

V. A. WAGNER AND THE ORIGIN OF RUSSIAN ETHOLOGY

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The rise and development of Russian ethology provides a unique case for historical study. In the early twentieth century, the original school of naturalistic research on animal behavior developed quickly in Russia. But, at the end of the 1930's, when such investigations were being expanded in Europe, naturalistic studies had come almost entirely to a stop and had little influence on the subsequent elaboration of Russian ethology in the 1960's. Consequently, modern Russian ethology is based on Western programs and traditions in general.

Many Western historians have analyzed various aspects of ethology: its theoretical and methodological propositions (Gray, 1968, 1969; Jaynes, 1969; Richards, 1987); the development of different approaches and methods (Gerardi, 1984; Burkhardt, 1981); the contributions of various scholars (Richards, 1977; Gray, 1967, 1968; Huxley, 1963); the influence of ideology and politics (Kalikow, 1983) and other considerations of the origin and rise of ethology (Thorpe, 1979; Singer, 1981). But Western historians have not mentioned Russian ethological investigation. The history of Russian comparative psychology is found in only a few summarizing annual reviews (Roginsky, 1947; Ladygina-Kots, 1960); and of ethology in the article by Krushinsky (1975); in several biographical notes on Wagner (Dogel', 1934; Roginsky, 1940; Fabri, 1969; Lukin, 1987), and in short abstracts of reports at different conferences (Malakhovskaya, 1975; Strel'chenko, 1975; Blagosklonov, 1978).

Did Russian ethology ever exist? Why did not Soviet ethologists build on the legacy of their forerunners? And why did not Russian ethological research have an effect on Western studies? It is impossible in a short

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paper to give a complete account of the history of Russian ethology. I present only a few episodes that reflect important moments in this history.

WAGNER AND RESEARCH ON ANIMAL BEHAVIOR

In Russia the founder of the naturalistic approach to animal behavior was Vladimir A. Wagner (1849-1934). Wagner was educated in law and then in physics and mathematics at Moscow University. The range of his scientific interests was extremely wide: comparative anatomy, sociology, taxonomy, psychiatry, pedagogy, evolutionary theory and musicology. His first research was in the field of comparative anatomy. Under the influence of A. O. Kovalevsky and I. I. Mechnickov, he studied the blood cells of some marine invertebrates. At the same time, he began to work on the taxonomy of spiders. It was from this taxonomic research that Wagner's interest in studying animal behavior arose and it affected all his later work.

Wagner often indicated that his approach to animal behavior was inspired by Charles Darwin, but he rejected the anthropomorphic interpretations used by Darwin and his followers, e.g., Romanes, J. H. Fabre, and J. Lubbock. This stimulated his search for an objective approach to animal behavior.

Wagner's approach was not a simple transfer of the methods of comparative anatomy to a new subject, comparative psychology. Wagner principally created a new approach to comparative studies. Wagner was the first to study intraspecific variation of behavioral characteristics.

When we have finished the comparison of many webs of the one species and have established its typical characteristics, we move on to the same comparative investigations of another, a third, etc. species of the same genus of spiders. (Wagner, 1896, p. 61)

Then a generic type of web should be compared with typical webs by another genus of the same family. The same principle should be used for the comparison of families, orders, etc. On the basis of the material of such comparative studies Wagner concluded: "the forms originated from the general root remain in relation to one another not only by morphological characters, but by the peculiarities of instincts too" (Ibid, p. 65).

In his thesis for the degree of doctor of zoology (!) entitled "Biological method in zoopsychology," Wagner (1903), substantiated the subject, methods, and aims of the new scientific discipline, which he later named biopsychology (comparative psychology). By his definition, biopsychology is the study of the laws and trends of behavioral evolution. The basic method of biopsychology consists in field observations and experiments on behavior of individuals of the species under natural circumstances.

The data produced by these methods are used for comparative analysis of behavioral features within a taxonomic group and offer the opportunity to discuss the trends and mechanisms of the evolution of these features.

Wagner's concept of behavioral evolution contains two respectively independent parts. The first treated the questions of the evolution of certain forms of behavior, such as nest building, sexual behavior, parental care, feeding behavior, etc. Wagner considered every concrete form a compound hereditary instinct. The evolution of the instinct resulted from the natural selection of occasional variations that created a statistical spectrum of species-specific instinct (Wagner, 1900a,b).

The second part of his concept treated the question of the evolution of types of behavioral reactions. Wagner distinguished three main types of behavior: reflexes, instincts, and behavior of a "reasoning type." Many authors before Wagner tried to constitute a linear evolutionary series, connecting these three types (see review by Lilin, 1911). Wagner proposed that the evolution of the main behavioral types was nonlinear, and occurred independently and in parallel in different branches of the animal kingdom, proto- and deuterostomata. Both instincts and reasoning behavior, according to Wagner, arose from the simplest reflexes and then developed in parallel, so that instincts generally developed in the branch of protostomata, and reasoning behavior in the branch of deuterostomata.

Wagner's ideas and methods of behavioral studies were very popular among Russian zoologists, and his ideas were widely disseminated in Russian scientific literature (Karavaev, 1906; Pogodin, 1905; Zav'jalov, 1913). Among zoologists Wagner was recognized as the authority on behavioral questions.

It should be mentioned that there is a great similarity between Wagner's approach to these problems and those of classical Lorenzian ethology. But the ensuing history of Wagner's ideas differed greatly from that of Western ethology.

BIOPSYCHOLOGY OR PHYSIOLOGY

Early in the 20th century in Russia, in parallel and simultaneously with Wagner's investigations, another approach to behavioral studies, a physiological approach, was developed. The foundation of the physiological study of animal behavior was built by two famous scientists, I. P. Pavlov (1903) and V. M. Bekhterev (1904). There was much discussion between the naturalistic and physiological schools on the content, methods and aims of behavioral studies. Wagner's main opponents were the physiologists of Pavlov's school (Zeleny, 1913a,b; Frolov, 1913). Bekhterev and his pupils generally studied human behavior, but they took part in the discussion also (Bekhterev, 1912). In response to the physiologists' criticism, Wagner published a special volume entitled "Biopsychology" that included two of his papers: "Physiology and biology in the formu-

lation of psychological problems" (Wagner, 1914a) and "Segmentary psychology" (Wagner, 1914b). In these papers, Wagner analyzed in detail the arguments of his opponents and gave new data to support his point of view.

For Wagner, as a naturalist, the main aims were explanations of the purposefulness ("biological sense" in Wagner's words) of concrete behavioral forms, of the differences in the displays of various species and of their evolution in concrete phylogenetic lines. Thus, he tried to describe animal behavior continuously, as a whole, and to study behavior in nature. To describe whole behavioral patterns, which have a "biological sense" (feeding, breeding, self-defense, etc.), Wagner used the notion "instinct," the main characteristics of which, were species-specificity, heritability and adaptability.

Physiologists generally simplified the conditions of their experiments (e.g., "the tower of silence" of I. P. Pavlov) and studied behavioral units; it did not matter what kind of units . . . reflexes, tropisms, stimulus and response, trial and error, etc. They ignored variation in these behavioral units as a "mistake of the experiment." Such an analytic, "elementary" approach led physiologists to the interpretation of "instinct" as a chain of separate elementary actions (reflexes, tropisms, etc.).

The main results of the polemics between supporters of the naturalistic and the physiological approaches were verification and concretization of the subject fields of each school, and the search for a suitable methodology for the study and interpretation of animal behavior. Therefore, supported by the authority of the "number one physiologist," I. P. Pavlov, the tendency for physiological studies to monopolize all behavioral investigations, played a negative role in the next, the Soviet period, of the development of Russian ethology.

ETHOLOGY IN SOVIET RUSSIA

Before 1917, except for a few physiological laboratories, there were no special scientific institutions for the study of animal behavior and its evolution. Special courses on comparative psychology were given only by Wagner in the Moscow and Petrograd Universities and in the Psychoneurological Institute. After the Russian Civil War, institutes were created under the authority of various Narkomats (People's Commissariats, or ministries), generally under Narkompros (Commissariat of Education) and Narkomzdrav (Commissariat of Health). Some of these were:

Zoopsychological Station of the P. F. Lesgeft Natural Science Institute in Borisovka (Arens, 1924)

Zoopsychological Laboratory of the Institute of Experimental Biology (Sadovnikova-Kol'tsova, 1925)

Practical Laboratory for Zoopsychology (Durov, 1924)

Zoopsychological Laboratory in the Darwin Museum (Ladygina-Kots, 1921)

Laboratory of Comparative Psychology of the Institute of Experimental Psychology (Borovsky, 1925)

Department of Biogenesis and Comparative Psychology of the Brain Institute (Aronovich & Khotin 1929)

Special courses were given in different institutes: in the Moscow and Tashkent Universities by D. N. Kashkarov; in the Stavropol' Agricultural and Pedagogical Institutes and in the Petrograd University and Pedagogical Institute by Wagner. Reports concerning problems of animal behavior and its evolution were regularly given at various conferences; for example, at the All-Russia Congresses of Zoologists, Anatomists and Histologists. At the First Reflexological Congress on Human Studies, a special symposium "Comparative Psychology" was organized by Wagner and his pupil, B. I. Khotin. At the symposium eight speakers gave reports.

At that time publishing activity was very high. About ten books devoted to animal behavior were published annually. Translations of the books of leading foreign scientists such as J. Loeb, J. Watson, W. Dilthey, and E. Thorndike were published.

At the institutions named above a great variety of research was conducted that can be divided into three groups: study of innate, species-specific behavior in the field (Wagner's tradition); experimental analysis of free behavior by using mazes, problem boxes, multiple choice methods, etc. (the behaviorists' tradition); and the study of behavior by using the method of conditioned reflexes (Pavlov's tradition). Thus, in the first half of the 1920's in Russia, the preconditions existed for the development and continuation of Wagner's traditions in ethology, as well as for the formation of institutional communities based on those traditions.

However, at the end of the 1920's, the variety of investigations united under the general name of "comparative psychology," steadily decreased. Behavioral studies began more and more to acquire a "physiological colour." By the end of the 1930's, no laboratory remained in Russia in which naturalistic studies of animal behavior were conducted. Special courses on comparative psychology were also stopped by the 1930's.

The causes of the curtailment of naturalistic studies in the USSR in the 1930's, at the time when such studies were increasing in the West, were complex. Certain principle causes and conditions can be distinguished.

A main cause was the system of the organization of Soviet science. In the USSR science had no financial sources other than the state. Before "The Great Turning Point" (1928) and the institution of strong central planning of scientific research, it was possible to receive financial support from the different Narkomats (Peoples' Commissariats, that is ministries), which were free to choose who would be given how much support

and for what. This explains the appearance of a great number of zoopsychological institutions organized under the Narkompros (Peoples' Commissariat of Education) in the 1920's. However, the negative effects of an exclusively state financed science began to appear.

By the end of the 1920's, the system of exclusively state financed research and the intensified centralization led to emphasis of the practical application of scientific research as the main criterion for the evaluation and approval of the financing of concrete research. Favorable comments on the "practical usefulness" of particular research in a laboratory or an institute began to be widely used in scientific critiques. The propaganda for applied behavioral studies became especially pervasive after "the Great Turning Point," when the slogan, "Science for the service of the building of socialism," became very popular (Zalkind, 1930; Kolbanovsky, 1932). These developments may explain the section, "Practical significance of biological psychology," in Khotin's paper in this issue.

Another important factor in the curtailment of naturalistic behavioral studies was the ideological pressure put upon science after the revolution. The process of ideologizing Soviet science was complex and long. It differed for the individual sciences according to the content of the ideology introduced into them, the methods used to influence each scientific community, the distribution of roles among the separate groups of scientists, and so on. After 1922, the polemics among the supporters of the different approaches to behavioral research sharpened. A new group of scientists, psychologists with the behaviorist orientation of B. Borovsky and his coworkers, acquired a clear ideological "colour." More and more of the discussion was occupied by statements of conformity to the methods, results and conclusions of "Marxist psychology." The appearance of "Marxist physiology," "Marxist biology," and other "Marxist" sciences, makes it possible to distinguish essential changes in the language and style of the polemics.

A significant factor in the criticism of Wagner's ideas in the 1920-30's was the "ideological vulnerability" of his conceptual and categorical scheme of description and explanation of behavior. At first, this related to the term "biopsychology" and to the treatment of "psychology as a part of biology" (Wagner, 1923a,b). This treatment was "open" to an accusation of the biologicization of mind, i.e., the reduction of psychological and social processes to biological ones. Biologicization was "a mortal sin" in the eyes of the ideologists of those years (Frankfurt, 1926). Thus, it is no accident that Wagner rarely used the term "comparative psychology." However, using "psychology," or psychological terms to describe and explain animal behavior evoked accusations of subjectivism, anthropomorphism, idealism, and other "isms" against Wagner. He used psychological terms to separate his own research from the studies of the physiologists (Wagner, 1921). We can only speculate what might have

happened if Wagner had used the term "ethology," proposed by G. Zeleny (1913b, p. 1193) to describe his research.

Another cause of the "neglect" of Wagner's views was his consistent, strong protest against any attempts to ideologically substantiate an advantage of one or another approach to scientific problems. Wagner wrote:

The tendency to call everyone a vitalist if they refuse to follow blindly the doctrines of materialistic schools à la Molleshot and Buchner and he who speaks of psychology as if it is something more than the data of chemistry, anatomy and physiology is so zealously propandized, that the word "vitalist" sounds to "a real scientist", the way the word "heretic" sounded to a real religious person in the Middle Ages. (Wagner, 1925–1929, 1927 volume, p. 18)

It may be that it was Wagner's activity against the monopolization and ideologizing of behavioral studies that prevented the publication of his own works in this field after 1930: the tenth and eleventh volumes of "Essays on comparative psychology" as well as his last monograph, "Comparative psychology, its field of study and tasks." These are still unpublished. Probably the same cause prevented the publication of Khotin's paper (in this issue) in spite of citations from Lenin and Engels, which should have confirmed the ideological usefulness of his ideas and approach to animal behavior.

The ideological circumstances and the tendency to monopolize behavioral studies supported by the system of central planning and financing of science resulted in the concentration of behavioral studies primarily in physiological institutions, and to some extent in zoological institutions. However, the intellectual tradition of Wagner's approach to behavioral studies was not completely interrupted. During the 1930's several groups of scholars continued investigations of innate behavior in field and laboratory. Investigations were continued by Wagner's pupils, B. Khotin and G. Roginsky, who worked in the Brain Institute. Although it seems paradoxical, the main ideological critic of Wagner, V. Borovsky and his collaborators carried out many theoretical and practical experiments devoted to the study of instinctive behavior (Borovsky, 1935, 1936). However, in 1936 as a result of the mass reorganization of psychological institutions stimulated by the resolution of the Central Committee of the Communist Party "On pedagogical perversions in the Narkompros system," Borovsky's laboratory in the Institute of Psychology, Pedology and Psychotechnics was closed. Borovsky and some of his collaborators "migrated" to the Zoological Institute of Moscow University where their research was continued. A year later, Borovsky, threatened by arrest, was forced to move from Moscow and the laboratory fell apart. Nevertheless, several of Borovsky's pupils continued to study field behavior in different sanctuaries (Skrebitsky, 1939; Kaftanovsky, 1941).

Another group of scholars continued Wagner's tradition by finding refuge in the Institute of Evolutionary Physiology and Pathology of Higher Nervous Activity n. I. P. Pavlov. The Institute was organized on the basis of Pavlov's laboratories in Koltushi by Pavlov's closest pupil and successor, L. A. Orbeli. L. Krushinsky began to work in the Institute in the 1930's.

However, the work by these investigators was not extensive. The reports were often published in marginal journals and literally were lost in the tremendous stream of literature devoted to the physiological analysis of behavior. There was no special periodical concerning field behavioral studies in Russia.

SUMMARY

It may be concluded that the curtailment of naturalistic studies of animal behavior in Russia resulted from a complex of causes. The main cause was the system of organization and financing of science aimed at the support of utilitarian and ideologically "useful" research. Scientists who did naturalistic studies of behavior, unlike the physiologists, could not prove "the usefulness" of their work for "the building of Socialism." This led to the disruption of their institutional bases that had begun to be formed at the beginning of the 1920's. The absence of a base, i.e., institutes, journals, scientific societies, a system of education, diminished the interest in such research in the USSR. The politics of the isolation of Soviet scholars from the international scientific community, actively carried out by Stalin's government, prevented Russian scientists from becoming familiar with the works of their Western colleagues. And, accordingly, investigations by Russians remained unknown to Western scholars.

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REFERENCES

- Arens, L.E. (1924). Zoopsikhologicheskaja stantsija v Borisovke (The Zoopsychological Station in Borisovka). *Chelovek i priroda*, 10, 783-786.
- Aronovich, G.D., & Khotin, B.I. (1929). K voprosu o podrazhanii u obez'jan (Macacus rhesus) (On the question of imitation in monkeys (Macacus rhesus)). *Novoe v refleksologii i fiziologii nervnoj sistemy*, 3, 378-398.
- Bekhterev, V.M. (1904). Ob'ektivnaja psikhologija i ee predmet (Objective psychology and its subject). *Vestnik psikhologii*, 9, 650-661; 10, 721-737.
- Bekhterev, V.M. (1912). *Ob'ektivnaja psikhologija* (Objective psychology). St. Petersburg.

- Blagosklonov, K.N. (1978). Razvitie polevoj experimental'noi etologii ptits v nashej strane (Development of field experimental ethology of birds in our country). *Upravlenie povedeniem zhivotnykh* (pp. 35–37). Moskva: Nauka.
- Borovsky, V.M. (1925). K voprosu ob instinkte v nauke o povedenii (On the question of instinct in the science of behavior). *Psikhologija i marksizm* (pp. 161–174). Leningrad.
- Borovsky, V.M. (Ed.) (1935). *Instinkt y i navyki* (Instincts and habits). Moskva-Leningrad: Gossotsekgiz.
- Borovsky, V.M. (Ed.) (1936.) *Refleksy, instinkty i navyki* (Reflexes, instincts and habits). Moskva: Gossotsekgiz.
- Burkhardt, R.W. (1981). On the emergence of ethology as a scientific discipline. *Conceptus Historia*, 1, 62–81.
- Dogel', V. (1934). V.A. Wagner. *Priroda*, 4, 90–92.
- Durov, V.L. (1924). *Dressirovka zhivotnykh. Psikhologicheskie nabl yudenija nad zhivotnymi, dressirovannymi po moemu met odu. 40-letnij opyt.* (Animal training. Psychological observations of animals trained by my method. 40 years experience). Moskva.
- Fabri, K.E. (1969). V.A. Vagner i sovremennaja zoopsikhologija (V.A. Wagner and modern zoopsychology). *Voprosy psikhologii*, 6, 100–107.
- Frankfurt, Yu.V. (1926). *Refleksologija i marksizm* (Reflexology and Marxism). Moskva-Leningrad.
- Frolov, G.P. (1913). *Sovremennoe sostojanie uchenija ob instinkte (s tochki zrenija fiziologii uslovnykh refleksov)* (Modern development of the doctrine of instinct—from the standpoint of the physiology of conditioned reflexes). St. Petersburg: Merkulov.
- Gerardi, F.C. (1984). A historical reconstruction of some preethological approaches to animal behavior. *Rivista di Storia della Scienza*, 1, 355–402.
- Gray, P.H. (1967). Spalding and his influence on research in developmental behavior. *Journal of the History of Behavioral Science*, 3, 168–179.
- Gray, P.H. (1968). Prerequisite to an analysis of behaviorism: The conscious automaton theory from Spalding to William James. *Journal of the History of Behavioral Science*, 4, 365–376.
- Gray, P.H. (1969). The early animal behaviorists, prolegomen to ethology. *Journal of the History of Behavioral Science*, 5, 372–383.
- Huxley, J. (1963). Lorenzian ethology. *Zeitschrift für Tierpsychologie*, 20, 402–409.
- Jaynes, J. (1969). The historical origins of “ethology” and “comparative psychology.” *Animal Behaviour*, 17, 601–606.
- Kaftanovsky, Yu.M. (1941). Opyt sravnitel'noj kharakteristiki biologii razmnozhenija nekotorykh chistikovykh (An attempt to study the comparative characteristics of mating biology in some gulls). *Trudy Goszapovednika “Sem” ostrovov*, 1, 53–73.
- Kalikow, T.J. (1983). Konrad Lorenz's ethological theory: Explanation and ideology, 1938–1943. *Journal of the History of Biology*, 16, 39–73.
- Karavaev, V. (1906). Psikhologicheskie vzgljady V. Vagnera (V. Wagner's psychological views) In E. Wasmann (Ed.), *Itogi srnitel'noj psikhologii* (pp. 495–524). Kiev.
- Kolbanovsky, V. (1932). Psikhologiyu na sluzhbu promyshlennosti (Psychology in the service of technology). *Psikhologija. Ser. A*, 5, 3–7.
- Krushinsky, L.V. (1975). Etologija (Ethology). *Istorija biologii s nachala XX veka do nashikh dnei* (pp. 109–122). Moskva: Nauka.
- Ladygina-Kots, N.N. (1921). *Otchet o dejatel'nosti zoopsikhologicheskoy laboratorii pri Darvinovskom muzee.* (Report on the works of the zoopsychological laboratory in the Darwin Museum). Moskva: OGIz.
- Ladygina-Kots, N.N. (1960). Rabota sovetskikh uchenykh b oblasti sravnitel'noj psikhologii (The work of Soviet scholars in the field of comparative psychology). *Psikhologicheskaja nauka v SSSR*. (Tom 2, pp. 570–595). Moskva: Izdatel'stvo APN RSFSR.
- Lilin, P. (1911). Instinkt i um zhivotnykh (Instinct and reason in animals). St. Petersburg: Lirkushev.
- Lukin, B.V. (1987). Pervyj redaktor “Prirody” V.A. Wagner (V.A. Wagner—the first editor of “Priroda”). *Priroda*, 1, 48–58.
- Malakhovskaya, D.B. (1975). K istorii izuchenija roditel' skogo povedenija kajr i moevok na ptich'ikh bazarakh (Toward the history of studying the parental behavior of plovers and gulls in bird colonies). *Voprosy zoopsikhologii, etologii i sravnitel'noj psikhologii* (pp. 79–80). Moskva: Izdatel'stvo Moskovskogo Universiteta.

- Pavlov, I.P. (1903). Eksperimental'naja psikhologija i psikhopatologija na zhivotnykh (Experimental psychology and the psychopathology on animals). *Izvestija Imp. Voeno-Medits. Akademii*, 7, 150-159.
- Pogodin, A.L. (1905). *Pochemu ne govorjat zhivotnye?* (Why animals do not speak). Moskva: Vol'f.
- Richards, R.J. (1977). Lloyd Morgan's theory of instinct: From Darwinism to neo-Darwinism. *Journal of the History of Behavioral Science*, 13, 12-32.
- Richards, R.J. (1987). *Darwin and the emergence of evolutionary theories of mind and behavior*. Chicago, London: Chicago University Press.
- Roginsky, G.Z. (1940). V.A. Wagner. Sovetskaja pedagogika, 1.
- Roginsky, G.Z. (1947). Sravnitel'naja psikhologija v SSSR (Comparative psychology in the USSR). *Vestnik Leningradskogo Universiteta*, 7, 60-69.
- Sadovnikova-Kol'tsova, M.P. (1925). Geneticheskij analiz psikhicheskikh sposobnostej krys (Genetic analysis of the psychological abilities of rats). *Zhurnal eksperimental'noj biologii i meditsiny*, 1.
- Singer, B. (1981). History of the study of animal behavior. In D. McFarland (Ed.), *The Oxford companion to animal behavior* (pp. 255-272). New York: Oxford University Press.
- Skrebitsky, G.A. (1939). Izuchenie povedeni ja ptits v period gnezdovanija (Study of bird behavior during the nestling period.) *Nauchno-metodicheskie zapiski Glavnogo upravlenija po zapovednikam*, 3, 49-64.
- Strel'chenko, V.I. (1975). V.A. Wagner kak zoopsikholog-darvinist (V.A. Wagner as a zoopsychologist-Darwinist). *Istorija i teorija evulutsionnogo uchenija*, 3, 101-110.
- Thorpe, W.H. (1979). *The origins and rise of ethology*. London: Heinemann.
- Wagner, V.A. (1896). *Voprosy zoopsikhologii* (Questions of zoopsychology). St. Petersburg: Pantelev.
- Wagner, V.A. (1900a). *Vodjanoj pauk (Argironeta Aquatica Cl.), Ego industrija i zhizn' kak material sravnitel'noj psikhologii*. [The water spider (Argironeta aquatica Cl.), its industry and life as material for comparative psychology]. Moskva: Kushnerev.
- Wagner, V.A. (1900b). Gorodskaja lastochka (Chelidon urbica), eje industrija i zhizn' kak material sravnitel'noj psikhologii. The urban swallow (Chelidon urbica), its industry and life as material for comparative psychology). *Zapiski imperatorskoj Akademii nauk po fiziko-matematicheskomu otdelu. Ser. VIII*, 10, 1-125.
- Wagner, V.A. (1903). *Biologicheskij metod v zoopsikhologii*. (The biological method in zoopsychology). St. Petersburg: Pozharov.
- Wagner, V.A. (1914a). Fiziologija i biologija V reshenii psikhologicheskikh problem (Physiology and biology in the solution of psychological problems). *Biopsikhologija*, 1-37.
- Wagner, V.A. (1914b). Segmentarnaja psikhologija (Segmentary psychology). *Biopsikhologija*, 38-138.
- Wagner, V.A. (1921). *Kurs biologii zhivotnykh. Chast' 2. Sravnitel'naja (ili obshaja) psikhologija kak odna iz osnovnykh chastej biologii* (A course of animal biology. Chapter 2. Comparative [or general] psychology as a main part of biology). Stavropol': SKhNKh.
- Wagner, V.A. (1923a). Psikhologija kak oblast' biologii (Psychology as a field of biology). *Trudy I-ogo Vserossijskogo s'ezda zoologov, anatomov i gistologov*. Moskva, 17-18.
- Wagner, V.A. (1923b). *Biopsikhologija i smezhnye nauki* (Biopsychology and cognate sciences). Petrograd: Obrazovanie.
- Wagner, V.A. (1925-1929). *Vozniknovenie i razvitie psikhicheskikh sposobnostej* (Origin and development of mental abilities) (NN. 1-9). Leningrad: Nachatki znanija.
- Zalkind, A.E. (1930). *Psikhonevrologicheskie nauki i sotsialisticheskoe stroitel'stvo* (Psychoneurological science and building socialism). *Psikhonevrologicheskie nauki v SSSR* (pp. 5-13). Moskva-Leningrad.
- Zav'jalov, V.V. (1913). Instinkt i razum (Instinct and reason). *Priroda*, 7-8, 841-860.
- Zelenyj, G.P. (1913a). Sovremennaja biologija i psikhologija (Modern biology and psychology). *Novye idei v filosofii*, 9, 40-60.
- Zelenyj, G.P. (1913b). Psikhicheskije reaktsii zhivotnykh kak ob'ekt estestvoznanija (The mental reactions of animals as a subject of the natural sciences). *Priroda*, 10, 1191-1208.