



Evolution of Mind and Language

Learning from the Pirahã Case

Georg W. Oesterdiekhoff

Abstract. – The language of the Pirahã, an indigenous group living in the Amazonian rain forest, lacks recursion and embedding, plural and passive, and has some other traits that discriminate this kind of language from those nowadays usually spoken. Daniel L. Everett described this language, and intended to explain mind, language, and culture of the Pirahã by their cultural values and norms they allegedly appreciate. He assumed that they follow the immediate experience principle that hinders them to surpass *hic et nunc* experiences and to apply any kind of abstractions. In this article, the author demonstrates that developmental psychology is needed for the explanation of the traits of language and mind mentioned. He also argues that both Chomsky's universal grammar theory and Darwinian approaches blockade the proper study of the history of language. The Pirahã language takes a certain place in the history of the human language, as the Pirahã mind does in the history of mind and culture. [*Pirahã, Language evolution, recursion, immediate experience principle, dream, myth, educability, psychological stage, preoperational stage*]

Georg W. Oesterdiekhoff, Dr. Dr. reader in sociology at the University of Karlsruhe; previously deputy chair for sociology at the universities of Aachen and Erlangen-Nürnberg as well as visiting professor at the National University of Colombia. He has written about 25 books and 150 articles; see References Cited.

Introduction

Daniel L. Everett's books "Don't Sleep, There Are Snakes" (2008) and "Language. The Cultural Tool" (2012a) received great attentiveness among those interested in language development and indigenous peoples. His books gave insights into a kind of language widely differing from those spoken across the continents and known among linguists. Especially their grammar seems to be very simple and limited

in comparison to those languages usually known and studied. The syntax does not allow any embeddings, that is, the inclusion of a sentence into another sentence. Moreover, the language does not know any recursion. Language and grammar are so simple and alien that linguists have problems to explain their nature and origination. In any case, the data Everett presents seem to contradict to Noam Chomsky's theory of the universal grammar that explains recursion as a universal feature to all languages.

Everett found some more striking phenomena in the Pirahã culture. For example, the Pirahã cannot count and calculate. They have neither numerals nor number substitutes. Moreover, adult Pirahã are not able to learn to count 1 to 10, or to add $1 + 1 = 2$, not even after eight months of daily schooling. Their children can learn it but the adults are not able to learn this anymore. This phenomenon is very strange and hardly believable but nonetheless undeniable. Further, the Pirahã do not know the categorical color names and any quantifiers such as "all" or "some." More, they take their dreams as true experiences and not as subjective fantasies. They discriminate dreams from perceptions but do not assign to dreams the status of being imaginary phenomena only. They really believe that they personally visit the places and physically experience the incidents their dreams present. Thus, dreams represent the same kinds of real experiences as perceptions and actions in real life do. Thus, dreams manifest real life and not imagination only. Further, Everett asserts that the Pirahã do not have any religion and myths but only the experience of ghosts.

This latter assertion is exaggerated. However, their mythological culture seems to be very limited in comparison. They have in any case no tradition of myth telling, a cultural trait usually universal in indigenous cultures over the world.

Everett tries to explain these different patterns mentioned with reference to the principle of immediate experience (IEP). He maintains that the Pirahã's mind is ruled by this main feature. Their mind accepts only the reference to personal experiences won by the individual, or reported by persons he knows, Everett maintains. They do not develop or exhibit ideas disrupted from perceptions or personal experiences. Accordingly, Everett believes that categorical color names, quantifiers, numbers, discriminations between dreams and perceptions, and complex grammars contradict to the IEP. However, IEP is not the ultimate reference basis to that Everett refers the phenomena mentioned. The author contends that certain values, and the intimate social relations, that is the small group structure of Pirahã society, cause the IEP. The face to face communication does allow IEP with its simple language and the other peculiarities mentioned (Everett 2009: 432).

On the whole, Everett's theory cannot explain the data he presents. The relationship of values and face to face communication as causers to the IEP is unexplicated. Why should a *small* group of people favor values constructing the IEP? Can cognitive psychologists accept the idea that social values cause basic patterns of mind and psyche? Usually conversely, basic patterns of mind and psyche cause values. The whole phenomenon of IEP remains theoretically unclear. Is it limited to perceptions only or to personal experiences of people? Does IEP exclude any kind of ideas and imaginations, only allowing judgments basing on perceptions, close to the mind of perception-bound animals? Does IEP base on free choices, that is, values, or rather on competences, that is, cognitive shortcomings?

Numbers do not contradict to IEP and personal experiences, as however Everett contends. Neither do dreams, categorial color names, and quantifiers (Nevins, Pesetsky, and Rodrigues 2009b: 364, 385). In fact, Everett has no convincing theory available to explain the phenomena. He only has some hypotheses contradicting to each other and not being based on deep and convincing grounds.

However, developmental psychology is the research industry having evidenced the causes to the origination of numbers, categorical color terms, quantifiers, realistic and subjective dream concepts, and language acquisition. There is no other research branch that explores the development of these phenomena. Developmental psychology has been find-

ing out and describing the sources to these phenomena for over 100 years. Therefore, it is necessary to refer to developmental psychology and Piagetian cross-cultural psychology, something the both sides mentioned have not done and does not had any idea of that possibility or necessity.

The Mental Characteristics in Overview

The starting sentences of Everett's article "Cultural Constraints on Grammar and Cognition in Pirahã" outlines his whole approach very well.

The Pirahã language challenges simplistic application of Hockett's nearly universally accepted design features of human language by showing that some of these features (interchangeability, displacement, and productivity) may be culturally constrained. In particular, Pirahã culture constrains communication to nonabstract subjects which fall within the immediate experience of interlocutors. This constraint explains a number of very surprising features of Pirahã grammar and culture: the absence of numbers of any kind or a concept of counting and of any terms for quantification, the absence of color terms, the absence of embedding, the simplest pronoun inventory known, the absence of "relative tenses," the simplest kinship system yet documented, the absence of creation myths and fiction, the absence of any individual or collective memory of more than two generations past, the absence of drawing or other art and one of the simplest material cultures documented, and the fact that the Pirahã are monolingual after more than 200 years of regular contact with Brazilians and the Tupi-Guarani-speaking Kawahiv (Everett 2005a: 621).

The immediacy of experience is the fundamental and organizing principle of mind, culture, and language, Everett writes. However, it is by no means described as a clear and convincing principle or trait. There is no place to find in Everett's writings where he defines and outlines it in a clear way. At some places he seems to define IEP as a personal experience.

Pirahã of course exhibits displacement in that people regularly talk about things that are absent from the context at the time of talking about them, but this is only one degree of displacement. The inability in principle to talk about things removed from personal experience (for example, abstractions of the type represented by counting, numbers, quantification, multigenerational genealogies, complex kinship, colors, and other semantic/cultural domains discussed above) shows that displacement in Pirahã grammar and language is severely constrained by Pirahã culture (Everett 2005a: 633).

Everett opposes here abstractions to personal or immediate experiences. However, the nature of ab-

stractions such as numbers, quantifiers, and categorical color terms is not their failure to meet personal experiences but their status to be abstractions, namely abstractions that appear on certain cognitive developmental stages. Abstractions can sometimes be a part of personal or immediate experience, and sometimes not. Abstractions are not defined by their suprapersonal or supraexperiential status but by their cognitive developmental stage. When I see two canoes or five horses, then the numbers two or five are not outside or beyond my personal or immediate experience but are a part of it (Nevins, Pesetsky, and Rodrigues 2009b: 364, 385). The same is true with the experience or perception of green or blue birds. The colors are not beyond my immediate experience but are a part of it. On the whole, the IEP cannot be the causing and originating source of the lack of the abstractions mentioned. Instead, developmental stages account both to the existence and lack of abstractions.

The mental incapacity to perform abstractions seems to be the reason to the actual lack of such abstractions, as it will be described more exactly below. This would also explain the paucity of more complex ideas, representations, and thoughts in Pirahã culture, something that Everett wrongly refers to the IEP. The Pirahã mind mainly refers to perceptions of real incidents and avoids drawing difficult conclusions or embedding their analysis in wider conceptual or theoretical contexts. A mind strongly relying on perceptions is interconnected with the lack of abstractions, not a mind only resorting to immediate or personal experiences. Developmental psychology knows that humans on lower stages more rely on perceptions, while those mentally advanced have a more conceptual mental framework, a mind capable to abstractions and to a world full of ideas and theories. Everett, however, confuses perceptual and nonabstractive mind on the one side and personal or immediate experience on the other side. The real opposition, however, is a more perceptual and a more conceptual frame of mind, in strong dependency from the human's developmental stage.¹

The younger humans are the more perceptions and ideas are not discriminated from each other. Humans on lower cognitive stages do not have highly developed worlds of ideas and theories. They rather recognize their ideas as perceptions. Perceptions and ideas are not as differentiated from each other as among more cognitively developed humans. That is the reason to the eidetic organization of the

psyche of (premodern and modern) children, on the one side, and uneducated adults living in premodern societies on the other side. Eidetism vanishes with the rising differentiation between perception and concept (idea, thought) in cognitively more developed humans (Luria and Vygotskij 1992: 52–55). The avoidance of the Pirahã to refer to ideas, generalizations, and abstractions does not originate in the immediacy of experience but in their developmental stage, as already Schultze (1900: 86, 91) recognized regarding other archaic peoples. It is the developmental stage below the acquisition of abstractions, such as quantifiers, numbers, and categorical color terms, as it will be described more below, that characterizes their mental state.

Everett's second main trait of IEP, the dependency of or concentration of mind on the respective presence, likewise hint at the necessity to resort on developmental psychology. Everett contends that the Pirahã more live in and mentally concentrate on *hic et nunc* than modern people do. They are neither interested in past or future but only in present incidents. Their psyche and mind are almost absorbed by the respective presence, as Everett additionally defines immediacy of experience. When they see a canoe bending around a corner and departing they react as if it goes into another dimension, Everett exemplifies this kind of mental dependency on presence. Their frequently used word *xibipio* refers to disappearance and arrival of an object within the reach of perception. They do not prepare their activities for the next day but live from one day to another without planning. Thus, their mental concentration on *hic et nunc* prevents them from planning over weeks or months (Everett 2005a: 632; 2010: 152, 196).

However, this second trait of IEP does not root in values, as Everett assumes, but in lower developmental stages of mind and reason. This appears as obvious even at first glance when considering that this second trait also characterizes the mind of children. Developmental psychology describes the mental life of young children as ruled by presence. Children tendentially neither care for past nor for future states but live in an everlasting presence. Their mind is absorbed by the just happening incidents. Therefore, it is more dependent from perceptions than from representations. The younger children are the stronger this trait mentioned prevails. The speechless children of the first stage, the sensory motor stage, lasting by the 18th month of life, are mainly characterized by this rule of presence and perception. Even children of the second stage, the preoperational stage, do not have a strong stand against the suggestibility of present incidents as modern adults

1 Piaget and Inhelder (1969), Piaget (1959), Stern (1924), Werner (1948), Luria and Vygotskij (1992), Romanes (1888).

have. Present states rather absorb their psyche and mind. The more psyche and mind grow, the higher the developmental stage of a human being, the more humans surmount the ruling power of presence by a more simultaneous consideration of past, present, and future. The mastering of time characterizes humans on higher stages (Piaget and Inhelder 1969; Piaget 1969b, 1950).

On the whole, even the first encounter with Everett's research results hints at the necessity to resort on developmental psychology and to identify psychological primitivity as the foundation of all the phenomena he presents. Rarely but sometimes Everett himself makes remarks that should have led him recognizing this apparent truth. "These properties intuitively seem like they have something in common: they all seem to be on the side of being simpler in some way than other systems. If this pattern is true, it deserves some attempt at explanation. All of these issues have simultaneously seemed related and yet puzzled me for over a decade. It was something I long felt was on the tip of my tongue but was not quite able to articulate. The IEP is the articulation of what seemed to me to be the best explanation of the facts. But the IEP was never intended to be a hard and fast deductive explanation" (Everett 2009: 434).

When simplicity is the main trait of Pirahã psyche and mind then it should be evident that not values, social structures, or immediacy of experience but lower psychological stages account to this overall simplicity. However, Everett, raised in the epoch of "universalism" and "relativism," completely rejects the idea the Pirahã could be a people staying on lower psychological stages.

No one should draw the conclusion from this paper that the Pirahã language is in any way "primitive." It has the most complex verbal morphology I am aware of and a strikingly complex prosodic system. The Pirahã are some of the brightest, pleasantest, most fun-loving people that I know... Questioning Pirahã's implications for the design features of human language is not at all equivalent to questioning their intelligence or the richness of their cultural experience and knowledge (Everett 2005a: 621, fn. 1)

He maintains the idea of their mental primitivity could be easily refuted by the recognition of their ample food and their intermarriages with other phenotypes, both appropriate to refute racial factors or malnutrition as causes to their cognitive deficiencies. Therefore, he concludes only cultural values can be responsible for their cognitive constraints (Everett 2005a: 634). He really believes that the hint at culture and values as causes to cognitive

constraints would make them irreal, as almost non-existent. "An alternative view that has been suggested by some readers of this paper, namely, that the gaps in Pirahã discussed above are a result of a lack of 'conceptual structure' – in other words, that the Pirahã are substandard mentally – is easily disposed of" (Everett 2005a: 634). On the whole, as many other relativists (Cole and Scribner 1974) do, Everett believes that the cultural explanation of cognitive deficits let them magically disappear. Culturally caused cognitive deficits or lower developmental stages are somehow unreal, Everett suggests. Instead it is apparent, however, that the cultural explanation of cognitive deficits does not only secure their very existence but also adds an explanation to them.

What we see here is an incompetence to understand and to decide whether Pirahã have cognitive constraints or not, whether they exhibit simple or differentiated forms of mind and psyche or not, whether they are humans on the same psychological level as modern humans are or not. Everett is incapable to identify the psychological structures behind the phenomena he describes and incapable to draw the proper conclusions from the data he has won.

The Cognitive-Developmental Approach as Theoretical Alternative and Solution

All the data Everett presents must be explained in terms of psychological stage structures. Moreover, psychological stage structures are the only source to the existence/nonexistence of numbers, categorical color terms, quantifiers, realistic dream concepts, etc., in the mind of humans. Therefore, developmental psychology is the single scientific branch that has the capacity to describe these phenomena. Neither normative sociology (values) nor social structure sociology (group size) are appropriate to explain the phenomena, as Everett suggests. Not one serious developmental psychologist would come up with the idea that there could exist another branch of science to describe the data and phenomena mentioned.

The idea that humans of archaic or premodern societies, of the so-called folk societies (R. Redfield), of underprivileged social milieus in developing nations, of primitive societies or the famous agrarian civilizations, stay on lower psychological stages and exhibit more primitive and simple forms of mind and reason than educated humans living in modern societies was widespread in the social sciences and in the public especially between 1840 and 1940, or between 1800 and 1970. Practically every founder of child psychology and psychoanaly-

sis and many main representatives of the early social sciences shared this idea, likewise many or most military experts, missionaries, or medical doctors working in the colonies. Especially the founders of child psychology and ethnology described the psychological parallels between children and primitives, predominantly A. F. Chamberlain, G. J. Romanes, F. Schultze, H. Werner, J. Baldwin, P. Janet, E. Claparède, M. Lombroso, and H. Wallon. The best early books with this regard came from Romanes (1888), Schultze (1900), and especially from Werner (1948 [1926]).

Jean Piaget, the most influential developmental psychologist so far, described the parallels between children and primitives right across the whole psychological life and world understanding, including logic, physics, social affairs, morals, worldview, and religion, down to the smallest details (Oesterdiekhoff 2016d). He described the human development unfolding in four stages, the sensory motor, the pre-operational, the concrete operational, and the formal operational stage. The first stage lasts up to the 18th month, the second stage dominates the psyche up to the sixth year of life, and the third stage prevails by the 10th or 12th year of life. The fourth stage, the adolescent stage of formal operations, begins with 10 or 12 years and develops stepwise during the whole second decade. Substage A of this latter stage is replaced by substage B, coming into existence with 15 roughly and increasing to the 20th or 25th year of life (Piaget and Inhelder 1969; Piaget 1950).

Piaget compared the children of the preoperational stage with the so-called primitives, living in tribal or ancient societies. This implies that he compared the developmental age of primitive adults with that of children in their years 3–7. This discovery was mainly shared by other authors such as Schultze (1900), Romanes (1888), Werner (1948), and Wallon (1928). Further, Piaget compared the Ionian philosophers with the traits of the concrete operational stage and found the breakthrough of the formal operational stage in the mind of the scientists of the 17th century (Piaget 1960, 1969a; Piaget and Garcia 1989). From that source the adolescent stage of formal operations spread right across the whole Western culture, growing from generation to generation, conquering the whole population especially during the 20th century. The recent process of modernization and globalization right across the southern hemisphere likewise implies the psychological advancement of the peoples of the developing nations.²

2 Flynn (2007), Hallpike (1979), Lurija (1982), Oesterdiekhoff (2009, 2011, 2012a, 2013a, b, 2014, 2015c, 2016a, c).

Piagetian cross-cultural psychology is the name for the branch that studied human development right across continents, cultures, and social milieus. More than 1,000 empirical studies concerning the four stages of human development have been conducted during the past 80 years, especially between 1960 and 1990. It was found that humans of all cultures develop the early stages the same way as it was described by Piaget. Every human being goes through the sensory motor and preoperational stage. However, the concrete operational stage has not the universal status as the two prior stages. Greater percentages of human beings in premodern or folk societies do not develop this stage at all, or they develop it only in certain domains but not in others. The characteristics of the formal operational stage are consequently absent in the minds of adults of premodern societies. These results concern the whole psychological life and world understanding including logic, physics, social affairs, politics, religion, law, and morals.³

Both the early research of Piaget and the Piagetian cross-cultural psychology, and before the studies of Werner especially, could not find any differences between children and primitives. The similarities between the two groups concern the whole psychological life. Every phenomenon typical for children is also characteristic for primitives. However, there are differences. Adult primitives and (ancient and modern) children share the same psychological stages and stage structures (the qualitative development) but differ in their life experience and knowledge (that does not depend from stage structures) (the quantitative development) (Hallpike 1979; Oesterdiekhoff 2009, 2011, 2016a, b, c). However, the impact of the qualitative development on mind and behavior overrides that of the quantitative one by far.

Nonetheless, primitive adult humans are defined by psychological stages of children aged 5, 7, or 10 years, respectively, while modern humans manifest developmental stages of humans aged 10, 15, 20, or 25 years, respectively.⁴ Thus, the conclusion is apparent that the whole premodern humankind stood on stages of children and that the human race stepwise climbed on higher stages over the last millennia, and especially over the last centuries and generations. To my opinion this is the greatest discovery in the history of the human disciplines.

3 Hallpike (1979, 2004), Lurija (1982), Ibarra (2007), Flynn (2007), Cole and Scribner (1974), Berry and Dasen (1974), Dasen (1977), Oesterdiekhoff (2009, 2011, 2013b, 2016a), Peluffo (1967), Ponzo (1966), Modgil and Modgil (1976).

4 Porteus (1937), Oesterdiekhoff (2009, 2011, 2016a, b), Romanes (1888).

The fact that premodern Europeans also stood on lower stages, and that different races and nations have advanced during the past few generations, convincingly disapproves of tries of racial-biological explanations to the phenomena mentioned. Therefore, the introduction of the compulsory school attendance, job enrichments, etc., have attracted and compelled modern humans to raise their stage structures. The whole power of modern culture must affect human brain and mind from the first year of life onwards in order to enable the human being to benefit from the sequential developmental windows. Only then the modern human being can develop the fourth stage of human development. All those humans who are not exposed to modern socialization conditions have not the chance to use developmental windows to that rate. Therefore, their development is arrested when they arrive the 5th, 7th, 10th, or 12th year of life, respectively. On the whole, “developmental window” and “arrested development” are the main concepts in order to understand the divergent developmental paths of premodern and modern human beings. People raised in face-to-face communities, in societies without schools or with bad curricula, and with preindustrial economies, stop earlier in their human development.⁵

Number

Next to language structures, Everett mainly refers to counting and numbers in his description of the deviating mind and culture of the Pirahã. Everett found that the Pirahã do not count anything and have no numbers at all. They never know how many things they see when they see or touch some objects. When someone shows three fingers they do not know what the person wants to say – even then when there are three objects nearby or pointed at. Moreover, adult Pirahã are not able to learn to count one to ten, or to add and subtract any numbers.

In 1980, at the Pirahã's urging, my wife and I began a series of evening classes in counting and literacy. My entire family participated, with my three children (9, 6, and 3 at that time) sitting with Pirahã men and women and working with them. Each evening for eight months my wife would try to teach Pirahã men and women to count to ten in Portuguese. They told us that they wanted to learn this because they knew that they did not understand nonbarter economic relations and wanted to be able to tell whether

they were being cheated. After eight months of daily efforts, without ever needing to call them to come for class (all meetings were started by them with much enthusiasm), the people concluded that they could not learn this material, and classes were abandoned. Not one learned to count to ten, and not one learned to add $3+1$ or even $1+1$ (if regularly responding “2” to the latter is evidence of learning) – only occasionally would some get the right answer (Everett 2005a: 625 f.).

Everett does not offer any sufficient analysis why the Pirahã are not able to count and why they cannot learn it. His quickly constructed relationship of this lack to the IEP has nothing to do with a thorough explanation to the phenomenon. His missing discussion of the phenomenon shows that he is by no means surprised by the Pirahã's inability to learn it despite eight months of daily training. He fails to understand that his description contradicts to his own theory. He maintains that IEP and lack of numbers roots in the Pirahã's values; they therefore *want* only immediate experience and *reject* any other. However, in case values would cause their number avoidance then they would not try to learn numbers. Thus, their freely chosen school attendance reveals that they estimate number knowledge very high and long for it. Although they want to learn numbers they are not able to do so. Everett clearly realizes, against his own theoretical preconditions, that the Pirahã *cannot* learn it. However, if they cannot learn it, then neither social requirements nor values can be the reason to their incompetence. Henceforth, only the psychological conditions that cause their incompetence can be the reason to their failure. Everett, however, knows nothing about these psychological conditions and he cannot even *see* the explanatory problem.

According to the relativistic and universalistic ideas, which particularly Everett and in general today's social scientists share, the mentioned fact of the Pirahã incompetence should be a clear case of impossibility. Today's social scientists should be forced to choose between an abandonment of their ideological framework or a complete ignorance of the Pirahã incompetence (and the greatest part of social reality). Of course, they choose the latter possibility. Either Pirahã have enormous mental deficits that should be studied as an extremely astonishing fact, or the phenomenon described cannot exist. As it does really exist, it is necessary to apply the scientific theory capable to explain the phenomenon. Imagine the situation where a classroom of adults tries to count $1-10$ or to add $1+1=2$ without any success during eight months. There are not stimuli strong enough to provoke the competence needed in their brains. The Pirahã try and try – and fail to un-

⁵ Hallpike (1979), Herschensohn (2007), Lévy-Bruhl (1985), Luria (1982), Luria and Vygotzkij (1992), Modgil and Modgil (1976), Porteus (1937), Scott, Fredericson, and Fuller (1951), Werner (1948), Oesterdiekhoff (2009, 2011, 2013a, b, 2015a, 2016a, b, c).

derstand tasks of this easy type, weeks over weeks, months over months. Do they understand and master anything else? Yes, they know how to use arrow and bow for fishing and hunting, to fire a shotgun, to find tracks in the forest, to kill their neighbors, to plant maize and fruits, and to use motors moving their canoes. Why is counting and adding numbers more difficult to them than the activities mentioned?

Do Pirahã suffer from dyscalculia for genetic reasons? Among other reasons there are two facts that disapprove of such a hypothesis. Firstly, most archaic people suffer from several forms of dyscalculia; some of them close to the Pirahã behavior. Secondly, Everett (2009: 437; 2012a) mentions, only within a short sentence, that Pirahã children can learn number usage. Again the phenomenon that Everett does not realize the relevance of the phenomenon that Pirahã children, but not the adults, can learn numbers when exposed to appropriate training. Everett completely overlooks the relevance of this fact and seems to take it as an irrelevant folklore phenomenon – as he seems to understand the whole issue. I will come back to the explanation of the divergent learning abilities of young and adult Pirahã later. The conclusion to be drawn right here can only be that any kind of number usage is more difficult to the adult Pirahã than the learning of the activities mentioned. It needs a very long training to master the handling of bows for fishing or to follow a beast's tracks, but the understanding of number usage obviously requires more difficult capabilities. Number usage is beyond the adult Pirahã's possibilities as it is for children below twenty or thirty months of age and for animals. These three groups, however they may differ from each other, otherwise share some psychological features that cause their common deficiency.

The understanding of numbers is not innate and given by birth. Modern children initially are unable to count 1, 2, and 3; they learn counting during their third year, and the counting principles with six years roughly (Sarnecka and Lee 2009: 326; Piaget 1965). Often the counting from 1 to 5 starts with four years of age (Stern and Stern 1987: 282). It is impossible to teach children to count before the beginning of the third year. They simply cannot learn it before this age; every effort with this regard is senseless (Stern and Stern 1987: 280). Children learn number usage stepwise after their third or fourth year of life. There are many stages in number usage and number understanding to go through only to be able to add $2+2=4$ or to subtract $2-1=1$, or to master simple additions only by head calculation without using fingers. British children, below the age of 30 or 36 months of life, are not able to identify and to

discriminate numbers. On this stage they are called "pre-numeral-knower." From that age onwards they reach the stage of being "one-knower" in case they only give one object when requested to give one object, while still not knowing how many objects they should give when requested to give two objects or more. Some months later, the child reaches the stage "two-knower" where she rightly hands over one or two objects when requested, but fails giving the right number of objects with numbers beyond two. Even if children can count up to 10, they may be still only "two-knowers," "three-knowers," and "four-knowers." Less than 10% in the age-group 2–4 are "four-knowers" (Sarnecka and Carey 2008: 664, 673). Even some children aged three are still "one-knowers." The next stage is reached when children count some objects and say the number counted, respectively the sum. Then they are "cardinal principle knowers." Prior to that, they count the objects without being able to tell the result of their counting, the sum (Le Corre and Carey 2007: 423).

Research found that there is a gap between the learning of the numbers 1–4 and the learning of higher numbers. The learning of 1–4 does not base on an understanding of the counting principles but on representations of small sets. Even "cardinal principle knowers" initially fail to estimate the cardinality of sets with more than four objects (Le Corre and Carey 2007: 428). Only when the counting principles are understood humans are able to understand greater numbers. Children understand the abstract and logical principles of counting and numbers on the third stage of psychological development, on the concrete operational stage. With six years roughly they understand that counting principles and numbers base on the unit "one" and that any number has a certain place in the row of numbers. Only then they understand that any number can be reached by the addition or subtraction of the unit "one." Therefore, only children on the concrete operational stage can add and subtract by calculations performed in their heads only, without using fingers or other supporters. Only modern children aged from six onwards understand the cardinal principles according to them 4 can equally consist of $3+1$ or of $2+2$ (Piaget 1965).

Henceforth, by using the head only, calculations, additions, and subtractions appear only on the concrete operational stage. They are manifestations of the general psychological development of the human being, exhibiting certain stages of the abstractive and logical mind. Therefore, the concrete operational number usage appears during the same developmental phase as the conservation of other logical and physical entities emerges. During the

same stage when the child understands the conservation of mass, length, weight, quantity, time, etc., she attains the level to be able to handle numbers correctly, that is, the mastering of simple arithmetic (Piaget 1965; Piaget and Inhelder 1941). Thus, number usage is not an isolated technique to learn, such as to drive bycycle or to swim or to use a borrow. It only emerges in dependence of psychological developmental stages. On the whole, the many developmental stages of number usage in children of the age 2–6 reflect enduring shortcomings in simple arithmetic and the failure to understand the very principles of counting, the system of numbers, and calculations. These shortcomings reflect preoperational stages of mind and arithmetic alike.

Most archaic or primitive cultures do not know how to count or the general counting principles and have no numerals beyond 3 or 4. Their numerals 1–4 are not real numerals but only statements about one/little or two/much or three/more else, that is, statements that do not distinguish numbers from quantity or size. These statements only discriminate little from big quantity or few from many elements but do not discriminate thereby little from few or many from much (Le Corre and Carey 2007: 433). Likewise, children do not distinguish between total surface area or contour length from number. “One” can concern little milk or little sand or one fish; “two” can concern more milk and sand or two, three or four fish (Canobi and Bethune 2008: 675; Piaget 1965).

Everett (2010: 179–187, 289; Frank, Everett, Fedorenko, and Gibson 2008: 821) found the same among the Pirahã people. At first, he thought that the Pirahã had at least the numerals one, two, and three. Then he discovered that the three words of whom he thought they were numerals only designate indiscriminately little/few, bigger/more, and a little bit more bigger/more. Thus, they take the word of which he thought it might designate “two” for numbers from two to five or more and for big pieces or tall objects alike. Accordingly, they have no numerals at all, as most other primitive cultures and small children. From most archaic and primitive cultures is known that they only have the numerals one, two, three, and seldom the four. Often the row only includes one, two, many, that is, “three” seriously only means “many/much,” as among Pirahã.⁶

Therefore, it is apparent that most of these primitive cultures with numerals one, two, and three actually have no numerals at all. Some of them could be “pre-numeral-knower” as the Pirahã are. However, as it will be shown below, most of them already stay

on the stage of being “one-knower,” “two-knower,” and “three-knower.” Everett is right when maintaining that the lack or the short list of numerals in many primitive languages or cultures does not evidence that they have the same total lack as the Pirahã have. However, the question is not yet answered whether the Pirahã are the only “pre-numeral-knower” people in the world, as Everett assumes (Everett 2005b: 642; 2009: 427; Levinson 2005: 637). Most archaic cultures or primitive peoples namely have some, however, scanty possibilities to count, usually only by using fingers. More, they have only limited possibilities to calculate if at all. Thus, their abilities stay only a little bit higher than those of the “pre-numeral-knowers” such as the Pirahã do.⁷

That primitive languages usually only have three numerals strikingly coincides with the early knowledge of children. Many authors saw the parallels between the early child’s constraint on the first three (or rarely four numbers) and the existence of the first three (or rarely four numerals) in most primitive languages.⁸ “Hurford’s argument thus suggests that the ontogenetic construction of the counting principles mirrors its historical counterpart insofar as, in both cases, the acquisition of linguistic symbols for set sizes beyond 4 depends upon the creation of the counting principles. In fact, his specific model of the historical construction process is essentially the same as the developmental process proposed here” (Le Corre and Carey 2007: 433). The idea, that children aged 3–6 have the same arithmetic procedures and capacities as primitive adult humans, was already described by Romanes (1888), Schultze (1900), Piaget (1965), Tylor (1871), Werner (1948), Hallpike (1979), and Oesterdiekhoff (2009; 2011: 76–86; 2013a: 99–114). Piaget (1965) already has identified preoperationality as the common source of these parallels between history and ontogeny.

The Bakairi, an Indian tribe in Brazil, are a good example of a people during the 19th century that had some arithmetic capacities beyond the Pirahã level. They knew the numerals one, two, and three the same way as Pirahã and most other primitive peoples do, that is, their numerals were not true numerals. They were able to count up to 5, or 10 at the maximum, but only with their finger’s support. They could not calculate at all, even not $2+2=4$ or $2-1=1$. When the Bakairi counted some pieces they always had to touch them with the fingers of the one hand, to stretch out the fingers of the other

6 Lévy-Bruhl (1985), Von den Steinen (1894), Hurford (1987), Carey (2001), Fettweis (1927).

7 Fettweis (1927), Lévy-Bruhl (1985), Hurford (1987), Gay and Cole (1967), Oesterdiekhoff (2011: 76–86).

8 Hurford (1987), Lévy-Bruhl (1985), Carey (2001), Fettweis (1927), Schultze (1900).

hand, and to say the number of the stretched fingers, respectively of the pieces counted. Relying only on touching three pieces, without stretching the fingers, Bakairi were not able to determine the number “three.” “The right hand touched, the left hand counted. Without using the fingers of the right hand counting only by looking at the corns and stretching the fingers of the left hand was already impossible with only three pieces” (Von den Steinen 1894: 408, translated by G. O.). Thus, Bakairi could neither renounce on seeing and touching objects nor on stretching fingers when they wanted to determine numbers beyond two. Bakairi could not count in case they did not see any objects. Conversely, the mere perception of three objects did not suffice to be able to determine the number “three.” When the Bakairi saw three fruits or birds they did not know that there are three fruits or birds. They had to touch them, to stretch their fingers, and to look at their stretched fingers in order to be able to know the number. On the whole, the Bakairi neither knew the counting principles nor the simplest techniques of calculations. They knew more than the Pirahã about arithmetic but only very little more, that is, they could only count to 5 or 10 and nothing beyond (Oesterdiekhoff 2011: 78f.). Children of the lower stages of arithmetic count as Bakairi do. Children who only know the numerals “one” and “two” count with stretching their fingers to objects up to 5 or 10 by reading the number from the stretched fingers (Descoedres 1921: 248). Every child starts her counting with touching objects and stretching fingers as the archaic humankind did.⁹

On the whole, children aged 2–6 run through several sequential studies in mastering arithmetic until they reach the concrete operational stage where they understand the counting principles and simple head calculation. Ethnography has shown that most primitive societies stay on arithmetical stages typical for modern children aged 2–6. The Bakairi and Pirahã represent the earlier stages, while many other primitive or premodern societies develop some higher forms of arithmetic with group numbers, body counting, and supportive media such as stones to count, etc. Most of them, however, do not reach the stage of concrete operations with its forms of calculation mentioned.¹⁰

Both Pirahã (those under guidance of Everett) and Bakairi strive to master numbers but with-

out good results. The explanation to their failure is that they do not reach the concrete operational stage of psychological development. They remain staying on the earlier phases within the preoperational stage. They do not develop the logical and abstractive competences in order to be able to understand counting and calculation. The Pirahã cannot learn numbers for the same reasons as children aged two cannot learn them. It is as fruitless trying to teach numbers to children aged two (Stern and Stern 1987: 280) as it is senseless to teach Pirahã adults. Stood Pirahã on stages of children aged five, then they would learn numbers easily even if they had never known anything about numbers before. In this case they had the mental prerequisites and cognitive capacities in order to be able to understand number usage. The distance between psychological stage and task would be easily bridgeable by some training and effort. However, the Pirahã are too distant from the necessary psychological stages to learn numbers. Therefore, the stimuli caused by Everett’s education cannot provoke the emergence of arithmetical abilities (Oesterdiekhoff 2011: 76–86; 2013a: 99–114). Interestingly, even eight months of education are not able to develop nerve cells and psychological stages to bridge the gap (Oesterdiekhoff 2015a). This evidences that the Pirahã are completely encapsulated in their developmental stages typical for children on the lower phases within the preoperational stage.

Only the theory of “developmental window” and “arrested development” can explain these phenomena. Early in their childhood the Pirahã were not exposed to cognitive stimuli that triggered the emergence neither of the concrete operations nor of the higher phases of the preoperational stage and of the corresponding number usage. Astonishingly, the developmental stage they reach in their life span is completely arrested on the low level of small children. They cannot escape from this cognitive cage, not even a little, and not even with the great efforts as actually performed. It could have been expected that they attain the concrete operational stage after months of school education, or that they learn to count after some weeks of training. However, training with adults only functions when the gap between stage and task is not too big. Therefore, “arrested development” has a total character. The lower phases of the preoperational stage imply for the Pirahã to be imprisoned in a cognitive cage with unbreakable bars. The Bakairi are not so far from this stage. They count during their life again and again, that is, they try to learn numbers but cannot surmount their scanty usage. Thus, while the Bakairi try learning numbers their whole life long

9 Oesterdiekhoff (2011: 78–85), Werner (1948), Tylor (1871), Lévy-Bruhl (1985).

10 Piaget (1965), Werner (1948), Fettweis (1927), Lévy-Bruhl (1985), Hurford (1987), Carey (2001), Oesterdiekhoff (2011: 76–86; 2013a: 99–114).

without remarkable results, the Pirahã never try to learn numbers when living in their own culture, because they even would not know what they should or could learn. In case they are forced to learn numbers the effect is the same: They do not understand anything what's going on.

However, the Pirahã children can learn number usage, as Everett (2009: 437; 2012a) reports. The reason to that is that children can use developmental windows to advance psychologically. Only unused developmental windows cause arrested developments, while plasticity of the young brain and psyche allow children to raise their anthropological stages when sufficiently exposed to qualitative stimuli. Since the 19th century experts report about the opposition between the open-minded child and the closed-minded and ineducable adult they have recognized in colonies around the world. That is the reason why children from primitive cultures, when raised in modern settlements and schools, just in time can parallel the achievements of the local residents. The Pirahã case here gives only one further example. More, the examples of number usage can be extended to all other tasks covering physics, logic, social affairs, morals, etc., as the example of the arrested preoperational stage can be extended to all other developmental stages characterizing the nations of the world.¹¹

The article here will demonstrate that the Pirahã stay on the preoperational stage regarding the whole range of psyche and world understanding, not only regarding number usage. Ponzo (1966) applied Piagetian tasks to Brazilian Indians finding them staying on the preoperational stage. The scrutiny of their mental concepts and their worldview shows the far-reaching resemblances to the cognitions of children aged 3–6 as I showed with regard to Bakairi and some other tribes (Oesterdiekhoff 2015b). Romanes (1888) discovered already in 1880 and 1888 that some tribes really stay on stages of children aged 30 months, that is, on stages of children staying on the earlier phases of the preoperational stage. Romanes already knew that some tribes have no number knowledge at all, similar to children aged below 30 months and animals. He described at length the parallels between children of this age and primitives and scrutinized the psychological preconditions to the emergence of numbers. He already had the psychological instruments to an-

alyze these phenomena Everett and his opponents do not have at hand 120 years later.

Arrested Development and Educability

It is obvious that when adult Pirahãs are not able to learn numbers then they will not be able to learn most things that are taught at school. Then they can learn only practical things like hunting and fishing, farming and cooking, but not any systematic and comprehensive subjects such as geography, physics, chemistry, history, foreign languages, literature, etc. In fact, they are known as the only monolingual ethnicity in the world. Although they have been having some cultural contacts with Portuguese-speaking people and speakers of other Indian languages for centuries, no Pirahã ever learnt one of the foreign languages (Everett 2009: 429 f.).

The Everett jungle school tried to teach the Pirahã not only maths but also other subjects, without any success.

If one tries to suggest (as we originally did, in a math class, for example) that there is a preferred response to a specific question, they will likely change the subject and/or show irritation. They will “write stories,” just random marks, on paper I give them and then “read” the stories back to me – telling me something random about their day, etc. They may even make marks on paper and say random Portuguese numbers while holding the paper for me to see. They do not understand at all that such symbols should be precise (for examples, when I ask them to draw a symbol twice, it is never replicated) and consider their “writing” exactly the same as the marks that I make. In literacy classes, we were never able to train Pirahã even to draw a straight line without serious “coaching,” and they were never able to repeat the feat in subsequent trials without more coaching (partially because they saw the entire process as fun and enjoyed the interaction but also because the concept of a “correct” way to draw was profoundly foreign) (Everett 2005a: 626).

Of course, they cannot learn reading or writing at school. They usually only draw rings on sheets and avoid writing other symbols or signs. They make these rings in case they are requested to copy some writing from other papers, or in case they are requested to write anything. Thus, they write any stories by making endless rows of rings. Astonishingly, they always maintain that their rings are exact copies of the tasks or originals requested. Or, when requested to read their rows of rings they tell any story they want, thereby demanding that they would only say what they have written. They do not see any difference between Everett's original writings and their copies, consisting of rows of rings (Everett 2008:

¹¹ Herschensohn (2007), Lurija (1982), Lurija and Vygotskij (1992), Modgil and Modgil (1976), Porteus (1937), Scott, Fredericson, and Fuller (1951), Werner (1948), Oesterdiekhoff (2009, 2011, 2013a, 2013b, 2015a, 2016a, 2016b, 2016c).

117f.). It is absolutely clear that such people are not educable, not even for the first class of primary schools. They react at any school tasks like children aged three who are only capable to play in kindergarten. Even modern preschoolers aged four learn better in kindergarten than the adult Pirahā at Everett's jungle school. Piaget (1959) called this tendency among children "Mir-ist-Wurstismus."

Lurija (1982) found among Kashgar people in Usbekistan 1932/1933 great percentages of people that also were unable to concentrate on the simplest school tasks, always taking the tasks as starting points for telling some stories only weakly connected to the task. Lurija compared that task behavior with that of mentally handicapped persons. During the colonial times it was a frequent experience that illiterate adults fall into sleep or get headaches when exposed to any school or abstract tasks while being refreshed again when entertained by a story (Lévy-Bruhl 1923; Oesterdiekhoff 2012a: 121–123).

However, it is clear that, about 1932, both Kashgar and most other illiterate people performed better than the Pirahās. I estimate that they could draw a straight line the Pirahās could not learn despite of eight months' training (Everett 2005a: 626; 2010: 182). Note the preconditions necessary to be unable to draw a straight line, as apes or children aged two are unable to do. Apes and younger children do not have the mental prerequisites to draw a straight line. Among other preconditions, it is necessary to refer the left end of the line to the right end, to overtake a perspective and to have the insight into the nature of a straight line differing from any unexact lines. Modern children have the mental prerequisites to draw a straight line with four years of age roughly (Piaget and Inhelder 1967). On the whole, there is a direct relationship between Pirahā's incompetence to draw a straight line and their missing number competence.

Porteus (1937) found that numerous indigenous cultures around the world were not educable at all, not even for the first classes of primary school. The intelligence tests he made with indigenous people across the continents showed that the intelligence of many or most indigenous people was too low in order to enable them to visit primary schools successfully. This seems to be astonishing, considering that most ethnicities of the world today visit schools. Today we consider illiteracy as caused by poverty and not by low/minimal intelligence. The Pirahā case, however, teaches us that one hundred years ago many indigenous people had a lower intelligence than they have today. On the whole, all those indigenous peoples that stood on psychological stages of children younger than five years were

not educable in the same way as is the case with present-day adult Pirahā. The number of such peoples could have been much greater than today. The southern hemisphere enjoyed from the grown intelligence nearly to the same rate as the northern hemisphere during the past hundred years. Therefore, we have to go now into remote jungles in order to find peoples that reflect psychological stages that were more common a hundred years ago. Thus, Porteus' analysis does not reflect colonial myths but widespread realities nowadays diminished.

On the whole, the impossibility to teach adult Pirahā on a primary school level proves of the fact that their psychological stage is lower than that of modern children aged five or six. Their school behavior documented reflects the psychology of children aged three roughly. Consequently, the adult Pirahā transform their jungle school into a real kindergarten. They would feel better in a real kindergarten than in a primary school that is too hard and demanding for their souls and minds. The fact of uneducability of adult Pirahā proves of the rightness of my analysis both of their number incompetence and of their psychological stage position. "[T]heir motivation for attending the literacy classes turned out to be, according to them, that it was fun to be together and I made popcorn" (Everett 2005a: 626, fn. 9).

Color Terms

Everett discovered that Pirahā do not have categorical terms for the colors such as yellow, green, blue, and red. They only know color terms such as "looks like a leave or like a banana." Everett explains the lack of the categorical terms with the IEP because he believes that immediate experience does not know yellow, green, blue, and red but only banana-colored or leave-colored objects, etc. Thus, Everett (2008: 119f., 220–222; 2005a: 622, 627) links the lack of categorical color terms to the lack of numbers and any other abstractions.

Again, Everett does not put this fact into relation with the scientific branch that studies such phenomena, which are well-known in developmental and cross-cultural psychology. Most primitive cultures and languages do not have the categorical color terms but use instead the so-called visual-graphic terms such as "fox-colored," "peach-colored," or "brick-colored."¹² The reason to that is not the IEP but the missing level of abstractive mind that is requested to recognize the categorical color terms. For

¹² Lévy-Bruhl (1985), Lurija (1982), Werner (1948), Oesterdiekhoff (2011: 64–66), Levinson (2005: 637).

example, the illiterate test persons among the Kashgar sample of Lurija used the visual-graphic terms while the educated test persons applied the categorical color terms (Lurija 1982: 25–29). Likewise severely mentally handicapped persons only know visual-graphic terms, just as younger preschool children do in modern culture. The transition from visual-graphic to categorical color terms is, therefore, observable in the psychological development from younger to older preschool children. Thus, psychological development and not social values or immediate experience explain the lack and existence of categorical color terms alike (Oesterdiekhoff 2011: 64–66, Werner 1948, Lurija 1982).

Dreams

Everett found among the Pirahā a totally different understanding of dreams compared with that of modern culture. Pirahā take dreams as perceptions of real objects and incidents and not as products of illusion and imagination. “I came eventually to understand that *xaipípai* is dreaming, but with a twist: it is classified as a real experience. You are an eyewitness to your dreams. Dreams are not fiction to the Pirahās. You see one way awake and another way while asleep, but both ways of seeing are real experiences” (Everett 2008: 131). Thus, the Pirahā believe to perceive real incidents in their dreams or to take action as real participants in their dream stories. Everett explains the origination of this phenomenon in terms of the IEP. Pirahā do not recognize imaginations but only perceptions, that is, real incidents. Therefore, they interpret ideas, illusions, and imagination, including dreams, as perceptions of real life incidents.

This fact is well-known in ethnography. Right across the continents, primitive peoples have recognized dreams as perceptions of real incidents. They discriminate dreams from perceptions but understand them only as another kind of real life and of perceptions. Therefore, they continue in real life actions that started in dreams. They dream of a murder and arrest the alleged murderer the next day in real life. They dream of sex with a girl and try to continue the encounter next day, etc.¹³

The realistic understanding of dreams does not root in IEP but in lower psychological stages. Developmental psychology has described that initially young children have no subjective concept of

dreams but understand dreams as real life incidents. Children believe to visit in their dreams the places dreamt of or to perceive the incidents dreamt. This phenomenon called conceptual realism is the stronger the younger the child is. Children aged three discriminate less dreams from real life incidents than children aged seven. The realistic dream understanding diminishes after the fifth year and has almost disappeared with ten years. Modern children aged ten or twelve years of age know about the merely subjective character of dreams (Piaget 1960; Kohlberg 1974).

Language

Everett’s prominent subject regarding the description of the Pirahā concerns his description of their language. He found some remarkable characteristics that discriminate this language from most other languages and from all those frequently spoken today. According to Everett, this language does not know the technique of embedding a sentence or phrase into another sentence. More broadly, Pirahā language does not know recursion, the ability to put one unit into another. For example, Pirahā language does not know sentences such as “I eat the bread that I bought yesterday.” This sentence actually consists of two sentences Pirahā language cannot create. Therefore, Pirahā sentences cannot surpass certain limits of length. The average sentence length amounts only 5.9 words (Futrell et al. 2016: 5). It mainly consists of the grammar elements subject-object-verb connected by this sequence and cannot be extended by means known in other languages. Every sentence includes one and only one assertion. Everett adds that Pirahā language might have no syntax at all, that is, no strict word order within a sentence.

A final possibility is that Pirahā grammar simply fails to provide for structure in sentences. There would be no recursion because in effect there would be no phrases, only words placed side by side and interpreted as a sentence.

Without syntax, Pirahā’s grammar would lack verb phrases, noun phrases, embedded sentences, and so forth. In fact it does seem possible to interpret all Pirahā sentences as beads on a string, with no need for more complex structure of the type that phrase structures would predict. A sentence would be simply the list of words needed to complete the meaning of a verb, plus a minimum of modification, usually no more than one adjectivelike or adverblike modifier per sentence. Pirahā would lack syntax, in my rather extreme view, to guarantee that nonassertions do not appear within declarative sentences, in violation of the IEP. The IEP allows declarative clauses to contain only assertions. Therefore the IEP constrains the grammar of Pirahā (Everett 2008: 236).

13 Lévy-Bruhl (1923), Lurija and Vygotskij (1992), Hallpike (1979), Werner (1948), Von den Steinen (1894), Oesterdiekhoff (2009: 181–187; 2011: 91–96; 2013a: 121–129).

Therefore, Pirahã language does not know subordinate clauses of any kind, reported speech (“he said I’m going”), relative clauses (“the food that the man devoured”), sentential complements such as that (“I dreamt that …”), embedded possessives (“the woman’s sister’s husband”), adverbials (e.g., “because, although, after”), coordination (e.g., “and”), and disjunction, (e.g., “or”). Pirahã language does not have plural or the distinction between singular/plural. It has no passive constructions but only active verbs. It has no intensional verbs (“I know that I am right”) and it has no comparatives (“this is bigger than that”). Several tenses such as future II, perfect, past perfect, and conditional I and II are missing. The tenses are predominantly present, followed by past and future I (Everett 2009: 435).

Again, Everett maintains that social values supporting the IEP caused the language structures. He sees culture and values as direct causes to Pirahã grammar and language, thus deviating from Chomsky’s universal grammar theory that recognizes recursion as universal feature to all human languages.

The statement is positive because Pirahã imposes and enforces a cultural value on its grammar. It is not, again, simply that Pirahã accidentally lacks recursion. It doesn’t want it; it doesn’t allow it because of a cultural principle … The prohibition against abstractions and generalizations of the immediacy of experience principle is a very narrow prohibition (Everett 2008: 237).

Everett’s idea, social values caused IEP and the simple language structures, seems to be wrong even at first glance. It makes much more sense to assume that the simple language structures originate in simple structures of mind and reason, in lower stages of psychological development. The human mind staying on lower psychological stages is not capable to come to terms with more complicated grammar structures. The human mind staying on stages of very young children develops only constrained forms of grammar and language. Thus, the peculiarities of the Pirahã language do not originate in the free choice of the people, in their values, as Everett supposes, but in the necessities and constraints the psychological stage structures impose on the abilities to develop language structures. A human mind with limited cognitive possibilities produces a language with limited grammar possibilities. The lack of syntax and word order, of embedding and recursion, of abstraction and generalization, does not root in prohibitions, as Everett writes, but in intellectual constraints and borders made by very low developmental stages. Higher forms of grammar are not prohibited because unwished; instead, they simply

are impossible for people staying on a stage so low. Thus, Pirahã grammar comes from necessities and constraints and not from possibilities, choices, and values.

Even at first glance, this fact explains why not one Pirahã ever spoke using Portuguese grammar. In cases Pirahã have ever spoken some Portuguese words then always in the frame of Pirahã grammar. Pirahã necessarily force Portuguese words into Pirahã grammar. They simply cannot learn Portuguese language and grammar. “No one has communicated successfully with the Pirahãs using normally spoken Portuguese” (Everett 2009: 430). Henceforth, this fact explains why Pirahã are said to be the only people in the world that is monolingual (Everett 2008: 20, 129; 2005b: 644; 2009: 429 f.). “The only completely monolingual community I have ever known are the speakers of Pirahã, a small group of about 300 people who live in the Amazonian rain forest” (Ladefoged 2005: 154). The only reason to that is that Pirahã cannot learn languages with more difficult grammar structures due to their low psychological stage. Stimuli coming from more complicated grammar structures such as Portuguese language cannot arouse in the adult Pirahã mind abilities that may enable them to elaborate full grammar structures. Henceforth, they speak Portuguese words in the frame of Pirahã grammar.

This article here outlines that the lower phases within the preoperational stage explain Pirahã psyche, mind, behavior, culture, and language. Therefore, it is necessary to compare Pirahã language with that of (modern) younger children. The language of (modern) children has two roots, their developmental stage and the language and culture with which they grow up. (Modern) children stepwise learn the adult language according to the stages they stay upon. They assimilate the full grammar language to their lower stage structures, respectively. Sucklings do not speak at all, like animals. Then children during their first years continuously elaborate language structures until they are able to master their mother tongue as good as adults do. (Modern) children aged three do not master grammar and language as competent as adolescents and adults do. The fact that adult Pirahã stay on psychological stages of younger children gives first indications of the necessity to compare Pirahã language with that of (modern) children. Interestingly, neither Everett nor his followers and opponents came up with this idea, recognizing the necessity to conduct this comparison and to refer to the developmental psychology of language acquisition as possible or necessary reference frame. As far as I know, I am the first to exert this comparison.

The study of language acquisition of children is a huge and experienced research branch. Several linguists and child psychologists have presented some interesting developmental stages of language acquisition I am going to present here as a first step of conducting the comparison.

Clara and William Stern (1987: 150) presented a stage theory of language development in their famous book on children's language.

- a) The first stage with some understanding of single words lasts to 1.6 years of age.
- b) The second stage consisting of one-word and two-words sentences starts with 1.6 and ends with 2.0 at the average.
- c) The third stage starts with 2.0 and ends with 2.6 commonly. For the first time, this stage enables flexions of all kinds. Conjugations, declinations, and comparatives develop simultaneously during this stage. However, the syntax yet does not know subordinate clauses. It only makes possible the forming of main clauses. (This stage matches to the Pirahã language.)

d) The fourth stage comes into being with 2.6 roughly. Now the children learn subordinate clauses, that is, embedding and recursion. They surmount paratactical coordination of main sentences by hypotactic co-ordination of main clauses with subordinate clauses.

Johansson's (2005: 235) stage theory contains five stages of language development.

- a) One-word stage.
- b) Two-word stage.
- c) Hierarchical structure, but without embedding and recursivity, and without subordinate clauses. (This stage matches to the Pirahã language).
- d) Syntax with recursivity and embedding.
- e) Full grammar.

Wood's (1981: 114–116) stage theory defines six stages.

- a) Stage of basic relations. Two word-stage. Example: "Mother laughs."
- b) Stage of modulated relations. Sentence is established. Example: "Suzie is playing blocks."
- c) Stage of simple sentence modalities. Establishment of questions and negative phrases. Sentences have a length up to seven words. Examples: "The girl hugged her teddy bear. What can we feed here?" (This stage matches to the Pirahã language.)
- d) Stage of advanced sentence modalities. Emergence of subordinate clauses and indirect questions. Example: "The dentist that I know best is my uncle."
- e) Stage of categorization. Discrimination of singular and plural. Emergence of either – or. This stage appears with five years of age.

- f) Stage of complex structures. Full grammar. The stage unfolds in children five to ten years of age.

Even at first glance the parallels between certain stages of (modern) children's language development, on the one side, and the Pirahã language, on the other side, are clearly identifiable. The Pirahã language corresponds to the stage c) of the three models. According to the model of William and Clara Stern, the stage c) starts with 2.0 years of age and ends with 2.6, that is, with 30 months of age.

According to these research results it is quite clear that the Pirahã language does not reach the stages of language acquisition (modern) children achieve during their fourth and fifth year. Pirahã people simply do not run through all the stages modern children go through during their preschool time. Instead, adult Pirahã master and manifest a kind of grammar and language that is typical for children during their third year. The parallels to the psychological stage positioning regarding number usage, color terms, myths, and dreams are obvious.

Of course, the parallels must not concern every detail. This is not possible because modern children are exposed to learn a full grammar language made by people staying on comparably very high stages. "It is apparent that the language community in which the child finds itself must play a decisive role in language acquisition" (Hill and Arbib 1984: 293). Therefore, modern children are exposed to quite different stimuli, more provoking and attracting stimuli, than Pirahã people. Pirahã people learn children's language only to a certain extent, because their mother tongue, their parents, and ancestors never had anything else than a children's language on an intermediary stage. More, the ultimate causes to the Pirahã language constraints are to find in the psychological stage development and not in language structures themselves. Conversely, while modern children aged two or three have only one year time to establish a certain stage, Pirahã remain staying on their low stage of language acquisition their whole lifetime. They never learn number usage nor sentences with recursion and embedding, that is, the language typical for modern children aged four and five years. Both the commonalities and differences of Pirahã language and the language of modern children are understandable against this theoretical background.

Modern children develop the full grammar language because they are exposed to it during their youth, so that they can use and must use the sequential developmental windows. Pirahã, however, do not develop beyond the third year and beyond the lower stages of language development, because their culture and language does not demand them to

advance beyond. They do not receive the required cognitive stimuli and language stimuli that could provoke them to use any developmental windows beyond. They are neither forced nor attracted to establish higher cognitive and grammar structures, becoming victims of arrested development and closed developmental windows very early. Therefore, they cannot learn full grammar, e.g., Portuguese grammar, later in their life.

The transition from the non-recursive language to recursive language in children depends from cognitive advancements, Hill and Arbib maintain.

There are several ways that the template grammar might evolve into a recursive grammar – and these pose a challenge for further modelling. An illustration is the use of repeated adjectives. The child may talk of a “big, big balloon,” or a “big, big, big balloon,” or a “big, big, ... big balloon.” Once a child attains the (unconscious) realization that there is no limit to the number of “big’s” he or she may use, then this fact must be reflected in the child’s grammar. Now the child has need of an altered template form which can permit recursion (Hill and Arbib 1984: 291).

This fact explains the link between the lack of more than one adjective accompanying a noun and the likewise flat or template structure of grammar in Pirahã language. Moreover, it explains that the same developmental transition that explains the transition from non-recursive to recursive language in children once appeared in human history. Therefore, only arrested cognitive development is able to explain the patterns of Pirahã language.

Language acquisition in children depends on brain development, genetic control, developmental window, and environmental stimuli. The brain area responsible for phonemes, namely the left perisylvian area, myelinates during the first year. The brain areas responsible for syntax and grammar, Broca and Wernicke, develop during the second year (Herschensohn 2007: 192, 217). These developments are controlled by certain genes that activate developments during certain critical developmental stages. Different circuits are activated during different periods to enable the sequential developmental stages. Most of syntax and grammar are achieved during the years two to four, meanwhile the left brain hemisphere gains control upon language acquisition (Herschensohn 2007: 20, 63). “Unlike chimps, under normal circumstances children by the age of four years have mastered their native morphosyntax, phonology and core vocabulary” (Herschensohn 2007: 65). “The core period for the development of grammar is principally birth to five years; vocabulary continues to be added throughout

life” (Herschensohn 2007: 66). Especially between the months 21 and 27 language develops more than in the succeeding eight years altogether (Bickerton 1988: 100). Vocabulary and semantics are learned throughout the whole lifetime because the corresponding brain area maintains its plasticity lifelong. While grammar has to be developed by the fifth or sixth year due to their dependence of the Broca and Wernicke centers, vocabulary can be learned during decades because the prefrontal cortex is the brain area responsible for the learning of words (Herschensohn 2007: 192).

Without exposure to language and culture during the critical years up to five, the Broca and Wernicke centers do not develop sufficiently. It is very difficult or almost impossible to learn full grammar and language in case the developmental windows and developmental years are not used. All those persons, who grew up isolated, are not able to develop later in their life any language at all, or only scanty language of the two-word stage or the main sentence-stage (Herschensohn 2007: 80–90; Bickerton 1988: 93). The resemblance with certain Broca’s aphasia syndromes and Pirahã grammar are not by chance (Herschensohn 2007: 1–20).

The contention that children learn grammar and syntax by their fifth year is not new but was held already generations ago.¹⁴ This is astonishing because one could assume that adolescents aged 16 are better in grammar than children aged seven. However, research found that modern children aged six have already established the full grammar structures including all tenses and syntax structures. Against this background it is beyond any doubt that the Pirahã language is only explainable by considering the connection of an insufficient environment (primitive adult language, primitive culture, and low psychological stage of people), lack and insufficiency of stimuli, unused developmental windows in the development of Broca and Wernicke and of brain and mind, and, therefore, an arrested development of brain, mind, and language on a very early stage.

Modern children develop sentences with subordinate clauses with roughly 30 months for the first time (Stern and Stern 1987: 58, 150, 208; Wood 1981: 114–116). Younger children only know main sentences as the Pirahã.

The template grammar is a flat grammar, while adult grammar is both hierarchical and recursive. Since the model only attains the language level of a 2-year-old speaking in four- or five-word sentences, it has no need of a recursive grammar (Hill and Arbib 1984: 291).

14 Wood (1981: 114–116), Ament (1902), Stern and Stern (1987: 150), Herschensohn (2007: 63).

Pirahã sentences have upper bounds to sentence size. “The boundedness is principled, producing a maximum phrase consisting of the verb’s lexical frame plus as much as one modifier word per constituent of the phrase and up to one prepositional adjunct phrase” (Everett 2012b: 558).

Pirahã cannot say: “Hey Paitá, bring the nails that Dan bought yesterday.” Instead, they say: “Hey Paitá, bring some nails. Dan bought these nails. They are the same.” They cannot say: “The man who caught the fish is in the house.” Instead, they rather say: “The man is in the house. The man caught the fish. He is the same” (Everett 2008: 226 f.). Pirahã cannot form sentences such as “John and Bill came to town yesterday.” They must say: “John came to town yesterday. Bill came to town yesterday.” Pirahã language has no sentences such as “Bill ran and Sue watched or Sue ran and ate” (Everett 2008: 237). This Pirahã pattern corresponds to that of modern children younger than four years. Children aged four understand for the first time sentences such as “the boy ran and fell” or the “the girl petted the dog and the cat” (James 1990: 91).

Pirahã also know only one possessor in a sentence. They cannot say: “The dog’s tail’s tip is malformed.” They say instead: “The dog’s tail is bad, on the tip” (Everett 2008: 235). Accordingly, they cannot say: “The dog is dark and tall or the animals are dark and big” or “The animals are dark or white.” Pirahã cannot express conjunction and disjunction. A sentence such as: “Well, then I and the big Brazilian woman disappeared” is said this way: “Well, me, the very big foreigner went away.” Or a sentence such as: “He and his relatives were fishing for piranha” is said this way: “He, his relative, is also searching for animals” (Futrell et al. 2016: 16 f.). They cannot say: “I had some meat, chicken or pork.” “Pirahã lacks disjunction because it, like coordination, requires putting phrases inside of other phrases – recursion. The Pirahãs would say, for example, rather than “Either Bob or Bill will come,” something like “Bob will come. Bill will come. Hmm. I don’t know” (Everett 2008: 237). Either/or constructions appear among children only at five years, when staying on the fifth stage of language development according to Wood (1981: 114–116).

Accordingly, Pirahã do not add two or three adjectives to a noun. It is impossible to say “Many big dirty Brazil nuts.” It would be necessary to formulate paratactically: “There are big Brazil nuts. There are many. They are dirty” (Everett 2012b: 560). The same procedure is found among very young children (Hill and Arbib 1984: 291 f.).

Reported speech is a form of embedding, in which a sentence entails records of other sentences.

Pirahã do not express direct and indirect quotations. They neither say “He said I’m going” (direct quotation) nor “He said he was going” (indirect quotation) (Futrell et al. 2016: 10–12). A sentence such as “As I dreamed I and the Brazilian woman were there” would be said this way: “The foreign woman was there. I began dreaming” (Futrell et al. 2016: 13).

Pirahã do not have intensional verbs such as “want,” “desire,” “believe” to introduce a sentence. They do not say: “I believe you are right.” A sentence such as “I am not ordering you to make an arrow” is said this way: “I am not giving you an order. Make an arrow!” (Everett 2009: 408). They do not say: “I remembered to close the door” but instead “I remembered it. I closed the door” (Nevins, Pesetsky, and Rodrigues 2009b: 371).

Further, they do not have adverbials. They cannot say: “After John arrived, the party began.” Nominalizers and complementizers are missing too. A sentence such as “That he is not ignorant is certain” is said this way: “He is ignorant. Certainly not” (Futrell et al. 2016: 15). A similar situation exists with temporal clauses. “When I finish eating, I want to speak to you” is said this way: “I finish eating. I speak to you.” The sentence: “If it rains, I will not go” is said: “Raining I go not.” The sentence: “The woman wants to see you” is said: “Woman she you see want.” A question such as “Whose son’s daughter is that?” is said: “Who son daughter that true” (Everett 2005a: 628–630). Modern children use the word “because” at the age of seven, the words “although” or “nonetheless” at about 10 years (James 1990: 137; Piaget 1959).

It is not possible for Pirahã to express long-distance dependencies such as “Ann, I think he told me he tried to like ...” (Everett 2012b: 560; 2012a), nor are younger children able to do (Wood 1981; Johansson 2005).

When exposed to full grammar sentences Pirahã do not understand them. Therefore, it is necessary to transform them in Pirahã grammar. The Pirahã did not come to terms with Everett’s translation of Mark 1, 3 from the Bible:

“John, the man that put people in the water in order to clean them for God, that lived in a place like a beach with no trees and that yelled for people to obey God.” The Pirahãs rejected every attempt until I translated this as: “John cleaned people in the river. He lived in another jungle. The jungle was like a beach. It had no trees. He yelled to people. You want God” (Everett 2012b: 558).

Modern, very young children and Pirahã share the telegram style of language and speech (Herschensohn 2007: 47).

During the same time children start counting,

they start introducing plural forms. Before then, they use words without the differentiation of plural and singular, as well as our words “milk” or “sand” are neutral against this discrimination. Child psychologists explain that the emergence of plural and counting is connected to each other because both characteristics depend on the development of the capability of abstraction (Stern and Stern 1987: 196). Correspondingly, Pirahã language has no plural. Interestingly, Everett, although not knowing and referring to developmental psychology, likewise emphasizes the connection of counting and plural. He sees the common reason for the lack of counting and plural in the lack of any abstractions, too (Everett 2010: 289).

Modern children learn to understand the “passive” form only with five years of age (James 1990: 87). Before then, they only form active verbs and active constructions. With five years they initially only understand those passive forms such as “Donald was hit by Mickey” and not yet “Donald was liked by Mickey.” Even children aged seven only rarely use passive sentences (James 1990: 87, 135). Pirahã language likewise does not know passive verbs and passive constructions, as some other primitive languages, too (Everett 2008: 222 f.; 2012a).

Pirahã language, like most primitive languages, never uses comparatives (Everett 2010: 47; Schultze 1900: 77). They cannot say “Y pays more than X” or “A studies more than B.” They must say “Y pays much. X pays little,” and “A studies much. B studies little” (Nevins, Pesetzk, and Rodrigues 2009b: 371). Likewise very young children never use comparatives as child psychology found out (Piaget 1959; Piaget and Inhelder 1941).

More, Pirahã speeches and conversations are full of repetitions as is the case with children’s verbal statements and conversations. The tendency to repetitions sharply diminishes when children are between two and five years of age (Stern and Stern 1987: 198; James 1990: 117). Everett explains the high frequency of repetitions with the necessity to ensure the mutual understanding with regard to the noise made by animals in rain forests. In case this would be true, then New Yorkers would have adapted their speech behavior during the past 100 years. However, they have not increased repetitions in conversations. Therefore, Pirahã’s tendency to numerous repetitions during their speech I ascribe to mental deficiencies, being typical for very young children and Pirahã alike (Everett 2010: 192; 2008: 127).

On the whole, it is apparent that the difference between a full grammar language and the Pirahã language is explainable in terms of developmental

differences. The commonalities between the Pirahã language and the language of modern children below their fourth year are striking. Therefore, developmental psychology explains both the psychological structures of the Pirahã people generally and their language structures specifically (cf. Table).

The History of Language

Although Everett repeatedly emphasizes the unique character of Pirahã language at certain publications he does not exclude similarities with other primitive languages at other pages or publications. For example, he writes that Pirahã share the lack of plural with archaic or ancient languages. Or, he mentions the possibility that languages in history could have also lacked recursion (Everett 2010: 289, 347, 356). Obviously, many primitive languages still spoken today do not have recursion and embedding, missing any kind of subordinate clauses and corresponding features.¹⁵ Even Black Australian and Papua New Guinea languages are said to lack recursion and embedding (Levinson 2005: 637; Dixon 1995). Stern and Stern (1987: 324, 208) emphasized that many primitive languages have no subordinate clauses as well as children, thereby contending the existence of parallels between the language of children and the recent history of some languages. Moreover, most other primitive languages and cultures do not know categorical color terms and numerals or concrete operational number usage.¹⁶ Primitive cultures always have realistic dream understandings. Nonetheless, the total lack of counting and the extreme paucity of myth and religion seem to evidence that the Pirahã people belong to the simplest and most primitive peoples ever described, surely more archaic and elementary than the Black Australians with their more complex social structure and rich mythology.

Since the time of the dominance of Chomsky’s universal grammar theory it has been a taboo to see developmental differences between different languages. This taboo prevails until today, at least regarding the differences between languages spoken by today, or even between languages spoken in the last millennia. “One of the dubious truisms enshrined in the textbooks is that all human languages are equally complex and equally expressive,” rightly complains Levinson (2005: 638), who believes Pirahã language might express earlier historical stages of language. In fact, linguists of today usually do

15 Berlin (2005: 635), Newmeyer (2002), Mithun (1984).

16 Levinson (2005: 637), Nevins, Pesetzk, and Rodriguez (2009b: 385 f.), Le Corre and Carey (2007: 433).

<i>Hic et nunc</i> Consciousness	(Modern) Children	Pirahā
Not any number understanding	Children below 30 months of age	Pirahā
Cannot draw straight lines	Children below four years	Pirahā
Not educable on first class primary school level	Children below four years	Pirahā
Visual-graphic color terms only	Children below four years	Pirahā
Quantifiers such as “all” or “some” are missing	Children below four years	Pirahā
Realistic dream understandings	Children	Pirahā
Belief in ghosts	Children	Pirahā
Scanty religious ideas and scanty interest into myths	Children below three years	Pirahā
Strict word order in phrases is missing	Children below three years	Pirahā
Telegram style of sentences	Children below three years	Pirahā
Main sentences only, without recursion and embedding	Children below three years	Pirahā
No subordinate clauses of any kind	Children below three years	Pirahā
Disjunctions and conjunctions such as “or” or “either – or” missing	Children below three years	Pirahā
Not two nouns in one phrase such as “Heinz and Peter go to bathroom”	Children below three years	Pirahā
Not more than one adjective added to a noun	Children below three years	Pirahā
Passive missing	Children below five years	Pirahā
Plural missing	Children below three years	Pirahā
Comparative missing	Children below three years	Pirahā
Most tenses are missing	Children below three years	Pirahā
Many repetitions	Children below five years	Pirahā
Some phonemes are still missing, both syllables and vowels	Children below five years	Pirahā
Preference of concrete to abstract words	Children	Pirahā

Table: Some Main Resemblances between Children and Pirahā (Archaic People Generally).

not discuss developmental differences between the thousands of languages known today, or any differences between languages of native peoples and advanced peoples.

Considering that a hundred years ago many more primitive peoples than today had mental characteristics such as the Pirahā have, realistic dream understanding, lack of categorical color terms and operational number usage, non-recursive language, etc., we can imagine that the Pirahā language was more widespread 200 years ago, 2,000 years ago, and especially 10,000 years ago. It is thinkable that Pirahā culture and language was the human standard

10,000 years ago. It is even thinkable that half of the globe 5,000 years ago was peopled by cultures of the Pirahā type.

Obviously, many languages, for example, the Indo-European languages, have developed full grammar structures at certain times in prehistory. Possibly the transformation of the Indo-European languages from the Pirahā grammar to full grammar happened not so far away in history, maybe 5,000 years ago. In any case, Sanskrit, Latin, and Greek languages have been full grammar languages for some millennia. Against the research result of Herschensohn and other authors, a psychol-

ical development of two or three years more, the psychological developmental stage of a child aged five, would have sufficed to cause the transition from Pirahã grammar to full grammar in Europe's prehistory roughly 5,000 years ago. What we can learn from Piagetian cross-cultural psychology is that most recent primitive peoples stay on psychological stages of children aged three to eight.¹⁷ All those peoples that stay on stages of children five to seven have automatically developed a full grammar language. As the cultures of India, Near East, and Southern Europe considerably advanced during the past 5,000 years, the psychological development of their people as well advanced accordingly. The cultures of Mesopotamia, Egypt, North India, and the Mediterranean developed strongly and exceeded that of the Pirahã by far, therefore, their psychological development reached that of children aged four to eight roughly some thousand years ago.¹⁸ That is the reason why the Greeks even at the time of Homer spoke a language that already had full grammar characteristics, and why the Greeks at the time of Homer were culturally much more developed than the Pirahã of today.

Conclusion

It is clear that only developmental psychology can explain the main characteristics of Pirahã language, mind, and culture. Only with this theory it is possible to explain traits such as missing number usage, missing categorical color terms, missing quantifiers, realistic dream understandings, paucity of myth and religion, complete uneducability, and a language without recursion, embedding, passive, and plural. To the most important facts raised by this research is added that adult Pirahã cannot even learn to count 1–10, or to add $2+2=4$, or to draw a straight line even when trained over eight months on a daily basis. It is remarkable that the facts of arrested development on the preoperational stage and of a closed developmental window has this total character unbreakable by that amount of education as actually applied. This fact belongs to the most astonishing data ever discovered in the history of the human disciplines.

Breathtaking is the proof that the Pirahã language matches to stages of modern children's language during their third year. Children aged five

have already a full grammar language that surely did evolve late in the history of the race, as did psychological stages of children aged five in the human race. Present-day linguists usually follow Darwinian approaches when discussing evolutionary mechanisms steering language developments. Linguists are recommended to resort to developmental approaches close to my theory when discussing language evolution. This article here evidences the superiority of the developmental approach to the explanation of language evolution. Language development follows psychological stage developments as already Piaget had argued against the universal grammar theory in his famous controversy with Chomsky (Piattelli-Palmarini 1980; Hill and Arbib 1984). My contribution here transfers Piaget's insight, which was limited to children's language development, on the language evolution in history.

The psychological stage development from sensory motor over preoperational to operational stages is the main motor behind the humankind's language evolution. The transformation from the speechless sensory motor stage to the preoperational stage took place anywhere in the Hominid evolution during the time of *Homo habilis* or *Homo erectus*. The early preoperational stage with one-word or two-word-stage may have characterized *Homo erectus* or perhaps even early *Homo sapiens*. The Pirahã language type emerging in psychological stage structures of children aged three may characterize either the early *Homo sapiens* or later in his biography, perhaps after the alleged cultural breakthrough 70,000 years ago. Full grammar languages appeared surely very late, probably only in the past 5,000 years, when humankind reached stages of the late preoperational stage, of children aged five.

This article here shows the necessity to combine developmental psychology, brain research, socialization theory, and ethnology in order to be able to explain both language evolution and societal evolution. This theoretical background is stronger than Darwinian approaches such as the so-called evolutionary psychology or sociobiology. The fact that the humankind in his history went through the same psychological stages as children do is the most important fact ever raised in the history of the human disciplines and social sciences. My theory programme, called structural-genetic theory programme, has drawn the theoretical consequences of 80 years of Piagetian cross-cultural psychology. It has rehabilitated great prewar traditions such as the early child psychology, the British and French schools of ethnology, the Russian cultural-historical school, and all those traditions that worked on the study of the parallels between ontogeny and history

17 Hallpike (1979), Luria (1982), Werner (1948), Oesterdiekhoff (2009, 2011, 2013a).

18 Oesterdiekhoff (2009, 2011, 2013a), Werner (1948), Schultze (1900), Romanes (1888).

(Oesterdiekhoff 2012b, 2016b, c, d, e). Any recovery of the human disciplines and social sciences necessitates the replacement of the currently prevailing ideologies, “cultural relativism” and “universalism,” by the developmental approach or the structural-genetic theory programme. These two embarrassing ideologies penetrate every human discipline and social science, likewise linguistics especially in consequence of Chomsky’s universal grammar theory. For half a century now the two ideologies blockade the progress of the humanities and social sciences. A breakthrough regarding their advancement depends from the replacement and removal mentioned.

The structural-genetic theory programme has shown that a general theory of the human being is only feasible upon the foundations of developmental psychology. Without this general theory of the human being any comprehensive theory of history is not possible. Against this background alone it is attainable to reconstruct the history of population, economy, society, culture, politics, law, religion, philosophy, sciences, morals, arts, literature, and manners (Oesterdiekhoff 2009, 2011, 2013a, 2012a, 2014). Against this background only one can explain the long duration of the stone ages, the basic patterns of the agrarian civilizations, and the emergence of the modern, industrial civilization. The emergence of the formal-operational stage during the 17th century caused the rise of the sciences *in stricto sensu*, the emergence of the industrial economy, the era of Enlightenment, the rise of humanism, and democracy. These five main patterns of modern, industrial civilization are five main manifestations of the formal operational stage.

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