SECTION: THEORETICAL AND METHODOLOGICAL PROBLEMS OF PSYCHOLOGICAL ADVICE AND PSYCHOTHERAPY

РОЗДІЛ: ТЕОРЕТИЧНІ ТА МЕТОДОЛОГІЧНІ ПРОБЛЕМИ ПСИХОЛОГІЧНОГО КОНСУЛЬТУВАННЯ ТА ПСИХОТЕРАПІЇ

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QUANTUM MECHANICS (QM) AND PSYCHOLOGY: A NEW FIELD OF COOPERATION?

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We will try to present critically published works on Quantum Mechanics (QM) and Psychology (perhaps more generally regarding the so called social sciences), partly by ourselves (Giacomuzzi, 2008, 2002), in an overview. It is of course impossible to give a complete summary here, but critical points should be emphasized, which perhaps leave a more differentiated view on the problems of "psychological reality". Nowadays QM is “hip” in scientific literature. But common approaches doesn`t take into consideration that physicists already 80 years ago tried to establish a connection between life sciences and physics. But do neuroscientific findings really validate essential psychological basic assumptions? Do they really open up new, interdisciplinary research perspectives? Physics itself today struggles with its theories and we`ve a big gap between on what we experience and on what we really understand. Maybe this gap of understanding our own reality is much bigger than 120 years ago when QM was born by the work of Max Planck.
KEYWORDS: Quantum Mechanics, Psychology, Psychological reality

Linking Quantum Mechanics and Psychology already in the 20th. Century

Wolfgang Pauli in 1955 stated already: The only acceptable point of view appears to be the one that recognizes *both sides of reality—the quantitative and the qualitative, the physical and the psychical—as compatible with each other, and can embrace them simultaneously* (Pauli, 1955).

To date, modern physics approaches have shown the most innovative models and approaches for dealing with the complexity of large systems, such as humans. Systemic thinking methods are a construct of ideas that has developed - and continues to develop - since the 1930s by linking theory and practice from different scientific disciplines. Especially the modern natural sciences have shown the limits of our "common sense". Even in the world of complexity, our linear thinking of cause and effect often fails (Giacomuzzi, 2007).

Let's go one step further and have a look at the most popular approaches of modern physics so far: quantum mechanics (QM) and its attempts to describe "reality". The physicist and Nobel Prize winner Niels Bohr once said: "If you don't get dizzy when thinking about the quantum of action, you haven't understood anything (Bohr, 2012). But quantum mechanics (QM) has nowadays, without trying to do anybody wrong, not made any

significant theoretical developments since the 1936s. All or most of what followed was mathematical advancement, group-mathematical acrobatics (such as the quantum loop approaches, string approaches, etc.) and theoretical speculations.

Even the discovery of the “Higgs-Boson” in 2012 is not a step forward regarding the understanding of what is our reality. The theoretical framework is already from the 1960s and has nothing to do with our main problem on reality itself. QM thus came to a standstill, at least from a theoretical point of view, but opened up the discussion about on what we can even consider "real".

The line between a construct and the supposedly real has become thin and is often subject to confusion. Erwin Schrödinger, with his thought experiment of the trapped cat, also only wanted to point out the problem of the conclusions of QM and not, as is wrongly assumed today, see them as an endorsement of this approach and its conclusions.

Nevertheless, physics is now also facing these questions, albeit with a certain uneasiness and until now not as open and ready for change as Wolfgang Pauli did in the 1930s. It is not without a certain irony that the most empirical of all sciences had to engage in this dialogue or that its own results brought it to this topic itself.

However, we`re not going to throw quantum mechanical formulas at you now and try to use them to create mental smoke bombs. Nor will we demand extensive understanding, for example within atomic-physical discussions. Instead, we would like to remind you e.g. of Hans Peter Dürr, Heisenberg's student and famous successor in Munich as well as Nobel Peace Prize winner, who stated that when it comes to QM, nobody can "understand" anything really fundamental anymore. So maybe first it is worthy to have a more historical look on what has already been done in regard to build a bridge between QM and Psychology.

Ettore Majorana (1906-1938?) (Giacomuzzi, 2002).

Ettore Majorana mysteriously disappeared in 1938 and was never found again. Enrico Fermi regarded him as a genius like Johannes Kepler. Still today every year in Sicily there are the Conferences on theoretical physics in his name (E. Majorana Foundation and Center for Scientific Culture).

A work published posthumously by Ettore Majorana in 1942 in the journal Scientia ("Il valore delle leggi statistiche nella fisica e nelle scienze sociali - The role of statistical laws in physics and social sciences") represents a very early attempt to apply the statistical laws of physics to the social sciences.

In this work, Ettore Majorana first describes the effects of the success of classical mechanics in the late 18th and 19th centuries as well as the insights and triumphs of celestial mechanics. The successes described were mainly based on the assumption of a strict determinism of the laws of nature. In a further step, however, Ettore Majorana criticizes this classical determinism in thinking in a certain way, which in his opinion does not agree with the exact data of the natural sciences and does not give enough space to human freedom of thought.

Especially the physics of the twenties and thirties of the 20th century shows that the classical laws of physics can no longer be applied without restrictions. In this work, Ettore Majorana refers as an example to the impossibility of being able to calculate exactly the states of molecules or atoms with the help of classical mechanics. In contrast, Ettore Majorana shows that such systems can be better described using the concept of entropy. Furthermore, Majorana shows in this work the value of the statistical description of systems based on this concept, which in his opinion comprise a large part of the existing physics.

In this context, Ettore Majorana points out that although classical physics still believes in a fixed determinism of the processes of nature, not ordinary observation, but only calculation with the help of statistics and the associated probabilities of system states could still guarantee approximately exact results of the natural processes. In other words, the inaccuracy of the results would undoubtedly depend on the chosen or simplified boundary conditions in the description of the system states. In addition, the social sciences have also succumbed to deterministic thinking, which believes in a strict application of classical statistical laws to human behaviour.

In a further step, Ettore Majorana shows in this work that physics, too, would have to leave the

classical paths of strictly deterministic thinking, for example by the quantum mechanical assumptions of nature. Furthermore, Majorana gives a short overview, which shows the difference between classical and quantum mechanical theory. In particular, he shows that even in the sub molecular domain, the laws only have a statistical character, which at most only means the stabilization of probabilities. Especially these new ways of thinking will show the defect of deterministic thinking, which has nothing in common with the classical statistical description, which until now attributes its inaccuracy of the results only to a voluntary limitation of the number of components for the characterization of a system.

Majorana also points out the lack of objectivity in the scientific sense, which calls into question our thinking of causality and determinism. In particular, the character of probability, which is hidden behind the classical statistical laws, shows the necessity to provide for corresponding considerations in the social sciences. A similar mathematical description of the processes in the social sciences would also have to be provided. There would be no contradiction to the fact that the factual conditions in human processes have a vital, unpredictable and unavoidable character of probability just like the processes in the quantum world. Since there was no contradiction to this, the statistical descriptions of the social sciences would have to be extended accordingly.

This almost 80-year-old text shows an astonishingly fresh reference to today's systems theory and the mathematical ideas of chaos, complexity and synergy approaches. Replacing the word determinism by causality in the article Majoranas reveals a modern text for the critical analysis of complex processes within the social and human sciences. Majorana's call for a new scientific discipline is revealed today in the modern concepts of the emergence of new system states and the departure from linear, monocausal models of thought.

Erwin Schrödinger (1897-1961)

This discussion leads us to a text by Erwin Schrödinger (Schrodinger, 1944), which was written several years after Majorana's work. The concept of negative entropy Schrödinger is also taken up again within psychiatry some decades later. Ideas about the relationship between entropy and living organisms have inspired hypotheses and speculations in many contexts, including psychology, information theory, the origin of life, and the possibility of extraterrestrial life. The notion of entropy as disorder has been transferred from thermodynamics to psychology by Polish psychiatrist Antoni Kępiński, who admitted being inspired by Erwin Schrödinger (Kępiński, 1972). Kępiński explained how various mental disorders are caused by distortions of that hierarchy, and that the return to mental health is possible through its restoration. The idea was continued by Struzik (1987), who proposed that Kępiński's information metabolism theory may be seen as an extension of Léon Brillouin's negentropy principle of information. In 2011, the notion of "psychological entropy" was reintroduced to psychologists by Hirsh et al (2012). The Italian psychiatrist Scrimali shall also be mentioned here. In his book "Entropia della mente e entropia negativa" - Entropia of the mind and negative entropy", he deals with the so-called frenentropy within the schizophrenic circle of forms (Scrimali, 2006).

Heinz von Förster (1911-2002)

Within this framework of discussion, it is worthy to remind to an almost forgotten contribution by Heinz von Förster. This work was created only a few years later than the work of Schrödinger quoted above. Heinz von Förster was already interested in the idea of a formal theory of the dynamics of human memory during his studies. Förster stated that the work was inspired by an edition of an old book by EBBINGHAUS from 1885 which he found in an antiquarian bookstore in post-war Vienna, titled "Über das Gedächtnis" ("On the Memory"), which contained detailed descriptions of these experiments (Forster, 1948). Von Förster checked his theoretical approaches by using Ebbinghaus' "Forgetting Curves" and, to his disappointment, did not found any clear agreement.

Von Förster developed the idea that day by day the syllables still remembered by Ebbinghaus are, so

to speak, re-learned by their recitation, and that consequently the Ebbinghaus curves do not represent a forgetting process as such, but rather a superposition, a combination of forgetting and learning[1]. Von Forster integrated this idea into his formalism and it turned out that his theoretically calculated curve agreed very well with Ebbinghaus' experiment. For this production of the theoretical curve, two parameters were needed, a learning parameter and a forgetting parameter; for the first, there is a variation from person to person. The forgetting parameter, however, is the same for all test subjects. Von Förster explained this result as a biological constant and seeked a quantum molecular explanation. For this purpose he compared the time constant of forgetting with the time constant of the decay of organic macromolecules.

On the advice of his friend (Viktor Frankl) this work was published in 1948. The book publisher, however, asked Erwin Schrödinger to read this work beforehand, as he was not familiar with this topic. Schrödinger himself believed "none of it, but could not discover any mistakes." This work by Heinz von Försters was his entrance to the USA and to the circle of Norbert Wiener and others.

Burkhard Heim (1925 - 2001)

Heim probably made the most radical attempt to combine quantum mechanical phenomena with human forms of existence.

Heim was a German physicist. During a failed experiment he suffered life-threatening injuries, which he survived severely disabled. In 1954 he received his diploma in physics from professors Carl Friedrich von Weizsäcker and Richard Becker. He subsequently worked in the research group of C. F. von Weizsäcker at the Max Planck Institute for Physics in Göttingen. His main work is considered to be the attempt of a unified field theory, which focused to bring quantum physics in correlation with the theory of relativity. However, Heim did not publish a rigorous elaboration of his theory (Ludwiger, 2010).

However, he soon left this institute to work on a general field theory in which all physical fields were uniformly described as dynamic properties of geometric structures[2].

In his Uniform Description of the Material World, Heim also starts out from verifiable physical facts, but in contrast to the usual positivist explanations (Big Bang, supergravity) also takes up non-material organisations. Consequently, a distinction is made between latent and manifest events. This is something completely new. Quantum-physical events, which were previously interpreted as "random", proved now to be by no means arbitrary in the light of the new coordinates, but rather as being caused by certain activities in an organizational subspace. This also means that the statement repeatedly made by scientists that the really fundamental elementary particle processes are only "pure randomness" is also true. Thus, the new dimensions do not concern original physical quantities, but rather further degrees of organization of lower structures. These degrees of organization range from $n = 0$ for sub-material structures to $n > 25$ for mental processes. This means that not everything is reducible "to molecules", but that the higher levels of organisation have their own laws. Thus there is a multiple contouring of the areas of existence.

On a close examination of these forms of organization Heim found out that above $n = 7$ a new independence appears, which cannot be explained completely by the known physical laws. From this he drew the conclusion that these are ontologically (essentially) independent areas and built a fourfold contouring of world and human being in Physis (nature), Bios (living organism), Psyche (feeling and feeling) and Pneuma (spirit) into his concept of organization. Although the theory presented by Heim in Elementary Structures of Matter and Structures of

[1] Today we can also interpret entropy as negative information or even interpret information as negative entropy. An increase in information corresponds to a decrease in the entropy of the system. A decrease of information corresponds to an increase of entropy in the system.

[2] At present, there is no uniform description of all known fields and particles in an empirically verifiable form that can be derived from a common basis. Although A. Einstein tried to unite electromagnetism with gravity by means of a mathematical theory in his later years, but he was unsuccessful.

the Physical World is based on the General Theory of Relativity, it opens up completely new paths and therefore differs significantly from previous theories (Resch, 2001).

Wolfgang Pauli (1900-1958)

Another very innovative thinker in this respect was Wolfgang Pauli, who sought contact and exchange with psychology at an early stage in the last century. Wolfgang Pauli has unfortunately remained the great, unknown "spiritual son" of Albert Einstein to this day. At the age of 24 he prepared already the Nobel Prize-winning achievement (the so-called exclusion principle of spring 1925) in 1924. The complete edition of his "Scientific Correspondence" has only been available in print for a few years and awaits further revision (Hermann, 1979).

Wolfgang Pauli is still enigmatic today. Already at the beginning of his studies Pauli wrote his first physical-mathematical treatise, in which he dealt with the extended theory of gravity – by the titan of German mathematics - Hermann Weyl (1885-1955), his later colleague in Zurich and Princeton.

When Wolfgang Pauli came to study in Munich in October 1918 after his high school graduation in Vienna-Döbling, "he was already in full possession of the mathematical and mathematical-physical methods", as Arnold Sommerfeld remarked in astonishment: "He immediately brought with him a finished work on general relativity, which immediately attracted Einstein's attention and admiration" (Hermann, 1979). Albert Einstein himself commented: "Anyone studying this mature and large-scale work would not want to believe that the author is a man of 21. One does not know what to admire most, the psychological understanding of the development of ideas, the certainty of mathematical deduction, the deep physical view, the ability of clear systematic presentation, the knowledge of literature, the factual completeness, the certainty of criticism" (Hermann, 1979).

Even Hermann Weyl wrote Wolfgang Pauli (at the age of 19) personally on May 10, 1919: "...how you managed to get into possession of all the means of knowledge at such a young age and to acquire the freedom of thought necessary to make the theory of relativity my own is almost incomprehensible to me".

Wolfgang Pauli corresponded with C.G. Jung for almost 30 years and was, starting in July 1932, for two years weekly, in psychoanalysis and frequently a dinner guest in his family. Pauli had been in therapy by C.G. Jung's students, the physician Erna Rosenbaum (1897-1957), (Atmanspacher, 1995; Jayawardhana, 2013). This was followed by a cooperation between C.G. Jung and Wolfgang Pauli, which even led to a joint book publication. What is perhaps less known is the fact that Wolfgang Pauli made his dreams available to C.G. Jung, who incorporated them into his works. Understandably, Wolfgang Pauli did not want this to become known during his lifetime (Jung, 1952, 1944).

Martin Buber (1878-1965) & Wolfgang Pauli - Psyche and Physis reunited (Giacomuzzi, 2016)

Wolfgang Pauli is still kept in a quantum mechanical "straitjacket" by physics. Wolfgang Pauli's great project was to reverse the Cartesian cut between spirit and matter. In 1954, four years before his death, Pauli wrote: "I am interested in the holistic relationship between 'inside and outside', which is not contained in today's science, but which alchemy had foreseen and which can also be proven in my dream symbolism. I have come to the limits of what can be recognized today and have even approached 'magic'. At the same time, I am aware that there is a danger of a relapse into the most primitive superstitions and that everything depends on capturing the positive results and values of reason (Atmanspacher, 1995).

Pauli remembered wave and vibration symbols in his dreams. On the one hand, they express psychological processes for him, on the other hand they represent a pre-conceptual language for physical thinking. It is the collective images, formerly known as "archetypes", which are implanted in the unconscious of humanity. Pauli is convinced that the archetypes influence scientific thinking. "After careful critical consideration of many experiences, I came to accept the existence of deeper emotional layers that cannot be adequately described by the common concept of time. Due to the lack of suitable terms, these mental areas are

represented by symbols; in my case especially often by wave or vibration symbols. Sooner or later, atomic physics and psychology of the unconscious will converge in a significant way, since both, independently of each other and from opposite sides, will advance into transcendental territory, keeping those with the idea of the atom, those with that of the archetype (Meier, 1923).

It is proven today that Pauli knew also the works by Martin Buber. By chance, in February 2015 we found the following facts: In 1934 Pauli's former assistant Ralph Kronig gave him the work "I and You" by Martin Buber (1923) as a wedding present. On 3 August 1934 Pauli thanked him for this gift and reflected on the relationship that exists between Buber and his own views on the "subject-object relationship" (Meyenn, 1985). Pauli reported to Kronig in one of his letters that he undoubtedly believed in an objective-psychic which could or should not be explained by material causes. Pauli adds that everything will one day be scientific psychology - but not one that attributes everything to material causes or drives. For the time being, however, every author who does not remain within the framework of traditional denominational confessions, including Buber, has his own terminology. Pauli considers Buber's references to the subject-object relationship to be a fundamentally important concept. According to Pauli, it is precisely this terminology of Buber's that contains the entire logical paradox of the world, all the difficulties of human conceptualization and also the tragedy and comedy of life. Pauli interpreted Buber's concept of God as related to his idea of the objective-psychological. Wolfgang Pauli has emphatically pointed to a "synchronistic understanding of the world". In our Western scientific thinking, which also determines our everyday thinking to a large extent, we are used to understanding world contexts exclusively under the category of causality. In contrast, Pauli asserts the principle of synchronicity, of inner and outer parallel actions directed towards meaning, as a further and deeper category of explanation.

But how have physics developed since then in relation to Pauli's views?

The introduction into neuroscience and neuropsychology of the extensive use of functional brain imaging technology has revealed, at the empirical level, an important causal role of directed attention in cerebral functioning (Schwartz, 2005). The identification of brain areas involved in a wide variety of information processing functions concerning learning, memory and various kinds of symbol manipulation has been the subject of extensive and intensive investigation (Toga, 2000; Neumann, 1955). From a theoretical perspective, perhaps the most important aspect of this line of research is the empirical support it provides for a new science-based way of conceptualizing the interface between mind/consciousness and brain. Until recently, virtually all attempts to understand the functional activity of the brain have been based, at least implicitly, on some principles of classic physics that have been known to be fundamentally false for three-quarters of a century (Jeffrey et al., 2005).

According to the classic conception of the world, all causal connections between observables are explainable in terms of mechanical interactions between material realities. But this restriction on modes of causation is not fully maintained by the currently applied principles of physics, which consequently offer an alternative conceptual foundation for the scientific description and modelling of the causal structure of self-directed neuroplasticity. The consequence of these facts is that twentieth century physics, in contrast to classic physics, provides a rationally coherent pragmatic framework in which the psychologically and neurophysiologically described aspects of the neuroscience experiments mentioned above are causally related to each other in mathematically specified ways. Thus, contemporary physics allows the data from the rapidly emerging field of self-directed neuroplasticity to be described and understood in a way that is more rationally coherent, scientific and useful than what is permitted by theories in which all causation is required to be fundamentally mechanical (Schwartz, 2005).

In this regard, we may perhaps briefly outline the intellectual debates in the following, with reference to the dialogical principles of Martin Buber.

Dialogical principles by Martin Buber on a Quantum Mechanical basis

The QM-discussions can be roughly divided into physico-classical and more holistic and

comprehensive. We shall start with the former. The traditional approaches point out that quantum mechanics (QM) is primarily limited to the microscopic. In this respect, however, a structural similarity to QT (quantum theory) could be legitimately established. One can therefore try to formulate a "generalized or weak" QT. This would be a general theory, especially one in which a measurement changes the state of a QT (quantum system) and the sequence of measurements is also important.

Thus, four basic terms can be taken from the physical QT:

System is everything that I can separate from the rest of the world, at least in thought, and make it the object of my own observation. I can also identify subsystems in the system. An example would be the city of Vienna and all the buildings, institutions and opinions that can be found there.

A system from which I can learn must have the ability to be in different states. And the changes in the system must not endanger the status of the system as such. If a house is torn down, Vienna remains roughly the same as Vienna.

Observable: a feature of the system that I can examine. There are global and local observables. To carry out a measurement is nothing else but to actually carry out the investigation that belongs to an observable and to arrive at a result that is factually valid.

After the measurement of an observable A with result a, the system is in a state of its own, i.e. a new measurement brings the same result again.

Observables (O.) are called complementary if the sequence of the measurement is not interchangeable. If O. are complementary, then the eigenstates of complementary O. are different and it is not possible to assign sharp values to complementary O. at the same time.

Let us try another bridge to Martin Buber. For that we take the human being in the context of his self-observation. The state of the psyche changes precisely because I make myself aware of it. This is a basic structure that can be recorded as a commonality with the QT. This also applies to states and perceived products of the human mind.

The complementary structure of the QT is certainly also applicable beyond physics. I have entanglement, for example, whenever I have a system in which there are subsystems and these are sufficiently far away to be causally independent. The measurement on a subsystem allows to draw conclusions about another part of the system. This effect seems to skip space and time (Spooky remote effect). However, these do not serve to transmit signals or are not causally useful. The generalized QT only describes and does not ask for the causes. It is phenomenological.

Let us now look at a communication. Subsystems are the communicators. Global variable is the degree of agreement between the two. Local observables are the mental states. Local and global are in a complementary relationship.

If the "I-You" is well attuned, one's own mental state remains vague. If I concentrate on my own state, the global attunement remains weakened.

A successful communication in the Buberian sense requires exactly that kind of attunement. Correlations of entanglement are perceived here (countertransference through the conversation). The word leads to an interaction of the two. A macroscopic correlation of entanglement includes, for example, the emergence of images and emotions in the other person. The I or you understand these ideas as being in the other.

The double-slit experiment of QT teaches us above all that the measuring process decisively influences the result of the measurement. The factuality can also be influenced afterwards. Quantum theoretically, the tracks of particles are indefinite in their direction until they are measured ("delayed choice").

If this is applied to communication, it can be concluded that an action often does not depend on a specific motive. If one makes the motives clear, the result of the action is probably often different. If, for example, we subsequently reflect on our motives, these motives often become factual only through the reflection on them.

Measurements or better the own research of motives both have an active phenomena-generating character. We also ascertain this through our word

(ascertain). Motives can also be determined by ambivalent character and thus become factual.

The different descriptions of these processes under different assumptions are also called complementary. Complementarity here is also to be understood as enrichment. Different aspects (e.g. Buber?s I-Du) are necessary for complete description of a phenomenon.

This demonstrates that as soon as the human spirit comes into action, quantum-like phenomena also come into consideration.

But why then does the world often seem so classical to us? The structure of complementarity has actually been discovered in physics. But there are also cultural techniques for dealing with contradictions. By nature, however, human beings often orient themselves towards classical physics. Often one needs a corpus of recognized facts to orient oneself. These are cultural property. These are, for example, the web of science. These networks/islands are not consistent with each other, but have their own coherence.

Our existence consists in the fact that we have to bring two things into harmony (I-You). A rather fluid quantum theoretically organized interior (I) and a more resistant exterior (You), where we are still obliged to emphasize the consistent aspects.

This would show lines where Buber's dialectic could be brought in line with quantum mechanical ideas. Would it be feasible to formulate a QM of the word? The above chain of thought shows basically no impossibility or contradiction to that discussion. But let us perhaps go a little further.

A more extensive approach by physics

Plank and Einstein believed that QM can only be a "transitional stage". Heisenberg also believed that we need to see reality more openly (including the human being) and no longer just materially. According to Hans Peter Dürr, the classical laws are only coagulations of QM. We have no particles in the classical sense. Wolfgang Pauli, for example, was a very early representative of comprehensive, more radical approaches, as we mentioned earlier. In particular, we have found in him a direct reference to Martin Buber and his work. Unfortunately, this direct reference to Martin Buber has not been proven in further discussions on this subject since 1934. Martin Buber's approaches, however, give us a clear indication of the way in which the natural sciences think today. Hans Peter Dürr, for example, should be mentioned, who’s thought processes could guide us here.

Hans Peter Dürr (1929-2014) and the problem of the reality of matter

Hans Peter Dürr, born in 1929 and Heisenberg's assistant from 1958-1976, was fully aware of the development of QM.

As Hans Peter Dürr states: “After 50 years of research with matter, I have understood that matter does not exist. We experience more than we understand. What we call natural science today has found its own limits. We understand very little of QM, we experience it more. We have a spiritual crisis in that we don't really understand reality” (Dürr, 2012).

Martin Buber describes in his "I-You Approach" that the human being forms his identity primarily in relation to what surrounds him: Only the encounter with a human counterpart, the "you" (I-you relationship), or with the material world, the "it" (I-it relationship), enables a separation of the "I" from its environment. "There is no I per se, but only the I of the basic word I-You and the I of the basic word I-It. When man speaks I, he means one of both. "To be me and to speak me are one” (Stöger, 2003).

In quantum mechanics, the whole thing is the beginning. This is the essence of QM. There are no more particles. Everything is coupled with everything. There's a process that leads to more and more diversification, but it always remains coupled. I also help to couple with the word to each other. The process of finding out in which direction reality is developing is prepared by the word.

Evolution is a common procedure, it is not determined. The word is a building block for a common reality (atoms do not exist; perhaps they should better be called “Passierchen -“little happening things" in the sense of Dürr). Liveliness is mediated by the classical laws. But matter is already the development of a possibility (according to Hans Peter Dürr.

According to Hans Peter Dürr there is a superior, holistic physics, not only the QM. An ocean also

does not only consist of the visible, superficial waves. Hans Peter Dürr believes that the big bang approach, for example, is too much oriented towards matter. It is to be expected that cosmology will be different in the theory of QM.

According to Hans Peter Dürr, matter is already the result of a development of something that has always been holistic, just not yet in the realized form, so it already included all possibilities in advance. “Basically, matter does not exist at all. At least not in the common sense. There is only a structure of relationships, constant change, liveliness. It's hard for us to imagine. Primarily there is only connection, the connecting without material basis. We could also call it spirit. Something that we only experience spontaneously and cannot grasp. Matter and energy appear only secondarily - so to speak as coagulated, solidified spirit. According to Albert Einstein, matter is only a diluted form of energy. However, its underground is not a further refined form of energy, but something quite different, something alive. We can compare it to the software in a computer”. (Dürr, 2007, 2011)”

Hans Peter Dürr is not the only one here with his trains of thought. Wolfgang Pauli, for example, wrote already on 23 December 1953: “Since today the natural sciences draw their dynamics from the archetype of quaternity, the ethical problem of evil is also constellated, which has become particularly manifest through the atomic bomb. ...The old alchemical idea that matter indicates a psychic state could thus experience a new form of realization on a higher level …(Meiner, 1992)“

Thus, according to Hans Peter Dürr, the regularities arose from a pot of possibilities. Physics and biology and the word or relationship can be shaped.

Here we again encounter fundamental approaches by Martin Buber. The spiritual is the unifying and driving force also in Martin Buber. Precisely from an intuition from which concrete thoughts can be formed. So there is not exactly the goal, not from the beginning the concrete. It also creates itself within the I-You dialogue.

Let another thought bring in. A fundamental question here is: "Who actually creates the conditions for things to develop in exactly the same way and not differently?" The origin of life is not understood in terms of why things came together the way they did, to make this possible. Was someone rolling the dice to create the possibilities? Are theoretical acceleration mechanisms alone sufficient to explain development? Rather, it is probably intentional.

For the development of life there are infinitely many necessities - also in the cosmos. Is this a pure coincidence? Maybe we live where we were possible according to the QT. But the living cannot be built from the dead to explain it. You have to start with the living, for example. Life is more fundamental than matter; the processual, the creative and the mutable. 3.5 billion years make a dice game of development seem improbable. According to Dürr modern physics shows that from the beginning everything is connected. The basis of modern physics is not matter. So reality is reality, in other words reality in the sense of "material reality". It is much more about potentiality, i.e. the possibility of realizing oneself in every moment. A presentiment as opposed to a concrete thought. The intuition also has a form. It is something that belongs together, that becomes more and more concrete in the course of evolution and coagulates into matter. Evolution is not an unfolding, but a new creation in every moment. The transcendent consists in allowing the possibility of concrete form. The creation of the world in the next moment is a total work of art in which we all participate. Matter is coagulated spirit. It has come to a standstill. That is why we orient ourselves to it. But it is more important to put the one in the foreground who is constantly changing, that is, the human being. According to Dürr our mind wants to manipulate the world, that is, to shape it. But that which is matter is the origin of the spirit. I cannot understand the world when I only deal with the coagulated matter. The driving force is the spirit. The future becomes open and formable. Hope gives us a picture of how we want to shape the future and helps us to do so. The laws of nature also tell us that we can do something with the future that has not existed before.

The description of the natural science of reality is not the reality itself, but only how it appears here. Our way of thinking of analysing and fragmenting is also fundamentally decisive for the possibilities of

cognition states Dürr. Perhaps the mind is only a life-serving instrument. But how far is it capable of recognizing what holds the world together? But the world has a different structure than the one we can comprehend. But how do we express this in our limited language? Of course, man has a memory of what he is embedded in. That is why he also asks questions that cannot be answered. This may also be his relationship to the divine. Reality is not material like an interplay of objects.

Modern physics states, however, that reality has potentiality, i.e. it already has a form, but not yet a carrier for it. But how can one imagine form without substance? In the beginning there is form. Only the differentiation of the shape forms the form. Whether matter becomes spirit again is uncertain. But spirit will certainly become matter. Even in the ocean, the wave only simulates a superficial separation. As spiritual beings we do not die either, but go back to the one from which we were washed out. Master Eckart, for example, describes the world as reality. It is something that is constantly changing. Science castrates reality and makes it a reality. In the process, the liveliness is lost. Reality is only an approximation and is not strictly valid. "Alive" and "non-living" is not material and is a pure relationship structure. How can one see relationship without having A and B?

"In the beginning was the word," as it says in the Gospel of John. Do things exist independently of us? Is it possible to talk about a reality without having information about it. The Word shapes reality in a successful communication. So, there is according to Dürr probably no sufficient difference between information and reality. Information and reality are two sides of the same coin. What this is yet unclear even in the natural sciences.

Conclusion

History shows a lot of efforts to combine QM and Psychology in the 20th. Century. If we compare the approaches of Martin Buber at that time, we find a high degree of agreement with the approaches of modern physics. From very early on, Wolfgang Pauli, for example, was aware of Martin Buber's approaches and was seen by this immensely critical mind as original and compatible with his understanding of the natural sciences.

Pauli assumed anyway that the overriding principle is not matter but energy and its manifestations. As we showed, Pauli already considered Buber's references to the subject-object relationship to be a fundamentally important concept. According to Pauli, it is precisely this terminology of Buber's that contains the entire logical paradox of the world, all the difficulties of human conceptualization. Pauli sees Buber's concept of God as related to his idea of the objective-psychological. It is a pity that these very early connections of Martin Buber to physics must be regarded as lost to date. A resumption of these holistic considerations seems to me worth pursuing further.

In addition, it has been shown that although many approaches today try to incorporate quantum mechanical ideas, it has not been realised that physics itself has been in a theoretical crisis for several decades. This crisis is especially characterized by the fact that for almost 100 years no substantial progress has been made in how our reality is really created or can be understood.

The connection between psychology and life sciences is important. Due to the increasing complexity of physical theories as well as the lack of profound interpretation possibilities in quantum mechanics, for the moment it remains an attempt with few practical implications. It is too easy to be tempted to make hasty conclusions about human reality, and it is too easy to lose the insight of the current theoretical framework in physics.

There is no doubt that the two fields of science will cross-fertilise each other in the future. In the meantime, caution is needed until a supporting framework will be established on the understanding of how our reality is really created.

REFERENCES

Giacomuzzi, S.M., Garber, K. (2008). Kurzer Abriss früher systemischer Denkansätze der Physik im Bereich der Sozial-, Human- und Biowissenschaften. *Ber. nat-med. Verein Innsbruck*, *94,* 137-143.

Giacomuzzi, Holzmüller, G., Huemer, G. (2002). Ettore Majorana (1906-1938) – Eine Bestandsaufnahme 64 Jahre nach seinem Verschwinden. *Berichte zur Wissenschaftsgeschichte*, *25,* 137-148.

Pauli W. (1955). *The influence of archetypal ideas on the scientific theories of Kepler. The Interpretation of nature and the psyche*. London: Routledge & Kegan Paul.

Giacomuzzi S., Garber K. (2007). Kurzer Abriss früher systemischer Denkansätze der Physik im Bereich der

Sozial-, Human- und Biowissenschaften. *Ber. nat.-med. Verein Innsbruck*. *94*, 137 – 143.
Bohr, N. (2012). Einheit des Wissens. In (Hrsg. HP Dürr): Physik & Transzendenz, Driediger. 2. Aufl. 2012.
Giacomuzzi, S., Holzmüller, G., Huemer, G. (2002). Ettore Majorana (1906-1938) – Eine Bestandsaufnahme 64 Jahre nach seinem Verschwinden. *Berichte zur Wissenschaftsgeschichte*, *25*, 137-148.
Schrodinger, E. (1944). *Was ist Leben?* Cambridge: University Press.
Kępiński, A. (1972). *Rhythm of life*. Kraków: Wydawnictwo Literackie. (in Polish)
Struzik, T. (1987). "Kepiński's Information Metabolism, Carnot's Principle and Information Theory". *International Journal of Neuroscience*. *36*(1–2), 105–111. https://doi.org/10.3109/00207458709002144.
Hirsh, J.B., Mar, R.A., Peterson, J.B. (2012). "Psychological Entropy: A Framework for Understanding Uncertainty-Related Anxiety". *Psychological Review*. 119, 304–320. https://doi.org/10.1037/a0026767.
Scrimali, T. (2006). *Entropia della mente ed entropia negativa. Nuove prospettive, cognitive e complesse, per la schizofrenia e la sua terapia*, FrancoAngeli. ISBN: 8846474961.
Forster, H.V. (1948). *Das Gedächtnis: Eine quantenmechanische Untersuchung*. Wien: Franz Deuticke.
Ludwiger, Illobrand von. Heim Burkhard. (2010). *Das Leben eines vergessenen Genies*. München: Scorpio. ISBN 978-3-942166-09-6.
Resch, A., Heim, B. (2001*). (1925 – 2001). GW.* 50(1), 47-75.
Hermann, A., v. Meyenn, K., Weisskopf, V.F. (1979). *Wolfgang Pauli – Wissenschaftlicher Briefwechsel*. New York: Springer-Verlag. ISBN 3540089624
Hermann, A., v. Meyenn, K., Weisskopf, V.F. (1979). *Wolfgang Pauli - scientific correspondence*. New York: Springer-Verlag. ISBN 354008962, Vol. 1, Insb. The year 1919 - Discussion of the general theory of relativity.
Hermann, A., v. Meyenn, K., Weisskopf, VF. (1979). *Wolfgang Pauli - scientific correspondence*. New York: Springer-Verlag. ISBN 354008962, Vol. 1 Insb. The year 1919 - Discussion of general relativity. S 3ff WEYL to Pauli [1].
Atmanspacher, H., Primas, H., Wertenschlag-Birkhäuser E. (Eds.). (1995). *The Pauli-Jung-Dialogue and its Significance for Modern Science*. Berlin Heidelberg: Springer-Verlag. There are indications that Pauli behaved in the therapy with Erna Rosenbaum and had to be motivated by C.G. Jung to continue. See also Jayawardhana, Ray. (2013). *Neutrino Hunters: The Thrilling Chase for a Ghostly Particle to Unlock the Secrets of the Universe Scientific American.* Farrar: Straus and Giroux.
Jung, C.G. (1952). *Naturerklärung und Psyche*, Zürich: Rascher Verlag.
Jung C.G. (1944). *Psychologie und Alchemie*, Zürich: Rascher Verlag.
Giacomuzzi, S. (2016). Dialogphilosophie und Physik – nur ein komplementäres Paar?. In: *Buber begegnen – Interdisziplinare Zugange zu Martin Bubers Dialogphilosophie.* Hrsg.: Krobath, Shakir, Stöger. Arco Wissenschaft, Band 28, Paperback, ca.400 Seiten ISBN 978--3-938375-67-9
Atmanspacher, Harald/Primas, Hans/Wertenschlag-Birkhäuser, Eva. (1995). *Der Pauli- Jung-Dialog und seine Bedeutung für die moderne Wissenschaft*, Berlin: Springer.
Meier, C.A. Hrsg, (1992). Letter from 15.10.1938 to C.G. Jung. In: *Wolfgang Paul i und C.G. Jung*. Berlin, Heidelberg/New York/Tokyo: Springer.
Meyenn, Karl (1985). *Scientific Correspondence with Bohr, Einstein, Heisenberg and others, Vol. 2: 1930-1939/Scientific Correpondence with Bohr, Einstein, Heisenberg a. o., Vol. II: 1930-1939*, Berlin, Heidelberg/New York/Tokyo: Springer.
Schwartz J.M, Stapp H.P., Beauregard, M. (2005). Quantum physics in neuroscience and psychology: a neurophysical model of mind–brain interaction. Philos Trans R Soc Lond B Biol Sci. 2005 Jun 29; 360(1458): 1309–1327. Published nline 2005 Jun 29. https://doi.org/10.1098/rstb.2004.1598.
Toga, A.W, Mazziotta, J.C. (2000). *Brain mapping the systems*. San Diego: Academic Press.
Neumann, von J. (1955). Mathematical foundations of quantum theory. Princeton: Princeton University Press.
Schwartz, J.M., Stapp, H.P., Beauregard, M. (2005). Quantum physics in neuroscience and psychology: a neurophysical model of mind –brain interaction. Philos Trans R Soc Lond B Biol Sci. 2005 Jun 29; 360(1458): 1309–1327. Published online 2005 Jun 29. https://doi.org/10.1098/rstb.2004.1598.
Dürr, H.P. (2012). Physik & Transzendenz. Driediger. 2. Aufl.
Stöger, P. (2003). *Martin Buber. Eine Einführung in Leben und Werk*, Innsbruck: Tyrolia; Stöger, Peter.
Dürr, H.P. (2007). *Interview*, in: P.M. Magazin (Mai).
Dürr, H.P. (2011). *Das Lebendige lebendiger werden lassen. Wie uns neues Denken aus der Krise führt*, München: oekom.
Meiner, C. (1992). *Wolfgang Pauli an C.G. Jung*, Berlin/Heidelberg: Springer.

КВАНТОВА МЕХАНІКА (КМ) І ПСИХОЛОГІЯ: НОВЕ ПОЛЕ ДЛЯ СПІВРОБІТНИЦТВА?

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Ми спробуємо представити критично опубліковані роботи з квантової механіки (QM) та психології (можливо, загалом щодо так званих соціальних наук), частково ми самі (Giacomuzzi, 2008, 2002), в огляді. Тут, звичайно, неможливо дати повне резюме, але слід підкреслити критичні моменти, які, можливо, залишають більш диференційований погляд на проблеми "психологічної реальності". На сьогодні QM є «хіп» у науковій літературі. Але загальні підходи не враховують, що фізики ще 80 років тому намагалися встановити зв'язок між науками про життя та фізикою. Але чи справді нейронаукові підтверджують основні психологічні основні припущення? Чи справді вони відкривають нові, міждисциплінарні перспективи дослідження? Сама фізика сьогодні бореться зі своїми теоріями, і ми великі розриви між тим, що ми переживаємо, і тим, що насправді

розуміємо. Можливо, цей розрив у розумінні власної реальності набагато більший, ніж 120 років тому, коли QM народився роботою Макса Планка.
КЛЮЧОВІ СЛОВА: квантова механіка, психологія, психологічна реальність

КВАНТОВАЯ МЕХАНИКА (КМ) И ПСИХОЛОГИЯ: НОВОЕ ПОЛЕ ДЛЯ СОТРУДНИЧЕСТВА?

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Мы попытаемся представить критически опубликованные работы по квантовой механике (QM) и психологии (возможно, в более общем плане относительно так называемых социальных наук), частично нами (Giacomuzzi, 2008, 2002), в обзоре. Конечно, здесь невозможно дать полное резюме, но следует подчеркнуть критические моменты, которые, возможно, оставляют более дифференцированный взгляд на проблемы «психологической реальности». В настоящее время КМ является «модным» в научной литературе. Но общие подходы не учитывают того, что физики уже 80 лет назад пытались установить связь между науками о жизни и физикой. Но действительно ли нейробиологические результаты подтверждают основные психологические основные предположения? Действительно ли они открывают новые, междисциплинарные перспективы исследований? Сама физика сегодня борется со своими теориями, и у нас большой разрыв между тем, что мы переживаем, и тем, что мы действительно понимаем. Возможно, этот разрыв в понимании нашей собственной реальности намного больше, чем 120 лет назад, когда QM был рожден работой Макса Планка.
КЛЮЧЕВЫЕ СЛОВА: квантовая механика, психология, психологическая реальность