https://doi.org/10.28925/2412-2491.2024.224
UDC 81'1 : 316.77

DEVELOPMENT OF INTERDISCIPLINARY VIEWS ON THE ENERGETICS OF HUMAN COMMUNICATIVE BEHAVIOR

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This paper presents the results of a retrospective analysis of the scientific views on the energetics of human communicative and speech behavior. The etymology of the lexeme 'energy' is looked into; the definitions of the notion of 'energy' available in 17 lexicographic sources are analyzed, and semantic units incorporated into its lexical meaning are extracted. The analysis of their content makes it possible to define four essential features of the general scientific notion of 'energy' and synthesize its definition. As the energetics of human communicative behavior is traditionally seen as divided into the psychic and the physical components, its adequate description is possible only with the instruments of the integrative approach. The issues of mutual conversion of several types of energy to cater for various individual's behavioral programs, as well as physical and physiological aspects of speech energetics have already been researched to a certain extent. Less attention has been paid to the psychic energy of a person, which nonetheless is intuitively considered to be a significant motive of any form of human activity. A concise account of historical views on the human psychic energy, nominated "prana", "chi", "soul", "spirit", "entelechy", "energeia", "psychic pneuma", "animal spirits", etc. is provided in the paper. Milestones in the research of the neurophysiological aspect of the energy supply of human communicative and speech behavior are reviewed. Special attention is paid to Freud's description of the human psychic energy "economy" as the first full-fledged theory, capable of forming the basis for modeling the energetics of human communicative and speech behavior. Mention is made of the modern concept of "allostasis" oriented towards an anticipatory forecasting of energy needs by the organism rather than its posterior restoration upon some significant psychic events. Due to a lack of theoretical and experimental linguistic research, taking into consideration energy dynamics of the communicants' psychic processes, a universal stochastic model of utterance generation, developed by A. Kalyta and O. Klymeniuk appears specifically promising. It could be effectively used in the development of the methodology of an experimental-phonetic study of conflict talks, typically marked with a significant level of emotional tension.

Key words: *energetics of human communicative and speech behavior, a psychophysical problem, psychic energy, a retrospective analysis, psychic energy dynamics, linguoenergetics.*

Деркач Н.В. **Розвиток міждисциплінарних уявлень про енергетику комунікативної поведінки людини**

У статті представлено результати ретроспективного аналізу наукових уявлень про енергетику комунікативно-мовленнєвої поведінки людини. Розглянуто етимологію лексеми 'energy'; на основі визначень поняття 'енергія', вміщених у 17 лексикографічних джерелах, виокремлено смислові одиниці, що входять до його лексичного значення. Їх змістовий аналіз дозволив установити чотири сутнісні ознаки загальнонаукового поняття 'енергія' і синтезувати його визначення. Оскільки енергетика комунікативної поведінки людини традиційно розглядається у межах розподілу енергетичних субстанцій психічного начала людини на психічну та фізичну складові, її адекватний опис уможливлюється виключно засобами інтегративного підходу. Достатньо дослідженими на сьогодні є питання взаємної конвертації різновидів енергії для забезпечення реалізації поведінкових програм індивіда, а також фізичний і фізіологічний аспекти енергетики мовлення. Поза увагою залишається психічна енергія індивіда, що, тим не менш, інтуїтивно вважається рушієм будь-якої форми діяльності людини. У праці наведений стислий перелік історичних уявлень про психічну енергію людини, номіновану "прана", "ці", "душа", "дух", "ентелехія", "енергейя", "психічна пневма", "тваринні духи" тощо. Розглянуто основні здобутки в дослідженні нейрофізіологічного аспекту енергетичного забезпечення комунікативно-мовленнєвої поведінки людини. Увагу приділено концепції З. Фрейда як першому повноцінному теоретичному опису "економіки" психічної енергії, здатному слугувати підґрунтям для моделювання енергетики людської комунікації. Зауважується, що сучасна концепція "алостазу" орієнтована на випереджаюче прогнозування організмом власних енергетичних потреб, аніж на відновлення енергетичного балансу психіки після психічно значущих подій. Зважаючи на брак теоретичних і експериментальних мовознавчих досліджень, що беруть до уваги енергетичну динаміку психічних процесів комунікантів, багатообіцяючою виглядає універсальна стохастична модель породження висловлення, розроблена А.А. Калитою та О.В. Клименюком. Її концептуальні положення планується врахувати в розробці методики експериментально-фонетичного дослідження конфліктних діалогів, яким властивий значний рівень емоційної напруженості.

Ключові слова: *енергетика комунікативно-мовленнєвої поведінки людини, психофізична проблема, психічна енергія, ретроспективний аналіз, динаміка психічної енергії, лінгвоенергетика.*

Introduction

As an integrative approach to researching human communicative behavior is predominant in linguistics nowadays, its study from the standpoint of modern theory of speech energetics (Kalyta, 2007; Kalita, 2016; Kalita & Klimeniuk, 2022) is worth of particular attention. At the same time, a gradual development of linguoenergetic views on acts and processes of communicative behavior is

important, in order to confirm the validity of scientific concepts, represented in Kalyta (2007, p. 5–12), Kalita (2016), Kalita & Klimeniuk (2022, p. 269–286).

Thus, this theoretical review is aimed at the systematization of scientific views on the energetic nature of human communicative and speech behavior by means of a retrospective analysis of the development of respective interdisciplinary knowledge.

Methodology of research

The body of the definitions of the notion of "energy" was collected from 17 Ukrainian, English, German and French dictionaries, which made it possible to reveal 30 semantic units incorporated in its lexical meaning. A preliminary analysis of the definitions demonstrated that energetic phenomena of communication, including speech communication, are interpreted in the framework of a traditional division of the energetic substance of human psychic into its psychic and physical components. This view in general corresponds with the essence of the known scientific psychophysical problem, which has not been resolved by now within the scope of the integrative approach. Considering this, we conducted a retrospective analysis of the development of interdisciplinary views on a gradual deepening of the notion of the energy of communicative and speech behavior of a person, which were transformed and conventionalized throughout the human history and became a reliable basis for the formation of a modern speech energetics theory (Kalita, 2016).

Results and discussion

Examination of the origins of lexemes *enerhiia* (Ukr.), *energy* (Eng.) showed that they come from a Greek noun *energeia* denoting activity, action, functioning, which emerged from the adjective *energos* (Gr. "active"; "workable"), derived from the noun *ergon* (Gr. "an accomplished work"; "action"; "deed") (OED; ESUM, 1985, p. 166). Aristotle employed the notion of *energeia* in the meaning of "reality, existence" (something that de facto exists) in contrast with the notion of *ergon* as something that can potentially exist (OED). The meaning of "power" was acquired by the lexemes *enerhiia*, *energy* in the 17th century, and in the beginning of the 19th century they entered a scientific discourse with this meaning (OED; ESUM, 1985, p. 166).

Further analysis of the semantic units incorporated in the lexical meaning of the notion of "energy" demonstrated the appropriateness of their consolidation around four essential features of the general scientific notion of "energy", displayed in *table 1* below.

Table 1. Matrix of the analysis of content of the general scientific notion of "energy"

Lexicographic sources	**Essential features of the notion of "energy"**			
	Form of the motion of matter, capable of igniting physical and mental activity	Energy of physical activity of a person and functioning of machines and equipment	Ability of energy to change dynamically	Energy of psychic and mental activity of a person
	1.	**2.**	**3.**	**4.**
(LDCE)	■	■	■	■
(CCALD, p. 468)	■	■	■	■
(COD)	■	■		
(OLOD)	■	■	■	
(SUM, p. 480)	■		■	■
(Merriam-Webster)	■	■	■	■
(WED)	■	■		
(WNWCD)	■			■
(AHDEL)	■	■		■
(Duden)	■			
(DWDS)	■	■	■	■
(PONS)	■	■	■	
(GDF)	■		■	
(KEML)	■	■		
(Larousse)	■			
(DAF)	■	■	■	■
(DTV5)	■	■		
Frequency of features' coincidence (%)	100	71	53	47

The first essential feature, presented in the table as "form of the motion of matter, capable of igniting physical and mental activity", was formed by means of integrating such semantic units as "capacity / force, securing physical activity" (LDCE; CCALD, 2003, p. 468; COD; OLOD; Merriam-Webster; WED; AHDEL; Duden; GDF; KEML; Larousse; DAF), "power / ability / will to be mentally active

(COD; OLOD; Merriam-Webster; WED; AHDEL; Duden; GDF; KEML; Larousse; DAF), “the capacity of matter (body, substance), radiation, a physical system to perform work” (OLOD; SUM, 1971, p. 480; AHDEL; Duden; DWDS; DAF; DTV5), “a vital force” (PONS; GDF), “a physical value” (PONS; GDF), “form, number or level of the capacity of a physical system to perform work” (AHDEL; DTV5), “the ability of a body or substance to be the source of the force that will perform work” (SUM, 1971, p. 480), “a physical ability of a system to perform work” (Kernerman), “one of the main properties of matter, a common measure of all the forms of its movement” (SUM, 1971, p. 480), “an effective force” (WNWCD), “a sufficient amount of physical or mental power” (WED).

Defining the second feature, we considered the fact that the attribution of the notion of energy to the phenomena of human physical activity and functioning of machines and equipment can be represented in lexicographic sources by such semantic units as “power, e.g. from electricity, fuel, renewable energy sources, used to produce heat, light” (LDCE; CCALD, p. 468; COD; OLOD; Merriam-Webster; WED; AHDEL; DWDS; KEML), “power, e.g. from electricity, fuel, renewable energy sources, used to operate machines” (LDCE; CCALD, 2003, p. 468; OLOD; Merriam-Webster; WED; AHDEL; DWDS; KEML), “source of power that performs work, e.g. fuel or coal, electricity” (AHDEL; DAF; DTV5), “mechanical or electric power” (PONS).

As for the third feature, presented in the matrix, the mentions of it are fixed in such semantic units as “interest / enthusiasm with which a person acts” (LDCE; CCALD, 2003, p. 468; OLOD), “dynamism” (Merriam-Webster; DWDS; DAF), “liveliness, vitality” (PONS; GDF), “determination to act” (CCALD, 2003, p. 468; SUM, 1971, p. 480), “emotionality” (DWDS), “motive / impulse, expressed in decisive actions” (DWDS), “a feeling of being filled with physical power and life” (CCALD, 2003, p. 468), “a force that arises due to motion, combustion, etc. and can be transformed into other kinds of energy (e.g. electricity)” (GDF), “a value that characterizes a physical system and preserves its amount during all the internal transformations of the system (law of energy conservation) and expresses its ability to transform the state of other systems with each it interacts” (DAF).

In addition to that, considerable attention is paid in lexicographic sources to the energy of psychic and mental activity of a person, reflected in such semantic units as “force of expression of a certain meaning / self-expression with the help of non-verbal or verbal means” (WNWCD; AHDEL; DWDS; DAF), “a special (typically a positive one), spiritual / non-physical power, which is believed to exist

in a human body, a certain place, situation" (LDCE; Merriam-Webster; WNWCD; AHDEL), "a potential inner / psychic power for (intensive) expression" (LDCE; WNWCD; DWDS), "efforts (physical/mental) and attention, which a person directs towards a particular aim" (LDCE; CCALD, 2003, p. 468; SUM, 1971, p. 480).

Judging by the verbal and graphic image of the matrix, the first essential feature is available in all the lexicographic sources (see grey rectangles). Second in frequency of its mentioning in the matrix (71%), is the essential feature "energy of physical activity of a person and functioning of machines and equipment". Features presented below have the following frequency showings in the given lexicographic sources: ability of energy to change dynamically (53%) and energy of psychic and mental activity of a person (47%). Based on the results of the analysis of semantic components of the notion of "energy", we acquire objective grounds to define the general scientific notion of energy in the following way: energy is a general measure of the forms of matter, generating forces that are capable of causing dynamic changes in the outer and/or internal functioning of any physical or psychic systems.

According to Kalyta (2007) and Kalita & Klimeniuk (2022), in a generalized way energetic mechanism of speech generation can be described as falling into the following stages: 1) the energy of external or internal influences excites certain concepts-instincts stored in an individual's memory, and resulting from this, a certain energetically substantial contradiction arises (Kalita & Klimeniuk, 2022, p. 263–264); 2) a psychoenergetic field of informational excitation of individual's psychic is generated, and cognitive processes of thinking-and-speaking and thinking-and-acting are launched (Kalita & Klimeniuk, 2022, p. 267–268); 3) a structure-attractor of a would-be utterance is formed, and within it the psycho-energetic potential of the utterance is first distributed into the emotional and pragmatic components, and then, as a result of successive bifurcations, is actualized in the form of certain extralingual means, as well as chosen language means of communication (Kalyta, 2007, p. 9–11).

The energetics of speaking seems to be the most accessible for scientific observation at the stage of pronouncing the utterance, represented by the aggregate of its language and extralingual means. According to modern researchers in the field of neuroscience (Ramachandran & Blakeslee, 1999, p. 45–47; Feldman Barrett, 2017, p. 69–70; Sapolsky 2018, p. 48–50), brain process preceding speaking can be outlined in the following way: associative frontal cortex receives

signals from the hypothalamus about current biological and social needs of the individual and singles out the need which is most powerfully charged with energy, and therefore, is the most topical one. The search of a behavioral program, capable of satiating the need, is realized on the basis of the information from memory centers, individual experience and associative parietal cortex. Amongst the competitive programs the one is chosen, whose energetic potential has the most relevant rating under the particular circumstances of communication. The rating of this program depends, in the first place, upon the available experience of its successful implementation, each time reinforced by positive emotions of a varying level of intensity. As a result, chosen motor programs are launched in the form of a chain "associative frontal cortex → motor cortex → cerebellum → spinal cord → muscles → movements".

Mechanisms of energy supply of different types of human activities have been studied on the molecular level as well. By now several forms of converted energy have been discovered, which can be mutually transformed and supply the varieties of work ongoing in the organism: chemical, electric, osmotic, mechanic and generation of heat. Murray (2018) describes several systems of energy transformation, when chemical energy turns into a mechanical energy of movement to support various actions of an individual. Such systems may work simultaneously, but normally some of them prevail subject to the organism's needs – e.g. when it requires a great amount of energy to realize an immediate intensive reaction (anaerobic energy supply system), or is in need of a relatively high energetic capacity within a short period of time (anaerobic glycolytic system) or a moderate energy expense during a prolonged time period suffices for it (the most typical aerobic oxidative system).

A physical aspect of sound speech presents itself as a complex of muscular effort of articulation organs that generate sound waves. The energetic component of muscular work of the organs of articulation is explicitly described in Taranets (2014, p. 22–27). In the meantime, the peculiarities of sound wave energy actualization in oral speaking are set out in numerous works on phonetics (e.g. Taranets, 2014, p. 128) and bioacoustics (e.g. Larsen & Wahlberg, 2017).

Though psychic energy remains an essential component of speech energetics and a moving force of any form of human activity, yet, description of its mechanisms is complicated by the fact that dynamics of normal continuous energetic processes inside human psychic cannot be subject to direct observation. Despite such difficulties, the interest towards human energy as a "vital force" and a

source of activity has always been significant in the society in the framework of religious systems, philosophical doctrines, alternative healing practices, etc. Considering a significant amount of actually existing phenomena and culturally conditioned views formed within the scope of the notion of human psychic energy, which historically have acquired various nominations, let us review some of them in retrospect.

According to Aristotle's famous generalization (Aristotle, 1957, p. 29–30), trying to perceive the essence of a human being, its energetic basis – soul (or psychic – as Gr. *psychí* means "blow of the wind, breathing, soul") – philosophers utilized such three main features as movement (in space, to secure nutrition, in the processes of growth and decline), sensation (as a way of relating to the world) and incorporeity (absence of apparent material expression). It appears logical as firstly, philosophers of Ancient Greece saw the reason of self-motion in nature in elements whose motion may be visible – air, fire and water, or in a mixture of elements. Secondly, introduction of the criteria of the ability of sensation and rational perception initiated the emergence of teachings about different types of souls: nutritive, sensitive-locomotive and rational. Thirdly, observation of the fact that upon the individual's death self-motion of the body is over, and lack of understanding what exactly is lost to condition such a change, brought philosophers to the ideas of incorporeity, transparence and immortality of soul.

The notion of "prana" (Sanscr. *prāṇa* – breath, life) – a person's vital force, nourishing the aura through a system of minute channels – "nadi" (Sanscr. *nāḍī* – "a channel, a tube, a vein, pulse") has ever been a part of Indian religious and philosophical system. The varieties of such energy are called "vayu" (Sanscr. *vāyu* – "air, wind, gaseous state of a substance") – "vital winds" in a human body, governing energy circulation in its parts, facilitating awakening, opening eyes, activating eyesight, causing hunger, thirst, yawning, generating speech, etc. (Manasa, Jois & Prasad, 2020, p. 128–129, 131). Likewise, traditional Chinese medicine has utilized the notion of "chi" (Chin. "breathing, spirit, temperament, energy, vital force, etc.") (ibid., 2020, pp. 128, 132). As well as "prana", "chi" represents the energy of thoughts, intentions, emotions and feelings, and feeds all the vital functions of an individual through a system of body channels – meridians (Chin. *jīngluò* – "channel network, meridian") (Srinivasan, 2014, p. 1; Sweigart, 2016, p. 4–6).

Naturally, ancient Greek and Roman philosophers were also occupied with the problem of the origin of human vital energy and the specificity of its

functioning. According to the representatives of the Ionian school (7c. – 6c. B.C.), the corporal and the psychic have a common basis and differ only in the element of its manifestation, which could be water (Thales), "apeiron" – a qualitatively undefined state of matter, giving rise to the whole diversity in the world (Anaximander), "pneuma" (Gr. *πνεῦμα, pneuma* – "air in motion, breath"; later – "spirit") (Anaximenes) (FES, 2002, p. 384). It should be noted, that a Greek word *pneuma* was later translated into Latin as *spiritus* (Lat. "breathing as a life process; blowing of the wind"). It was borrowed into English in the 13th century directly from Latin or via Old French in the meaning of "life, its source in a human or an animal" (cf. Germ. *Spiritus*, Fr. *esprit*). While the origin of the English word *soul* denoting substance attributed to each individual that lives, feels, thinks and desires something, can be traced to the Old English word *sawol* ("spiritual and emotional part of a person, a spirited existence; life, a living being"), originating from the Proto-Germanic **saiwaz* ("sea"), possibly, in the meaning "coming from or belonging to the sea" as a possible allusion to a hypothetical dwelling-place of the immortal soul beyond the body. The difference between *soul* and *spirit* arose in the English Christian terminology by analogy with a pair of Greek notions *psykhē* and *pneuma*, and their Latin correlates *anima* and *spiritus*, though at first these lexemes were used interchangeably (OED). In their turn, Ukrainian notions *dusha* and *dukh* come from a Proto-Slavic word *duša*, cognate with the Lithuanian word *dvasià* ("spirit, breath") – an analogue of the Latin notion *anima* (ESUM, 1985, p. 150).

Heraclitus of Ephesus (c. 540 B.C. – c. 480 B.C.) conceived a human soul as a source of life, motion, power supply and growth, an immaterial and fluctuating substance of brain that comes from blood, is in permanent motion and contacts the world through organs of sense perception (Aristotle, 1957, pp. 27–28; Heraclitus, 2015, pp. 22–23). Also Socrates (c. 469 – c. 399 B.C.) in Plato's (427–347/348 B.C.) account of the dialogues "Phaedo", "Phaedrus" and "Timaeus" expressed thoughts that the soul animates the body, moves it from within (Plato 1999, p. 256, p. 308) and uses it for the research of the surrounding world by means of the organs of sense perception. In an attempt to overcome the opposition of the "idealness" of immortal soul and defects of corporeity Plato noted (Kraut, 2022), that except a rational immortal soul connected with the body through brain there also exists a mortal type of it. It is responsible, on the one hand, for such feelings as satisfaction, suffering, fear, fury, hope, love, unconscious feelings, etc. and, on the other hand, for the emergence of irresistible desires and yearnings.

Distinct from this was assumption of Democritus (460–370 B.C.), that a human soul is comprised of special mobile atoms replenished through breathing and dispersed throughout a human body. In doing so, fiery and the most mobile atoms accumulate in the head to ensure cognition – sensation, perception and thinking, while less mobile ones – in the heart, to facilitate emotional and affective states, and in the liver – to feed the sphere of yearnings, aspirations and needs (Berryman, 2023). Following Democritus also Epicurus (341–271 B.C.) and later also Lucretius (99–45 B.C.) adhered to the atomistic view on the structure of human psychic. Thus, for Lucretius spirit (*animus*) – mind, and soul (*anima*) are quite material and mortal, capable of moving the body. They are closely connected, but the spirit governs, concentrated in a certain place inside the body, and is able to generate feelings, while the soul is dispersed throughout the body and mirrors intense feelings experienced by the spirit, with physiological reactions (Lucretius, 1988, pp. 76–77, p. 82). According to Lucretius (1988, pp. 77–79), components of the spirit are wind, heat, air and the fourth unknown component, "the soul of soul", the most mobile and the thinnest one, which facilitates thinking. In a way, Lucretius described the processes of excitation and inhibition of psychic activity in the form of coupling of a sufficient amount of soul atoms and their mutual repulsion (Lucretius, 1988, p. 81).

Aristotle (384–322/324 B.C.) (1957, pp. 67, 69) resolved the contradiction between the existing views on corporeity and incorporeity of soul in the following way: a living being is comprised of matter (body) and form (soul), which are inseparable. It is soul that provides the body with a structuring form and definiteness as an inner objective of its self-motion, a live and active basis – "entelechy" (Gr. *entelecheia* – "that which realizes or makes actual what is otherwise merely potential" (Encyclopedia Britannica)). Aristotle used this term synonymously with the term "energeia" to denote something that brings the object from potential to actual existence and marks the realization of its full potential (Blair, 1967, pp. 101–117; Amadio & Kenny, 2024). He also supported a view on the close affinity of soul and "pneuma" (Gregoric, 2020, p. 25).

The notion of "pneuma" as a material medium of life and psychic is employed also by Herophilus (335–280 B.C.) and Erasistratus (304/303–250/249 B.C.), representatives of the Alexandria School of Medicine. They believed that "pneuma" flows into heart from the lungs, mixes with blood and forms the "vital pneuma", which fills the body and is transformed into the "psychic pneuma". The latter is channeled into nerves, organs of sense perception and muscles, starts the

body, ensures its active state (Leith, 2015, pp. 251–252). This idea is also contained in the teaching of Galen (130–200 B.C.), who understood "psychic pneuma" as an intermediary between body and soul, helping soul to feel and move the body (Singer, 2020, pp. 241–242; Leith, 2015, p. 256). The Early Stoics (3rd – 2nd centuries B.C.) also agreed that "pneuma" is a cause of life and brings the body into motion (Hensley, 2020, p. 197).

A concise review of the views on the psychic available in the writings of ancient authors demonstrates that the notion of energy-soul-psychic is regarded by them predominantly from the perspective of idealistic or materialistic monism. The features of dualism can be found in the works of Plato and acquire a greater definiteness in Aristotle's teachings. A complexity of interpreting the phenomenon of thinking urges philosophers with materialistic views to search for substances, responsible for its organization (e.g. specific atoms, an unknown component of spirit). The existing variety of psychic processes (intellectual activity, feelings, yearnings, etc.) is attributed by ancient philosophers to different types of souls: nutritive, sensitive-locomotive, and rational. Psychic energy is most typically viewed as a gaseous element, 'pneuma', which is dispersed throughout the body and helps the rational immortal soul control it.

Within the Christian philosophy, including the works of St. Augustine (354–430) the soul was presented as an immaterial immortal entity, watching over the functions of thinking, memory, volition and control of the body (FES, 2002, p. 6). For their part, the Scholastics (e.g. Th. Aquinas (1225–1274)) adapted Aristotle's teachings about the interdependence of a material body and immortal soul (form, 'entelechy') to the needs of Christian philosophy (FES, 2002, p. 643). However, in the late Middle Ages there appeared exhortations, e.g. from R. Bacon (1214–1292), to delineate theology and philosophy, concentrate on the empirical studies of man and nature (FES, 2002, p. 51). A tendency to recognize the natural origin of psychic processes intensified in the Renaissance. Thus, P. Pomponazzi (1462–1524) held that a human soul has both material and immaterial properties, hence people are apt both to be governed by moral principles and to act brutally (Martin, 2021; FES, 2002, p. 497). The views of B. Telesio (1508–1588) were also marked by the trend of empiricism. On the one hand, he declared the presence of an immortal "superior soul", while on the other hand, he admitted the availability in a person of a material mortal "vital spirit" – a specific fine substance moving with a nervous system and practically approaching the idea of consciousness (Boenke, 2023; FES, 2002, p. 631). In his turn, L. Vives (1492–1540) attempted to explain,

how the soul acts, thinks, speaks and feels. As well as Galen, he used the notion of "pneuma" (spirits) as a corporeal intermediary between the body and immortal soul (Casini, 2021).

Although the issue of the interaction of soul (psychic) and body had been discussed long since, only in the 16th –17th centuries, with the intensification of natural and technical sciences and the establishment of the mechanistic view of the world, it acquired the status of a psychophysical problem, and two variants of its resolution were suggested – concepts of a psychophysical interactionism (R. Descartes) and a psychophysical parallelism (B. Spinoza, G.W. Leibnitz, N. Malebranche, D. Hartley and others) (Hatfield, 2023; Heil, 2000, pp. 27–32). In fact, Descartes (1596–1650) offered the delimitation of matter as a material, "extended" substance (*rex extensa*) and spirit (consciousness) as a mental, "non-extended" substance (*res cogitans*) (Capra, 1975, p. 22; Chadwick, 2020, pp. 260–261). According to Descartes, the essence of a psychophysical interaction consists in the fact, that a human body is influenced by mind (in feelings and affects) and is able to influence it as well (e.g. with a volitional effort). His concept of "animal spirits" (Descartes, 1677, pp. 11–13, 28–21, 54–55) generally corresponds with the "psychic pneuma" doctrine, widespread in the Antiquity. Descartes (1677, pp. 55, 89–90) believed that the power of "animal spirits" is reflected in the varieties of emotional reactions and incites excitation and inhibition of muscles (Descartes, 1677, pp. 23, 89–90). He conjectured (Descartes, 1677, p. 10) that the soul is connected with the body by means of epiphysis, excites it with impulses thus influencing "animal spirits", and moves the body. In a reversed way from the organs of sense perception to the soul, sensual images, perceptions and affects are aroused in the latter (Descartes, 1677, pp. 50–56). As Descartes' explanation of soul and body interaction did not appear convincing enough for his followers (N. Malebranche, A. Geulincx, J. Clauberg and others), they eventually declared that the only authentic source of psychic states and physical actions of a person is God (Schmaltz, 2022). A psychophysical parallelism, postulated by them, was illustrated by N. Malebranche's metaphor of two watches going in a parallel way but independently from one another (Scott, 1997, p. 445).

In its turn, a materialistic view of human psychic processes, inspired by the works of I. Newton and J. Locke was shared by J. Toland, J. Priestley, J. de La Mettrie, D. Diderot, P.-H. Holbach, C.A. Helvetius and others. Already Th. Hobbes (1588–1679), known for his mechanistic views of the world and man, used the notions of "mind" and "soul". Hobbes considered the function of soul

bestowing life on the body, without reference to mind and mental faculties of a person. As the concept of "soul" was deeply integrated in the scientific discourse of that time, no wonder that he used this notion occasionally, but interestingly, the mentions of immortality of soul and its influence on intellectual processes were removed from the Latin version of "Leviathan" (1668) compared with the English edition of 1651 (Chadwick, 2020, pp. 269–270). Also D. Hartley (1705–1757) adhered to materialistic views on the human psychic, attempting to develop a so called "physics of the mind" in which vibrations of neural and cerebral substance were believed to cause sensations, sensory images and ideas (Allen, 2021). J. Müller (1801–1858) devised a theory of a specific energy (*Lebensform*), contained in the organs of sense perception, due to release of which perception takes place. According to Müller, sensory nerves of one modality, irrespective of the stimulation mode, are able to generate only a certain type of stimulation, which reaches the brain and is transformed into a certain type of perception (Berrios, 2005, pp. 233–234). Energetic competition of certain ideas in a human psychic was considered by J.F. Herbart (1776–1841). He believed that such interaction could be calculated mathematically and introduced the notion of the "threshold of consciousness" to explain a certain limit, which ideas, energetically weak or repressed into the unconscious, are unable to surmount (Kim, 2015).

Apparently, any further achievements in the empirical studies of human psychic could be successful only on condition of an adequate technical level of scientific research, which was not achieved until the middle of the 19c. Since then, a lot of breakthroughs have been made in the physiology of cerebral and neural processes. In 1870 G.Th. Fritsch (1838–1927) and E. Hitzig (1838–1907) established the connection between the electric irritation of certain parts of motor cortex and respective motor reactions (Eulner, 1972, p. 273–274). In his turn, G. Fechner (1801–1887) substantiated psychophysics as a science aimed at studying human psychic from the perspective of physical factors and anatomical and physiological data. Based on E. Weber's (1795–1878) observations of the force of stimuli, a Weber-Fechner law was formulated, describing the dependence of the force of sensation on the increase of the force of stimulus (e.g. loudness, intensity of light, etc.) (Hennemann, 1961, p. 38). In 1852 H. Helmholtz (1821–1894) identified the nerve conduction velocity and formulated the law of specific energy of nerve fibres, according to which separate fibres of the nerve conduct specific messages to the brain (Kopets, 2010, p. 22). To a considerable extent due to R. Cajal (1852–1934) a so called "neuron doctrine" was formed, according to

which neurons were recognized as the main structural units of brain and the ability of neurons to contact other neurons within neural chains to transfer the network signals was confirmed. Also, the ionic hypothesis about the ability of a separate neural cell to generate an electric signal (potential of action) and the chemical theory of synaptic transfer between neural cells with the help of neurotransmitters have formed the basis of the modern views on biology and physiology of cerebral processes (Kandel, 2006, pp. 65–66). An important addition to the Cajal's concept was discovery by Ch.S. Sherrington (1857–1952) of the possibilities of interneurons not only to transfer, but also to inhibit a further transfer of information in the chain (Kandel, 2006, pp. 69–72).

The idea that energy is a property of the surrounding reality and is an indispensable component of all its forms, including psychic processes, is spread also within psychology, which was established as a science in the end of the 19th century. In it, a psychic energy is regarded as a hypothetic form of energy, feeding psychic phenomena and connected with the work of brain as a physiological organ of the psychic (Jung, 1961, pp. 124–125; Berne, 1947, p. 9; Kandel, 2006, p. 72). An essential interest to the studies of the energetics of psychic phenomena was demonstrated, in the first place, in the works of the representatives of psychoanalysis, introduced by S. Freud (1856–1939). At the stage of his becoming as a scientist, Freud was interested, in the first place, in the physiology of cerebral activity. In particular, in his work "Entwurf einer Psychologie", first published only in 1975, a human psychic was described as the one having a natural propensity to balance (Freud, 1975, p. 306). Besides, according to the inertia principle (known also as the "nirvana principle"), the organism is liable to saving energy and automatisms, so neurons tend to dispose of an excessive energetic excitation and return to the state of balance (Freud, 1975, p. 305; APA Clinical, 2013, p. 455).

It should be noted, that Freud used the term *Besetzung* (Germ. also "energy charge", "energy investment") to denote an energy charge, but in 1922 in J. Strachey's English translations of Freud's works it was replaced with a Greek term cathexis (Gr. *kathexis* – "retention"), and since then the latter has been used in the English and Ukrainian translations of Freud, and nowadays a term "investment" is also employed in the English scientific discourse (Colman, 2014). According to Freud (APA Clinical, 2013, p. 95), cathexis is an energy charge with a positive or negative valence of affect and can be invested in *Ego*, desire, fantasy, objective, idea, person, social group, etc. In psychoanalysis, the notion of

"cathexis" is used in the description of the energy of life and death instincts. In its turn, with the help of anti-cathexis – a reverse charge – *Ego* taboos certain desires and thoughts, formed in the preconscious, and blocks their discharge, in order not to allow them into the conscious (APA Clinical, 2013, p. 38; Felluga, nd.). Besides, in the mentioned work (Freud, 1975) Freud postulates the interaction of three neural systems incorporated in the nervous system of an individual: a *phi*-system (a peripheral outer sensory-motor system), a *psi*-system (a psychic inner system) and an *omega*-system (a system of conscious perception). The *phi*-system works with the energies of the outer world and, on the one hand, is aimed at dispersing a considerable amount of energetic stimuli which access *phi*-neurons, and, on the other hand, allows specifically strong charges pass (Freud, 1975, p. 313) and acts as a filter, where stimuli of certain quantity and quality can influence only particular terminals (Freud, 1975, p. 319, 321). In the process, *phi*-neurons are able to pass essential energy stimuli through their chains without any hindrance (Freud, 1975, p. 311–312).

To the contrary, the *psi*-system is not directly connected with the outer world, and only obtains the information from it through energy stimuli from *phi*-neurons and interoception (Freud, 1975, p. 314). *Psi*-neurons work with small energy charges, that are able to retain a certain permanent charge, are the medium of memory, and, as Freud conjectured (Freud, 1975, p. 309), of all the psychic processes. Besides, they are capable of a certain resistance to an energy stimulus (Freud, 1975, p. 311–312). Their conductivity depends on the value of the stimulus, passing through an excited neuron, as well as on the number of excitations (Freud, 1975, p. 309). In so doing, the increase of the amount of stimulus takes place as a result of summing up the energy of excitation charges (Freud, 1975, p. 324–325). Freud believed (Freud, 1975, p. 309), that *psi*-neurons continuously changed in the processes of excitation and with time the conductivity of some of their synapses (Freud uses the term *die Kontaktschranken* – contact barriers) grew (Freud, 1975, p. 309). In such a way, neural ways, laid by experience and study and associated in the first place with an effective satisfaction of a certain need, affect, or overcoming unpleasant, painful sensations, gained advantage in their conductivity and, apparently, were chosen more often than others (Freud, 1975, p. 324).

According to Freud's conjecture (Freud, 1975, p. 330, pp. 367–368), an individual's Ego is formed in the *psi*-system and presents in itself the aggregate of interconnected neurons, capable of preserving their energy charge on a stable level

throughout a certain period of time (Freud, 1975, p. 345). Inhibition of the processes of energy stimuli discharge (tabooing) by *Ego* is caused, in addition, by the need to differentiate the data of perception and memory. The experience teaches us that it is not reasonable to discharge certain energy stimuli without the results of their verification with the reality due to the danger of its substitution with memories (Freud, 1975, p. 333). If the image of a desired object has a powerful energy supply, it can assume the features of reality, so a person may be misled (Freud, 1975, p. 333).

Eventually, energy stimuli travelling through the *phi*-system and the *psi*-system get into the *omega*-system, where conscious perceptions are formed (Freud, 1975, p. 317, p. 322). Freud assumed (Freud, 1975, p. 319), that the basis of consciousness is formed by *omega*-neurons' state of affective excitation, so when it is out of work (e.g. during the sleep), the input from the neurons of *omega*-system stops (Freud, 1975, p. 320).

As Freud noted (1955, p. 63), consciousness interprets interoceptive sensations as pleasant or unpleasant (a possible correlate of such perception on the energy level is changing the level of cathexis in the unit of time), as well as possessing a certain energy tension rate. According to Freud (Freud, 1975, p. 329), an energy charge of a certain "friendly" image, stored in the memory (*Erinnerungsbild*), in the state of desire substantially exceeds the energy potential of normal perception, which improves the conductivity of such signals. Contrary to this, traumatic "hostile" ideas, memories, images are repressed by protective mechanisms, in particular with the help of such energetic mechanisms as the "side-cathexis" (*Seitenbesetzung*), the "anti-cathexis", etc. With the help of these mechanisms *Ego* inhibits, "disperses" an energy charge, not allowing it to activate an unpleasant feeling (Freud, 1975, p. 330–331, 333). Freud believed that the *psi*-system is biologically motivated to discharge an unpleasant "hostile" image as soon as possible. Moreover, experiencing pain and dissatisfaction further leads to repulsion, aversion towards charging a "hostile" image with energy (Freud, 1975, p. 329).

Apparently, a description of energetic processes in the human psychic, provided in Freud (1975), is the first full-fledged theoretical construct, capable of being a basis for modelling the energetics of human communication. Further on, in his psychoanalytic doctrine Freud utilizes the notion of a psychic energy *libido* (Lat. "desire, yearning, passion") (LE, 2007, p. 556; APA, 2015, p. 600). To describe the dynamics of *libido*, distributed between *Id, Ego* and *Super-ego*,

namely, processes of its growth, reduction, displacement and discharge, the notion of *Besetzung* ("cathexis") is still used. The instincts of the unconscious, amalgamated into a pair of *Eros* (unity, ensuring life) and *Thanatos* (break of connections, destruction) a source of psychic energy (Freud, 1959, pp. 6–8; APA, 2015, p. 330). Freud conjectured that their energetic interaction forms a specific balance in the course of human life and gives birth to a whole diversity of vital processes (APA Clinical, 2013, p. 189). In psychoanalysis it is believed that *libido* either moves freely or is invested into various psychic objects: yearnings, desires, ideas, etc. ("object-cathexis") (APA, 2015, pp. 164, 722) – hence emerged a metaphor of the *libido* economy, convenient for psychoanalysts. Freud did not offer any denomination for the energy of *Thanatos*, but his followers did that, e.g. *destrudo* (E. Weiss) or *mortido* (P. Federn) (APA, 2015, pp. 157, 167, 367)). According to Freud (Freud, 1959, p. 7), it is much harder to track the energy of *Thanatos* compared with *libido*, as this instinct functions in a latent way and exposes itself only when it comes out in the form of aggression due to various reasons, e.g. self-defence. When *Super-Ego* is formed, a considerable energy potential of the *Thanatos* instinct is concentrated within *Ego*, becoming a source of self-destruction, and eventually killing the individual when *libido* is exhausted in the old age or is fixed in an unfavorable way due to internal conflicts.

Thus, owing to a psychoanalytic theory the energetics of human psychic as a motive force of human behavioral reactions first became an object of scientific analysis. It should be noted, that a term "homeostasis", borrowed from physiology, is often used to denote a balanced state of an individual's physiology, psychic and energetics. In a number of models, known in psychology, homeostasis of the human psychic is achieved by reducing tension and discomfort in it. Worth of mention is the specification, made by S. Maddi and D. Fiske (Maddi, 1989), that an individual is liable to daily variations of physical tension levels, graphically represented as an activation curve. Apparently, the shape of this curve can be defined by such factors as human genetics, specificity of temperament and acquired life experiences. In case of deviations from the norm on both sides, a need arises to restore balance. In 1988 though, P. Sterling and J. Eyer (Sterling, 2012, p. 5) suggested to replace the notion of "homeostasis", associated with the correction of the organism state upon receiving interoceptive signals about the needs, with the notion of "allostasis", aimed at the proactive forecasting by the organism of its own energy needs.

L. Feldman Barrett (2017) also relies upon this concept when she describes the energetic dynamics of human psychic using, among, others, such notions as “affect” and “body budget”. In most English reference books (e.g. Hayes & Stratton, 2003, p. 10; APA Clinical, 2013, p. 10) the notion of affect is interpreted in a broad way, as a psychic phenomenon which on a par with cognition, conation and behavior is a component of the human psychic. Apart from this, affect is related to a whole spectrum of feelings, varying in their intensity, valence, complexity and “normality” (as compared with pathology) (APA Clinical, 2013, p. 10; APA, 2015, pp. 26–27; Hayes & Stratton 2003, p. 10)). Accordingly, L. Feldman Barrett (2017, pp. 72–74) understands the affect as a fundamental aspect of consciousness, a continuous current, which functions throughout the human life and at each moment is assessed by interoception in terms of valence (pleasant or unpleasant sensation) and the level of energetic excitation (from low to high). Taking the results of this assessment into consideration, our mind plans the budget of bodily energy expenditures, which varies during the day and is corrected when something happens, which is psychologically relevant for the person. In that case, energy consuming reactive schemes, capable of causing short-term and long-term energy disbalances, may be activated.

Within a “quantum” approach to the problem of conscience, which came into being in the beginning of the 1970s, an attempt was made to resolve it on the basis of the quantum theory (Penrose, 2004, p. 100). Trying to connect the macrophenomena – psychic processes and a conscious behavior of a person or at least human cerebral activity – with quantum phenomena of microphysics a few mutually contradictive theories have been suggested, e.g. by S. Hameroff and R. Penrose, F. Beck and J.C. Eccles, H. Stapp and others (see the review of these theories in Atmanspacher, 2020). In fact, H. Stapp notes that contrary to the classical mechanics, a quantum one is able to offer some space for the mental (Velmans, 2009, p. 18). But at the moment neither of the given theories, according to their critics (see e.g. Chalmers, 2007, p. 232; Velmans, 2009, p. 28) is able to explain, how quantum and mechanical processes correlate themselves with subjective aspects of consciousness, use of language and communication systems. While physical consequences of a conscious intention of the individual could be substantiated by quantum laws, the specificity of its choice is apparently not conditioned by them. Also B. Loewer (Loewer, 2003, p. 522) has doubts as regards the possibility of the quantum theory to explain the essence of mental states, emerging on a material basis, but supervenient to brain microevents.

Active harmonization of research in the field of cognitive and neuroscience already allows us to obtain some basic knowledge of the energetic basis of human behavioral programs' activation. The interest towards the energetic aspects of speech communication is enlivened within linguistics as well, even though it is hardly possible to claim that the science already possesses a sufficient amount of systemic and experimentally confirmed views on speech energetics. A forerunner of the scientific interest of linguists to speech energetics is probably W. von Humboldt (1767–1835), who mentioned both the internal energy of an individual, channeled into his activities (Humboldt, 1854, pp. 14–15, p. 58), and the energy of the national spirit shaping language and interacting with it through its material manifestation (Humboldt, 1908, p. 602). Humboldt believed (Humboldt, 1836, p. 297) that language is subordinated to unconscious energy of human individuality and depends on the circumstances, surrounding an individual in the world. To generate speech, inner speech consciousness directs its energy into sounds to express the thought in the most appropriate way.

I.O. Baudouin de Courtenay (1845–1929) also accentuated the connection between the psychophysical problem and linguistics, even though he had to admit that at his time no definitive relations between the material substance of the brain, on the one hand, and thinking and language, on the other hand, had been revealed (Baudouin de Courtenay, 1903, pp. 153–154). Nonetheless, their interdependence seemed apparent to him (Baudouin de Courtenay, 1903, p. 154, 159) at least in pronunciation, where physical energy facilitates the release of potential energy of language in the phenomena of motion, heat, electricity, etc. In his work (Baudouin de Courtenay, 1903, p. 161–162), the researcher offered a view of the cognitive and energetic nature of speech generation and perception, which turned out to be quite consistent with the modern one. As Kalyta justly remarks (Kalita, 2016, p. 12), the model of human language development on its early stage, devised by Baudouin de Courtenay, demonstrates that the author perceived the naturalness of the idea of the re-distribution of the psychic and energetic potential of an individual in the process of utterance formation.

A review of modern linguistic studies (in Kalita 2016, pp. 13–20), approaching the ideas of linguoenergetics, demonstrates that they are related to its semantic aspect and touch upon its problems in an intuitive way. In respect of the functional trend of linguoenergetic research worth of particular attention are the following conceptual principles, set forth in works of Kalyta and Klimeniuk (Kalyta, 2007, pp. 5–12; Kalita, 2016; Kalita & Klimeniuk, 2022, pp. 269–286):

1) a psychophysical energy is generated in the sphere of the unconscious and then migrates within the psychic and feeds all its processes (Klimeniuk & Kalita, 2004; Klimeniuk, 2010, pp. 205–213; Kalita & Klimeniuk, 2022, pp. 263–264, pp. 275–276);

2) emotional excitation is a source of psychophysical energy causing the mechanical movement of the human body and igniting respective electric charges in the human nervous system (Kalita & Klimeniuk, 2022, p. 400);

3) excitation is caused by the energy of the external and internal stimuli, capable of reaching the depth of concepts-instincts in a human memory and provoking a contradiction between them (Kalita & Klimeniuk, 2022, pp. 263–264);

4) the aggregate energy of neural excitation generates psychoenergetic fields of informational excitation of the individual's psychic and ignites the self-development of cognitive processes of thinking-and-speaking and thinking-and-acting (Kalita & Klimeniuk, 2022, pp. 267–268);

5) in the process of utterance formation, presented in work of Kalyta (Kalyta, 2007, pp. 9–11) as an attractor structure, a psychoenergetic potential of the utterance is first distributed into its emotional and pragmatic components. Then, resulting from consecutive bifurcations on the way to speech message actualization, the energy of emotions is invested in extralingual means, while the pragmatic component reveals itself in the choice of the respective language means of communication.

Conclusion

A universal stochastic model of utterance formation, resulting from the self-development of the speaking-and-thinking and thinking-and-acting processes in the mental sphere of the individual and supplied by the energy of the human psychic, is integrative and takes into consideration the results of contemporary research in the fields of psychology, neurophysiology and linguistics, thus providing a reliable basis for modelling different kinds of human communicative and speech behavior. A cognitive and synergetic component of this model makes its application especially promising in the analysis of the energetics of speech communication, marked with a high level of emotional tension, including conflict talks with different levels of conscious control, ecologicity and communicative adequacy.

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Дата надходження статті до редакції: 19.02.2024
Прийнято до друку: 12.03.2024