as NLP, the training standards and quality differ greatly. In 2009, a British television presenter was able to register his pet cat as a member of the British Board of Neuro Linguistic Programming (BBNLP), which subsequently claimed that it existed only to provide benefits to its members and not to certify credentials.

Gender-neutral language

Gender-neutral language or gender-inclusive language is language that avoids bias towards a particular sex or social gender. In English, this includes use of nouns that are not gender-specific to refer to roles or professions, formation of phrases in a coequal manner, and discontinuing the blanket use of male terms. For example, the words *policeman* and *stewardess* are gender-specific job titles; the corresponding gender-neutral terms are *police officer* and *flight attendant.* Other gender-specific terms, such as *actor* and *actress*, may be replaced by the originally male term; for example, *actor* used regardless of gender. Some terms, such as *chairman*, that contain the component *-man* but have traditionally been used to refer to persons regardless of sex are now seen by some as gender-specific. An example of forming phrases in a coequal manner would be using *husband and wife* instead of *man and wife*. Examples of discontinuing the blanket use of male terms in English are referring to those with unknown or indeterminate gender as singular *they*, and using *humans*, *people*, or *humankind*, instead of *man* or *mankind.*

History

The notion that parts of the English language were sexist was brought to mainstream attention in Western English cultures by feminists in the 1970s. Simultaneously, the link between language and ideologies (including traditional gender ideologies) was becoming apparent in the academic field of linguistics. In 1975, the National Council of Teachers of English (NCTE) published a set of guidelines on the use of

"non-sexist" language. Backlash ensued, as did the debate on whether gender-neutral language ought to be enforced. In Britain, feminist Maija S. Blaubergs' countered eight commonly used oppositional arguments in 1980. In 1983, New South Wales, Australia required the use of *they* in place of *he* and *she* in subsequent laws. In 1985, the Canadian Corporation for Studies in Religion (CCSR) passed a motion for all its ensuing publications to include "non-sexist" language. By 1995, academic institutions in Canada and Britain had implemented "non-sexist" language policies. More recently, revisions to the Women's Press publications of *The Handbook of Nonsexist Writing* and *The A–Z of Non-Sexist Language* were made to de-radicalize the original works. In 2006, "non-sexist" was challenged: the term refers solely to the absence of sexism. In 2018, the State of New York enacted policy to formally use the gender-neutral terms *police officer* and *firefighter*.

Terminology and views

General

Historically, the use of masculine pronouns in place of generic was regarded as non-sexist, but various forms of gender-neutral language became a common feature in written and spoken versions of many languages in the late twentieth century. Feminists argue that previously the practice of assigning masculine gender to generic antecedents stemmed from language reflecting "the prejudices of the society in which it evolved, and English evolved through most of its history in a male-centered, patriarchal society." During the 1970s, feminists Casey Miller and Kate Swift created a manual, *The*

Handbook of Nonsexist Writing, on gender neutral language that was set to reform the existing sexist language that was said to exclude and dehumanize women. In 1995, the Women's Press published *The A–Z of Non-Sexist Language*, by Margaret Doyle. Both publications were written by American authors, originally without the consideration of the British-English dialect. Many feminist efforts were made to reform the androcentric language. It has become common in some academic and governmental settings to rely on gender-neutral language to convey inclusion of all sexes or genders (gender-inclusive language).

Various languages employ different means to achieve gender neutrality:

- Gender neutrality in languages with grammatical gender
- Gender neutrality in genderless languages
- Gender neutrality in English

Other particular issues are also discussed:

- Gender marking in job titles
- Gender-specific and gender-neutral pronouns

Gender indication

There are different approaches in forming a "gender-neutral language":

- Neutralising any reference to gender or sex, like using "they" as a third person singular pronoun instead of "he" or "she", and proscribing words like

actress (female actor) and prescribing the use of words like *actor* for persons of any gender. Although it has generally been accepted in the English language, some argue that using "they" as a singular pronoun is considered grammatically incorrect, but acceptable in informal writing.

- Creating alternative gender-neutral pronouns, such as "hir" or "hen" in Swedish.
- Indicating the gender by using wordings like "he or she" and "actors and actresses".
- Avoiding the use of "him/her" or the third person singular pronoun "they" by using "the" or restructuring the sentence all together to avoid all three.
- NASA now prefers the use of "crewed" and "uncrewed" instead of "manned" and "unmanned", including when discussing historical spaceflight (except proper nouns).

Canada

University of Toronto psychology professor Jordan Peterson uploaded a video to YouTube expressing his opposition to Bill C-16 – An Act to amend the Canadian Human Rights Act and the Criminal Code, a bill introduced by Justin Trudeau's government, in October 2016. The proposed piece of legislation was to add the terms "gender identity" and "gender expression" to the Canadian Human Rights Act and to the Criminal Code's hate crimes provisions. In the video, Peterson argued that legal protection of gender pronouns results in "compelled speech", which would violate the right to freedom of expression outlined in the Canadian Charter of Rights and Freedoms. In the view of

Peterson, legal pronoun protects would force an individual to say something with which one has an opposition to. The bill passed in the House of Commons and in the Senate, becoming law once it received Royal Assent on 19 June 2017. In response to the passing of the bill, Peterson has stated he will not use gender-neutral pronouns if asked in the classroom by a student.

Chapter 3

Evolutionary Linguistics

Evolutionary linguistics or Darwinian linguistics is a sociobiological approach to the study of language. Evolutionary linguists consider linguistics as a subfield of evolutionary biology and evolutionary psychology. The approach is also closely linked with evolutionary anthropology, cognitive linguistics and biolinguistics. Studying languages as the products of nature, it is interested in the biological origin and development of language. Evolutionary linguistics is contrasted with humanistic approaches, especially structural linguistics.

A main challenge in this research is the lack of empirical data: there are no archaeological traces of early human language. Computational biological modelling and clinical research with artificial languages have been employed to fill in gaps of knowledge. Although biology is understood to shape the brain which processes language, there is no clear link between biology and specific human language structures or linguistic universals.

For lack of a breakthrough in the field, there have been numerous debates about what kind of natural phenomenon language might be. Some researchers focus on the innate aspects of language. It is suggested that grammar has emerged adaptationally from the human genome, bringing about a language instinct; or that it depends on a single mutation which has caused a language organ to appear in the human brain. This is hypothesized to result in a crystalline grammatical structure underlying all human languages. Others

suggest language is not crystallized, but fluid and ever-changing, forming patterns like sand dunes. Others, yet, liken languages to living organisms. Languages are considered analogous to a parasites or populations of mind-viruses. While there is no solid scientific evidence for any of the claims, some of them have been labelled as pseudoscience.

History

1863—1945: social Darwinism

Although pre-Darwinian theorists had compared languages to living organisms as a metaphor, the comparison was first taken literally in 1863 by the historical linguist August Schleicher who was inspired by Charles Darwin's *Origin of the Species*. At the time there was no scientific evidence to prove that Darwin's theory of natural selection was correct. Schleicher proposed that linguistics could be used as a testing ground for the study of the evolution of species. A review of Schleicher's book *Darwinism as Tested by the Science of Language* appeared in the first issue of the evolutionary biology journal *Nature* in 1870. Darwin reiterated Schleicher's proposition in his 1871 book *The Descent of Man*, claiming that languages are comparable to species, and that language change occurs through natural selection as words 'struggle for life'. Darwin believed that languages had evolved from animal mating calls. Darwinists considered the concept of language creation as unscientific.

The social Darwinists Schleicher and Ernst Haeckel were keen gardeners and regarded the study of cultures as a type of

botany, with different species competing for the same living space. Their ideas became advocated by politicians who wanted to appeal to working class voters, not least by the national socialists who subsequently included the concept of struggle for living space in their agenda. Highly influential until the end of World War II, social Darwinism was eventually banished from human sciences, leading to a strict separation of natural and sociocultural studies.

This gave rise to the dominance of structural linguistics in Europe. There had long been a dispute between the Darwinists and the French intellectuals with the topic of language evolution famously having been banned by the Paris Linguistic Society as early as in 1866. Ferdinand de Saussure proposed structuralism to replace evolutionary linguistics in his *Course in General Linguistics*, published posthumously in 1916. The structuralists rose to academic political power in human and social sciences in the aftermath of the student revolts of Spring 1968, establishing Sorbonne as an international centrepoint of humanistic thinking.

From 1959 onwards: genetic determinism

In the United States, structuralism was however fended off by the advocates of behavioural psychology; a linguistics framework nicknamed as 'American structuralism'. It was eventually replaced by the approach of Noam Chomsky who published a modification of Louis Hjelmslev's formal structuralist theory, claiming that syntactic structures are innate. An active figure in peace demonstrations in the 1950s and 1960s, Chomsky rose to academic political power following Spring 1968 at the MIT.

Chomsky became an influential opponent of the French intellectuals during the following decades, and his supporters successfully confronted the post-structuralists in the *Science Wars* of the late 1990s. The shift of the century saw a new academic funding policy where interdisciplinary research became favoured, effectively directing research funds to biological humanities. The decline of structuralism was evident by 2015 with Sorbonne having lost its former spirit.

Chomsky eventually claimed that syntactic structures are caused by a random mutation in the human genome, proposing a similar explanation for other human faculties such as ethics. But Steven Pinker argued in 1990 that they are the outcome of evolutionary adaptations.

From 1976 onwards: Neo-Darwinism

At the same time when the Chomskyan paradigm of biological determinism defeated humanism, it was losing its own clout within sociobiology. It was reported likewise in 2015 that generative grammar was under fire in applied linguistics and in the process of being replaced with *usage-based linguistics*; a derivative of Richard Dawkins's memetics. It is a concept of linguistic units as replicators. Following the publication of memetics in Dawkins's 1976 nonfiction bestseller *The Selfish Gene*, many biologically inclined linguists, frustrated with the lack of evidence for Chomsky's Universal Grammar, grouped under different brands including a framework called Cognitive Linguistics (with capitalised initials), and 'functional' (adaptational) linguistics (not to be confused with functional linguistics) to confront both Chomsky and the humanists. The replicator approach is today dominant in evolutionary

linguistics, applied linguistics, cognitive linguistics and linguistic typology; while the generative approach has maintained its position in general linguistics, especially syntax; and in computational linguistics.

View of linguistics

Evolutionary linguistics is part of a wider framework of Universal Darwinism. In this view, linguistics is seen as an ecological environment for research traditions struggling for the same resources. According to David Hull, these traditions correspond to species in biology. Relationships between research traditions can be symbiotic, competitive or parasitic. An adaptation of Hull's theory in linguistics is proposed by William Croft. He argues that the Darwinian method is more advantageous than linguistic models based on physics, structuralist sociology, or hermeneutics.

Approaches

Evolutionary linguistics is often divided into functionalism and formalism, concepts which are not to be confused with functionalism and formalism in the humanistic reference. Functional evolutionary linguistics considers languages as adaptations to human mind. The formalist view regards them as crystallised or non-adaptational.

Functionalism (adaptationism)

The adaptational view of language is advocated by various frameworks of cognitive and evolutionary linguistics, with the

terms 'functionalism' and 'Cognitive Linguistics' often being equated. It is hypothesised that the evolution of the animal brain provides humans with a mechanism of abstract reasoning which is a 'metaphorical' version of image-based reasoning.

Language is not considered as a separate area of cognition, but as coinciding with general cognitive capacities, such as perception, attention, motor skills, and spatial and visual processing. It is argued to function according to the same principles as these.

It is thought that the brain links action schemes to form–meaning pairs which are called constructions. Cognitive linguistic approaches to syntax are called cognitive and construction grammar. Also deriving from memetics and other cultural replicator theories, these can study the natural or social selection and adaptation of linguistic units. Adaptational models reject a formal systemic view of language and consider language as a population of linguistic units.

The bad reputation of social Darwinism and memeticshas been discussed in the literature, and recommendations for new terminology have been given. What correspond to replicators or mind-viruses in memeticsare called*linguemes* in Croft's *theory of Utterance Selection* (TUS), and likewise linguemes or constructions in construction grammar and usage-based linguistics; and metaphors, frames or schemas in cognitive and construction grammar. The reference of memeticshas been largely replaced with that of a Complex Adaptive System. In current linguistics, this term covers a wide range of evolutionary notions while maintaining the Neo-Darwinian

concepts of replication and replicator population. Functional evolutionary linguistics is not to be confused with functional humanistic linguistics.

Formalism (structuralism)

Advocates of formal evolutionary explanation in linguistics argue that linguistic structures are crystallised. Inspired by 19th century advances in crystallography, Schleicher argued that different types of languages are like plants, animals and crystals. The idea of linguistic structures as frozen drops was revived in tagmemics, an approach to linguistics with the goal to uncover divine symmetries underlying all languages, as if caused by the Creation.

In modern biolinguistics, the X-bar tree is argued to be like natural systems such as ferromagnetic droplets and botanic forms. Generative grammar considers syntactic structures similar to snowflakes. It is hypothesised that such patterns are caused by a mutation in humans.

The formal–structural evolutionary aspect of linguistics is not to be confused with structural linguistics.

Evidence

There was some hope of a breakthrough at the discovery of the *FOXP2* gene. There is little support, however, for the idea that *FOXP2* is 'the grammar gene' or that it had much to do with the relatively recent emergence of syntactical speech. There is no evidence that people have a language instinct. Memetics is widely discredited as pseudoscience and neurological claims

made by evolutionary cognitive linguists have been likened to pseudoscience. All in all, there does not appear to be any evidence for the basic tenets of evolutionary linguistics beyond the fact that language is processed by the brain, and brain structures are shaped by genes.

Criticism

Evolutionary linguistics has been criticised by advocates of (humanistic) structural and functional linguistics. Ferdinand de Saussure commented on 19th century evolutionary linguistics:

"Language was considered a specific sphere, a fourth natural kingdom ; this led to methods of reasoning which would have caused astonishment in other sciences. Today one cannot read a dozen lines written at that time without being struck by absurdities of reasoning and by the terminology used to justify these absurdities"

Mark Aronoff however argues that historical linguistics had its golden age during the time of Schleicher and his supporters, enjoying a place among the hard sciences, and considers the return of Darwnian linguistics as a positive development. EsaItkonen nonetheless deems the revival of Darwinism as a hopeless enterprise:

"There is … an application of intelligence in linguistic change which is absent in biological evolution; and this suffices to make the two domains totally disanalogous … [Grammaticalisation depends on] cognitive processes, ultimately serving the goal of problem solving, which intelligent

entities like humans must perform all the time, but which biological entities like genes cannot perform. Trying to eliminate this basic difference leads to confusion."

Itkonen also points out that the principles of natural selection are not applicable because language innovation and acceptance have the same source which is the speech community. In biological evolution, mutation and selection have different sources. This makes it possible for people to change their languages, but not their genotype.

Biolinguistics

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 is important as 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). 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 the Language Acquisition Device (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.

Origins of biolinguistics

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

19th century: Darwin's theory of evolution

Darwinism 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:

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

- 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 all the way 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.

20th century: Biological foundation of language

The first phase in the development of biolinguistics 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 the 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 question 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.

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 mechanism. 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.

Developments

Chomsky's Theories

Universal Grammar and Generative Grammar

 In *Aspects of the theory of Syntax*, Chomsky proposed that 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 our 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 merge 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 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 a Universal Grammar (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.

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 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.

Minimalist Program

The Minimalist Program (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.

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 element 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;

- Merge is binary
- Merge is recursive

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

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 element 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).

Core components

In a minimalist approach, there are three core components of the language faculty proposed: Sensory-Motor system (SM), Conceptual-Intentional system (CI), and Narrow Syntax (NS). SM includes biological requisites for language production and

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.

Biolinguistics: Challenging the Usage-Based Approach

As mentioned above, 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 is 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 biolinguisticsWhile 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.

Contrary to the concept of the existence of a language faculty 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.

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.

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 where data can be displayed with evidence cross-linguistically, due to the nature of biolinguistics, and that it is 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, is it assumed that they can provide evidence for some linguistic competence.

The relatively new science of evo-devo 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, human language is the combination of the Expressive (E) component and the Lexical (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.

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.

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 .

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.

The Rapid Emergence of Human Language

As traces of the E and L components 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 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 piccolimonili]]* lit. carry-rings-earrings-or-small-jewels, there is recursion because of the string of complements *[anelli, orecchini o piccolimonili]* containing the noun to the verb *[porta]*.

The common claim 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 than 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

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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.

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Evolutionary psychology of language is the study of the evolutionary history of language as a psychological faculty within the discipline of evolutionary psychology. It makes the assumption that language is the result of a Darwinian adaptation.

There are many competing theories of how language might have evolved, if indeed it is an evolutionary adaptation. They stem from the belief that language development could result from an adaptation, an exaptation, or a by-product. Genetics also influence the study of the evolution of language. It has been speculated that the FOXP2 gene may be what gives humans the ability to develop grammar and syntax.

Language evolution theories

In the debate surrounding the evolutionary psychology of language, three sides emerge: those who believe in language as an adaptation, those who believe it is a by-product of another adaptation, and those who believe it is an exaptation.

Adaptation

Scientist and psychologists Steven Pinker and Paul Bloom argue that language as a mental faculty shares many likenesses with the complex organs of the body which suggests that, like these organs, language has evolved as an adaptation, since this is the only known mechanism by which such complex organs can develop. The complexity of the mechanisms, the faculty of language and the ability to learn language provides a comparative resource between the psychological evolved traits and the physical evolved traits.

Pinker, though he mostly agrees with Noam Chomsky, a linguist and cognitive scientist, in arguing that the fact that children can learn any human language with no explicit instruction suggests that language, including most of grammar, is basically innate and that it only needs to be

activated by interaction, but Pinker and Bloom argue that the organic nature of language strongly suggests that it has an adaptational origin.

By-product/Spandrel

Noam Chomsky spearheaded the debate on the faculty of language as a cognitive by-product, or spandrel. As a linguist, rather than an evolutionary biologist, his theoretical emphasis was on the infinite capacity of speech and speaking: there are a fixed number of words, but there is an infinite combination of the words. His analysis from this considers that the ability of our cognition to perceive infinite possibilities, or create infinite possibilities, helped give way to the extreme complexity found in our language. Both Chomsky and Gould argue that the complexity of the brain is in itself an adaptation, and language arises from such complexities.

On the issue of whether language is best seen as having evolved as an adaptation or as a by product, evolutionary biologistW. Tecumseh Fitch, following Stephen J. Gould, argues that it is unwarranted to assume that every aspect of language is an adaptation, or that language as a whole is an adaptation. He criticizes some strands of evolutionary psychology for suggesting a pan-adaptationist view of evolution, and dismisses Pinker and Bloom's question of whether "Language has evolved as an adaptation" as being misleading. He argues instead that from a biological viewpoint the evolutionary origins of language is best conceptualized as being the probable result of a convergence of many separate adaptations into a complex system. A similar argument is made by Terrence Deacon who in *The Symbolic Species* argues that

the different features of language have co-evolved with the evolution of the mind and that the ability to use symbolic communication is integrated in all other cognitive processes.

Exaptation

Exaptations, like adaptations, are fitness-enhancing characteristics, but, according to Stephen Jay Gould, their purposes were appropriated as the species evolved. This can be for one of two reasons: either the trait's original function was no longer necessary so the trait took on a new purpose or a trait that does not arise for a certain purpose, but later becomes important. Typicallyexaptations have a specific shape and design which becomes the space for a new function. The foundation of this argument comes from the low-lying position of the larynx in humans. Other mammals have this same positioning of the larynx, but no other species has acquired language. This leads exaptationists to see an evolved modification away from its original purpose.

Genes and language

Research has shown that "genetic constraints" on language evolution could have caused a "specialized" and "species-specific language module. It is through this module that there are many specified "domain-specific linguistic properties," such as syntax and agreement. Adaptationists believe that language genes "coevolved with human language itself for the purpose of communication." This view suggests that the genes that are involved with language would only have coevolved in a very stable linguist environment. This shows that language

could not have evolved in a rapidly changing environment because that type of environment would not have been stable enough for natural selection. Without natural selection, the genes would not have coevolved with the ability for language, and instead, would have come from "cultural conventions." The adaptationist belief that genes coevolved with language also suggests that there are no "arbitrary properties of language." This is because they would have coevolved with language through natural selection.

The Baldwin effect provides a possible explanation for how language characteristics that are learned over time could become encoded in genes. He suggested, like Darwin did, that organisms that can adapt a trait faster have a "selective advantage." As generations pass, less environmental stimuli is needed for organisms of the species to develop that trait. Eventually no environmental stimuli are needed and it is at this point that the trait has become "genetically encoded."

FOXP2 gene

The genetic and cognitive components of language have long been under speculation, only recently have linguists been able to point out a gene that may possibly explain how language works. Evolutionary psychologists hold that the FOXP2 gene may well be associated with the evolution of human language. In the 1980s, psycholinguist Myrna Gopnik identified a dominant gene that causes language impairment in the KE family of Britain. The KE family has a mutation in the FOXP2, that makes them suffer from a speech and language disorder. It has been argued that the FOXP2 gene is the grammar gene, which is what allows humans the ability to form proper syntax

and make our communication of higher quality. Children that grow up in a stable environment are able to develop highly proficient language without any instruction. Individuals with a mutation to their FOXP2 gene have trouble mastering complex sentences, and shows signs of developmental verbal dyspraxia.

This gene most likely evolved in the hominin line after the hominin and the chimpanzee lines split; this accounts for the fact that humans are the only ones able to learn and understand grammar. Humans have a unique allele of this gene, which has otherwise been closely conserved through most of mammalian evolutionary history. This unique allele seems to have first appeared between 100 and 200 thousand years ago, and it is now all but universal in humans. This suggests that speech evolved late in overall spectrum of human evolution.

Variation in human language

There are nearly 7000 languages worldwide, with a great amount of variation thought to have evolved through cultural differentiation. There are four factors that are thought to be the reason as to why there is language variation between cultures: founder effects, drift, hybridization and adaptation. With the vast amounts of lands available different tribes began to form and to claim their territory, in order to differentiate themselves many of these groups made changes to their language and this how the evolution of languages began. There also tended to be drifts in the population a certain group would get lost and be isolated from the rest of the group, this group would lose touch with the other groups and before they

knew there had been mutations in their language and a whole new language had been formed.

Hybridization also played a big role in the language evolution, one group would come in contact with another tribe and they would pick up words and sounds from each other eventually leading to the formation of a new language. Adaptation would also play a role in the evolution of language differentiation, the environment and the circumstances were constantly changing therefore the groups had to adapt to the environment and their language had to adapt to it as well, it is all about maximizing fitness.

Atkinson theorized that language may have originated in Africa since African languages have a greater variation of speech sounds than other languages. Those sounds are seen as the root for the other languages that exist across the world.

Communication in other animals

Research indicates that nonhuman animals (e.g., apes, dolphins, and songbirds) show evidence of language. Comparative studies of the sensory-motor system reveal that speech is not special to humans: nonhuman primates can discriminate between two different spoken languages. Anatomical aspects of humans, particularly the descended larynx, has been believed to be unique to humans' capacity to speak. However, further research revealed that several other mammals have a descended larynx beside humans, which indicates that a descended larynx must not be the only anatomical feature needed for speech production. Vocal imitation is not uniquely human as well. Songbirds seem to

acquire species-specific songs by imitating. Because nonhuman primates do not have a descended larynx, they lack vocal imitative capacity, which is why studies involving these primates have taught them nonverbal means of communication, e.g., sign language.

Koko and NimChimpsky are two apes that have successfully learned to use sign language, but not to the extent that a human being can. Nim is a chimpanzee that was taken in by a family in the 1970s and was raised as if he were a human child. Nim was able to master 150 signs, which were limited but useful. Koko was a gorilla that was taken in by a Stanford student. She was able to master 1,000 signs for generative communication.

FOXP2

Forkhead box protein P2 (FOXP2) is a protein that, in humans, is encoded by the *FOXP2* gene. FOXP2 is a member of the forkhead box family of transcription factors, proteins that regulate gene expression by binding to DNA. It is expressed in the brain, heart, lungs and digestive system.

*FOXP2*is found in many vertebrates, where it plays an important role in mimicry in birds (such as birdsong) and echolocation in bats. *FOXP2* is also required for the proper development of speech and language in humans. In humans, mutations in *FOXP2* cause the severe speech and language disorder developmental verbal dyspraxia. Studies of the gene in mice and songbirds indicate that it is necessary for vocal imitation and the related motor learning. Outside the brain,

*FOXP2*has also been implicated in development of other tissues such as the lung and digestive system.

Initially identified in 1998 as the genetic cause of a speech disorder in a British family designated the KE family, *FOXP2* was the first gene discovered to be associated with speech and language and was subsequently dubbed "the language gene". However, other genes are necessary for human language development, and a 2018 analysis confirmed that there was no evidence of recent positive evolutionary selection of *FOXP2* in humans.

Structure and function

As a FOX protein, FOXP2 contains a forkhead-box domain. In addition, it contains a polyglutamine tract, a zinc finger and a leucine zipper. The protein attaches to the DNA of other proteins and controls their activity through the forkhead-box domain. Only a few targeted genes have been identified, however researchers believe that there could be up to hundreds of other genes targeted by the FOXP2 gene. The forkhead box P2 protein is active in the brain and other tissues before and after birth, many studies show that it is paramount for the growth of nerve cells and transmission between them. The FOXP2 gene is also involved in synaptic plasticity, making it imperative for learning and memory.

FOXP2 is required for proper brain and lung development. Knockout mice with only one functional copy of the *FOXP2* gene have significantly reduced vocalizations as pups. Knockout mice with no functional copies of *FOXP2* are runted, display abnormalities in brain regions such as the Purkinje

layer, and die an average of 21 days after birth from inadequate lung development.

*FOXP2*is expressed in many areas of the brain, including the basal ganglia and inferior frontal cortex, where it is essential for brain maturation and speech and language development. In mice, the gene was found to be twice as highly expressed in male pups than female pups, which correlated with an almost double increase in the number of vocalisations the male pups made when separated from mothers. Conversely, in human children aged 4–5, the gene was found to be 30% more expressed in the Broca's areas of female children. The researchers suggested that the gene is more active in "the more communicative sex".

The expression of *FOXP2* is subject to post-transcriptional regulation, particularly microRNA (miRNA), which binds to multiple miRNA binding-sites in the neocortex, causing the repression of the FOXP2 3' untranslated region.

Three amino acid substitutions distinguish the human *FOXP2* protein from that found in mice, while two amino acid substitutions distinguish the human *FOXP2* protein from that found in chimpanzees, but only one of these changes is unique to humans. Evidence from genetically manipulated mice and human neuronal cell models suggests that these changes affect the neural functions of *FOXP2*.

Clinical significance

The FOXP2 gene has been implicated in several cognitive functions including; general brain development, language, and

synaptic plasticity. The FOXP2 gene region acts as a transcription factor for the forkhead box P2 protein. Transcription factors affect other regions, and the forkhead box P2 protein has been suggested to also act as a transcription factor for hundreds of genes. This prolific involvement opens the possibility that the FOXP2 gene is much more extensive than originally thought. Other targets of transcription have been researched without correlation to FOXP2. Specifically, FOXP2 has been investigated in correlation with autism and dyslexia, however with no mutation was discovered as the cause. One well identified target is language. Although some research disagrees with this correlation, the majority of research shows that a mutated FOXP2 causes the observed production deficiency.

There is some evidence that the linguistic impairments associated with a mutation of the *FOXP2* gene are not simply the result of a fundamental deficit in motor control. Brain imaging of affected individuals indicates functional abnormalities in language-related cortical and basal ganglia regions, demonstrating that the problems extend beyond the motor system.

Mutations in FOXP2 are among several (26 genes plus 2 intergenic) loci which correlate to ADHD diagnosis in adults – clinical ADHD is an umbrella label for a heterogeneous group of genetic and neurological phenomena which may result from FOXP2 mutations or other causes.

A 2020 genome-wide association study (GWAS) implicates single-nucleotide polymorphisms (SNPs) of FOXP2 in susceptibility to cannabis use disorder.

Language disorder

It is theorized that the translocation of the 7q31.2 region of the FOXP2 gene causes a severe language impairment called developmental verbal dyspraxia (DVD) or childhood apraxia of speech (CAS) So far this type of mutation has only been discovered in three families across the world including the original KE family. A missense mutation causing an arginine-to-histidine substitution (R553H) in the DNA-binding domain is thought to be the abnormality in KE. This would cause a normally basic residue to be fairly acidic and highly reactive at the body's pH. A heterozygous nonsense mutation, R328X variant, produces a truncated protein involved in speech and language difficulties in one KE individual and two of their close family members. R553H and R328X mutations also affected nuclear localization, DNA-binding, and the transactivation (increased gene expression) properties of FOXP2.

These individuals present with deletions, translocations, and missense mutations. When tasked with repetition and verb generation, these individuals with DVD/CAS had decreased activation in the putamen and Broca's area in fMRI studies. These areas are commonly known as areas of language function. This is one of the primary reasons that FOXP2 is known as a language gene. They have delayed onset of speech, difficulty with articulation including, slurred speech, stuttering, and poor pronunciation, as well as dyspraxia. It is believed that a major part of this speech deficit comes from an inability to coordinate the movements necessary to produce normal speech including mouth and tongue shaping. Additionally, there are more general impairments with the processing of the grammatical and linguistic aspects of speech.

These findings suggest that the effects of FOXP2 are not limited to motor control, as they include comprehension among other cognitive language functions. General mild motor and cognitive deficits are noted across the board. Clinically these patients can also have difficulty coughing, sneezing, and/or clearing their throats.

While FOXP2 has been proposed to play a critical role in the development of speech and language, this view has been challenged by the fact that the gene is also expressed in other mammals as well as birds and fish that do not speak. It has also been proposed that the FOXP2 transcription-factor is not so much a hypothetical 'language gene' but rather part of a regulatory machinery related to externalization of speech.

Evolution

The *FOXP2* gene is highly conserved in mammals. The human gene differs from that in non-human primates by the substitution of two amino acids, a threonine to asparagine substitution at position 303 (T303N) and an asparagine to serine substitution at position 325 (N325S). In mice it differs from that of humans by three substitutions, and in zebra finch by seven amino acids. One of the two amino acid differences between human and chimps also arose independently in carnivores and bats. Similar *FOXP2* proteins can be found in songbirds, fish, and reptiles such as alligators.

DNA sampling from *Homo neanderthalensis* bones indicates that their *FOXP2* gene is a little different though largely similar to those of *Homo sapiens* (i.e. humans). Previous genetic analysis had suggested that the *H. sapiens* FOXP2 gene became

fixed in the population around 125,000 years ago. Some researchers consider the Neanderthal findings to indicate that the gene instead swept through the population over 260,000 years ago, before our most recent common ancestor with the Neanderthals. Other researchers offer alternative explanations for how the *H. sapiens* version would have appeared in Neanderthals living 43,000 years ago.

According to a 2002 study, the *FOXP2* gene showed indications of recent positive selection. Some researchers have speculated that positive selection is crucial for the evolution of language in humans. Others, however, were unable to find a clear association between species with learned vocalizations and similar mutations in *FOXP2*.

A 2018 analysis of a large sample of globally distributed genomes confirmed there was no evidence of positive selection, suggesting that the original signal of positive selection may be driven by sample composition. Insertion of both human mutations into mice, whose version of *FOXP2* otherwise differs from the human and chimpanzee versions in only one additional base pair, causes changes in vocalizations as well as other behavioral changes, such as a reduction in exploratory tendencies, and a decrease in maze learning time. A reduction in dopamine levels and changes in the morphology of certain nerve cells are also observed.

Interactions

FOXP2 is known to regulate *CNTNAP2*, *CTBP1*, *SRPX2* and *SCN3A*.

FOXP2 downregulates *CNTNAP2*, a member of the neurexin family found in neurons. *CNTNAP2* is associated with common forms of language impairment.

FOXP2 also downregulates *SRPX2*, the 'Sushi Repeat-containing Protein X-linked 2'. It directly reduces its expression, by binding to its gene's promoter. SRPX2 is involved in glutamatergic synapse formation in the cerebral cortex and is more highly expressed in childhood.

SRPX2 appears to specifically increase the number of glutamatergic synapses in the brain, while leaving inhibitory GABAergic synapses unchanged and not affecting dendritic spine length or shape. On the other hand, FOXP2's activity does reduce dendritic spine length and shape, in addition to number, indicating it has other regulatory roles in dendritic morphology.

In other animals

Chimpanzees

In chimpanzees, FOXP2 differs from the human version by two amino acids. A study in Germany sequenced FOXP2's complementary DNA in chimps and other species to compare it with human complementary DNA in order to find the specific changes in the sequence. FOXP2 was found to be functionally different in humans compared to chimps. Since FOXP2 was also found to have an effect on other genes, its effects on other genes is also being studied. Researchers deduced that there could also be further clinical applications in the direction of

these studies in regards to illnesses that show effects on human language ability.

Mice

In a mouse *FOXP2* gene knockouts, loss of both copies of the gene causes severe motor impairment related to cerebellar abnormalities and lack of ultrasonic vocalisations normally elicited when pups are removed from their mothers. These vocalizations have important communicative roles in mother-offspring interactions. Loss of one copy was associated with impairment of ultrasonic vocalisations and a modest developmental delay. Male mice on encountering female mice produce complex ultrasonic vocalisations that have characteristics of song. Mice that have the R552H point mutation carried by the KE family show cerebellar reduction and abnormal synaptic plasticity in striatal and cerebellar circuits.

Humanized FOXP2 mice display altered cortico-basal ganglia circuits. The human allele of the FOXP2 gene was transferred into the mouse embryos through homologous recombination to create humanized FOXP2 mice. The human variant of FOXP2 also had an effect on the exploratory behavior of the mice. In comparison to knockout mice with one non-functional copy of *FOXP2*, the humanized mouse model showed opposite effects when testing its effect on the levels of dopamine, plasticity of synapses, patterns of expression in the striatum and behavior that was exploratory in nature.

When FOXP2 expression was altered in mice, it affected many different processes including the learning motor skills and the

plasticity of synapses. Additionally, FOXP2 is found more in the sixth layer of the cortex than in the fifth, and this is consistent with it having greater roles in sensory integration. FOXP2 was also found in the medial geniculate nucleus of the mouse brain, which is the processing area that auditory inputs must go through in the thalamus. It was found that its mutations play a role in delaying the development of language learning. It was also found to be highly expressed in the Purkinje cells and cerebellar nuclei of the cortico-cerebellar circuits. High FOXP2 expression has also been shown in the spiny neurons that express type 1 dopamine receptors in the striatum, substantia nigra, subthalamic nucleus and ventral tegmental area. The negative effects of the mutations of FOXP2 in these brain regions on motor abilities were shown in mice through tasks in lab studies. When analyzing the brain circuitry in these cases, scientists found greater levels of dopamine and decreased lengths of dendrites, which caused defects in long-term depression, which is implicated in motor function learning and maintenance. Through EEG studies, it was also found that these mice had increased levels of activity in their striatum, which contributed to these results. There is further evidence for mutations of targets of the FOXP2 gene shown to have roles in schizophrenia, epilepsy, autism, bipolar disorder and intellectual disabilities.

Bats

FOXP2 has implications in the development of bat echolocation. Contrary to apes and mice, *FOXP2* is extremely diverse in echolocating bats. Twenty-two sequences of non-bat eutherian mammals revealed a total number of 20 nonsynonymous mutations in contrast to half that number of

bat sequences, which showed 44 nonsynonymous mutations. All cetaceans share three amino acid substitutions, but no differences were found between echolocating toothed whales and non-echolocating baleen cetaceans. Within bats, however, amino acid variation correlated with different echolocating types.

Birds

In songbirds, *FOXP2* most likely regulates genes involved in neuroplasticity. Gene knockdown of *FOXP2* in area X of the basal ganglia in songbirds results in incomplete and inaccurate song imitation.

Overexpression of FoxP2 was accomplished through injection of adeno-associated virus serotype 1 (AAV1) into area X of the brain. This overexpression produced similar effects to that of knockdown; juvenile zebra finch birds were unable to accurately imitate their tutors. Similarly, in adult canaries, higher *FOXP2* levels also correlate with song changes.

Levels of *FOXP2* in adult zebra finches are significantly higher when males direct their song to females than when they sing song in other contexts. "Directed" singing refers to when a male is singing to a female usually for a courtship display. "Undirected" singing occurs when for example, a male sings when other males are present or is alone. Studies have found that FoxP2 levels vary depending on the social context. When the birds were singing undirected song, there was a decrease of FoxP2 expression in Area X. This downregulation was not observed and FoxP2 levels remained stable in birds singing directed song.

Differences between song-learning and non-song-learning birds have been shown to be caused by differences in *FOXP2* gene expression, rather than differences in the amino acid sequence of the *FOXP2* protein.

Zebrafish

In zebrafish, FOXP2 is expressed in the ventral and dorsal thalamus, telencephalon, diencephalon where it likely plays a role in nervous system development. The zebrafish FOXP2 gene has an 85% similarity to the human FOX2P ortholog.

History

FOXP2 and its gene were discovered as a result of investigations on an English family known as the KE family, half of whom (15 individuals across three generations) suffered from a speech and language disorder called developmental verbal dyspraxia. Their case was studied at the Institute of Child Health of University College London. In 1990, Myrna Gopnik, Professor of Linguistics at McGill University, reported that the disorder-affected KE family had severe speech impediment with incomprehensible talk, largely characterized by grammatical deficits. She hypothesized that the basis was not of learning or cognitive disability, but due to genetic factors affecting mainly grammatical ability. (Her hypothesis led to a popularised existence of "grammar gene" and a controversial notion of grammar-specific disorder.) In 1995, the University of Oxford and the Institute of Child Health researchers found that the disorder was purely genetic. Remarkably, the inheritance of the disorder from one

generation to the next was consistent with autosomal dominant inheritance, i.e., mutation of only a single gene on an autosome (non-sex chromosome) acting in a dominant fashion. This is one of the few known examples of Mendelian (monogenic) inheritance for a disorder affecting speech and language skills, which typically have a complex basis involving multiple genetic risk factors.

In 1998, Oxford University geneticists Simon Fisher, Anthony Monaco, Cecilia S. L. Lai, Jane A. Hurst, and FaranehVargha-Khadem identified an autosomal dominant monogenic inheritance that is localized on a small region of chromosome 7 from DNA samples taken from the affected and unaffected members. The chromosomal region (locus) contained 70 genes. The locus was given the official name "SPCH1" (for speech-and-language-disorder-1) by the Human Genome Nomenclature committee. Mapping and sequencing of the chromosomal region was performed with the aid of bacterial artificial chromosome clones. Around this time, the researchers identified an individual who was unrelated to the KE family but had a similar type of speech and language disorder. In this case, the child, known as CS, carried a chromosomal rearrangement (a translocation) in which part of chromosome 7 had become exchanged with part of chromosome 5. The site of breakage of chromosome 7 was located within the SPCH1 region.

In 2001, the team identified in CS that the mutation is in the middle of a protein-coding gene. Using a combination of bioinformatics and RNA analyses, they discovered that the gene codes for a novel protein belonging to the forkhead-box (FOX) group of transcription factors. As such, it was assigned with the official name of FOXP2. When the researchers sequenced

the *FOXP2* gene in the KE family, they found a heterozygous point mutation shared by all the affected individuals, but not in unaffected members of the family and other people. This mutation is due to an amino-acid substitution that inhibits the DNA-binding domain of the *FOXP2* protein. Further screening of the gene identified multiple additional cases of *FOXP2* disruption, including different point mutations and chromosomal rearrangements, providing evidence that damage to one copy of this gene is sufficient to derail speech and language development.

Chapter 4

Stubs

Educating Eve

Educating Eve: The 'Language Instinct' Debate is a book by Geoffrey Sampson, providing arguments against Noam Chomsky's theory of a human instinct for (first) language acquisition. Sampson explains the original title of the book as a deliberate allusion to *Educating Rita* (1980), and uses the plot of that play to illustrate his argument. Sampson's book is a response to Steven Pinker's *The Language Instinct* specifically and Chomskyan linguistic nativism broadly.

The title, *Educating Eve*, was dropped after the first edition because the allusion to *Educating Rita* "was deemed unduly mysterious". The revised edition (2005) contains an additional chapter and "many passages, from a few words up to new chapter-sections, that discuss relevant scientific findings which have emerged since the first edition, or respond to objections made by critics of that edition."

Abstract

Sampson critically evaluates the ability of theories of linguistic nativism to accommodate the growing understanding of human brain processing over the course of the late 20th century. He proposes an alternative explanation, borrowing some ideas and terminology from Karl Popper.

Overview

- "Eve was not a born know-all. She was ignorant. But she was a good learner." — Geoffrey Sampson, *Educating Eve*

The book has seven chapters introduced by a foreword by Paul Postal who claims an agnostic position regarding the debate. He expresses serious concerns regarding the strength of the "nativist" argument; but despite being unconvinced of the alternative view, he commends Sampson for challenging nativism and attempting to make a case for an alternative.

The first chapter of *Educating Eve* considers broad contours of the nature versus nurture debate in regard to human knowledge generally, before narrowing this down to the rise of late 20th century linguistic nativism in particular. It concludes with an overview of the methodology of the rest of the book. Chapter 2 reports evidence that was available to the "first wave" of nativists (like Chomsky) during the 1960s and 1970s. Chapter 3 reports the results of research that have become available since then.

Chapter 4 turns to examining the distinctive arguments of "new wave" nativists (like Pinker). Chapter 5 presents a case for an alternative view. In chapter 7 Sampson concludes with a short personal perspective on sociological changes in the nature of academic discourse over the 40 years of the debate regarding nativism. He attributes the popularity of nativism to various features of these sociological changes.

Annotated journal commentary

- Victor M. Longa. Review for *Linguistics***37** (1999): 325–344.
- Geoffrey Sampson. "Reply to Longa" *Linguistics***37** (1999): 345–350.
- James H. Hurford. Review for *Journal of Linguistics***36** (2000): 663–664.
- Ernst Pulgram. Review for *Language***76** (2000): 704.
- Stephen John Cowley. "The Baby, the Bathwater, and the 'Language Instinct' Debate". *Language Sciences***23** (2001): 69–91. [challenges an assumption held by both sides, and proposes an alternative, third explanation]
- *The Linguistic Review***19** (2002). [devoted to debating linguistic nativism]
- Ben G. Blount. "Nativism Revisited: Language and the Brain". *Current Anthropology***43** (2002): 340. [Blount is a linguistic anthropologist]
- Michael Toolan. Review for *Language in Society***36** (2007): 622–626.
- Julia Herschensohn. "Theory and Practice". Review for *The Modern Language Journal***91** (2007): 486–487.
- Eve Zyzik. Review for *Studies in Second Language Acquisition***29** (2007): 134–136.
- John H McWhorter. Review for *Language***84** (2008): 434–437.

Cowley, and some others, view Sampson and Pinker as standing at extreme ends of a nature–nurture spectrum, as applied to explaining language acquisition. Cowley notes

philosophical difficulties with each extreme, as they are argued by Sampson and Pinker: Sampson's version of the nurture position also argues for philosophical dualism; whereas Pinker's version of the nature position also argues for an ontological reality for syntax. Both these auxiliary arguments are unsatisfactory to many writers who address the relevant broader philosophical questions.

Cowley proposes an alternative: that language acquisition involves culturally determined language skills, apprehended by a biologically determined faculty that responds to them. In other words, he proposes that each extreme is right in what it affirms, but wrong in what it denies. *Both* cultural diversity of language, and a learning instinct, can be affirmed; *neither* need be denied.

Fluid construction grammar

Fluid construction grammar (FCG) is an open-source computational construction grammar formalism that allows computational linguists to formally write down the inventory of lexical and grammatical constructions as well as to do experiments in language learning and language evolution. FCG is an open instrument that can be used by construction grammarians who want to formulate their intuitions and data in a precise way and who want to test the implications of their grammar designs for language parsing, production and learning. The formalism can be tested through an interactive web interface at the FCG website.

FCG integrates many notions from contemporary computational linguistics such as feature structure and unification-based

language processing, but uses them in a novel way to operationalize insights from construction grammar theory. Constructions are considered bi-directional and hence usable both for parsing and production. Processing is flexible in the sense that FCG provides meta-layer processing for coping with novelty, partially ungrammatical or incomplete sentences. FCG is called 'fluid' because it acknowledges the premise that language users constantly change and update their grammars.

The research on FCG is primarily carried out by Luc Steels and his teams at the VUB AI Lab in Brussels and the Language Evolution Lab in Barcelona, and the Sony Computer Science Laboratories in Paris. Besides Steels, current and former contributors to the FCG formalism include KatrienBeuls, Paul Van Eecke, Remi van Trijp, JorisBleys, Joachim De Beule, Martin Loetzsch, Nicolas Neubauer, Michael Spranger, Wouter Van den Broeck, Pieter Wellens, and others.

Transient structure

FCG treats parsing and production as a search problem, in which the FCG engine searches for the best utterance to verbalize a meaning (language production) or the best semantic network (or meaning representation) to analyze an utterance (parsing). Each state representation in the search process is called a Transient Structure.

A Transient Structure can be considered as an extended feature structure, as it consists of a (flat) list of "units" that consist of a unit-name (a unique constant symbol) and a unit-body (a set of feature-value pairs). Older versions of FCG (before 2011) used to split the transient structure into two

separate poles for semantics and syntax, but the current version implements a single representation for all linguistic information.

Constructions

FCG constructions (or technically speaking: construction schemas) are treated as the operators of the search process. That is, by applying a construction to a transient structure, a new transient structure (or state representation) in the search space may be created. Just like transient structures, constructions mostly consists of units of feature-value pairs. Constructions are however more structured because they contain two distinct parts:

- A conditional part: This part of the construction specifies the conditions under which the construction may apply. Moreover, units of features that appear in the conditional part are split into a "comprehension lock" and a "formulation lock". This split is important for ensuring the bidirectional application of an FCG construction (see below).
- A Contributing part: This part of the construction specifies information that the construction may add to the transient structure if the conditions for application are satisfied.

Linguistic processing

To decide whether a construction can apply, the conditional part is "matched" against the current transient structure using

a unification-based algorithm. In production, only features that are part of the formulation locks of the construction must be matched against the transient structure; whereas in parsing, only features that are part of the comprehension locks will be considered. If a match is successful, the FCG engine will "merge" all of the units of feature-value pairs with the transient structure in a similar unification-based process.

Flexibility

FCG features a meta-layers of diagnostics, repairs and consolidation strategies that allow the grammar designer to implement ways to handle novelty, errors and unexpected input during processing. These diagnostics and repairs can also be used for exploring the (automated) acquisition of new constructions.

Bow-wow theory

A bow-wow theory is any of the theories by various scholars, including Jean-Jacques Rousseau and Johann Gottfried Herder, on the origins of human language.

Bow-wow theories suggest that the first human languages developed as onomatopoeia, imitations of natural sounds. The name "bow-wow theory" was coined by Max Müller, a philologist who was critical of the notion. The bow-wow theory is largely discredited as an account of the origin of language, though some contemporary theories suggest that general imitative abilities may have played an important role in the evolution of language.

Generative anthropology

Generative anthropology is a field of study based on the theory that the origin of human language was a singular event and that the history of human culture is a genetic or "generative" development stemming from the development of language.

In contrast to more common theories that examine human culture in terms of a multiplicity of complex cultural differences, generative anthropology attempts to understand cultural phenomena in the simplest terms possible: all things human are traced back to a hypothetical single origin point at which human beings first used signs to communicate.

Eric Gans and the origin of generative anthropology

Generative Anthropology originated with Professor Eric Gans of UCLA who developed his ideas in a series of books and articles beginning with *The Origin of Language: A Formal Theory of Representation* (1981), which builds on the ideas of René Girard, notably that of mimetic desire.

However, in establishing the theory of Generative Anthropology, Gans departs from and goes beyond Girard's work in many ways. Generative Anthropology is therefore an independent and original way of understanding the human species, its origin, culture, history, and development.

Anthropoetics

Gans founded (and edits) the web-based journal *Anthropoetics: The Journal of Generative Anthropology* as a scholarly forum for research into human culture and origins based on his theories of Generative Anthropology and the closely related theories of fundamental anthropology developed by René Girard. In his online *Chronicles of Love and Resentment*Gans applies the principles of Generative Anthropology to a wide variety of fields including popular culture, film, post-modernism, economics, contemporary politics, the Holocaust, philosophy, religion, and paleo-anthropology.

The originary hypothesis of human language

The central hypothesis of generative anthropology is that the origin of language was a singular event. Human language is radically different from animal communication systems. It possesses syntax, allowing for unlimited new combinations and content; it is symbolic, and it possesses a capacity for history. Thus it is hypothesized that the origin of language must have been a singular event, and the principle of parsimony requires that it originated only once.

Language makes possible new forms of social organization radically different from animal "pecking order" hierarchies dominated by an alpha male. Thus, the development of language allowed for a new stage in human evolution – the beginning of culture, including religion, art, desire, and the sacred. As language provides memory and history via a record

of its own history, language itself can be defined via a hypothesis of its origin based on our knowledge of human culture. As with any scientific hypothesis, its value is in its ability to account for the known facts of human history and culture.

Mimetic behaviour

Mimetic (imitatory) behaviour connects proto-hominid species with humans. Imitation is an adaptive learning behavior, a form of intelligence favored by natural selection. Imitation, however, as René Girard observes, leads to conflict when two individuals imitate each other in their attempt to appropriate a desired object. The problem is to explain the transition from one form of mimesis, imitation, to another, representation. Although many anthropologists have hypothesized that language evolved to help humans describe their world, this ignores the fact that intra-species violence, not the environment, poses the greatest threat to human existence. Human representation, according to Gans, is not merely a "natural" evolutionary development of animal communication systems, but is a radical departure from it. The signifier implies a symbolic dimension that is not reducible to empirical referents.

The originary event

At the event of the origin of language, there was a proto-human hominid species which had gradually become more mimetic, presumably in response to environmental pressures including climate changes and competition for limited resources. Higher primates have dominance hierarchies which serve to limit and

prevent destructive conflict within the social group. However, as individuals within the proto-human group became more mimetic, the dominance system broke down and became inadequate to control the threat of violence posed by conflictual mimesis.

Gans asks us to imagine an "originary event" along the following lines: A group of hominids have surrounded a food object, e.g. the body of a large mammal following a hunt. The attraction of the object, however, exceeds the limits of simple appetite due to the operation of group mimesis, essentially an expression of competition or rivalry.

The object becomes more attractive simply because each member of the group finds it attractive: each individual in the group observes the attention that his rivals give the object. Actual appetite is artificially inflated through this mutual reinforcement. The power of appetitive mimesis in conjunction with the threat of violence is such that the central object begins to assume a sacred aura – infinitely desirable and infinitely dangerous.

Mimesis thus gives rise to a pragmatic paradox: the double imperative to take the desired object for personal gain, and to refrain from taking it to avoid conflict. In other words, imitating the rival means not imitating the rival, because imitation leads to conflict, the attempt to destroy rather than imitate (Gans, *Signs of Paradox* 18). Generative Anthropology theorizes that when this mimetic instinct becomes so powerful that it seems to possess a sacred force endangering the survival of the group, the resultant intra-species pressure favours the emergence of the sign.

No member of the group is able to take the sacred object, and at least one member of the group intends this aborted gesture as a sign designating the central object. This meaning is successfully communicated to the group, who follow suit by reading their aborted gestures as signs also. The sign focuses attention on the sacred power of the central object, which is conceived as the source of its own power. The object which compels attention yet prohibits consumption can only be represented. The basic advantage of the sign over the object is that "The sign is an economical substitute for its inaccessible referent. Things are scarce and consequently objects of potential contention; signs are abundant because they can be reproduced at will" (Gans, *Originary Thinking* 9). The desire for the object is mediated by the sign, which paradoxically both creates desire, by attributing significance to the object, yet also defers desire, by designating the object as sacred or taboo. The mimetic impulse is sublimated, expressed in a different form, as the act of representation. Individual self-consciousness is also born at this moment, in the recognition of alienation from the sacred center. The primary value/function of the sign in this scenario is ethical, as the deferral of violence, but the sign is also referential. What the sign refers to, strictly speaking, is not the physical object, but rather the mediated object of desire as realized in the imagination of each individual.

The emergence of the sign is only a temporary deferral of violence. It is immediately followed by the *sparagmos*, the discharge of the mimetic tension created by the sign in the violent dismemberment and consumption of the worldly incarnation of the sign, the central appetitive object. The violence of the sparagmosis mediated by the sign and thus

directed towards the central object rather than the other members of the group. By including the sparagmos in the originary hypothesis, Gans intends to incorporate Girard's insights into scapegoating and the sacrificial (see *Signs of Paradox* 131–151).

The "scene of representation" is fundamentally social or interpersonal. The act of representation always implies the presence of another or others. The use of a sign evokes the communal scene of representation, structured by a sacred center and a human periphery. The significance of the sign seems to emerge from the sacred center (in its resistance to appropriation), but the pragmatic significance of the sign is realized in the peace brokered amongst the humans on the periphery.

All signs point to the sacred, that which is significant to the community. The sacred cannot be signified directly, since it is essentially an imaginary or ideal construction of mimetic desire. The significance is realized in the human relationships as mediated by the sign. When an individual refers to an object or idea, the reference is fundamentally to the significance of that object or idea for the human community. Language attempts to reproduce the non-violent presence of the community to itself, even though it may attempt to do so sacrificially, by designating a scapegoat victim.

Generative Anthropology is so called because human culture is understood as a "genetic" development of the originary event. The scene of representation is a true cultural universal, but it must be analyzed in terms of its dialectical development. The conditions for the generation of significance are subject to

historical evolution, so that the formal articulation of the sign always includes a dialogical relationship to past forms.

Generative Anthropology Society and Conference

The Generative Anthropology Society & Conference (GASC) is a scholarly association formed for the purpose of facilitating intellectual exchange amongst those interested in fundamental reflection on the human, originary thinking, and Generative Anthropology, including support for regular conferences. GASC was formally organized on June 24, 2010 at Westminster College, Salt Lake City during the 4th Annual Generative Anthropology Summer Conference. Further information, including how to join, can be found at the Generative Anthropology Society & Conference Website.

Since 2007, Generative Anthropology Society & Conference (GASC) has held an annual summer conference on Generative Anthropology.

2007 - Kwantlen University College of University of British Columbia (Vancouver, British Columbia)

2008 - Chapman University (Orange, California)

2009 - University of Ottawa (Ottawa, Ontario)

2010 - Westminster College (Utah) (Salt Lake City) and Brigham Young University (Provo, Utah)

2011 - High Point University (High Point, North Carolina)

2012 - International Christian University (Tokyo, Japan)

2013 - University of California, Los Angeles

2014 - University of Victoria (Greater Victoria, British Columbia), Canada

2015 - High Point University (High Point, North Carolina)

2016 - Kinjo Gakuin University (Nagoya, Japan)

Grooming, Gossip and the Evolution of Language

Grooming, Gossip and the Evolution of Language is a 1996 book by the anthropologist Robin Dunbar, in which the author argues that language evolved from social grooming. He further suggests that a stage of this evolution was the telling of gossip, an argument supported by the observation that language is adapted for storytelling.

Thesis

Dunbar argues that gossip does for group-living humans what manual grooming does for other primates—it allows individuals to service their relationships and thus maintain their alliances on the basis of the principle: *if you scratch my back, I'll scratch yours.* Dunbar argues that as humans began living in increasingly larger social groups, the task of manually

grooming all one's friends and acquaintances became so time-consuming as to be unaffordable. In response to this problem, Dunbar argues that humans invented 'a cheap and ultra-efficient form of grooming'—*vocal grooming.*

To keep allies happy, one now needs only to 'groom' them with low-cost vocal sounds, servicing multiple allies simultaneously while keeping both hands free for other tasks. Vocal grooming then evolved gradually into vocal language—initially in the form of 'gossip'.

Dunbar's hypothesis seems to be supported by the fact that the structure of language shows adaptations to the function of narration in general.

Criticism

The book has been criticised on the grounds that since words are so cheap, Dunbar's "vocal grooming" would fall short in amounting to an honest signal. Further, the book provides no compelling story for how meaningless vocal grooming sounds might become syntactical speech.

Critics of Dunbar's theory point out that the very efficiency of "vocal grooming"—the fact that words are so cheap—would have undermined its capacity to signal honest commitment of the kind conveyed by time-consuming and costly manual grooming. A further criticism is that the theory does nothing to explain the crucial transition from vocal grooming—the production of pleasing but meaningless sounds—to the cognitive complexities of syntactical speech.

Indigenous Aryanism

Indigenous Aryanism, also known as the Indigenous Aryans theory (IAT) and the Out of India theory (OIT), is the conviction that the Aryans are indigenous to the Indian subcontinent, and that the Indo-European languages radiated out from a homeland in India into their present locations. It is a "religio-nationalistic" view on Indian history, and propagated as an alternative to the established migration model, which considers the Pontic steppe to be the area of origin of the Indo-European languages.

Reflecting traditional Indian views based on the Puranic chronology, indigenists propose an older date than is generally accepted for the Vedic period, and argue that the Indus Valley Civilization was a Vedic civilization. In this view, "the Indian civilization must be viewed as an unbroken tradition that goes back to the earliest period of the Sindhu-Sarasvati (or Indus) tradition (7000 or 8000 BCE)."

Support for the IAT mostly exists among a subset of Indian scholars of Hindu religion and the history and archaeology of India, and plays a significant role in Hindutva politics. It has no relevance, let alone support, in mainstream scholarship.

Historical background

The standard view on the origins of the Indo-Aryans is the Indo-Aryan migration theory, which states that they entered north-western India at about 1500 BCE. The Puranic chronology, the timeline of events in ancient Indian history as

narrated in the Mahabaratha, the Ramayana, and the Puranas, envisions a much older chronology for the Vedic culture. In this view, the Vedas were received thousands of years ago, and the start of the reign of Manu Vaivasvate, the Manu of the current kalpa (aeon) and the progenitor of humanity, may be dated as far back 7350 BCE. The Kurukshetra War, the background-scene of the Bhagavad Gita, which may relate historical events taking place ca. 1000 BCE at the heartland of Aryavarta, is dated in this chronology at ca. 3100 BCE.

Indigenists, reflecting traditional Indian views on history and religion, argue that the Aryans are indigenous to India, which challenges the standard view. In the 1980s and 1990s, the indigenous position has come to the foreground of the public debate.

Indian homeland and Aryan Invasion theory

In 19th century Indo-European studies, the language of the Rigveda was the most archaic Indo-European language known to scholars, indeed the only records of Indo-European that could reasonably claim to date to the Bronze Age. This primacy of Sanskrit inspired scholars such as Friedrich Schlegel, to assume that the locus of the proto-Indo-European homeland had been in India, with the other dialects spread to the west by historical migration. With the 20th-century discovery of Bronze-Age attestations of Indo-European (Anatolian, Mycenaean Greek), Vedic Sanskrit lost its special status as the most archaic Indo-European language known.

In the 1850s, Max Müller introduced the notion of two Aryan races, a western and an eastern one, who migrated from the

Caucasus into Europe and India respectively. Müller dichotomized the two groups, ascribing greater prominence and value to the western branch. Nevertheless, this "eastern branch of the Aryan race was more powerful than the indigenous eastern natives, who were easy to conquer." By the 1880s, his ideas had been adapted by racist ethnologists. For example, as an exponent of race science, colonial administrator Herbert Hope Risley (1851 – 1911) used the ratio of nose width to height to divide Indian people into Aryan and Dravidian races, as well as seven castes.

The idea of an Aryan "invasion" was fueled by the discovery of the Indus Valley (Harappan) Civilisation, which declined around the period of the Indo-Aryan migration, suggesting a destructive invasion. This argument was developed by the mid-20th century archaeologist Mortimer Wheeler, who interpreted the presence of many unburied corpses found in the top levels of Mohenjo-daro as the victims of conquests. He famously stated that the Vedic god "Indra stands accused" of the destruction of the Indus Civilisation. Scholarly critics have since argued that Wheeler misinterpreted his evidence and that the skeletons were better explained as hasty interments, not unburied victims of a massacre.

Indo-Aryan migration theory

Migrations

The idea of an "invasion" has been discarded in mainstream scholarship since the 1980s, and replaced by more sophisticated models, referred to as the Indo-Aryan migration theory. It posits the introduction of Indo-Aryan languages into

South Asia through migrations of Indo-European-speaking people from their *Urheimat* (original homeland) in the Pontic Steppes via the Central European Corded ware culture, and Eastern European/Central Asian Sintashta culture, through Central Asia into the Levant (Mitanni), south Asia, and Inner Asia (Wusun and Yuezhi). It is part of the Kurgan-hypothesis/Revised Steppe Theory, which further describes the spread of Indo-European languages into western Europe via migrations of Indo-European speaking people.

Historical linguistics provides the main basis for the theory, analysing the development and changes of languages, and establishing relations between the various Indo-European languages, including the time frame of their development.

It also provides information about shared words, and the corresponding area of the origin of Indo-European, and the specific vocabulary which is to be ascribed to specific regions. The linguistic analyses and data are supplemented with archaeological and genetical data and anthropological arguments, which together provide a coherent model that is widely accepted.

In the model, the first archaeological remains of the Indo-Europeans is the Yamna culture, from which emerged the Central European Corded Ware culture, which spread eastward creating the Proto-Indo-IranianSintashta culture (2100–1800 BCE), from which developed the Andronovo culture (1800–1400 BCE). Around 1800 BCE Indo-Aryan people split-off from the Iranian branches, and migrated to the BMAC (2300–1700 BCE), and further to the Levant, northern India, and possibly Inner Asia.

Cultural continuity and adaptation

The migration into northern India was not necessarily of a large population, but may have consisted of small groups, who introduced their language and social system into the new territory when looking for pasture for their herds.These were then emulated by larger groups, who adopted the new language and culture.

Witzel also notes that "small-scale semi-annual transhumance movements between the Indus plains and the Afghan and Baluchi highlands continue to this day."

Indigenous Aryanism

According to Bryant, Indigenists

... share a conviction that the theory of an external origin of the Indo-Aryan speaking people on the Indian subcontinent has been constructed on flimsy or false assumptions and conjectures. As far as such scholars are concerned, no compelling evidence has yet been produced to posit an external origin of the Indo-Aryans [...] they have taken it upon themselves to oppose the theory of Aryan invasions and migrations—hence the label Indigenous Aryanism.

The "Indigenist position" started to take shape after the discovery of the HarappanCivilisation, which predates the Vedas. According to this alternative view, the Aryans are indigenous to India, the Indus Civilisation is the Vedic Civilisation, the Vedas are older than the second millennium BCE, there is no discontinuity between the (northern) Indo-

European part of India and the (southern) Dravidian part, and the Indo-European languages radiated out from a homeland in India into their present locations. According to Bresnan, it is a natural response to the 19th century narrative of a superior Aryan race subjecting the native Indians, implicitly confirming the ethnocentric superiority of the European invaders of colonial times, instead supporting "a theory of indigenous development that led to the creation of the Vedas."

Main arguments of the Indigenists

The idea of "Indigenous Aryans" is supported with specific interpretations of archaeological, genetic, and linguistic data, and on literal interpretations of the Rigveda. Standard arguments, both in support of the "Indigenous Aryans" theory and in opposition the mainstream Indo-Aryan Migration theory, are:

- Questioning the Indo-Aryan Migration theory:
- Presenting the Indo-Aryan Migration theory as an "Indo-Aryan Invasion theory", which was invented by 19th century colonialists to suppress the Indian people.
- Questioning the methodology of linguistics;
- Arguing for an indigenous cultural continuity, arguing there is a lack of archaeological remains of the Indo-Aryans in north-west India;
- Questioning the genetic evidence
- Contesting the possibility that small groups can change culture and languages in a major way;
- Re-dating India's history by postulating a Vedic-Puranic chronology:

- Arguing for ancient, indigenous origins of Sanskrit, dating the Rigveda and the Vedic people to the 3rd millennium BCE or earlier; This includes:
- Identifying the Sarasvati River, described in the Rig Veda as a mighty river, with the Ghaggar-Hakra River, which had dried up c. 2000 BCE, arguing therefor for an earlier dating of the Rig Veda;
- Arguing for the presence of horses and horse-drawn chariots before 2000 BCE;
- Identifying the Vedic people with the HarappanCivilisation;
- Redating Indian history based on the Vedic-Puranic chronology.

Questioning the Aryan Migration model

Rhetorics of "Aryan invasion"

The outdated notion of an "Aryan invasion" has been used as a straw man to attack the Indo-Aryan Migration theory. According to Witzel, the invasion model was criticised by Indigenous Aryanists for being a justification for colonial rule:

The theory of an immigration of IA speaking Arya ("Aryan invasion") is simply seen as a means of British policy to justify their own intrusion into India and their subsequent colonial rule: in both cases, a "white race" was seen as subduing the local darker colored population.

While according to KoenraadElst, a supporter of Indigenous Aryans:

The theory of which we are about to discuss the linguistic evidence, is widely known as the "Aryan invasion theory" (AIT). I will retain this term even though some scholars object to it, preferring the term "immigration" to "invasion." ... North India's linguistic landscape leaves open only two possible explanations: either Indo-Aryan was native, or it was imported in an invasion.

Linguistic methodology

Indigenists question the methodology and results of linguistics. According to Bryant, OIT proponents tend to be linguistic dilettantes who either ignore the linguistic evidence completely, dismiss it as highly speculative and inconclusive, or attempt to tackle it with hopelessly inadequate qualifications; this attitude and neglect significantly minimises the value of most OIT publications.

Archaeological finds and cultural continuity

In the 1960s, archaeological explanations for cultural change shifted from migration-models to internal causes of change. Given the lack of archaeological remains of the Indo-Aryans, Jim G. Shaffer, writing in the 1980s and 1990s, has argued for an indigenous cultural continuity between Harappan and post-Harappan times. According to Shaffer, there is no archaeological indication of an Aryan migration into northwestern India during or after the decline of the Harappan city culture. Instead, Shaffer has argued for "a series of cultural changes reflecting indigenous cultural developments." According to Shaffer, linguistic change has mistakenly been attributed to migrations of people. Likewise, Erdosy also notes

the absence of evidence for migrations, and states that "Indo-European languages may well have spread to South Asia through migration," but that the Rigvedic*aryas*, as a specific ethno-linguistic tribe holding a specific set of ideas, may well have been indigenous people whose "set of ideas" soon spread over India.

Since the 1990s, attention has shifted back to migrations as an explanatory model. Pastoral societies are difficult to identify in the archaeological record, since they move around in small groups and leave little traces.

In 1990, David Anthony published a defense of migratory models, and in his *The Horse, the Wheel, and Language* (2007), has provided an extensive overview of the archaeological trail of the Indo-European people across the Eurasian steppes and central Asia. The development and "revolutionary" improvement of genetic research since the early 2010s has reinforced this shift in focus, as it has unearthed previously unaccessible data, showing large-scale migrations in prehistoric times.

Genetic evidence

OIT-proponents have questioned the findings of genetic research, and some older DNA-research has questioned the Indo-Aryan migrations. Since 2015, genetic research has "revolutionarily" improved, and further confirmed the migration of Steppe pastoralists into Western Europe and South Asia, and "many scientists who were either sceptical or neutral about significant Bronze Age migrations into India have changed their opinions."

Cultural change

Indigenists contest the possibility that small groups can change culture and languages in a major way. Mainstream scholarship explains this by elite dominance and language shift. Small groups can change a larger cultural area, when an elite male group integrates in small indigenous groups which takes over the elite language, in this case leading to a language shift in northern India. Indo-Aryan languages were further disseminated with the spread of the Vedic-Brahmanical culture in the process of Sanskritisation. In this process, local traditions ("little traditions") became integrated into the "great tradition" of Brahmanical religion, disseminating Sanskrit texts and Brahmanical ideas throughout India, and abroad. This facilitated the development of the Hindu synthesis, in which the Brahmanical tradition absorbed "local popular traditions of ritual and ideology."

Redating Indian history

Redating the Rig Veda and the Rig Vedic people

Sanskrit

According to the mainstream view, Sanskrit arose in South Asia after Indo-Aryan languages had been introduced by the Indo-Aryans in the first half of the second millennium BCE. The most archaic form of Sanskrit is Vedic Sanskrit found in the Rig Veda, composed between 1500 BCE and 1200 BCE.

Taking recourse to "Hindu astronomical lore" Indigenists argue for ancient, indigenous origins of Sanskrit, dating the Rigveda

and the Vedic people to the 3rd millennium BCE or earlier. According to SubhashKak, situating the arrival of the Aryans in the seventh millnnium BCE, the hymns of the Rig Veda are organised in accordance with an astronomical code, supposingly showing "a tradition of sophisticated observational astronomy going back to events of 3000 or 4000 BCE." His ideas have been rejected by mainstream scholars.

Horses and chariots

Several archaeological finds are interpreted as evidencing the presence of typical Indo-Aryan artefacts before 2000 BCE. Examples include the interpretation of animal bones from before 2000 BCE as horse-bones, and interpreting the Sinauli cart burials as chariots.

While horse remains and related artifacts have been found in Late Harappan (1900-1300 BCE) sites, indicating that horses may have been present at Late Harappan times, horses did not play an essential role in the Harappancivilisation, in contrast to the Vedic period (1500-500 BCE). The earliest undisputed finds of horse remains in South Asia are from the Gandhara grave culture, also known as the Swat culture (c. 1400-800 BCE), related to the Indo-Aryans

Horse remains from the Harappan site Surkotada (dated to 2400-1700 BC) have been identified by A.K. Sharma as *Equusferuscaballus*. However, archaeologists like Meadow (1997) disagree, on the grounds that the remains of the *Equusferuscaballus* horse are difficult to distinguish from other equid species such as *Equusasinus* (donkeys) or *Equushemionus* (onagers).

Bronze Age solid-disk wheel carts were found at Sinauli in 2018. They were related to the Ochre Coloured Pottery culture, and dated at ca. 2000-1800 BCE.

They were interpreted by some as horse-pulled "chariots", predating the arrival of the horse-centered Indo-Aryans. According to Parpola, the carts were ox-pulled charts, and related to a first wave of Ino-Iraninan migrations into the Indian subcontinent, noting that the Ochre Coloured Pottery culture (2000-1500 BCE) shows similarities with both the Late Harappan culture and steppe-cultures.

Sarasvati river

In the Rig Veda, the goddess Sarasvati is described as a mighty river. Indigenists take these descriptions as references to a real river, the Sarasvati river, identified with the Ghaggar-Hakra, an eastern tributary to the Indus. Given the fact that the Ghaggar-Hakkra had dried-up at 2000 BCE, Indigenists argue that the Vedic people must therefore have been present much earlier.

Rig Vedic references to a physical river indicate that the Sarswati "had already lost its main source of water supply and must have ended in a terminal lake (samudra)," "depicting the present-day situation, with the Sarasvatī having lost most of its water."

"Sarasvati" may also be identified with the Helmand or Haraxvati river in southern Afghanistan, the name of which may have been reused in its Sanskrit form as the name of the Ghaggar-Hakrariver, after the Vedic tribes moved to the Punjab. *Sarasvati* of the Rig Veda may also refer to two distinct

rivers, with the family books referring to the Helmand River, and the more recent 10th mandala referring to the Ghaggar-Hakra.

Identifying the Vedic people with the HarappanCivilisation

Indigenists claim a continuous cultural evolution of India, denying a discontinuity between the Harappan and Vedic periods, identifying the IVC with the Vedic people.

According to Kak, "the Indian civilization must be viewed as an unbroken tradition that goes back to the earliest period of the Sindhu-Sarasvati (or Indus) tradition (7000 or 8000 BCE). This identification is incompatible with the archaeological, linguistic and genetic data, and rejected by mainstream scholarship.

Postulating a Puranic chronology

The idea of "Indigenous Aryanism" fits into traditional Hindu ideas of religious history, namely that Hinduism has timeless origins, with the Vedic Aryans inhabiting India since ancient times. The ideas Indigenist ideas are rooted in the chronology of the Puranas, the Mahabharata and the Ramayana, which contain lists of kings and genealogies used to construct the traditional chronology of ancient India. "Indigenists" follow a "Puranic agenda", emphasizing that these lists go back to the fourth millennium BCE. Megasthenes, the Greek ambassador to the Maurya court at Patna at c. 300 BCE, reported to have heard of a traditional list of 153 kings that covered 6042 years, beyond the traditional beginning of the *Kali Yuga* in 3102 BCE.

The royal lists are based on Sūta bardic traditions, and are derived from lists which were orally transmitted and constantly reshaped.

These lists are supplemented with astronomical interpretations, which are also used to reach an earlier dating for the Rigveda. Along with this comes a redating of historical personages and events, in which the Buddha is dated to 1100 BCE or even 1700 BCE, and Chandragupta Maurya (c. 300 BCE) is replaced by Chandragupta, the Gupta king. The Bharata War is dated at 3139–38 BCE, the start of the kali Yuga.

Indigenous Aryans scenarios

Michael Witzel identifies three major types of "Indigenous Aryans" scenarios:

- A "mild" version that insists on the indigeneity of the Rigvedic Aryans to the North-Western region of the Indian subcontinent in the tradition of Aurobindo and Dayananda;
- The "out of India" school that posits India as the Proto-Indo-European homeland, originally proposed in the 18th century, revived by the HindutvasympathiserKoenraadElst (1999), and further popularised within Hindu nationalism by ShrikantTalageri (2000);
- The position that all the world's languages and civilisations derive from India, represented e.g. by David Frawley.

Kazanas adds a fourth scenario:

- The Aryans entered the Indus Valley before 4500 BCE and got integrated with the Harappans, or might have been the Harappans.

Aurobindo's Aryan world-view

For Aurobindo, an "Aryan" was not a member of a particular race, but a person who "accepted a particular type of self-culture, of inward and outward practice, of ideality, of aspiration."

Aurobindo wanted to revive India's strength by reviving Aryan traditions of strength and character. He denied the historicity of a racial division in India between "Aryan invaders" and a native dark-skinned population.

Nevertheless, he did accept two kinds of culture in ancient India, namely the Aryan culture of northern and central India and Afghanistan, and the un-Aryan culture of the east, south and west. Thus, he accepted the cultural aspects of the division suggested by European historians.

Out of India model

The "Out of India theory" (OIT), also known as the "Indian Urheimat theory," is the proposition that the Indo-European language familyoriginated in Northern India and spread to the remainder of the Indo-European region through a series of migrations. It implies that the people of the Harappancivilisation were linguistically Indo-Aryans.

Theoretical overview

KoenraadElst, in his *Update in the Aryan Invasion Debate*, investigates "the developing arguments concerning the Aryan Invasion Theory". Elst notes:

> Personally, I don't think that either theory, of Aryan invasion and of Aryan indigenousness, can claim to have been proven by prevalent standards of proof; even though one of the contenders is getting closer. Indeed, while I have enjoyed pointing out the flaws in the AIT statements of the politicized Indian academic establishment and its American amplifiers, I cannot rule out the possibility that the theory which they are defending may still have its merits.

Edwin Bryant also notes that Elst's model is a "theoretical exercise:"

> …a purely theoretical linguistic exercise […] as an experiment to determine whether India can definitively be excluded as a possible homeland. If it cannot, then this further problematizes the possibility of a homeland ever being established anywhere on linguistic grounds.

And in *Indo-Aryan Controversy* Bryant notes:

> Elst, perhaps more in a mood of devil's advocacy, toys with the evidence to show how it can be reconfigured, and to claim that no linguistic evidence has yet been produced to exclude India as a

homeland that cannot be reconfigured to promote it as such.

"The emerging alternative"

KoenraadElstsummarises "the emerging alternative to the Aryan Invasion Theory" as follows.

During the 6th millennium BCE Proto-Indo-Europeans lived in the Punjab region of northern India. As the result of demographic expansion, they spread into Bactria as the Kambojas. The Paradas moved further and inhabited the Caspian coast and much of central Asia while the Cinas moved northwards and inhabited the Tarim Basin in northwestern China, forming the Tocharian group of I-E speakers. These groups were Proto-Anatolian and inhabited that region by 2000 BCE. These people took the oldest form of the Proto-Indo-European (PIE) language with them and, while interacting with people of the Anatolian and Balkan region, transformed it into a separate dialect. While inhabiting central Asia they discovered the uses of the horse, which they later sent back to the Urheimat. Later on during their history, they went on to occupy western Europe and thus spread the Indo-European languages to that region.

During the 4th millennium BCE, civilisation in India started evolving into what became the urban Indus Valley Civilization. During this time, the PIE languages evolved to Proto-Indo-Iranian. Some time during this period, the Indo-Iranians began to separate as the result of internal rivalry and conflict, with the Iranians expanding westwards towards Mesopotamia and Persia, these possibly were the Pahlavas. They also expanded

into parts of central Asia. By the end of this migration, India was left with the Proto-Indo-Aryans. At the end of the Mature Harappan period, the Sarasvati river began drying up and the remainder of the Indo-Aryans split into separate groups.

Some travelled westwards and established themselves as rulers of the HurrianMitanni kingdom by around 1500 BCE (see Indo-Aryan superstrate in Mitanni). Others travelled eastwards and inhabited the Gangetic basin while others travelled southwards and interacted with the Dravidian people.

David Frawley

In books such as *The Myth of the Aryan Invasion of India* and *In Search of the Cradle of Civilization*(1995), Frawleycriticises the 19th century racial interpretations of Indian prehistory, such as the theory of conflict between invading Caucasoid Aryans and Dravidians. In the latter book, Frawley, Georg Feuerstein, and SubhashKak reject the Aryan Invasion theory and support Out of India.

Bryant commented that Frawley's historical work is more successful as a popular work, where its impact "is by no means insignificant", rather than as an academic study, and that Frawley "is committed to channelling a symbolic spiritual paradigm through a critical empirico rational one".

Pseudo-historianGraham Hancock (2002) quotes Frawley's historical work extensively for the proposal of highly evolved ancient civilisations prior to the end of the last glacial period. including in India. Kreisburg refers to Frawley's "The Vedic Literature and Its Many Secrets".

Significance for colonial rule and Hindu politics

The Aryan Invasion theory plays an important role in Hindu nationalism, which favors Indigenous Aryanism. It has to be understood against the background of colonialism and the subsequent task of nation-building in India.

Colonial India

Curiosity and the colonial requirements of knowledge about their subject people led the officials of the East India Company to explore the history and culture of India in the late 18th century. When similarities between Sanskrit, Greek and Latin were discovered by William Jones, a suggestion of "monogenesis" (single origin) was formulated for these languages as well as their speakers. In the latter part of the 19th century, it was thought that language, culture and race were inter-related, and the notion of biological race came to the forefront The presumed "Aryan race" which originated the Indo-European languages was prominent among such races, and was deduced to be further subdivided into "European Aryans" and "Asian Aryans," each with their own homelands.

Max Mueller, who translated the Rigveda during 1849–1874, postulated an original homeland for all Aryans in central Asia, from which a northern branch migrated to Europe and a southern branch to India and Iran. The Aryans were presumed to be fair-complexioned Indo-European speakers who conquered the dark-skinned *dasas* of India. The upper castes, particularly the Brahmins, were thought to be of Aryan descent

whereas the lower castes and Dalits ("untouchables") were thought to be the descendants of *dasas*.

The Aryan theory served politically to suggest a common ancestry and dignity between the Indians and the British. KeshabChunder Sen spoke of British rule in India as a "reunion of parted cousins." Indian nationalistBal GangadharTilak endorsed the antiquity of *Rigveda*, dating it to 4500 BCE. He placed the homeland of the Aryans somewhere close to the North Pole. From there, Aryans were believed to have migrated south in the post-glacial age, branching into a European branch that relapsed into barbarism and an Indian branch that retained the original, superior civilisation.

However, Christian missionaries such as John Muir and John Wilson drew attention to the plight of lower castes, who they said were oppressed by the upper castes since the Aryan invasions. JyotibaPhule argued that the *dasas* and *sudras* were indigenous people and the rightful inheritors of the land, whereas Brahmins were Aryan and alien.

Hindu revivalism and nationalism

In contrast to the mainstream views, the Hindu revivalist movements denied an external origin to Aryans. Dayananda Saraswati, the founder of the Arya Samaj (Society of Aryans), held that Vedas were the source of all knowledge and were revealed to the Aryans. The first man (an Aryan) was created in Tibet and, after living there for some time, the Aryans came down and inhabited India, which was previously empty.

The Theosophical Society held that the Aryans were indigenous to India, but that they were also the progenitors of the

European civilisation. The Society saw a dichotomy between the spiritualism of India and the materialism of Europe.

According to RomilaThapar, the Hindu nationalists, led by Savarkar and Golwalkar, eager to construct a Hindu identity for the nation, held that the original Hindus were the Aryans and that they were indigenous to India. There was no Aryan invasion and no conflict among the people of India. The Aryans spoke Sanskrit and spread the Aryan civilization from India to the west.

Witzel traces the "indigenous Aryan" idea to the writings of Savarkar and Golwalkar. Golwalkar (1939) denied any immigration of "Aryans" to the subcontinent, stressing that all Hindus have always been "children of the soil", a notion which according to Witzel is reminiscent of the *blood and soil* of contemporary fascism. Since these ideas emerged on the brink of the internationalist and socially oriented Nehru-Gandhi government, they lay dormant for several decades, and only rose to prominence in the 1980s.

Bergunder likewise identifies Golwalkar as the originator of the "Indigenous Aryans" notion, and Goel'sVoice of India as the instrument of its rise to notability:

The Aryan migration theory at first played no particular argumentative role in Hindu nationalism. [...] This impression of indifference changed, however, with Madhav Sadashiv Golwalkar (1906–1973), who from 1940 until his death was leader of the extremist paramilitary organization the RashtriyaSvayamsevakSangh (RSS). [...] In contrast to many other of their openly offensive teachings, the Hindu nationalists did not seek to keep the question of the Aryan

migration out of public discourses or to modify it; rather, efforts were made to help the theory of the indigenousness of the Hindus achieve public recognition.

For this the initiative of the publisher Sita Ram Goel (b. 1921) was decisive. Goel may be considered one of the most radical, but at the same time also one of the most intellectual, of the Hindu nationalist ideologues. [...] Since 1981 Goel has run a publishing house named 'Voice of India' that is one of the few which publishes Hindu nationalist literature in English which at the same time makes a 'scientific' claim. Although no official connections exist, the books of 'Voice of India' — which are of outstanding typographical quality and are sold at a subsidized price — are widespread among the ranks of the leaders of the SanghParivar. [...] The increasing political influence of Hindu nationalism in the 1990s resulted in attempts to revise the Aryan migration theory also becoming known to the academic public.

Present-day political significance

Lars Martin Fosse notes the political significance of "Indigenous Aryanism". He notes that "Indigenous Aryanism" has been adopted by Hindu nationalists as a part of their ideology, which makes it a *political* matter in addition to a scholarly problem. The proponents of Indigenous Aryanism necessarily engage in "moral disqualification" of Western Indology, which is a recurrent theme in much of the indigenist literature. The same rhetoric is being used in indigenist literature and the Hindu nationalist publications like the *Organiser.*

According to AbhijithRavinutala, the indigenist position is essential for Hindutva exclusive claims on India:

The BJP considers Indo-Aryans fundamental to the party's conception of Hindutva, or "Hindu-ness": India is a nation of and for Hindus only.

Only those who consider India their holy land should remain in the nation. From the BJP's point of view, the Indo-Aryan peoples were indigenous to India, and therefore were the first 'true Hindus'. Accordingly, an essential part of 'Indian' identity in this point of view is being indigenous to the land.

Repercussions of the disagreements about Aryan origins have reached Californian courts with the Californian Hindu textbook case, where according to the Times of India historian and president of the Indian History Congress,

Dwijendra Narayan Jha in a "crucial affidavit" to the Superior Court of California:

> …[g]iving a hint of the Aryan origin debate in India, … asked the court not to fall for the 'indigenous Aryan' claim since it has led to 'demonisation of Muslims and Christians as foreigners and to the near denial of the contributions of non-Hindus to Indian culture'.

According to Thapar, Modi's government and the BJP have "peddled myths and stereotypes," such as the insistence on "a single uniform culture of the Aryans, ancestral to the Hindu, as having prevailed in the subcontinent, subsuming all others,"

despite the scholarly evidence for migrations into India, which is "anathema to the Hindutva construction of early history."

Rejection by mainstream scholarship

The Indigenous Aryans theory has no relevance, let alone support, in mainstream scholarship. According to Michael Witzel, the "indigenous Aryans" position is not scholarship in the usual sense, but an "apologetic, ultimately religious undertaking":

The "revisionist project" certainly is not guided by the principles of critical theory but takes, time and again, recourse to pre-enlightenment beliefs in the authority of traditional religious texts such as the Purāṇas. In the end, it belongs, as has been pointed out earlier, to a different 'discourse' than that of historical and critical scholarship. In other words, it continues the writing of religious literature, under a contemporary, outwardly 'scientific' guise … The revisionist and autochthonous project, then, should not be regarded as scholarly in the usual post-enlightenment sense of the word, but as an apologetic, ultimately religious undertaking aiming at proving the "truth" of traditional texts and beliefs. Worse, it is, in many cases, not even scholastic scholarship at all but a political undertaking aiming at "rewriting" history out of national pride or for the purpose of "nation building".

In her review of Bryant's *The Indo-Aryan Controversy*, which includes chapters by Elst and other "indigenists", Stephanie Jamison comments:

… the parallels between the Intelligent Design issue and the Indo-Aryan "controversy" are distressingly close. The Indo-Aryan controversy is a manufactured one with a non-scholarly agenda, and the tactics of its manufacturers are very close to those of the ID proponents mentioned above. However unwittingly and however high their aims, the two editors have sought to put a gloss of intellectual legitimacy, with a sense that real scientific questions are being debated, on what is essentially a religio-nationalistic attack on a scholarly consensus.

SudeshnaGuha, in her review of *The Indo-Aryan Controversy*, notes that the book has serious methodological shortcomings, by not asking the question what exactly constitutes historical evidence. This makes the "fair and adequate representation of the differences of opinion" problematic, since it neglects "the extent to which unscholarly opportunism has motivated the rebirth of this genre of 'scholarship'". Guha:

Bryant's call for accepting "the valid problems that are pointed out on both sides" (p. 500), holds intellectual value only if distinctions are strictly maintained between research that promotes scholarship, and that which does not. Bryant and Patton gloss over the relevance of such distinctions for sustaining the academic nature of the Indo-Aryan debate, although the importance of distinguishing the scholarly from the unscholarly is rather well enunciated through the essays of Michael Witzel and Lars Martin Fosse.

According to Bryant, OIT proponents tend to be linguistic dilettantes who either ignore the linguistic evidence completely, dismiss it as highly speculative and inconclusive,

or attempt to tackle it with hopelessly inadequate qualifications; this attitude and neglect significantly minimises the value of most OIT publications.

Fosse notes crucial theoretical and methodological shortcomings in the indigenist literature. Analysing the works of Sethna, Bhagwan Singh, Navaratna and Talageri, he notes that they mostly quote English literature, which is not fully explored, and omitting German and French Indology. It makes their works in various degrees underinformed, resulting in a critique that is "largely neglected by Western scholars because it is regarded as incompetent".

According to Erdosy, the indigenist position is part of a "lunatic fringe" against the mainstream migrationist model.

Interjectional theory

Interjectional theory is a theory of language formulated by the pre-Socratic philosopher Democritus, ca. 460 BC to ca. 370 BC, who argued that human speech derives from a variety of sounds and outcries of an emotional nature. These ideas were later held by Epicurus and Lucretius who cited Democritus as their authority. The theory continued to influence the study of the origin of language into the 18th century when it was again put forward by Vico and Rousseau.