BIAŁOBRZESKI Czesław—physicist and philosopher, b. August 3, 1878 in Poshekhon (Russia), d. November 12, 1953 in Warsaw.

From 1896 and 1901 he studied physics at the University of Kiev. From 1908 to 1910 he had a scholarship in the Collège de France (with P. Langevin). From 1911 to 1919 he was a private docent at the University of Kiev. In 1919 and 1920 he was a professor at Jagiellonian University. In 1920 until retirement he was a professor of theoretical physics at the University of Warsaw.

We may distinguish three periods in Białobrzeski's scientific work: from 1900 to 1913 he performed experiments on the optical and electric properties of dielectrics. In the period from 1913 to 1931 he dedicated himself to theoretical works on phenomenological thermodynamics (the role of the pressure of radiation in the thermodynamic equilibrium of stars). His last twenty years he dedicated to the foundation of quantum mechanics and its philosophical interpretation. Along with his scientific work, Białobrzeski worked to popularize the ideas of physics (the theory of relativity, atomic physics).

Białobrzeski's publications in physics: *Sur l'équilibre thermodynamique d'une sphère gazeuse libre* (Kr 1913)—results of studies of his first period of scientific work which anticipated A. S. Eddington's discoveries by two years; *La thermodynamique des étoiles* (P 1931)—this work concluded his second period of research; and *Termodynamika* [Thermodynamics] (Wwa 1923). His works in philsoophy: *Sur l'axiomatisation de la physique* (RMM 35 (1928),207); *Uwagi o pozytywistycznym kierunku filozofii fizyki* [Remarks on the positivistic direction of the philosophy of physics] (Wwa 1938); *Synteza filozoficzna i metodologia nauk przyrodniczych* [Philosophical synthesis and methodology of the natural sciences] (Nauka Polska [Polish Science] 25 (1947), 37–45); *O interpretacji ontologicznej podstaw fizyki świata atomowego* [On the ontological interpretation of the foundation of the physics of the atomic world] (Wwa 1956); *Podstawy poznawcze fizyki świata atomowego* [Cognitive foundations of the physics of the atomic world] (Wwa 1956, 1984[2]); *Religia i nauka* [Religion and science] (życie i Myśl [Life and Thought] 11 (1961) n. 7–8, 69–81); *Wybór pism* [Selection of writings] (Wwa 1964).

Białobrzeski was also a philosopher of nature. In ontology he held that "things in themselves" (the Kantian world of noumena) really exist independent of the subject. Persons endowed with the life of the psyche, material objects, and the phenomena occurring in them are things in themselves. Real beings occur at the physical-chemical level, the organic level, and the psychic or spiritual level. Their essential characteristics are individuality, mutability, and in the case of material beings—temporality. Białobrzeski also considered non-temporal ideal beings: mathematical constructs, relations between them, and ethical and aesthetic values.

Besides the world of noumena, Białobrzeski distinguished the world of common sense, i.e., the set of mental images "joined by categorial elements" that is obtained by direct data. This world is a simplified image of the world of "things in themselves". Furthermore there exists the physical world fashioned on the basis of of scientific cognition, a world that is subject to modifications with the development of knowledge and asymptotically approximates the world of noumena.

In microphysics Białobrzeski distinguished three kinds of indeterminism: temporal

 

indeterminism (the time of nuclear change and the emission of a photon are unknown), indeterminism associated with relations of non-designation (e.g., the velocity and position of a micro-object cannot be simultaneously measured with any accuracy), and dimensional indeterminism (from the mixture of the quantum states of a microsystem before measurement in the act of measurement one is realized).

Białobrzeski understood categories as tools that serve "the conceptual appropriation by the mind of the world of our experience". They perform a uniting function for the data of experience. Beside the teleology that most clearly occurs at the organic level, Białobrzeski accepted the categories of substance, causality, the concept of structurality that he introduced, space, and time. These categories are not marked by invariability and necessity; with the development of science their features can change.

He ascribed substantiality in classical physics to the mass of a body, and in microphysics he ascribed it to elementary particles. Elementary particles possess a limited independence (electrons in an atom, nucleons in nuclides) and invariability (the annihilation of the positron and negatron into photons).

Białobrzeski regarded causality in physical terms as the relation between successive states of a physical process. He distinguished between the deterministic (univocal) causality typical of phenomena in the macro-world, and the indeterministic (equivocal) causality that occurs in the micro-world. Deterministic causality is the univocal relation between the present state and a later state of a system, and equivocal causality is a non-univocal relation.

Structurality is the tendency to create complex structures from hierarchically ordered elements: atoms from nuclides, molecules from atoms and ions, galaxies from stars. An essential part of structurality is potentiality. Potentiality is understood as a really existing factor that causes the creation of structures from elements and causes interaction between elements. Potentiality has an active character. In classical physics it is made present by forces. In microphysics it is found in the wave aspect of matter described by a wave function. There are many hierarchically ordered potentialities: e.g., the potentiality of electrons and nuclides ordered to the potentiality of the atom. Białobrzeski generalized the concept of potentiality to extend to other levels of reality (especially the organic). With regard to the property of activity he compared potentiality with substantial form in the Aristotelian-Thomistic understanding, and with regard to the feature of "the creation of magnitude" he compared it with substantial form as Duns Scotus understood it.

In the theory of knowledge Białobrzeski admitted cognition by the senses and intellect. Since it lacks the proper sensory powers (e.g., to investigate radio waves or ultrasonic waves), sense cognition has a limited range of application. Mental images obtained by sense cognition and situated in space and time constitute the raw material for our knowledge of nature. By "the creative work of the mind" the material is transformed into the set of concepts and assertions that constitute the components of scientific knowledge. Białobrzeski postulated the possibility of obtaining (in an borderline case) knowledge about the world of things in themselves "in such a measure as will be accessible for human nature".

Białobrzeski thought of religion as an "indestructible" need of the human soul, as the ultimate justification for spiritual values (good, moral obligations) and as the creation of these values by human societies. Of all known religions the most perfect is the Christian religion. Białobrzeski was a theist with a pantheistic tone—"more closely connecting God

 

with nature".

W. Ścisłowski, *Czesław Białobrzeski (1878–1953)*, Postępy Fizyki [Advances of physics] 5 (1954), 413–422; J. Twardowska, *Zagadnienia z zakresu filozofii fizyki i filozofii przyrody u Czesława Białobrzeskiego* [Problems from the area of the philosophy of physics and the philosophy of nature in Czesław Białobrzeski], SPCh 5 (1969) n. 2, 141–157; S. Mrozowski, *Czesław Białobrzeski*, Postępy Fizyki [Advances of physics] 21 (1970), 573–580; L. Kostro, Przyczynki Czesława Białobrzeskiego do hylemorficznej interpretatcji mechaniki kwantowej [Czesław Białobrzeski's contributions to the hylemorphic interpretation of quantum mechanics, Studia Gdańskie 1 (1973), 223–239; T. Przybylski, *Dualizm falowo-korpuskularny w interpretacji Czesława Białobrzeskiego* [Wave-corpuscle dualism in Czesław Białobrzeski's interpretation] in: *Z zagadnień filozofii przyrodoznawstwa i filozofii przyrody*, 1, Wwa 1976, 53–79.

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