HUNDRED YEARS RELATIVITY THEORIES — A STIMULUS FOR A THEORY FOR MEDICINE?

W. Kofler

I. M. Sechenov First Moscow State Medical University, Moscow, Russia
International Academy of Science (Health&Ecology), Innsbruck, Austria

СТО ЛЕТ ТЕОРИИ ОТНОСИТЕЛЬНОСТИ СТИМУЛ ДЛЯ РАЗВИТИЯ ТЕОРИИ МЕДИЦИНЫ?

В. Кофлер

Первый Московский государственный медицинский университет им. И. М. Сеченова, Москва, Россия
Международная академия наук (Здоровье и Экология), Инсбрук, Австрия

Natural scientists celebrate actually 100 years Relativity Theories. A good reason to jubilate for physicists and cosmologists: Einstein changed their world view thanks to new theories of science. So physics improved from a discipline without options for new discoveries to the leading discipline. This caused dramatic influences on manpower, grants and world economics. Einstein contributed also to the implementation of former unaccepted positions about the power of science. These positions liberated all types of scientists from former restrictions. This ongoing enabled scientists to successful problem oriented specializations e.g. in pharmacology. So medicine could use more powerful tools. These tools are based just on — from the philosophical view — materialistic principles. These aspects can be handled by computers with increasing success. But the feature and central proposition of medicine is based just on «idealistic» principles: on a comprehensive and insightful attention to the individual person. No improvements are to observe in these «idealistic» principles. On the contrary: The complaints against machine-like impersonal medicine are increasing. But Einstein opened the door also to improve this unique selling position as he caused the revival for its most genius period of physics. Einstein's secret was to open brand new applications thanks to the unification of disciplines which seemed to be logically incompatible. So medicine should focus on a unification of all health related sectoral disciplines within one theory of medicine. As well Einstein's theory of sciences which were used to invent the SRT allows the creation of such a comprehensive theory as the won liberty to apply ontological positions just problem oriented. This liberty justifies postulating fundamentals just on and for the basis of the obvious needs of patients and health care workers. These fundamentals allow deducing a principle for the self-creation of any emergent health related win within the permanent evolutionary win.

Key words: relativity theory, philosophy, medicine, health, evolution

Сегодня специалисты в области естественных наук отмечают 100-летие теории относительности. Хороший повод ликовать для физиков и космологов: Эйнштейн изменил их взгляд на мир благодаря новой теории науки. Таким образом, физика изменилась от дисциплины без возможностей для новых открытий до ведущего научного направления. Это вызвало драматические влияния на трудовые ресурсы, финансы и мировую экономику. Эйнштейн способствовал также внедрению ранее неприемлемых положений о мощи науки. Эти позиции освободили ученых различных областей знания от ранее существовавших ограничений в пользу проблемно-ориентированной специализации, например — развитие фармакологии. Следовательно, и медицина может использовать более мощные научные инструменты, основанные, с философской точки зрения, на материалистических принципах. Например, все более продуктивные техники компьютерной обработки множества медико-биологических данных. Но особенность и центральная идея медицины основаны на «идеалистических» принципах: на всеобъемлющем и глубоком внимании к конкретному. Напротив, возрастает негативное отношение к автоматизированной, высокотехнологичной, но обезличенной медицине. Эйнштейн, «запустил» гениальный период развития физики, открыв перспективу разрешения сложной дилеммы решения прикладных проблем за счет объединения потенциала дисциплин, которые, казалось бы, логически несовместимы. Так и медицина должна быть направлена на объединение всех связанных со здоровьем отраслевых дисциплин в рамках единой теории. Именно эта техника применения проблемно-ориентированных онтологических позиций позволила Эйнштейну сформулировать теорию относительности. И эта свобода оперировать научными фактами позволяет постулировать теорию медицины на основе очевидных потребностей как пациентов, так и медицинских работников. Все это позволяет сформулировать принцип само-создания, само-развития здоровья как неотъемлимой характеристики эволюции жизни.

Ключевые слова: теория относительности, философия, медицина, здоровье, эволюция

INTRODUCTION

Natural scientists all over the world celebrate actually «100 years Relativity Theories» [1]. Is this a reason for medicine just to congratulate the supporter of more effective tools we have now available or should this recall other activities? A short analysis should help to answer.

ANALYSIS

Specific scientific arguments. No discussion: Einstein stimulated a revolution in physics and cosmology. The details, e.g. the equivalence of mass and energy — are irrelevant for the applied research oriented medicine. We are thankful for imaging apparatus. We use GPS and fear atomic war. But the unique selling position of medicine is based on the way of comprehensive thinking. This should enable us to cross-link the data to the individual diagnosis and to transfer logically and with insight the adequate therapy, prevention and promotion.

Einstein modified also the way of thinking in physics: He created a new paradigm about the universe. But it is irrelevant for the applied and scientific daily work of a medical doctor, if the metric of the four-dimensional space and the energy of fields interact and modify the curation of the time-space and the movement of fields. Medicine accepts this as we accept Darwin's Theory of Evolution — but both without a direct influence on daily medical work.

Similar the scientific position of Einstein's proposals to ontology: The comprehensive guidelines of correct scientific work do not cover how to deal with paradigms. Therefore we can allocate to the philosophers the reflection about the correctness of the considerations of Einstein: including the ambivalent discussion about e.g. the correct use of terms like «theory» in physics and biology [2].

So the specific scientific progress of RTs and Einstein cause no special need of activity for medicine.

Economic and application oriented surplus

...based on an extended view on physics. Einstein grew up in a time, when leading physicist believed that no more fundamentals can be discovered in physics. Therefore Max Planck received the recommendation not to study physics: There is no need for creative persons if nothing new can be found. In addition there would be is no realistic chance for an adequate job, which allows a suitable survival for a family. But this prediction was basically wrong. The cometlike ascent of physics was just coming to the leading discipline — and this thanks to Einstein. And the explosion like increase of employment of physicist, grants etc. had not started. So physics experienced a revival like a phoenix. Now scientific answers were possible which were formerly assumed former as unanswerable. Applications could be created which could not be matter even of utopist thinking because of a lack of insight into natural processes. The actual world economy is depending also on these former unpredicted and unpredictable possibilities e.g. for employment. This is not only the merit of Einstein. But there are minimum two indispensable contributions of him: On one hands the linkage between the former logically incompatible theories of Newton and Maxwell thanks to the Special Relativity Theory. This is relevant primarily just for physicists. And the other contribution is obviously relevant also for medicine.

...based on a new understanding of the power of science in general

Einstein stimulated the liberation of science from former restrictions which were based on ontological positions and their outer scientific support by the Christian churches and the governmental institutions. In the 19th century any scientific work had to accept as prerequisite the special ontological position, which was expressed in the (dualistic) theories of Descartes. Scientists had to exclude from their research field aspects dealing with the nature of logic, the ability to distinct between truth and lay, failure and intended or unintended sins including their future consequences. These topics were restricted to priests. Even only assumed violations were punished even up to the in the 19th and early 20th century. This demonstrates the fight against Darwin's theory [3]. The dramatic history of Sechenov is well known [2]. He was accused of a sacrilege because of his formulation of positions, which are indispensable for a scientific understanding of health [4]. So nothing had changed in that relation to the situation of Newton up to Einstein: Newton's paradigm explained the scientifically unexplainable action at a distance of gravitation as expression of a natural law which was created by God jointly with the creation of the universe. Therefore the explanation is not the duty of the scientist — but of the church. Therefore Newton left the ontological explanation to the reader's own choice[1] [6].

Einstein solved this discrepancy logically quasi alongside: His basic problem was the logically incompatibility of the practically indispensable theories of Newton and of Maxwell: Newton's formula is based on the proposition that a statement about the movement of a physical entity can only be correct if the position and the movement of the observer is integrated. But the proposition for the power of Maxwell's formulas is to neglect the observer, if the physical entity is an electric or magnetic field. Therefore one of the theories must be correct, the other is falsified. One of both had to be excluded according to Aristotle. And there should not exist a third solution. Einstein proposed a solution: The nature is not in contradiction. In contradiction are only the contents of the identical terms. Terms are free invention of the human mind. They simplify and should simplify problem oriented:

[1] «It is inconceivable, that inanimate brute matter should, without the mediation of some-thing else, which is not material, operate upon and affect other matter without mutual contact...That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance, through a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking, can ever fall into it. Gravity must be caused by an agent, acting constantly according to certain laws; but whether this agent be material or immaterial, I have left to the consideration of my readers.» (Einstein: «Autobiographical notes»)

Electromagnetic processes are different from mechanic ones. Therefore their terms — e.g. with identical wording like «movement» — should focus on other aspects than the content of «movement» in mechanics. In the language of physiology we can say: Both terms «inhibit» given aspects and «enforce» others[2]. Therefore any (even scientific) term, and the related natural laws and constants including the used symbols and formulas are in principle from another nature than that for what they are staying. This can be compared with the relationship between landscape and roadmap. The only justification for the simplification and the focusing of terms, symbols, natural laws and therefore of the use of mathematics is their power to deal better with the problems in our world [4, 7].

Therefore scientist should feel free to invent new qualities and related terms according to their problem-oriented needs — but always in agreement with the empirical facts.

It is not possible to make a statement about our world without an — implicit or explicit used — world's view. Therefore paradigms must be also just «free inventions of the human mind» and related to problems, which should be handled as economical as possible. Therefore it is sufficient to simplify the world «as if it would be a plate» if your problem is to control the correctness of a wall with a water- scale. You have to modify your simplification if you calculate the optimal route of an airplane from Moscow to New York. Therefore no scientific position can reclaim to be the objective and unchangeable answer about the world in general. But this was the former definition of paradigm.

There are consequences of this understanding of the power of science, which should be taken in consideration:

a) The problem-orientation solves logically the conflict with Christian churches

Science cannot reclaim to explain the most fundamental question according to Einstein. Science can only offer assumptions about this and compare the conclusions from them to the phenomena. Therefore the argumentations of science and religions are from different qualities. So as well the former complaints of the Christian Churches lost their logic arguments as did the related restrictions for science.

b) From taboo to the ivory tower

But the logically new relationship between churches and political power was known only by the small group of scientists and decision makers who analyzed the work of Einstein up to these philosophical details. Therefore even these progressive scientists had to accept the former logically based restrictions in their work now as a social frame e.g. in the interest of their carrier. They had to fear to be excluded from the scientific community if they would violate the norm e.g. by the use of unaccepted formulations. Einstein recommended to communicate even about — from the philosophical view — idealistic aspects just with the terms for the linked materialistic aspects[3]. But Einstein — as nearly anybody — accepts that every human person has also immaterial aspects[4]. Therefore any scientific position, which reclaims to focus on all what is generalized in our world has to integrate adequately constructivistic aspects and individuality . The proposed technique was understandable in the beginning of the 20th century as a strategy. But this position created a new social norm, which caused the ivory tower of science — far away from daily live. And now — in the 21st century — we should think over its applicability and to avoid the negative effects. Social norms and other outer scientific aspects should no longer dominate over logical arguments.

c) The new freedom opened the way for successful specialization...

The problem oriented understanding of the relevance of theory of science allowed to neglect in principle relevant questions and to focus with great success on immediate problem oriented ones. C.F. Weizsäcker expressed this impressively with his saying, «that science owes a relevant part of its success thanks to the abstinence to ask certain questions. These refer to the own fundamentals of the related discipline» [10]. It is acceptable to use just implicitly any world view as long as the position is not excluded by the state of knowledge in another discipline. So it is to exclude that the stork can bring babies. But it is acceptable, that social scientists link the decrease of birthrate with the increase of the education level of mothers even without available pharmaceutical or mechanic techniques of contraception. This position is a scientific argument for the Mother-Child concept of the UN. We know that chameleons can modify actively the color of their skin thanks to the modification of the distance of photonic crystals in the skin [11, 12]. Therefore the frequency of the reflected light can be modified thanks to subjective messages which the chameleon can express e.g. observing an enemy, a female chameleon or an eatable observer. We have no explanation in which way such a linkage between the brain and the organs takes place. So we have no idea in which way the soil microbe

[2] The physiological principals «Inhibition and enforcement» can be understood as expression of natural principles (Einstein A.: Über die Spezielle und die allgemeine Relativitätstheorie)

[3] *«Why is it needed to bring down the basic terms of natural scientific thinking from the platonic Olympus and to try to lay open their earthly origin? Response: To release these terms from the adherent taboo, and to win greater freedom for the creation of terms thanks to this technic.» Original in German: Warum ist es nötig, die Grundbegriffe naturwissenschaftlichen Denkens aus den platonischen olympischen Gefilden herunterzuholen und zu versuchen, deren irdische Herkunft aufzudecken? Antwort: Um diese Begriffe von dem an ihnen haftenden Tabu zu befreien, und damit größere Freiheit in der Begriffsbildung zu erlangen.» [9]*

4 *«Body and soul are not two different things, but only two different ways of perceiving the same thing. Similarly, physics and psychology are only different attempts to link our experiences together by way of systematic thought»*, Aphorism (1937), p. 38 [15]

Mycococcus xanthus communicates with others so that «they hunt other microbes like a pride of wolves»[4]. And immunologists accept that antigens and antibodies can recognize each another and can move actively themselves versus another — without any idea about the implicitly accepted abilities behind these processes. These and many other examples of the state of knowledge confirm:

Not only can the «classic» options of theory of science help to bridge the gap between former incompatible theories [4]. The now used «shortcut» — proposed by Einstein and characterized by Weizsäcker — is also scientifically correct and effective.

d) ...but caused the increase of incompatible but indispensable sectoral disciplines

The lack on explicitly formulated paradigms caused the use of identical wordings as terms with different meaning in the special, but familiar meaning in principle. So the term «evolution» is used with success in the meantime not only in biology, but e.g. in cosmology, for the understanding of languages etc. The specific differences remain irrelevant as long as there is no need to link the different applications. But this is needed for a comprehensive understanding of complex processes, e.g. of the interaction of «body and mind», of «individual and society» or of «physical reality, mental reality and virtuality» and their relevance for health and diseases [7, 13]. The need of their connection for a comprehensive understanding of health is generally accepted latest since 1977 and the classic publication of Engel in Science about the need of a bio-psycho-social model [14]. The proposed use of the General System Theory and of a hierarchical evolutionary understanding could not be realized because of the incompatibility of the used identical terms . Therefore medicine has further on a fundamental problem:

How to link former incompatible theories: The example of Special Relativity Theory

a) The invention of a more fundamental understanding of «movement» and a link between Einstein and Darwin

The type of problem could be solved by Einstein in principle: Electromagnetism and mechanics are sub-disciplines of physics. Therefore a view should be possible e.g. about «movement», which is so fundamental that all aspects of movement in mechanics and all of movement in electromagnetism should be covered within this. The prerequisite for such an extended view on movement must be a view of the physical world with a dynamic process which caused two different specifications of the former less differentiated situation. Such a view can be understood as evolutionary process from the less differentiated «energetic fields» as precursors for «electromagnetic fields» and for «solid matter». Therefore electromagnetic fields and solid matter follow the joint principles of «energetic fields». Therefore mass is equivalent to energy. The formulas of Newton and Maxwell can be understood as attempts to «re-invent» the different «agreements» of «energetical fields». If you accept such a chain of argumentation then it is conclusive, why SRT did not falsify «Newton» and «Maxwell». Then it is conclusive, that the use of «Newton» is sufficient for classic mechanic processes and the use of «Maxwell» is sufficient for classic problems of electromagnetism.

b) The need of a problem oriented ontology

The first step for an «extended meaning of movement» was a «free invention» about a joint ontology. The ontology for SRT must not exclude neither the ontology of Newton nor the ontology of electromagnetism. Physical objects move actively according to Einstein [18]. This fits to Maxwell and is not excluded by Newton. But physical objects are only able to guide themselves within the determinations of natural laws. This fits to Newton and is not excluded by Maxwell. «Natural laws» are inventions of scientists about the real world according to Einstein. It is not a scientific question to explain, what is finally «behind natural laws and natural constants» according to Einstein. This fits with Newton and Maxwell. So the option that such formulas can be inventions about divine creation is of great interest for Einstein as a person[5]. But the answer to this question is irrelevant for the applicability of the formulas of Einstein, Maxwell and Newton. Therefore the question can be skipped according to Einstein as scientist.

CONCLUSION

The jubilee can be understood as reminder to the challenge to create a theory for medicine

The analysis makes clear: There is no hope for fundamental new findings about the core competence and the unique selling proposition of medicine: This is the comprehensive and insightful attention to the individual person thanks to linkages of data and tools of actually incompatible sectoral disciplines. Therefore the core competence of medicine is still based on empathy and not on science. The efficiency of empathy is depending on lifelong experiences in the dealing with problems but with restricted diagnostic tools and insufficient instruments for therapy. We should not expect an improvement or a change in principle without a comprehensive theory for medicine as a whole. Einstein demonstrated that it is possible to link former incompatible theories. The power of the former distinct theories will persist, if the connecting theory allows integrating them according to the evolutionary progress in nature. The further progresses in consequence of his work allow a pragmatic ongoing and a focus on the needs of medicine for the paradigmatic fundamentals of such a comprehensive theory.

The unpredictable improvements in consequence of the successful integration of mechanics and electromagnet-

[5] «What I am really interested in is knowing whether God could have created the world in a different way; in other words, whether the requirement of logical simplicity admits a margin of freedom», in: M. Jammer: Einstein and Religion, Princeton University Press, 1999, p. 124 [17]

ism thanks to their unification within the Special Relativity Theory give the hope for similar effects thanks to the application of such a comprehensive theory for medicine.

The presetting for a theory for medicine

The theory must cover the nature of patient, doctors and all other health care workers. They are actors with intentions, but restricted e.g. by their abilities, resources, relationships to different environments [19] but also according to their evolutionary level (from cell to person). Patients can fall ill: physically, mentally and social. Therefore a theory for medicine must integrate materialistic/realization oriented aspects and idealistic/constructivistic ones within one comprehensive entity. This is possible without vitalism if we accept different abilities as expression of just one substance. We can compare this with two sides of a coin. The two sides show phenomena which seems to be incompatible. But it is easy to accept the complementarity of them if you integrate the quality of the joint substance: The characteristic of the substance allows such different applications.

We should not forget: The most relevant basis of medicine is compassion. A theory which would exclude even generalized aspects of subjectivity cannot be accepted as joining fundament for medicine. Such a theory would be counterproductive even for empathy. It cannot explain the effects of motivation, compliance or of placebo and toxicopy [20].

Paradigmatic assumptions

The paradigmatic inventions must fit to these requirements. But they have to make plausible the only one evolutionary process from the early beginning (of quanta as — from the evolutionary point of view — «oldest entity» and gravitation as oldest health relevant force) up to now. Therefore we have to make a proposal to fulfill the dream of Darwin: A stringent theory not only for the differentiation of life from basic living being. He accepted the assumption of a general evolutionary process of the whole universe, but has not seen the option to realize it with the former given knowledge[6] [21]. Therefore we need a proposal for a self-organized emergent ongoing also e.g. from waves and particles to atoms, from not living entities to living ones etc.

To describe the follow up of steps in evolution is not sufficient for the needed deductive model. But we can use the won freedom that any paradigm, which cannot be excluded by the state of knowledge is to accept, if it increases the scientific power to deal with health [12].

Such a process is plausible if we assume that any entity is a restricted, not ideal but autonomous actor with abilities for energetical and information related effects [22]. Any actor is using its abilities to increase the own surplus. There are wins, which can be reached just in cooperation or on prerequisites which are based on cooperation. So actors can agree to use just a special form of the different options, which are given as prestatus just because of this joint agreement. This agreement is a restriction compared with the plurality of options of the pre-status. But all members of the so originated new subset of actors will act in a predictable way as long as the surplus of the accepted restriction in the use of the former given plurality is bigger than the loss. The new subset has reached an emergent new level. All integrated entities accept the former agreements but use just the jointly agreed ones. Therefore, this application can be predicted by an outside observer.

This concept allows to understand natural laws and natural constants just as the expression of agreements in the interest of actors. This model makes plausible as well why electric and magnetic fields as solid masses can be understood as specifications of the energetical field. It makes also plausible why they can be so different but from the same basic nature. And it makes plausible that the SRT can be understood as the attempt of an invention about the agreements, which can be attributed to the precursors of electromagnetic waves and of solid matter. It makes also plausible why the use of Newton and Maxwell is more economical to deal with classic mechanics and electromagnetism than the application of SRT.

This principle allows also to deduce the autopoiesis of living processes just on the extended understanding of not living entities. We have used this model to deduce the emergent steps from multicellular to sense oriented entities and from them to human persons as final oriented social beings. There are different papers available about the application for the «Extended View» of a human person as a social being and its interaction with and expectation on its environments [23].

Литература

1. *Einstein A.* Four sessions of the Prussian Academy of Sciences, Berlin November 1915 and different publications in: Preubische Akademie der Wissenschaften, Sitzungsberichte, 1915 und 1916 Personal discussions with Kleinknecht Reinhard. 2016.
2. *Schmidt W.*, one of the followers of W. Roux on this chair, University Innsbruck, oral communication, 2004.
3. *Kofler W.* The relevance of Sechenov for the development of the theory of an «Extended view» of a human person as a social being, Russian Acad. Science et al (eds.). Sechenov Honor Lectures. 2004. Moscow, 2005: 3—68.
4. *Kofler W.* I.M. Sechenov (1829—1905) and the Scientific Self-understanding for Medical Sciences. History of Neurosciences, 2007; 16: 30—41.
5. *Newton I.*:Third letter to Bentley, 25 Feb 1693. Quoted in The Works of Richard Bent-ley, D. D. 1838; 3: 212—3.
6. *Einstein:* «Autobiographical notes» in: Schilpp PA (ed.): Einstein — philosopher — scientist, The library of living philosophers, VII, La Jolla, 1949.
7. *Anisimov O. S., Glazachev O. S.* Essence of the Notion «Health» in the Logical-methodological approach's frames. Electronic periodical «Herald of the International Academy of Sciences. Russian Section». 2012. Vol. 2. P. 6—12.
8. *Einstein A.:* Über die Spezielle und die allgemeine Relativitätstheorie; Anhang 5, 24. Auflage; p 97, Springer 2009.
9. *Kofler W.* Konstruktiver Realismus und ein anwendungsorientierter Zugang zu Gesundheit und Umwelt/ Holzenthal N.(ed.) Constructing Reality/ Realität konstruierend, Edition Petter Lang, Frankfurt, 2016: 79—97.

[6] Darwin accepted also a prebiotic evolution for the whole universe as prerequisite for the emergence of the most basic cell. But his position was: *«It is mere rubbish thinking, at present, of origin of life; one might as well think of origin of matter»* [21]

10. *Weizsäcker C.F.* Deutlichkeit. Beiträge zu politischen und Religiösen Gegenwartsfragen, München, Hanser 1979, zit. Nach Koltermann R. Grundzüge der Modernen Naturphilosophie: Ein kritischer Gesamtentwurf, Knecht, Frankfurt aM 1994. 167.
11. *Teyssier J., Saenco S.V., Marel Dvd., Milinkovitch M.C.* Photonic crystals cause active color change in chameleons, nature communications, 2 Mar 2015.
12. *Velicer G.J., Yuen-tsu N.Yu.* Evolution of novel cooperative swarming in the bacterium Myxococcus xanthus, Nature, 2003; 4: 425.
13. *Kofler W.* Philosophy for fundamental science and applied medicine, Herald of the University St. Petersburg, Medicine, 2015: 109—124.
14. *Engel G.L.* The need for a New Medical Model: A Challenge for Biomedicine, Science, 1977; 196, 4286, 129—196.
15. *Tress W., Junkert B.* Psychosomatische Medizin zwischen Naturwissenschaft und Geisteswissenschaft — Tertium non datur?, Psychother Psychosom Med Psychol. 1992; 42: 400—407.
16. *Kofler W.* 100 years Relativity Theory: The relevance of Sechenov, Einstein and Darwin for a comprehensive theory of medicine, Part 1: Sechenov's and Darwin's overseen cornerstones for natural science, Session of Russian Academy of Sciences/ Russian Academy of Medical Science, Moscow, 03.03.2016
17. *Russell B.* The ABC of Relativity Theory, Routledge, London, NY, edition 1997.
18. *Kofler W.* An «Extended view» of a human person as a social being: The health relevance of environmental factors. Herald of the International Academy of Sciences. Russian Section. 2006; 2: 11—18
19. *Glazachev S. N., Kosonoghkin V. I.* Comparative Characteristics of Natural Ecosystems and Antropoecosystems. Electronic periodical «Herald of the International Academy of Sciences. Russian Section». 2012; 1: 30—33.
20. *Kofler W., Wongphanich M.* (eds.) Toxicopy (in English, Thai and German). OS Printing House, Bangkok 1988.
21. Letter of Darwin to Joseph Dalton Hooker, March 29, 1863, Darwin Correspondence Project
22. *Kofler W.* «Information» from an Evolutionary Point of View. Information. 2014: 272—284; doi:10.3390/info5020272.
23. *Kofler W.* Think Fundamental — Act Problem Oriented: A Challenge for Physiology and Public Health in the 21st Century. Electronic periodical «Herald of the International Academy of Sciences. Russian Section», 2013; 1: 32—44.

Сведения об авторе:

Кофлер Вальтер — доктор наук, профессор,
профессор кафедры нормальной физиологии Первого МГМУ им. И. М. Сеченова,
Президент Международной академии наук (Здоровье и Экология), Инсбрук, Австрия,
E-mail: walter.kofler@ias-he.com