



The psychological literature in Konrad Lorenz's work: a contribution to the history of ethology and psychology

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Abstract

This paper aims at investigating the presence of psychological literature in Konrad Lorenz's work as a preliminary instrument to investigate how Lorenz's ideas are related to Psychology. The bibliography of fourteen books written by Konrad Lorenz (including three volumes containing 26 selected papers) have been analyzed. A total of 245 references related to Psychology and related sciences have been selected. These references were organized in five groups: a) The pioneers of Ethology; b) Animal and Comparative Psychology; c) General Psychology (Associationism, Structuralism, Functionalism, Russian Reflexology and Classic Conditioning, Perceptual and Gestalt Psychology, Psychoanalysis, Behaviorism, Social and Developmental Psychology, Cognition, Emotion and Motivation); d) Epistemology; e) Psychiatry and Neurosciences. These data show that the History of Ethology and, particularly, Lorenz's ideas, show an extremely important relation with Psychology, justifying the inclusion of Konrad Lorenz also in the History of Psychology.

Keywords: Konrad Lorenz; ethology; history of ethology.

I. INTRODUCTION

Konrad Zacharias Lorenz (1903-1989), Nobel Prize for Physiology or Medicine (1973), may be considered one of the most important authors in the History of Ethology. Although the use of the term *Ethology* replacing *Comparative* or *Animal Psychology* has become usual, Lorenz preferred the expression *Vergleichende Verhaltensforschung* to name his approach (*Comparative Behavioural Research*). The use of *Ethology* as a synonym for *Biology of Behaviour* has, in a certain way, given the impression that Ethology had been separated from Psychology.

This paper aims at investigating the presence of psychological literature in Konrad Lorenz's work as a preliminary instrument to investigate how Lorenz's ideas are related to Psychology. This literature is organized and classified and some points are discussed regarding the inclusion of Konrad Lorenz as a relevant author in the History of Psychology.

II. METHODOLOGY

The bibliography of fourteen books written by Konrad Lorenz (Lorenz, 1949, 1950, 1963, 1965, 1970, 1971, 1973a, 1973b, 1978a, 1978b, 1978c, 1983, 1988, 1992), including three volumes containing 26 selected papers (Lorenz, 1970, 1971, 1978b), and covering the period from 1931 to 1988, have been analyzed. A total of 245 references related to Psychology and related sciences have been selected. The bibliography has been analyzed and the references relevant for Psychology have been classified in five items: a) The Pioneers of Ethology; b) Animal and Comparative Psychology; c) General Psychology; d) Epistemology; and e) Psychiatry and Neurosciences. Each one of these five areas are briefly discussed below. Complementary data on the History of Psychology have been based on Garrett (1974), Heidbreder (1978), Herrnstein & Boring (1971), Marx & Hillix (1978), Mueller (1968), Penna (1978) and Schultz & Schultz (2002), especially concerning the position of the cited authors in the History of Psychology, their theoretical



affiliation and biographical data, when available. The notes at the end of the paper give the data available on the references found in Lorenz's writings.

III. RESULTS AND DISCUSSION

1. THE PIONEERS OF ETHOLOGY

Lorenz considered that Ethology had been created mainly by Whitman and Heinroth, although other authors such as Craig and Huxley are also mentioned. Two works published by Charles Ottis Whitman (1842-1910) are cited by Lorenz. The paper *Animal Behavior - 16th lecture from Biological Lectures from the Marine Biological Laboratory of Woods Hole, Massachusetts* (Whitman, 1898, cited by Lorenz, 1970, 1971, 1973b, 1978a, 1978b, 1992)(1) is considered an important work in the foundation of Ethology due to the fact that Whitman used behavioural data with systematic aims. Whitman investigated the behaviour of pigeons (Whitman, 1919, cited by Lorenz, 1963, 1978a, 1992)(2). Wallace Craig (1876-1954), a disciple of Charles Whitman, also interested in bird behaviour, has also influenced Lorenz. Lorenz cites several works by Craig on the behaviour of doves. His work *Appetites and aversions as constitutens of instincts* (1918, cited by Lorenz, 1963, 1965, 1970, 1971, 1973b, 1978a, 1978b, 1992)(3) is mentioned in eight of the books reviewed. Among the cited works, Craig wrote about animal learning (Craig, 1912, cited by Lorenz, 1970, 1992) (4), the development and social behaviour of doves (Craig, 1908, cited by Lorenz, 1970 and Craig, 1914, cited by Lorenz, 1970) (5)(6), aggressive behaviour in animals (Craig, 1921, cited by Lorenz, 1970)(7) and the expression of emotions in animals (Craig, 1909, cited by Lorenz, 1970, 1992, and Craig, 1921/1922, cited by Lorenz, 1970, 1992) (8)(9). Craig published in journals of Biology, Ethics, Sociology, Animal Behaviour, Comparative Neurology and Psychology, Abnormal and Social Psychology. Craig's discovery of appetitive behaviour is considered one of the most important theoretical contributions in the advance of Ethology.

Oskar Heinroth (1871-1945) was considered by Lorenz the founder of Ethology. Three works by Heinroth are mentioned in the material analyzed: about behavioural patterns in vertebrates (Heinroth, 1930, cited by Lorenz, 1973b, 1978a)(10), about reflexive movements in birds (Heinroth, 1918, cited by Lorenz, 1970, 1973b)(11) and, the one cited most frequently (in ten books) is a text presented at the Fifth International Congress of Ornithology (Heinroth, 1910, cited by Lorenz, 1963, 1965, 1970, 1971, 1973a, 1973b, 1978a, 1978b, 1983, 1992)(12). This is a remarkable paper about "Ethology and Psychology" of Anatids. Julien Huxley, also considered to be an important influence in the shaping of Ethology, related field studies and psychology (Huxley and Howard, 1934, cited by Lorenz, 1970)(13).

What may be concluded from these authors cited and considered as pioneers of Ethology is that although Whitman, Craig and Heinroth were ornithologists, they were close to the area of Animal Psychology.

2. ANIMAL OR COMPARATIVE PSYCHOLOGY

The classic area of Animal Psychology has a fundamental influence on Lorenz's work. Several authors are mentioned including English, German, Austrian, American and others.

2.1 Charles Darwin and other English Authors

There is a strong influence of evolutionary thinkers on Lorenz's work, including Charles Darwin (1809-1882). Although Lorenz adopted evolutionary approach, the only book written by Darwin and mentioned in his work is *The Expression of Emotions in Man and Animals* (1872, cited by Lorenz, 1963, 1971, 1973b, 1978a, 1978b, 1983, 1992)(14), which appears in the bibliography of seven books. It should be noted, for instance, that in the *Russian Manuscript* (Lorenz, 1992), Darwin is mentioned only a few times while Kant, for instance, is mentioned more than 80 times. Another classic of evolutionary thinking mentioned is Herbert Spencer (1820-1903) (*Principles of Psychology*, 1855-



1872, cited by Lorenz, 1992)(15). Another English animal psychologist who is present in Lorenz's work is Charles Lloyd Morgan (1852-1936) in a book relating instinct and totality (Lloyd Morgan, 1909, cited by Lorenz, 1992)(16) and another relating instinct and experience (Lloyd Morgan, 1913, cited by Lorenz, 1970, 1992)(17). William MacDougall (1871-1938) is the most important British *proximate* influence on Lorenz's work. The psychologist MacDougall worked at Oxford for several years and then moved to the USA, where he was a fierce opponent of Watson. Three of his books are mentioned: *An Outline of Psychology* (1923, cited by Lorenz, 1970, 1971, 1978a, 1978b, 1983, 1992)(18), *An introduction to social psychology* (1923, cited by Lorenz, 1970)(19) and *The use and abuse of instinct in social psychology* (1921-1922, cited by Lorenz, 1970)(20). Hinde's book *Animal Behavior, a Synthesis of Ethology and Comparative Psychology* (1972, cited by Lorenz, 1973b)(21) may also be mentioned as an effort to relate Ethology and Comparative Psychology, although Lorenz had some reserves about the synthesis.

Although the idea of evolution is a central issue in Lorenz's writings, the influence of Darwin should be regarded in a general theoretical level, as the proponent of evolution. He has written several articles to defend the idea of evolution, claiming that the 'theory of evolution' should not be considered a 'theory' but a fact, often defending the idea of evolution as an established scientific fact. However, the original idea of behaviour patterns being subject to homology (and so being useful to systematics) are not attributed to Darwin, but to Whitman and Heinroth. Although Darwin has received an increasing attention in the last decades from English and American psychologists, he may not be considered the direct founder of Ethology, according to Lorenz. It is interesting to note that in the 25th anniversary of the Nobel Prize for Ethology, the organizers of the event (in Canada) chose the image of Darwin and not of Lorenz, Tinbergen and Von Frisch to celebrate the event.

Herbert Spencer, MacDougall and Lloyd Morgan are criticized as 'vitalistic philosophers'. This does not prevent Lorenz from agreeing with these authors in some points. For instance, he agrees with MacDougall that the healthy animal is up and doing. He also declared that MacDougall made a number of entirely correct points. The opposition between Lorenz and Hinde is known. The title of the copy of the above mentioned book by Hinde, in Lorenz's private library, was changed to read "Animal Behaviour, a Castration of Ethology in Order to Save Comparative Psychology", what represents the feelings of Lorenz regarding the work of Hinde.

2.2 Traditional Animal Psychology and the Concept of Instinct

Traditional papers on Animal Psychology are present in Lorenz's work. These include from old papers on the "Psychology" of ants by Brun (1912, cited by Lorenz, 1973b)(22) and the investigation of the *biologische, tierpsychologische und reflexbiologische* aspects of the behaviour of ants by Doflein (1916, cited by Lorenz, 1970)(23). There is also an experimental psychological analysis of hens published by Katz in the *Journal für Psychologie* (1909, cited by Lorenz, 1970)(24) and again about hunger and appetite, Katz (1931, cited by Lorenz, 1970)(25), and some general books on Animal Behaviour: Russell (1934, cited by Lorenz, 1970, 1992)(26), and Buytendijk (1940, cited by Lorenz, 1971, 1978a, 1992)(27). Three works by D. O. Hebb (1904-1985) are mentioned: *The Organization of Behaviour* (1940, cited by Lorenz, 1978a, 1978b)(28), *Heredity and environment in mammalian behaviour* (Hebb, 1953, cited by Lorenz, 1965, 1971, 1978a, 1978b)(29), and *A Textbook of Psychology* (1958, cited by Lorenz, 1978a)(30). Several traditional animal psychologists are mentioned concerning their conceptions of instinct. Among these, Lorenz cites Herrick (n.d., cited by Lorenz, 1970, 1992)(31) and the image that he had proposed of the key and lock to give an idea of innate releasing mechanism and the fixed action pattern. The problem of animal instinct is also discussed by Bierens de Haan, 1933 (cited by Lorenz, 1970) (32), 1935 (cited by Lorenz, 1970) (33) and 1940 (cited by Lorenz, 1971, 1978a, 1978b, 1992) (34), Ziegler (1920, cited by Lorenz, 1971)(35), and Fletcher (1957, cited by Lorenz, 1970)(36). William Thorpe discussed learning and instinctive behavior in animals (1948, cited by Lorenz, 1971)(37), the



modern concept of instinctive behaviour (1956, cited by Lorenz, 1963, 1965, 1971)(38) and science, man and morals (1965, cited by Lorenz, 1978b)(39). Lorenz's criticism on traditional Animal Psychology refers to the problem of teleology and the lack of an evolutionary approach.

These authors, usually, are related somehow to the problem of innate and learned aspects of behaviour. Lorenz used to identify two trends in traditional Animal Psychology: Vitalism and Mechanism. Although he may not be identified with any of these schools, he accepted and adopted ideas present in both of them. Authors, such as Bierens de Haan (and also Russell), have been considered vitalists (a kind of supernatural interpretation of instinct). This author, for instance, has been criticized by Lorenz for having proposed that we meditate on instinct, but we do not explain it. He also criticizes Buytendijk for having questioned the dependence of the human psyche upon biological laws, in particular those of heredity. Sometimes, he replies to criticism directed against ethological ideas (the concept of innate), as the case of Hebb. In other cases, he accepts some ideas of a cited author, as the case of Thorpe's ideas about habituation as a form of modification of behaviour. In other cases, a particular point is mentioned as a support of his ideas, as the case of Brun, who, according to Lorenz had demonstrated in ants that each individual fixates its social response on the particular species of ant which helped in hatch from the pupa or Katz, whose studies about domestic chickens have demonstrated that a bird can individually recognize a fair number of conspecifics.

2.3 Animal Sociology, Animal Social Psychology and Phenomenology

Animal Sociology and Animal Social Psychology are expressions used by some authors cited by Lorenz. Lorenz mentions the works of Schjelderup-Ebbe on the social psychology of the domestic hen (1922/1923, cited by Lorenz, 1970, 1992)(40) and the social psychology of birds (1924, cited by Lorenz, 1970)(41). Both these papers were published in the *Zeitschrift für Psychologie*. The expression *Animal Sociology* was used by Alverdes (1925, cited by Lorenz, 1970, 1992)(42) and Brückner (1933, cited by Lorenz, 1970)(43), in a paper also published in the *Zeitschrift für Psychologie*.

Jakob von Uexküll, considered by Lorenz as one of his "masters", was a representative of Phenomenology. He cites three works written by von Uexküll on animal and human behaviour: *Umwelt und Innenleben der Tiere* (Uexküll, 1909, cited by Lorenz, 1970, 1971, 1973b, 1978a, 1978b, 1983, 1992)(44), cited in seven books; *Theoretische Biologie* (Uexküll, 1920, cited by Lorenz, 1970, 1992)(45); and *Streifzüge durch die Umwelten von Tieren und Menschen* (Uexküll, 1934, cited by Lorenz, 1970)(46).

The idea of Animal Sociology or Animal Social Psychology in these authors (including Lorenz) is influenced by the classic considerations of *whole* and *part* in the behaviour, classic ideas of *Gestalt* Psychology. In this way, Lorenz, as a researcher of animal social behaviour using these ideas, should be included also in the history of Social Psychology, sharing some points of view with Kurt Lewin. The presence of authors related to Phenomenology among the influences Lorenz received is an indication that Lorenz's intention has never been to deny subjective experience or subjective phenomena.

2.4 Ethology and Psychology of Animals in Zoos and Circuses

Lorenz mentions several authors working with animals in zoos and circuses and who used the expression *Animal Psychology* in their works. The most famous is, probably, Heini Hediger (1908-1992) and his works on the Psychology of animals in zoos and circuses. Hediger wrote about the Biology and Psychology of scape in animals (1934, cited by Lorenz, 1963, 1970, 1978a, 1983)(47), about Biology and Psychology of animals in captivity (1935, cited by Lorenz, 1970)(48) and about wild animals in captivity (1942, cited by Lorenz, 1983)(49). His most famous work is "*Studies of the Psychology and Behaviour of Captive Animals in Zoos and Circuses*" (Hediger, 1954, cited by Lorenz, 1978a, 1983 and Hediger, 1955, cited by Lorenz, 1963) (50)(51). Portielje wrote about Ethology and Psychology of *Botaurus stellaris* and *Phalacrocorax carbo subcormoranus*



(Portielje 1926, cited by Lorenz, 1970; Portielje, 1927, cited by Lorenz, 1970; and Portielje, 1928, cited by Lorenz, 1978a, 1983, 1992) (52) (53) (54). It should not be forgotten that Heinroth, who Lorenz considered the real "father" of Ethology, investigated captive animals in the Berlin Zoo. Zeeb (1964, cited by Lorenz, 1973b, 1978a)(55) also wrote about circus and Animal Psychology. Another author who discussed "ethological and psychological" aspects of birds is Makkink (1960, cited by Lorenz, 1970, 1978a, 1978b)(56). It is interesting to note the use of both terms Biology (or Ethology) and Psychology. Heinroth, and even Lorenz, sometimes, used both terms as complementary in the study of their animals.

Lorenz has always given credit to people who knew animals from experience, people who had to live with animals every day, to work with them and, so, familiar with them. This was the case of these authors, several of them working as zoo directors. This is the kind of experience that he cannot find in some American psychologists who investigate animal behaviour in laboratory conditions.

2.5 The Behaviour of Lower and Higher Organisms

The behaviour of primates is of special interest to Lorenz. Several references are made to comparative psychologists working on primate behaviour, usually American psychologists investigating the behaviour of the chimpanzee and other primates. The authors mentioned include Klüver (1933, cited by Lorenz, 1971, 1978b)(57), on behaviour mechanisms in monkeys, R. M. Yerkes and his book on "Chimpanzees: A Laboratory Colony" (1943, cited by Lorenz, 1963)(58). Several works by H.F. Harlow have been mentioned: Harlow, 1954 (cited by Lorenz, 1971)(59), Harlow, 1960a (cited by Lorenz, 1973b) (60), Harlow, 1960b (cited by Lorenz, 1973b, 1978a, 1983) (61), Harlow, 1950 (cited by Lorenz, 1965, 1971, 1973b, 1978a, 1983) (62), Harlow, 1962a (cited by Lorenz, 1978a, 1983) (63), Harlow, 1962b (cited by Lorenz, 1978a, 1983) (64). Harlow's themes are: learning and object discrimination, maternal and infantile affectional patterns, the effect of rearing conditions on behaviour and social deprivation in monkeys. Lorenz also mentions three works of Gardner and Gardner, published in 1967 (cited by Lorenz, 1978a) (65), 1969 (cited by Lorenz, 1978a) (66) and 1971 (cited by Lorenz, 1978a) (67) about language and communication in the chimpanzee. Finally, Lorenz mentions two works by D. Premack (1971, cited by Lorenz, 1978a and Premack, 1976, cited by Lorenz, 1978a) (68)(69) who discussed intelligence and language in man and ape. Hayes (1951, cited by Lorenz, 1978a)(70) investigated the behaviour of apes in home environment and Carpenter (1934, cited by Lorenz, 1963)(71) investigated the behaviour and social relations of howling monkeys. As an ornithologist, the interest of Lorenz in these papers on primate behaviour indicates that these references are relevant for his discussions of the evolution of human psychological aspects, in his Evolutionary Epistemology.

On the other side, Lorenz also mentions some classic authors working on the behaviour of lower organisms. This is also an indication that he is interested in the wide possibilities of animal behaviour. These traditional studies are also related to physiological investigation and are, in this way, a bridge between biological and psychological issues. Lorenz mentions three classic authors: a) the American psychologist H.S. Jennings (1868-1947). His book *Behaviour of the lower organisms* (1906, cited by Lorenz, 1970, 1971, 1973b, 1978a, 1992)(72) was mentioned in five books; b) The German psychologist Jacques Loeb (1859-1924) was important by the work *Die Tropismen*, published in a handbook of comparative physiology (1913, cited by Lorenz, 1973b, 1992)(73); c) The book *Die Orientierung der Tiere im Raum*, written by Alfred Kühn (1919, cited by Lorenz, 1965, 1971, 1973b, 1978a, 1978b, 1983, 1992)(74) received seven mentions and discusses the orientation of animals in space.

Jennings, for instance, is praised and considered to be the first one to observe and describe animal behaviour as a worthy task, however, he never conducted phylogenetic comparisons between the behaviour patterns of related animal species. Some ideas that became very important in Lorenz's work, such as the ideas of orienting responses and



taxes, are taken from Alfred Kühn. The idea of tropism is used by Lorenz although he criticizes the attempts of Loeb to explain all animal and human behaviour in terms of the principle of tropism.

3. GENERAL PSYCHOLOGY

It is possible to find several classic authors related to traditional systems in Psychology in Konrad Lorenz's work, such as Associationism (including Russian Reflexology), Perception and Gestalt Psychology, Psychoanalysis, Behaviourism, Social and Developmental Psychology and papers on cognition, emotion and motivation, classic themes in Psychology.

3.1 "Classic Psychology": Associationism, Structuralism and Functionalism

It is possible to find references to representatives of Associationism (Edward L. Thorndike, 1874-1949), Structuralism (Wilhelm Wundt, 1832-1920) and Functionalism (John Dewey, 1859-1952) in Lorenz's work. Wundt's book *Vorlesungen über die Menschen- und Tierseele* (1922, cited by Lorenz, 1978a, 1973b, 1992)(75) was cited in three books. Thorndike's *Animal Intelligence* (1911, cited by Lorenz, 1965, 1973b, 1978a)(76) is also cited. The references seem to be mainly related to Animal Psychology. Thorndike and Wundt are considered representatives of the mechanistic way of thinking. Lorenz agrees with the pragmatist John Dewey in that the idea that a factor introduced for the purpose of explanation is nothing other than the articulation of the already known fact with a new word, an epistemological point.

3.2 Russian Reflexology and Classic Conditioning

Lorenz is quite positive in relation to Ivan P. Pavlov (1849-1936) and classic conditioning. He mentions two books written by Pavlov: a treatise on the higher nervous activities of animals (1926, cited by Lorenz, 1992)(77) and a classic work on conditioned reflexes (1927, cited by Lorenz, 1965, 1971, 1978a, 1978b, 1992)(78). As previously observed, the liaison of Lorenz with some psychological authors seems to be in function of Animal Psychology. Lorenz also mentions a work by W. Bechterev (1857-1927) on human reflexology (1926, cited by Lorenz, 1970)(79). Another Russian reflexologist mentioned is P.K. Anokhin, also in a text on conditioned reflex, discussing a new physiological interpretation (1961, cited by Lorenz, 1978a)(80). Other authors that are mentioned working on conditioned reflexes are H.S. Lidell (1934, 1944) and Hogan and Adler (1963, cited by Lorenz, 1978a)(81). Two of these texts are directly related to comparative psychology of animal behaviour. Lidell (1934, cited by Lorenz, 1978a)(82) writes about conditioned reflexes in a book on Comparative Psychology. Lidell (1944, cited by Lorenz, 1978a)(83) relates conditioned reflex method and experimental neurosis in a book about personality and behaviour disorders. Hogan & Adler (1963) relate classical conditioning and punishment and instinctive response in the fish *Betta splendens*.

An intriguing aspect of Lorenz's writings is his fierce opposition to Behaviourism (dealing with operant conditioning) and his positive reaction to Pavlov's work on classic conditioning. Two points could be discussed: 1) The first is that Lorenz has always been interested in processes of learning (which he prefers to denominate modification of behaviour). His opposition to Watson and Skinner is not because he denies the importance of learning processes in animals and man but for their election of one kind of learning process as the only one to be considered; 2) The second point is that, while Watson and Skinner are not interested in physiological processes, Pavlov was, in reality, a physiologist. Lorenz considers that the discovery of conditioned reflex was an extremely useful tool for the analytical investigation of animal and human behaviour. Lorenz also considered that Pavlov never denied the psychological side of the phenomena he studied from a physiological point of view, what he considered a positive aspect.

3.3 Perception and Gestalt Psychology



These are, probably, the areas/systems of Psychology that were more influential on Lorenz's thinking. Traditional authors investigating perception such as Ehrenfels and Helmholtz are very important in Lorenz's work. Perception was an essential aspect in the development of Evolutionary Epistemology. Helmholtz, assistant of Gustav Fechner (1801-1887), worked on visual and auditory perception uniting Physics, Physiology and Psychology. Several works by Hermann von Helmholtz (1821-1894) are cited by Lorenz (especially in Lorenz, 1992 and 1978). The first one to be mentioned is the *Handbook of Physiological Optics* (1856-1867, cited by Lorenz, 1978a, 1992)(84). Writings about perception, Physics, Epistemology (*Erkenntnistheorie*) are also mentioned: Helmholtz, 1877 (cited by Lorenz, 1978a) (85), Helmholtz, 1878 (cited by Lorenz, 1978a)(86), Helmholtz, 1882-1895 (cited by Lorenz, 1978a)(87), Helmholtz, 1887 (cited by Lorenz, 1978a)(88), Helmholtz, 1897-1898 (cited by Lorenz, 1978a) (89) and Helmholtz, 1921 (cited by Lorenz, 1978a) (90). Lorenz presents several points in common with Helmholtz, as the interest in Epistemology, in perception and in Physics/Physiology. Christian von Ehrenfels (1859-1932), considered one of the pioneers of Gestalt Psychology and known by the proposition of *Gestaltqualitäten* or form qualities is cited in the *Russian Manuscript* (Ehrenfels, 1904, cited by Lorenz, 1978a, 1992)(91). The idea of totality (*ganzheit*) and of parts is an important basis for the development of Lorenz's systemic ideas. Wolfgang Köhler (1887-1949) is another case in which Animal Psychology is discussed from the point of view of an important school of Psychology. Lorenz cites the experiments of *insight* in apes and this will be taken into account in his Evolutionary Epistemology. The references to Köhler are always due to his research on the mentality of apes (Köhler, 1915, cited by Lorenz, 1970, 1992 and Köhler, 1921, cited by Lorenz, 1978a, 1978b, 1983 and Köhler, 1973, cited by Lorenz, 1973b) (92) (93) (94). The Austrian Gestalt Psychologists were very influential on Lorenz's thinking. In this sense, he mentions Charlotte Bühler's work on developmental psychology (1922, cited by Lorenz, 1971)(95) and about the problem of instinct (1927, cited by Lorenz, 1970)(96). The most important psychological influence on Lorenz was certainly the work of Karl Bühler. This author has exerted a direct influence on Lorenz as his teacher. Bühler was an important "bridge" to psychological thinking in Lorenz's career. Lorenz was guided in the field of psychological literature by Bühler, and this author used to invite researchers from other countries to go to Austria. Bühler's experiments of "aha" effects are cited in Lorenz's books. He cites three works by Bühler: *Handbuch der Psychologie, I. Teil: Die Struktur der Wahrnehmungen* (Bühler, 1922, cited by Lorenz, 1971, 1973b, 1978a, 1983, 1992)(97), *Die geistige Entwicklung des Kindes* (Bühler, 1922, cited by Lorenz, 1965, 1971)(98) and, *Zukunft der Psychologie* (Bühler, 1936, cited by Lorenz, 1970)(99).

Other authors related to the Gestalt movement are mentioned: Metzger (1936, cited by Lorenz, 1992 and Metzger, 1953, cited by Lorenz, 1973b, 1978a, 1983) (100)(101) working on perception and general psychology, Sander (1928, cited by Lorenz, 1971)(102) and Matthaui (1929, cited by Lorenz, 1971, 1978a, 1992)(103). Important issues in Gestalt Psychology (as the concept of totality) were also the object of biological thinkers close to Lorenz, what can be found in the works by Alverdes (*Die Ganzheitsbetrachtung in der Biologie*, 1932, cited by Lorenz, 1970)(104) and Otto Koehler (*Die Ganzheitsbetrachtung in der modernen Biologie*, 1933, cited by Lorenz, 1992)(105).

The contact between Lorenz and psychological thinking was first mediated by Karl Bühler, a Gestalt Psychologist. Some similarities between Lorenz ideas and the attitudes of Gestalt psychologists are amazing, as the opposition in relation to Behaviourism, the influence of Physics (Lorenz's correspondence with Max Planck), the research in the same areas (as animal intelligence), the ideas of system, the proximity with Physiology and the importance of perception, for instance. The Evolutionary Epistemology proposed by Lorenz is, in a large measure, a development of Gestalt Psychology.

3.4 Psychoanalysis



Konrad Lorenz and Sigmund Freud (1856-1939) share several similar ideas about motivation, the problems civilization brought to human life and so on. Four references to Sigmund Freud (1856 – 1939) may be found in the books reviewed: *Three Essays on the Theory of Sexuality* (1905, cited by Lorenz, 1978a)(106); *Introductory Lectures on Psycho-Analysis* (1917, cited by Lorenz, 1978a)(107); *Vorlesungen zur Einführung in die Psychoanalyse* (1930, cited by Lorenz, 1971, 1992)(108) and *Gesammelte Werke* (1950, cited by Lorenz, 1978a)(109). Concerning the first authors working on Psychoanalysis, there is a reference to Jung in a work by Feuerborn (1939, cited by Lorenz, 1992)(110), relating the concept of instinct and the concept of archetype. Alverdes also discussed the idea or archetype in animal psychology in the *Die Wirksamkeit von Archetypen in den Intinskthandlungen der Tiere* (1937, cited by Lorenz, 1971)(111). Another ancient reference to a work published in the *Psychoanalytical Review* is Friedmann's *The instinctive emotional life of birds* (1934, cited by Lorenz, 1970)(112). René Spitz (1887-1974), an Austrian psychoanalyst, was a friend of Lorenz and influenced Lorenz's ideas, especially those concerning the risks of *hospitalism*. Two books written by Spitz have been mentioned: *Hospitalism* (1945, cited by Lorenz, 1970)(113) and *La première année de la vie de l'enfant* (1958, cited by Lorenz, 1963, 1970, 1973a, 1978a, 1978b, 1983)(114). John Bowlby (1907-1990), whose work has been influenced by Ethology, had two references cited: *Maternal care and mental health* (1952, cited by Lorenz, 1970, 1978b)(115) and *The nature of the child's tie to his mother* (1958, cited by Lorenz, 1970, 1978b)(116). Lorenz, in his last books, also cites Erik Erikson (especially his idea of pseudo-speciation). The works by Erikson cited by Lorenz are *Wachstum und Krisen der gesunden Persönlichkeit* (1953, cited by Lorenz, 1978b)(117); *Insight and Responsibility* (1964, cited by Lorenz, 1973a)(118) and *Ontogeny of Ritualization in Man* (1966, cited by Lorenz, 1973a, 1973b, 1978b, 1983)(119). Lorenz also cites Erich Fromm's *Anatomie der menschlichen Destruktivitat* (1974, cited by Lorenz, 1978b, 1983)(120). There is a trend in Lorenz's work to discuss human social life as a physician and to discuss human behaviour and its crisis in human civilization. In this sense, he tends to be closer to some authors in Psychoanalysis. Mitscherlich's *Die vaterlose Gesellschaft* (1963, cited by Lorenz, 1973a)(121) should also be inserted here.

There is no doubt that the theoretical system developed by Lorenz shows several points in common with Psychoanalysis. As we have discussed in relation to Behaviourism, the relationship of Lorenz and Psychoanalysis, however, presents positive and negative aspects, agreement and disagreement. Some times he criticizes some points of Psychoanalysis (as the opposition of Eros and Thanatos), in other moments he adopts and uses psychoanalytic concepts (as the concept of sublimation). Some personal contacts have influenced Lorenz in this use. Lorenz's meeting with Erik Erikson in a work group organized by the World Health Organization may have been sufficient for Lorenz's adoption of his concept of 'pseudo-speciation', which he applied several times. The classic concept of sublimation is adopted and used side by side with the concept of behaviour displacement. The ideas of motivational energy, of accumulation of energy, and of catharsis (close to the idea of consumation) are very similar to some of Lorenz's ideas. Concerning human life and civilization, some ideas of Lorenz remind those of Freud as our difficulty to live in the modern conditions of civilization and the demands of culture upon our psychic apparatus.

3.5 Behaviourism

The behaviourists Watson, Skinner (1904-1990), Tolman and Garcia are mentioned. Lorenz is a hard opponent of the Behaviourism of Watson and Skinner, but he is more positive concerning the ideas of Tolman and Garcia. John Watson (1878-1958)'s *Psychology as the behaviorist views it* (1913, cited by Lorenz, 1971, 1978b)(122) and *Der Behaviorismus* (1930, cited by Lorenz, 1983)(123) are cited. He also cites four references by Skinner: *Conditioning and extinction and their relation to drive* (1936, cited by Lorenz, 1973b, 1978a)(124), *The Behavior of Organisms* (1938, cited by Lorenz,



1973b, 1978a, 1983)(125), *Reinforcement Today* (1958, cited by Lorenz, 1973b, 1978a, 1983)(126) and *Beyond Freedom and Dignity* (1971, cited by Lorenz, 1973b, 1978a, 1983)(127). Lorenz has always been an opponent of Behaviourism, considering that the behaviouristic selection of conditioning by reinforcement as a general principle of behaviour as an error. Lorenz never denied the importance of learning and his theory on the possibilities of different kinds of learning occupies an important place in his work. What is remarkable is that the main opponents of his ideas (behaviourists) are in the psychological field. In his opposition to Behaviourism, Lorenz is again aligned with Gestalt psychologists and even with MacDougall. He also mentions Clark L. Hull (1884-1952) and his "*Principles of Behavior*" (1943, cited by Lorenz, 1965, 1970, 1971, 1973b, 1978a)(128).

Although Lorenz is very critic about Watson and Skinner contributions, he is influenced by Tolman and he cites Garcia several times as a positive contribution. Tolman's *Purposive Behaviour in Animals and Men* (1932, cited by Lorenz, 1965, 1970, 1971, 1973b, 1978a, 1992)(129) is frequently cited (in six books). Tolman's *purposive behaviour* and Lorenz's *appetitive behaviour* are similar concepts. In both, we may see the emphasis on cognitive mechanisms that have been recognized as a very important theme in contemporary Psychology.

John Garcia (1917-) is another behaviourist that is cited by Lorenz as a support for the idea that learning shows important limitations. He cites Garcia & Koelling (1967, cited by Lorenz, 1973b, 1978a)(130); Garcia & Ervin (1967, cited by Lorenz, 1978a)(131); Garcia, McGowan, Ervin & Koelling (1968, cited by Lorenz, 1978b)(132) and Garcia, Hankins & Rusiniak (1974, cited by Lorenz, 1978a)(133).

Although Lorenz criticizes the position adopted by Watson, for instance, denying the existence of complex coordinated sequences of innate motor activities, he also recognizes the considerable value of behaviourist research, for instance, taking objective behaviour as the focus of observation. The same may be said about Tolman. Lorenz considered animal behaviour as purposive and considered that Tolman had given a very good objective definition of purposive behaviour as the fact that the same constant end or goal is achieved in the animal by variable adaptive behaviour.

3.6 Social and Developmental Psychology

Several authors related to social and developmental psychology are mentioned in Lorenz's writings. Concerning these areas, the idea of *imprinting* seems to be an important point of contact.

Social psychologists are not usual in Lorenz's writings. Traditional authors are restricted to Bavelas (1957, cited by Lorenz, 1971)(134), in a paper about group size, and the classic Milgram's *Behavioral Study of Obedience* (1963, cited by Lorenz, 1978b)(135). Although Gehlen is an anthropologist, we could mention his paper on human life in industrial society and social-psychological problems arising from it (Gehlen, 1960, cited by Lorenz, 1978b)(136). References to Kurt Lewin (1890-1947) and to incest taboo are also mentioned (Bischof, n.d., cited by Lorenz, 1973b and Bischof, 1972, cited by Lorenz, 1973b) (137)(138).

The problem of development is a common point of interest in Psychology and Ethology. Several works related to Developmental Psychology are cited by Lorenz in the material investigated. The area may be subdivided as follows: a) The investigation of the relations between development and animal psychology, including Volkelt (1914, cited by Lorenz, 1970, 1992)(139) and Schneirla (1966, cited by Lorenz, 1978b)(140). Volkelt (1937, cited by Lorenz, 1970, 1978b, 1992)(141) discussed Animal Psychology as genetic totality psychology; b) The discussion of imprinting, early social experience and development: Carmichael (1926, cited by Lorenz, 1970, 1992)(142), Birch (1945, cited by Lorenz, 1971)(143), Riess (1954, cited by Lorenz, 1965, 1971, 1978b)(144), Hess (1959, cited by Lorenz, 1970, 1978b)(145), Hess (1973, cited by Lorenz, 1978a)(146), Schutz (1964, cited by Lorenz, 1965)(147), Gottlieb (1965, cited by Lorenz, 1978b)(148) and Kruijt (1971, cited by Lorenz, 1978a)(149); c) Neonate behaviour including early



social behaviour: Freedman, 1964 (cited by Lorenz, 1978b) (150) and Freedman, 1965 (cited by Lorenz, 1978b) (151), Peiper, 1935 (cited by Lorenz, 1971) (152) and Peiper, 1961 (cited by Lorenz, 1978b) (153), Prechtl & Knol (1958, cited by Lorenz, 1965, 1971)(154); d) Play and object manipulation: Groos (1907, cited by Lorenz, 1970)(155), Bally (1945, cited by Lorenz, 1971, 1973b, 1978a, 1978b, 1983)(156), Bower (1971, cited by Lorenz, 1973b, 1978b) (157), Eigen & Winkler (1975, cited by Lorenz, 1978a, 1983)(158); e) Developmental Psychology general issues: Werner (1933, cited by Lorenz, 1970) (159), Schroeder (1931, cited by Lorenz, 1971) (160) and Ahrens (1953, cited by Lorenz, 1978b)(161).

Although Lorenz has always investigated social behaviour, his discussions with authors from Social Psychology are limited. The importance of the phenomenon of imprinting for Developmental Psychology probably explains a more proximate relation with some literature in the area, although one could consider it quite limited as well.

3.7 Cognition, Emotion and Motivation

These three concepts are very important in the History of Psychology and are also present in Konrad Lorenz's work in a remarkable form. Lorenz mentions authors discussing cognition (learning, reasoning, perception, thinking, orientation, language), emotion and motivation. Lorenz emphasized cognition what makes sense with his interest in Evolutionary Epistemology.

Cognition and language are traditional areas of Psychology and Lorenz cites works about different cognitive processes: a) Orientation: optical orientation in ants (Jander, 1957, cited by Lorenz, 1965)(162); orientation in birds – Hoffman (1954, cited by Lorenz, 1965) (163) and Sauer (1961, cited by Lorenz, 1970) (164); the sun in the orientation of animals (Hoffmann, 1952, cited by Lorenz, 1965)(165); orientation of animals - Engelmann (1928, cited by Lorenz, 1928)(166) and Fraenkel & Gunn (1961, cited by Lorenz, 1978b)(167); b) Space perception: in the chick – Hess (1956, cited by Lorenz, 1965, 1971, 1973b, 1978a)(168) and Bateson (1964, cited by Lorenz, 1970)(169), and in children (Ball & Tronick, 1971, cited by Lorenz, 1973b, 1978b)(170); c) Size, colour and form perception: in birds (Bingham, 1913, cited by Lorenz, 1970)(171), in bees (von Frisch, 1914, cited by Lorenz, 1965)(172) and Hertz (1937, cited by Lorenz, 1965) (173), and in children (Bower, 1966, cited by Lorenz, 1978b)(174); d) Sound perception: music (Kneutgen, 1970, cited by Lorenz, 1978b, 1983)(175); e) Kinesis (Birdwhistell, 1963, cited by Lorenz, 1978b and 1970, cited by Lorenz, 1978b)(176)(177); f) Social perception: the *kindchenschema* (Hückstedt, 1965, cited by Lorenz, 1978b)(178); sensory cues involved in maternal retrieving in rats (Beach & Jaynes, 1956, cited by Lorenz, 1965)(179); g) Reasoning: in white rats (Maier, 1929, cited by Lorenz, 1973b)(180), in humans, on direction (Maier, 1930, cited by Lorenz, 1973b)(181); h) Language: evolution of language and reason (Hopp, 1970, cited by Lorenz, 1973b)(182), non-verbal communication – Frijda, 1964 (cited by Lorenz, 1978b)(183) and Birdwhistell, 1968 (cited by Lorenz, 1978b)(184), language of bees (von Frisch, 1923, cited by Lorenz, 1992)(185), an experimental test of an *alleged* innate sign stimulus (Hirsch; Lindley & Tolman, 1955, cited by Lorenz, 1971)(186); i) Learning: discrimination learning by rhesus monkeys to visual exploration (Butler, 1953, cited by Lorenz, 1953)(187), experience and problems of Learning Psychology (Foppa, 1966, cited by Lorenz, 1973b, 1978a)(188). And also general works such as the discussion of epistemological basic problems of Perception Psychology (Bischof, 1966, cited by Lorenz, 1978b)(189) and conceptual thinking and hominisation (Decker, n.d., cited by Lorenz, 1973b)(190).

Concerning emotions, a paper by Labarre (1947, cited by Lorenz, 1978b)(191) about the cultural basis of emotions and gestures is cited. Motivation is a common concept in both areas: classic Ethology and Psychology (and also Behavioral Physiology). Lorenz mentions the physiological aspects of motivation – Stellar (1954, cited by Lorenz, 1978a) (192), Roberts & Kiess (1964, cited by Lorenz, 1978b)(193) and motivation in Ethology (Leyhausen, 1965, cited by Lorenz, 1963)(194).



In sum, cognition, emotion and motivation are parts of Lorenz's system. His work not only takes into account these traditional psychological concepts but he also tries to relate them. Cognition is the most evident trend in his system. Learning, reasoning, perception, thinking, orientation, language are present in his writings. These processes receive an evolutionary interpretation and also a physiological explanation. What could be observed here is that it is not difficult to relate Lorenz ideas with psychological literature in these fields. Obviously, Lorenz has emphasized evolutionary processes and he has never worked directly on human beings. What is remarkable is that his advances in the studies of cognition, emotion and motivation have not been continued in an empirical area of research. His disciples or students have focused on other points. Eibl-Eibesfeldt, for instance, devoted his career to find and investigate universals in human behaviour in a descriptive way, being closer to the ancient ideas of Lorenz that instinctive behaviour patterns should be shared by all the members of a species. Others worked on Cultural Ethology (e.g. Otto Koenig). It is remarkable that Ethology could possibly have influenced the development of an 'Ethological Psychology' as a continuation and expansion of Lorenz's ideas. However, Human Ethology has taken another direction and these ideas resulted in the building of an Evolutionary Epistemology, and not a formal school of Psychology. The reason why this occurred is an open question. One could speculate that Lorenz's ideas have been poorly understood and that Ethology has been received as a form of observation of external behaviour (and even a kind of Behaviourism in its 'objectivity'). But this does not represent the intellectual project of Lorenz. Lorenz was fully interested in human cognition (the evolution and functioning of human cognitive apparatus), emotion (even as the basis of our ethical, esthetic and moral judgements) and motivation. Human Ethology developed in Austria as a search for universals in human behaviour (close to Anthropology) or as a method of observation of human behaviour (not directly dealing with language and cognitive, emotional processes). Psychology has recently advanced towards evolutionary ideas stemming mainly from Sociobiology.

4. EPISTEMOLOGY

Although Epistemology is, traditionally, a division of Philosophy, recent authors working on Epistemology have exerted a crucial influence on Psychology and vice-versa. There are three major areas in which the epistemological literature may be found in Lorenz's writings: a) Physics and Knowledge; b) Philosophy and Knowledge; and, c) Cognition and Epistemology. Epistemology and Cognitive Psychology are intimately related and Lorenz considered that his contribution to Epistemology (particularly Evolutionary Epistemology) was even more important than his contribution to Ethology. As Epistemology and Psychology are related fields, we list and comment below the references in Lorenz's work about this area of knowledge.

4.1 Physics and Knowledge

There is no doubt that Lorenz had a particular admiration for Physics. He was proud of his contact with Max Planck, one of the most important physicists of the XXth century and known for his contribution to Quantic Physics. The point of contact between Lorenz and the scientists of the physical world are the limits and possibilities of knowledge as the result that we, human beings, are also formed by physical elements and that our knowledge of the world is limited by our capacities. Lorenz cites Bohr (1958, cited by Lorenz, 1971)(195) commenting on atoms and human knowledge (and remarks made by Bridgman, 1958, cited by Lorenz, 1971)(196). But, the most important influence from a physicist on Lorenz was from Max Planck (1942, cited by Lorenz, 1971, 1973b, 1992)(197). Lorenz was proud of having changed letters with Planck and that both agreed in the need of Epistemology as an important tool for the advancement of science, when we have also to analyse our perceptual apparatus together with the world that we are investigating. This attraction between Physics and Epistemology and Psychology is a



tradition in German Psychology, as we can see in the work by Helmholtz or in the attraction that Physics has exerted on *Gestalt* Psychology.

4.2 Phylosophy and Knowledge

Konrad Lorenz's interest in Epistemology certainly was influenced by the position he occupied as professor of Psychology in Königsberg. He was the last one to occupy the chair of Immanuel Kant, together with Eduard Baumgarten. Baumgarten had studied with John Dewey in the USA and Lorenz mentions several works by Baumgarten, a philosopher of Pragmatic orientation, closely related to Dewey, an important American philosopher and psychologist – Baumgarten, 1933 (cited by Lorenz, 1978b) (198), Baumgarten, 1938 (cited by Lorenz, 1978b, 1992) (199), Baumgarten, 1941 (cited by Lorenz, 1978b) (200), Baumgarten, 1950 (cited by Lorenz, 1971, 1978b) (201). He also cites John Dewey's *Experience and Nature* (1925, cited by Lorenz, 1978a, 1992)(202) and *Reconstruction in Philosophy* (1936, cited by Lorenz, 1978a, 1992)(203). John Dewey is a very important bridge between Philosophy and Psychology in the USA, and the familiarity of Lorenz with his work is an interesting point of contact between both areas.

4.3 Cognition and Epistemology

Two distinguished psychologists investigating the problem of knowledge are present in Lorenz's writings: Egon Brunswick and Donald T. Campbell. Lorenz cites Brunswick's *Wahrnehmung und Gegenstandswelt, Psychologie vom Gegenstand her* (1934, cited by Lorenz, 1970, 1978a, 1992)(204), *The Conceptual Framework of Psychology* (1952, cited by Lorenz, 1973b)(205) and *Scope and aspects of the cognitive problem* (1957, cited by Lorenz, 1965, 1971, 1973b, 1978a, 1983)(206). Lorenz and Brunswick present similar ideas concerning the importance of constance phenomena in perception and knowledge. Campbell, former president of the American Psychological Association, was also directly related to Lorenz, especially concening Evolutionary Epistemology. Campbell's *Methodological suggestions for a comparative psychology of knowledge processes* (1958, cited by Lorenz, 1965, 1971)(207), *Pattern matching as an essential in distal knowing* (1966a, cited by Lorenz, 1971, 1973a, 1973b, 1983)(208) and *Evolutionary Epistemology* (1966b, cited by Lorenz, 1971, 1973b, 1983)(209) have been mentioned by Lorenz. Lorenz considered that Campbell (and also Popper, Riedl and himself) had, independently from each other, developed similar ideas about Evolutionary Epistemology. Anyway, Campbell and Brunswick, are important psychologists working on cognition in the borders of Psychology and Epistemology.

It is interesting to note that cognition is one of the most important areas of research in nowadays Psychology and that Lorenz was interested in the evolution and functioning of cognitive processes. His epistemological ideas, related to cognition, are also largely influenced by Gestalt Psychology: the ideas of perception and knowledge, of insight, the central role of the central representation of space, for instance, and also include learning possibilities in the evolution of knowledge.

5. PSYCHIATRY AND NEUROSCIENCES

Both these areas are closely related to Psychology and the History of Psychiatry and Neurophysiology is also closely connected with the History of Psychology. Several psychiatrists and neurophysiologists are mentioned.

5.1 Neurophysiology

Authors related to Physiology and Neurophysiology are frequently cited in Lorenz's work. Classics of Physiology are mentioned, as Sir C. Bell's *The Nervous System of the Human Body* (1830, cited by Lorenz, 1992)(210), Claude Bernard's *Physiologie générale* (1872, cited by Lorenz, 1992)(211) and Johannes Müller's *Handbuch der Physiologie des Menschen* (1833-1840, cited by Lorenz, 1992)(212). Two books of the English psychologist C.S. Sherrington (1857-1952) about the integrative action of the nervous



system (1906, cited by Lorenz, 1973b, 1978a)(213) and about low level coordination (1931, cited by Lorenz, 1978a, 1978b)(214) are mentioned, relating Physiology and Psychology. But Lorenz cites especially authors analysing the brain and the central nervous system: Weiss, 1941 (cited by Lorenz, 1971)(215), Hess & Brügger, 1943 (cited by Lorenz, 1971)(216), Grey Walter, 1953 (cited by Lorenz, 1971, 1978a)(217), Hess, 1954 (cited by Lorenz, 1978b)(218), Hess, 1957 (cited by Lorenz, 1978a) (219), Mark & Ervin, 1970 (cited by Lorenz, 1978b)(220) or investigating the influence of hormones and chemicals – Beach, 1942 (cited by Lorenz, 1965, 1971, 1978a)(221) and Beach, 1948 (cited by Lorenz, 1973b) (222), Richter, 1954 (cited by Lorenz, 1965)(223), Hassler & Bak, 1966 (cited by Lorenz, 1978b)(224). Lorenz cites three works written by the important neurophysiologist John Eccles about the neurophysiological basis of mind (Eccles, 1953, cited by Lorenz, 1973b, 1978a)(225), brain and conscious experience (Eccles, 1966, cited by Lorenz, 1973b, 1978a)(226) and about the uniqueness of man (Eccles, 1968, cited by Lorenz, 1973b, 1978a)(227). A paper by Leyhausen (1954, cited by Lorenz, 1963)(228) about the relative coordination trying to take into account physiological and psychological aspects is also mentioned. But, certainly, the most important neurophysiological ideas in Lorenz's work are derived from Erich von Holst. Lorenz worked together with von Holst in Germany and his ideas about the spontaneity of the nervous system is one of the most important founding ideas in Lorenz's system. Several of von Holst's papers are mentioned discussing the process of central coordination (Holst, 1935a, cited by Lorenz, 1965, 1973a)(229), the problem of everything or nothing in nervous activity (Holst, 1935b, cited by Lorenz, 1992)(230), about locomotor reflexes in Fish (Holst, 1937, cited by Lorenz, 1978b and Holst, 1939, cited by Lorenz, 1971, 1992)(231)(232), optical perception (Holst, 1955, cited by Lorenz, 1965 and Holst, 1957, cited by Lorenz, 1965, 1971) (233) (234), and his general work on the behavioural physiology of men and animals (Holst, 1969-1970, cited by Lorenz, 1973b, 1978a, 1983)(235).

One could state that Neurophysiology is one of the foundations of Lorenz's concept of instinctive behaviour and also important for his epistemological ideas. Several of the neurophysiologists mentioned are dealing with humans.

5.2 Psychiatry

Historically, the first citation of psychiatry appears in the *Russian Manuscript*, written from 1944 to 1948 (Lorenz, 1992). Kretschmer's *Körperbau und Charakter* (1921, cited by Lorenz, 1992)(236) is mentioned only in the *Russian Manuscript*. Massermann's *Behavior and Neuroses* (1943, cited by Lorenz, 1963, 1965, 1978a)(237). The "psychiatric drift" in Lorenz's work is remarkable in two more recent books on human civilization (Lorenz, 1973a, 1983). In these polemic books, Lorenz proposes to discuss the pathology of modern civilization. Five authors related to Psychiatry and the problem of man in modern civilization are mentioned in these books: Hahn (1960, cited by Lorenz, 1973a)(238), Hargreaves (personal communication, cited by Lorenz, 1983), Czerwenka-Wenkstetten (a conference of 1977, cited by Lorenz, 1983)(239), Frankl (1979, cited by Lorenz, 1983)(240), Klages (1981, cited by Lorenz, 1983)(241). It is remarkable the citation of four books by H. Schulze: Schulze, 1963 (cited by Lorenz, 1983) (242), Schulze, 1964 (cited by Lorenz, 1973a) (243), Schulze, 1971 (cited by Lorenz, 1973a) (244), Schulze, 1977 (cited by Lorenz, 1983) (245), all discussing neuroses in our contemporary living conditions and psychotherapy.

It is not surprising the influence of Psychiatry on Lorenz writings. Lorenz was trained as a medical doctor and the idea of normal and pathological is clearly present in his *unweltanschauung*. Even considering the role of natural selection in the evolution of living creatures, Lorenz does not deny the possibility of the existence of patterns of behaviour that may be considered pathological. His contact with Psychiatry was still more important in war time, when he worked as a psychiatrist of the German Army. It is no coincidence that ideas stemming from Psychiatry are already present in the *Russian Manuscript*. His contact with patients suffering from neurosis during his work in the war



apparently exerted an enduring influence on his view of normal and pathological aspects of human life. Lorenz's contact with Psychoanalysis was also possible during this period, as his chief in the psychiatric service was Freudian. Lorenz mentions some episodes of his work as a psychiatrist and his way of dealing with neurotic behaviour.

6. CONCLUDING REMARKS

In sum, considering the literature related to Psychology in Lorenz's work, Heinroth (1910, cited by Lorenz, 1963, 1965, 1970, 1971, 1973a, 1973b, 1978a, 1978b, 1983, 1992) is the most frequently cited work (ten times) in Lorenz's writings. Craig (1918, cited by Lorenz, 1963, 1965, 1970, 1971, 1973b, 1978a, 1978b, 1992) occupies the second position with eight citations. Darwin (1872, cited by Lorenz, 1963, 1971, 1973b, 1978a, 1978b, 1983, 1992), Uexküll (1909, cited by Lorenz, 1970, 1971, 1973b, 1978a, 1978b, 1983, 1992), and Kuhn (1919, cited by Lorenz, 1965, 1971, 1973b, 1978a, 1978b, 1983, 1992), have been cited seven times each. Whitmann (1898, cited by Lorenz, 1970, 1971, 1973b, 1978a, 1978b, 1992), Mac Dougall (1923, cited by Lorenz, 1970, 1971, 1978a, 1978b, 1983, 1992), Tolman (1932, cited by Lorenz, 1965, 1970, 1971, 1973b, 1978a, 1992) and Spitz (1958, cited by Lorenz, 1963, 1970, 1973a, 1978a, 1978b, 1983) have been mentioned six times each. Finally, Jennings (1906, cited by Lorenz, 1970, 1971, 1973b, 1978a, 1992), Karl Bühler (1922, cited by Lorenz, 1971, 1973b, 1978a, 1983, 1992), Pavlov (1927, cited by Lorenz, 1965, 1971, 1978a, 1978b, 1992), Hull (1943, cited by Lorenz, 1965, 1970, 1971, 1973b, 1978a), Bally (1945, cited by Lorenz, 1971, 1973b, 1978a, 1978b, 1983), Harlow (1950, cited by Lorenz, 1965, 1971, 1973b, 1978a, 1983) and Brunswick (1957, cited by Lorenz, 1965, 1971, 1973b, 1978a, 1983) have been cited five times each one.

These data refer to the presence of authors related to the psychological field of knowledge in Lorenz's selected works. The kind of influence (if any) these authors exerted on Lorenz's work is complex. Some authors may have influenced his way of thinking, others may have been identified as assuming similar positions after Lorenz had already taken a position (as the case of Whitman, for instance) or being criticized for assuming diverse positions. The meaning of each one must be understood in a particular way. This is a huge and detailed work that we are conducting at the present moment. However, there is no simple direction of influence, when this may be considered. Usually, the same author is criticized by Lorenz in some aspects and this does not prevent him from agreeing with the same author in other points. The presence of an author does not mean that Lorenz depended on him to build his theoretical system, but that this particular author is relevant for the discussion of his ideas (agreeing or disagreeing). The important aspect here is that many of the authors he discusses in his work are recognized as representatives of the psychological area of knowledge.

Sometimes, the authors are mentioned as belonging to the new area of research, giving identity to this area, as the case of the presence of Heinroth (1910), the most frequently cited author in Lorenz's writings. It is possible to see here the efforts of Lorenz to identify his approach with that of Heinroth, who employed both terms, Ethology and Psychology in his work. Craig (1918) exerted some influence on Lorenz's ideas, especially concerning the conception of the appetitive behaviour. In this sense, Lorenz is conservative, trying to present his position as the continuation of a trend already extant. This kind of attitude towards authors before him is usually present in his works. Lorenz is continually trying to connect his ideas with a historical movement, trying to convey that his ideas are not new, but they are inserted in a wider scientific movement. The same may be said of Darwin (1872). The idea of evolution is extremely important in Lorenz's writings, but Lorenz has never tried to follow Darwin's points of research directly. Uexküll (1909) was considered by Lorenz a respected master and influenced Lorenz in the ideas of companion in the social world, the meaning of other animals as having specific social roles. As a representative of Phenomenology, Uexküll represents how diverse the influences on Lorenz have been. Uexküll was not an evolutionist and this also means that authors may be influential in some aspects but not in other ones.



Kuhn (1919) is another classic in the study of animal behaviour from a physiological point of view. Whitman (1898) may be considered a case similar to Heinroth. The research conducted by Lorenz has been done independently of Whitman. The constant presence of this author in Lorenz writings may indicate the recognizing by Lorenz (and Heinroth) of the seminal work conducted by Whitman with pigeons. The following authors mentioned have a conflicting influence on Lorenz's ideas (agreement and disagreement), although they are criticized by the author, it is possible to note Lorenz using some of their ideas. This is the case of Mac Dougall (1923) and Tolman (1932). The idea of intention or purpose is important in Lorenz's system, however he criticized vehemently what he called the vitalists (such as MacDougall). His attempts to discriminate teleology and teleonomy may be understood as an attempt to reformulate some of their ideas.

The relationship of Lorenz with Psychoanalysis is in no way only a positive or negative one. Sometimes Lorenz criticizes psychoanalytical ideas (such as the idea of the opposition of Eros and Thanatos), in other moments he not only shows an amazing similarity with psychoanalytical thinking (as the case of his motivational model or the uneasiness of man in modern civilization) but he even adopts explanatory resources from Psychoanalysis. In fact there is no formula to describe the possibilities of discussion of Lorenz's ideas and the traditional schools of Psychology. In this sense, he adopted the idea of hospitalism from Spitz (1958) and this concept presents an enduring influence on Lorenz's writings about the conditions of modern civilization. The case of Jennings (1906) is similar to that of Kuhn. The influence of traditional physiological analysis of behaviour is an indication of the importance of this area of the biological sciences for Ethology.

The most intimate contact of Lorenz with mainstream psychologists was with Karl Bühler (1922), an important representative of Gestalt Psychology. Bühler could be considered his most important direct influence in the psychological field and Lorenz could be considered, from the psychological point of view, a rather dissident and original Gestalt psychologist. His ideas about Evolutionary Epistemology are very influenced by psychological reasoning and quite close to Gestalt Psychology. In sum, if Lorenz had to be included in a traditional psychological system, we most probably should insert him in the Gestalt movement (although he might not be considered an orthodox Gestalt psychologist, he considered himself as heretic in regard to Gestalt Psychology). It is noteworthy that Piaget, when discussing Lorenz's ideas, seems to consider Lorenz as a Gestalt psychologist.

The presence of Pavlov (1927), as it is the case of Kuhn and Jennings, is an indication that Lorenz was interested not only in the physiological aspects of behaviour, but also in the processes of modification of behaviour. At this point we could state that Lorenz was a fierce opponent of Behaviourism, including Watson and Skinner. Lorenz criticizes the importance Behaviourism attributed to conditioning by reinforcement, he criticizes the doctrine of the 'empty-organism' of Behaviourism as responsible for a lot of problems of modern civilization and as the basis of 'pseudo-democracy' and the modern decadence of human civilization. Although these outrageous attacks against Behaviourism, his system also includes the conditioning by reinforcement (or modification of behaviour with feedback) as an extremely important part of his approach to learning. So, the relationships of Lorenz with other schools of Psychology are not always only positive or negative. Hull (1943) could be inserted in his discussion with Behaviourism. Bally (1945), in fact, is cited as a representative of Kurt Lewin's idea of the relevance of a tension-free environment for playing. Harlow (1950), and also Yerkes and Köhler, are of particular interest for Lorenz due to his theories about the origins of human conceptual thought. Brunswick (1957) was an assistant to Karl Bühler and his influence is also a direct one. Brunswick's interest in cognition is clearly connected with Lorenz's growing dedication to Epistemology.

This is an introductory essay pointing the massive presence of psychological literature in Lorenz's work and discussing some aspects of the complex links between the psychological field of knowledge and Konrad Lorenz's work. Of course, detailed analysis of the several points of contact deserve particular attention.



Ethology, and particularly Konrad Lorenz's work, are directly related to Psychology and its related fields. At least, part of the roots of Ethology may be found in traditional Animal and Comparative Psychology and Lorenz's ideas have developed in constant interaction with the psychological literature. Citations originated from the most important historical systems of psychology are present in his writings and they are relevant for his thinking (Associationism, Structuralism, Functionalism, Gestalt Psychology, Behaviorism, Psychoanalysis). In sum, Psychology is part of the structure of Lorenz's work. Other related fields, such as Psychiatry, Neurophysiology, Epistemology, are also present in Lorenz's writings. All this suggests that the History of Ethology and the History of Psychology should be understood side by side.

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