

The rise of formal operations and intelligence in history. The dialectics of cultural and cognitive evolution

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Piagetian cross-cultural psychology has shown in the past 80 years that pre-modern peoples do not develop the adolescent stage of formal operations but remain bound to earlier stages. This result is supported by the psychometric intelligence research and by the famous survey of Alexandr Lurija in Usbekistan from 1932/1933, which already isolated education as the main factor causing the divergent cognitive developments. Obviously, humankind has gone from pre-operational through concrete operational to formal operational stages. These results lead to a new Historical Anthropology or Psychology as basis for reconstruction of the history of society, religion, philosophy, sciences, worldview, law, morals, and manners. My structure-genetic sociology has done a lot of work to draw the theoretical consequences and to deliver a new frame to humanities and social sciences.

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1. A non-racial but dynamic and historical interpretation of the psychometric intelligence research

According to Richard Lynn [2006], the average IQ of Eastern Asians is 105, of Europeans 99, of people from India and North Africa 84 each, of people from Black Africa 67, and the IQ of the Khoisan amounts only 54. Like many other intelligence researchers he takes these data largely as biological data. He regards these data concerning cognitive capabilities as mainly unchangeable features originating in genetic roots or biological characteristics of different races. Already Alexandr Lurija [2002] emphasized, however, the solely historical nature of the intelligence differences of different nations and social milieus, maintaining that school education (or lack of such) and additional cultural phenomena would determine the intelligence level populations could reach. In fact, the recent intelligence scores of peoples from all continents, as listed above by Lynn, only have a historical nature and change over time.

The IQ of the Chinese in their homeland rose from 1936 to 1986 for 22 points on the Raven Progressive Matrices [Flynn 1998, p. 49]. According to the lower British standard adjustment of that time, Japanese and Chinese peoples, around 1920, had IQ scores of 77 and 70 respectively [Lurija 2002, p. 42; Sowell 1994, p. 160]. According to present-day standards, these scores would correspond to scores about 50, close to scores measured today among the weakest peoples of Black

Africa. The leading position of the Eastern Asians nowadays originated in recent social developments (schooling and education), largely diverging from their low position some generations ago.

The scores of the Russians rose tremendously during the last century [Vernon 1969, p. 16, 232]. John Raven calculated the growth of intelligence among the Britons from 1877 up to 1992, comparing results from 1942, surveyed among Britons aged 65, with those of 1992. 90 % of the Britons born in 1877 showed IQ scores lower than 75, in comparison to the adjustments valid in 1992 [Raven et al., 1993]. West German children aged 6 to 15 gained 20 points on the Wechsler test between 1954 and 1981. The French achieved a gain of 25 points on the Raven test between 1949 and 1974 [Flynn 1987, pp. 172-182]. The Southern and Eastern Europeans scored lower than the Western and Northern Europeans a hundred years ago. They scored close to the Chinese and the Japanese of that time and close to the weakest peoples of current Black Africa. Nowadays they are more or less on similar levels or only a few points below as the other Europeans [Sowell 1994, pp. 159-166; Storfer 1990, pp. 89 ff; Lynn 2006; Molnar 2002, pp. 283 f].

The IQ of the Northern Americans rose between 1918 and 1995 for about 25 points [Lynn & Vanhanen 2002; Lynn 2006]. The peoples of Latin America experienced some gains, too, in the past decades. The Blacks both in North America and in Africa participated in this rise, although they are still behind in comparison to all other races. The American Blacks are some points behind the other ethnicities. The difference (70 : 100) between African Blacks and Whites is today roughly the same as it was some generations ago. This fully evidences their participation in the progress [Biesheuvel 1943; Hauser 1998, p. 220; Grissmer 1998, pp. 251, 263].

Thus, the biggest push of intelligence rising took place after World War II obviously. At this time we find an increase across all five continents, including South America, Black Africa, and Asia. Introduction of school attendance, improvement of curricula and teacher education, temporal extension of schooling, visit of higher schools and universities, are the main causes of the rise of intelligence [Goodnow & Bethon 1966, pp. 573 ff; Vernon 1969, pp. 42, 219, 232; Barber 2005, p. 275; Klich 1988, pp. 433 f; Oesterdiekhoff 2009 a, 2011 a; Flynn 2007]. Additional causes are changes in preschool conditions, improvements of medicine and nutrition, job qualification, and many other features of modern societies.

Against the background of these data we have to draw some preliminary conclusions. The rise of intelligence to current levels has originated in the modernization and industrialization of society, especially in the introduction of mandatory school systems. This rise has largely cultural causes and concerns all races and peoples. Every pre-modern population has scores below 75, even all Chinese, Japanese, and European peoples only three generations ago. This implies that all nomadic peoples, all bands of hunters and gatherers, all peasant societies, and all agrarian civilizations must have had IQ scores below 75. The research calls the rise of intelligence under modernization pressure of the

Flynn effect, according to the scholar James Flynn from New Zealand who described this phenomenon at length.

However, the current psychometric intelligence research is completely incapable to understand the implications and consequences of the lower and higher forms of intelligence. I am going to develop these deeper conclusions step by step. First of all, these data need to be referred to developmental approaches. Children exposed to adult intelligence tests score lower than adults. Thus, children aged four have an IQ of about 20, aged eight show an IQ of 50, and teenagers aged 13 score with 75, whereas the eighteen-years-olds finally reach the average adult level of 100 [Vernon 1969; Oesterdiekhoff 2012 c, p. 3; Inhelder 1944]. Since the days of Alfred Binet, intelligence researchers calculate the IQ of peoples according to “mental ages” or “developmental ages”. Intelligence testers since generations have therefore estimated the “mental age” of pre-modern peoples across the continents by ages ranging from six to 13 respectively. These peoples never have surmounted mental ages modern teenagers reach by the age of 13 respectively scores beyond 75 [Porteus 1937; Maistriaux 1955]. Intelligence testers describe the intelligence of pre-modern peoples as childlike: “their reasoning capacities remain similar in many ways to those of younger children”, as Vernon [1969, p. 215] stipulated. However, intelligence research cannot answer the questions of whether pre-modern peoples share with children only their intelligence levels or even more their basic psychic and personality structures. Is the commonality restricted to reasoning abilities or does it encompass much more?

2. Developmental psychology and Piagetian cross-cultural psychology

Developmental psychology describes the development of not only reasoning and cognition but also of all aspects of psyche and personality. Thus, it gives a straight answer to the question above. In the view of developmental psychology the development of logical, abstract, and combinatorial reasoning abilities is only a small part of the growth of psyche and personality. In fact, developmental psychology is the often forgotten background theory of the intelligence research. It delivers the theory necessary to decode and to frame the intelligence research and its empirical results.

Developmental psychology explains the anthropological development from infancy over childhood and youth to adulthood. It describes the stages psyche and personality have to go through in order to attain the adult stage. The most elaborated stage theory was created by Jean Piaget. It describes four stages humans may pass on their way to adulthood. The sensory-motor stage lasts till the eighteenth month of life. During the second or pre-operational stage children learn language and ideas, anticipations of future and memory capabilities. Logical co-ordinations of objects characterize the concrete operations, starting at six, and being accomplished by 10 or 12 years of age. The formal operations, unfolding stepwise between the age of 10 and 20, form the adolescent stage of personality [Piaget, 1950; Piaget & Inhelder, 1969].

Humans understand themselves and reality, world and nature divergently according to the stages where they are respectively. Each new stage transforms the complete understanding of logic, physics, social affairs, and morals. Developmental psychology has wonderfully described that children have completely divergent forms of behaviour patterns and of cognition regarding every single phenomenon. Humans on different stages are different kinds of humans; they are staying on different anthropological layers. The formal stage is more distant from the stage of mammals than the pre-operational stage does.

Piagetian cross-cultural psychology in the past 80 years has been conducting several thousand empirical surveys among hundreds of ethnicities and social milieus around the world. One main result of the research concerns the notion that only modern, industrialized nations attain the adolescent stage of formal operations. 50 – 70 % of modern populations attain sub-stage A of formal operations, whereas 30 – 50 % reach also sub-stage B [Mogdil & Mogdil, 1976, vol. III, p. 149; Schröder 1989, pp. 204 f.].

Pre-modern peoples around the world do not establish the adolescent stage of formal operations but remain bound to pre-operational and concrete operational stages. The empirical surveys carried out among backward social settings in current developing countries such as illiterate or weakly educated milieus in cities, peasant and village societies, or archaic ethnicities revealed that those people usually stay on pre-operational or concrete operational stages. There are populations that largely stay on pre-operational stages; others cover both pre-operational and concrete operational stages, dependent on the tasks administered respectively. Very often, 30, 50, or 70 % of a current pre-modern population manifest concrete operations restricted to some physical or social areas, but in all others performing pre-operational structures. Research calls this phenomenon the asymptotic curve of concrete operations, thus designating the only partial development of the third stage among present-day backward populations [Dasen & Berry, 1974; Dasen 1977; Hallpike, 1979; Lurija, 1982; Poortinga 1977; Mogdil & Mogdil, 1976, vol. 8; Oesterdiekhoff, 1997, 2000, 2009 a, 2011 a, 2011 b, 2012 a, 2012 b].

When we analyse the data of Lurija [1982], won among the Kashgar in 1932 and 1933, concerning basic reasoning abilities, we find that the adult illiterates usually manifested abilities close to children aged six roughly. Only schooled adults had the chance to reach higher levels [Oesterdiekhoff 2009 a, pp. 130-148]. Cross-cultural psychology has replicated this result again and again in the past 80 years, valid for all pre-modern peoples around the world. Monique Laurendeau-Bendavid [1977, p. 144], in her considerate survey among Rwandese people, also discovered that weakly schooled subjects do not attain the concrete stage: “If there is no schooling, and if the cultural environment offers no particular challenges of its own, development very rarely reaches the level of concrete operations. It seems that the age of seven years, the unschooled subjects have already reached a level which they do not surpass in subsequent years.” Dasen [1974

b, p. 418], a leading test psychologist, confirmed: “According to this evidence, it can no longer be assumed that adults of all societies reach the concrete operational stage.”

Even if these peoples reach partially the concrete operations, both referring to percentages of populations or to specific tasks, they anyway never attain the adolescent stage. Piaget [1974, p. 309] summarized the cross-cultural enquiries this way: “In particular it is quite possible (and it is the impression given by the known ethnographic literature) that in numerous cultures adult thinking does not proceed beyond the level of concrete operations, and does not reach that of propositional [formal] operations, elaborated between 12 and 15 years of age.” There is not one empirical study which ever refuted this clear result in the past 80 years [Hallpike, 1979; Oosterdiekhoff 1997, 2000, 2009 a, 2009 c, 2011 a, 2012 a, 2012 b].

3. Anthropological conclusions

The cross-cultural psychometric intelligence research found that pre-modern peoples show the intelligence levels of children, ranging from six to 13 years of age. Its small twin sister, Piagetian cross-cultural psychology, discovered the lack of the adolescent stage among pre-modern peoples. Peoples largely staying on pre-operational stages reach developmental ages of modern children aged roughly five to nine. Peoples staying both on the second and the third stage range between mental ages of eight to 12 approximately. Most peoples in world history never surmounted anthropological peaks of children aged seven. There are no pre-modern societies with peaks beyond the tenth developmental year, compared to children in industrial societies. Modern peoples reaching sub-stage A move between the tenth and the fifteenth developmental year. Those percentages of modern peoples that attain B reach even some higher peaks. This implies that modern peoples are separated from pre-modern ones by several developmental years, usually by 5 to 10 years.

Whereas the psychometric intelligence research is able to determine this equivalence limited to reasoning abilities only, the Piagetian research or my structure-genetic sociology evidence the encompassing validity of this equivalence with regard to all features of psyche and personality, with regard to all logical, physical, social, and moral cognitions, and with regard to all aspects of worldview and world understanding.

Some current interpreters of cross-cultural research [Cole, 1996] maintain that tests among ethnicities revealing pre-operational modes of thought deliver only views on small spots, leaving undiscovered some existing formal-operational structures within these peoples. This is simply not true. There are no formal-operational structures among these peoples; all related tests, covering the diverse areas of world experience, tend to the same direction, namely to the discovery that the adolescent stage is completely absent in the pre-modern psyche. Pre-modern peoples share with children (from all cultures) not only a few or some cognitive characteristics but all of them. Pre-operational structures are not something like isolated modules embedded in structures staying on

higher stages. The empirical surveys do not support such a view, which has been very often suggested by cultural relativists such as M. Cole. The cognitive development of peoples follows “g” (Spearman) or “structures d’ensemble” (Piaget), that is, the cognitive development usually reaches the same level across the complete world experience. Adult modern peoples never manifest pre-operational structures typical for children aged five, whereas pre-modern peoples conversely never manifest formal operations of sub-stage B. Thus, the childlike anthropological stage of pre-modern peoples implies a full structural equivalence of children and pre-modern peoples. This is not identifiable with the behaviour of some modern people who like childlike jokes, or childlike hobbies, or childlike behaviour patterns in social relations. It is something different.

Against the background of the tools available in psychometric intelligence research and Piagetian research there are no differences between children and pre-modern peoples describable. Both leading research industries have to come to the conclusion that there are no differences between children (from all cultures) and pre-modern adults. This implies necessarily the conclusion that pre-modern man has a full childlike anthropological nature and completely stays on a childlike anthropological stage.

However, there exist some differences between children and pre-modern adults, only not describable by the tools of both paradigms. Pre-modern humans have more life-experience and more knowledge than children have. Christopher Hallpike (1979) therefore determined that children and pre-modern peoples share the same qualitative development (stages and structures) but diverge in their quantitative development (life experience and some forms of knowledge). The full notion of developmental psychology, however, reveals that the commonalities override the differences largely. I define therefore the anthropological nature of pre-modern man as follows: “Pre-modern peoples stay on anthropological stages of children, apart from life-experience and some forms of knowledge”.

4. The history of the greatest discovery within humanities and social sciences

The idea of the childlike nature of pre-modern man goes back to the ideas of the age of Enlightenment. It was a widespread assumption during the past two centuries, especially up to 1945 or to 1970. Nearly all (!) early child psychologists shared this view; also most psychoanalysts. Representatives of anthropology, psychology, sociology, history, and other disciplines held this idea and it sometimes formed the background of their ideas. Ludwig Feuerbach, Ernst Mach, Auguste Comte, Edward Tylor, Norbert Elias, Albert Schweitzer, Charles Blondel, Pierre Janet and Édouard Claparède shared this view. Especially in twenties and forties of the past century this idea had a prevailing status both in public opinion and in sciences [Oesterdiekhoff 2012 a, b, c, 1997, 2000].

However, the first great and encompassing evidence was procured by Heinz Werner in 1926 [1948]. He showed the structural equivalence with regard to all aspects of psyche and personality, including morals, emotion, experience of time, space, causality, nature, and self-awareness. I estimate his book as a great breakthrough because he collected the evidences to a rate unknown before and hardly to falsify later on.

Although Jean Piaget never wrote such a comprehensive book on the subject as Heinz Werner had done, he brought the biggest stake to the comparison between history and ontogeny. Piaget understood child psychology only as a laboratory to research the history of mind, reason, culture, civilization, sciences, and man. Ancient man has vanished and is not anymore available to scrutiny – therefore we must research children, when we want to know the mind of ancient man. That was the kernel idea of Piaget’s research on children. Piaget described the psychology of children to an exactitude and richness unknown before. He wrote books dedicated to the development of causality, chance, space, time, speed, physics, worldview, morals, social relations, arithmetic, and many other phenomena. In most or all of his books he inserted some sections where he mentioned the same phenomena among pre-modern peoples, including antiquity, ancient philosophy, and “primitive” tribes. He clearly determined the mind of “primitive” man as pre-operational, attributing the rise of the concrete operations to the Ionian philosophy, and the emergence of the formal operations to the modern mind from the age of Enlightenment onwards [Piaget, 1932, 1950, 1959].

However, he did not write comprehensive books dedicated to the reconstruction of history, culture, societal changes, economic history, religion, philosophy, magic, politics, morals, customs, etc. He only reconstructed the history of sciences, basing on the instruments of child psychology, finding that stage theory explains the history of sciences [Piaget & Garcia, 1989].

Christopher Hallpike [1979] formed the next step regarding the developmental interpretation of human’s history. He delivered the first demanding interpretation of Piagetian cross-cultural psychology after nearly 50 years of empirical research. He was the first to combine ethnology and Piagetian theory on a high and comprehensive level. He showed the reliance of the ethnological knowledge about the primitive worldview and customs on the tools of child psychology. Finally, he confirmed Piaget’s consideration that the pre-operational stage is the key to the mind of the “primitives”.

In the past 30 years I have written ten books and numerous essays on the relationship between developmental psychology and humanities. I filled the gaps Piaget and Hallpike have left over to succeeding scholars. I have fully reconstructed the history of cultures, economics, religion, magic, philosophy, politics, morals, law, arts, customs, etc. I have accomplished the main targets Piaget had envisaged from his early career. From now on developmental psychology is not only a psychology of children but of all mankind.

5. Understanding pre-modern societies and the history of humankind

Whoever has fully understood the fact of the childlike anthropological structure of pre-modern man knows immediately that this phenomenon delivers a new key to understanding human's history. Whatever ethnology found out as typical phenomena of pre-modern societies has to be referred to notions won by developmental psychology. Whatever important ethnologists such as Edward Evans-Pritchard [1976], R. F. Fortune [1963] or Lucien Lévy-Bruhl [1923, 1971, 1985] found out demands the reference to developmental psychology. I have shown this to the smallest details in my books mentioned. I can give here only a few examples to illustrate this very shortly.

For example, all pre-modern peoples believe stones, mountains, clouds, stars, forests, rivers and lakes are alive and conscious, listening what humans might do, being able to execute magical actions creating occurrences of all forms. Child psychologists have shown that these forms of animism are inevitable parts of every child's psyche up to their seventh or tenth year in modern societies. Pre-modern peoples remain bound to this animism lifelong.

Pre-modern peoples believe that plants and animals have humanlike capacities of reason, morals, free will, and judicial responsibility. They deny any mental differences between humans and animals. Thus, they regard predators as murderers and punish them the same way as human delinquents. If they have judicial courts they try against them, using lawyers, jury, prosecutors, and witnesses. Convicted animals are exposed to the same forms of punishment as humans are. I cannot even imagine a better and more convincing proof of the childlike psyche and personality of pre-modern man to the deepest sense possible [Evans, 1906; Oesterdiekhoff, 2009 b].

One of the main procedures to find the truth about past, present, and future is the oracle or ordeal. This custom, used to plan every activity or to detect criminals, is to find in all pre-modern societies across the globe. People ask fire, water, poison, or other elements about the truth of any accusation. Future and fate of accused persons depend on natural processes people regard as living and knowing judges. Developmental psychology discovered that every child, both from modern and ancient society, believe in the capability of things to judge about humans. Piaget [1932] himself designated this phenomenon "belief in immanent justice" [Oesterdiekhoff 2009 a, pp. 344-367].

It is absolutely clear that the entire phenomenon of religion must be seen in the light of the discovery of the childlike psyche of pre-modern man. Already Ludwig Feuerbach, who created the first scientific theory of religion in 1841, determined that the childlike psyche of pre-modern man is the source of religion, whereas the mature mind of modern man might tend to weaken and finally to erase all forms of religion. Humans have a childlike psyche that believe that a huge god made the universe, rules all events, punishes and rewards people in life and after death, and brings them to hell and paradise. Wishful thinking and fantasy, weak mind and scarce reasoning abilities account to these forms of dreamy thinking. Conversely, the spread of atheism and agnosticism since the age of Enlightenment, having reached by now roughly 50 % of the Europeans and 65 % of the Japanese, has been originating solely in the rise of anthropological peaks and formal operations

[Oesterdiekhoff, 2013, 2011 a: pp. 147-161]. Thus, developmental psychology explains the entire phenomenon of religion and its decline as well.

6. Structure-genetic sociology as the grand theory of modern society

In the past 350 years, originally in Western Europe and North America, the modern, industrial society has been originating. It consists mainly of the emergence of sciences, Enlightenment, industrialism, democracy, and humanism. The temporal and spatial coincidence of these evolutions cannot be accidental but refers to common roots of them. Three of them are solely intellectual in nature. "Democracy" and "industrialism" are mixtures of institutional and cognitive phenomena. But even on the first glance it is quite obvious that the rise of anthropological peaks and of formal operations is the single cause to the rise of all five evolutions.

Jean Piaget and Rolando Garcia [1989] showed that the rise of formal operations is the cause of the rise of sciences after 1640. Margaret Jacob [1997] evidenced that the new sciences created the industrial technologies and the industrial society. Enlightenment expresses the criticism both of childlike mental states such as belief in magic and sorcery and of social forms such as slavery and dictatorship. Jean Piaget [1932] showed that the rise of the adolescent stage gives birth to the ideas of democracy and liberty rights and overwhelms children's adherence to the rulership of the elderly as well. I showed comprehensively that the adolescent stage (formal operations) originates Enlightenment, humanism, democracy, sciences, and industrialism. Conversely, I evidenced fully that humans staying on childlike anthropological stages have no possibility to understand and to create these five evolutions. Thus, structure-genetic sociology delivers a new theory to understand the rise of modern, industrial society. It is not accidental then that the same populations that experienced the rise of intelligence and formal operations created the modern, industrial society.

7. Conclusions

Structure-genetic sociology is in the heritage of the classical sociology represented by A. Comte, N. Elias, and M. Weber, of the classical ethnology represented by E. Tylor, J. Frazer, and L. Lévy-Bruhl, of the Russian historical school represented by A. Lurija and L. S. Wygotski, of the philosophy of symbolic forms of E. Cassirer, of early developmental psychology represented by J. Piaget, H. Werner, S. Hall, and J. Baldwin, of the Völkerpsychologie of W. Wundt, and of all those scholars who have realized that developmental psychology delivers the key to understand history. Structure-genetic sociology builds a new frame to understand the history of mankind, of culture and society, religion and magic, philosophy and sciences, economy and technology, manners and morals, reason and mind. The fact of the childlike psyche of pre-modern man is the most important notion ever won in humanities and social sciences. It delivers the same breakthrough in basing humanities and social sciences as the ideas of evolutionary theory brought to biology.

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Историческое развитие формальных операций и интеллекта. Диалектика культурной и когнитивной эволюции

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Кросс-культурная психология Пиаже продемонстрировала в последние 80 лет, что народы, находящиеся на до-современной стадии развития, в своем развитии не доходят до подростковых типов формальных операций, но остаются привязанными к ранним стадиям. Этот результат подкрепляется данными психометрических исследований интеллекта и знаменитым исследованием, проведенным Александром Лурия в Узбекистане в 1932/1933, которое уже выделило образование как главный фактор, способствующий разнообразным типам когнитивного развития. Очевидно, человечество перешло от до-операционной стадии, через стадию конкретных операций, к стадии формальных операций. Эти результаты делают новую Историческую Антропологию или Психологию основой для реконструкции истории общества, религии, философии, науки, мировоззрения, права, морали и обычаев. Моя структурно-генетическая социология проделала большую работу по описанию теоретических последствий таких изменений и разработке нового аспекта гуманитарных и общественных наук.

Ключевые слова: возрастная психология, психология развития, кросс-культурная психология, интеллект, этнология, социология, история
