Editorial

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Surgery and quantum physics

Part I: what is life?

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Dear readers,

Welcome to the present issue of *European Surgery* including well-orchestrated contributions related to oncologic, general, minimally invasive, transplant surgery, and surgical research topics. May the data, methods, conclusions, and ideas foster your fruitful surgical routine and reasoning, and contribute to enrich your day. What remains to be questioned: *what* is it all about? It there an essential basis for inflammation, cancer, and functional disorders? Are there little notes for the score of life? Let us share some fundamental thoughts on space and time.

Science aims to address questions. Academies should never stop asking questions and they should motivate reasoning "outside the box". Otherwise roots retract from the tree, leaves fail to protect the fruits, soil dries, and life disappears. "Shall we never stop asking questions, walking in beauty and harmony!" What should we ask first? What should we ask and sense? Are we selfish? Do we want to be important? What counts?

As a surgeon, you deal with the interdisciplinary diagnosis, treatment, and management of disease. Your armamentarium includes conservative (medical, nutrition, life style) and surgical methods. One day you may ask yourself, as a surgeon, (grand) father, (grand) mother of children, as head of a working group, head of a small or large surgical institution, head of a medical university: what is the difference between life and dead matter. What defines life? From that perspective you may ask: what is the difference between health and disease, benign and cancer? Why you should address these issues? BECAUSE IT HAPPENS IN MAN! Well done, next step.

Let us open our minds to ask a fundamental question (at least for a surgeon): what is life? What is the difference between life and dead matter? And here we silently allow to spread out for the quiet search for finding an ultimate answer?

In the recent issues of *European Surgery*, we found that being equals the current individual state of emotion, sound, and atmosphere, which decides on *if* and how perceptions are perceived and translated into mind, actions, and thoughts [1]. Next, we identified a fascinating, common cause for disease: the lack, deficiency of energy, either due to an energy consumer (tumor, metabolic disease, inflammation, trauma) or the administration of the *wrong* nutrition (hunger, concentrated sugar, preservatives, artificial sugar, E-substances) [2]. Finally, we came to the conclusion that a *neurohumoral* response orchestrates disease, symptoms and signs [2]. Is there something missing here? Is there something mistaken here? Is there room for a falsification of a theory?

Let us go back to the above question? Maybe the questions "what is life?" and "what is the difference between dead and living matter" may help determine if something is missing in the above consideration. We stated that disease is mediated via a *neurohumoral* orchestration [2]. In line with embryology, nerve cells, epithelial cells (inner, outer surfaces), the brain, gut, liver, etc., all originate from a common germ cell layer [2]. Thus, we adequately understood that all epithelial cells, neuroendocrine cells represent nerve cells having the form of a cigarette pack [2]. What do nerve cells, epithelial cells, do? They serve the complex generation and processing of information [2]. But what about blood cells, vascular endothelial cells, muscle cells, cells of the connective tissue? What about bacteria, virus? What about immune cells? Our reasoning

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demands for a modification of our concept. And here we go:

*Life is **cytohumoral** orchestration within space along time* (approximation 1).

Relativity matters

In line with the theory of *special relativity* (Einstein), time and space are to be considered as a common entity, i. e., space time, and that the single constant is the speed of light [3, 4]. Furthermore, masses can be transformed into energy and vice versa [4]. Thus, you schedule your surgery at a given position within space (along the x, y, z axis) at a given time (t coordinate), which translates into nothing else than: you schedule the operation within space time. You do the same for dating friends, colleagues, symposia, hands on courses, etc.

Einstein's *general relativity* teaches that masses orchestrate the geometry of the curved space time and masses move, fall along the curved geometry of the space time, i. e., masses *follow* the curved geometry of space time, which itself is woven by the masses [5]. Thus, masses and space time are interacting as a common functional entity (energy), which permanently moves, waves, excites, and changes. This means that space time *is* gravitation and gravity *is* space time, i. e., there is no space *and* time, gravity is not a force [6]. Gravitation simply describes the geometry of space time, which is orchestrated by the masses (planets, suns, etc.). As such, beams of light originating from a far distant star are deviated by the *mass-induced curving* of the space time geometry around our sun ("Here comes the sun"). The concept was proven during an eclipse of the sun in 1919 [6].

If masses dramatically increase, they may maximize the curving of the space time geometry towards a critical level, where no more information (light) can leave the area around the mass, these structures are known as *black holes*. Such structures may develop during the collapse of a sun or the fusion of a double star [6]. A major black hole exists in the center of our wonderful Milky Way galaxy and "eats" up stars and solar systems. The energy within the black hole profoundly curves the geometry of space time around. As a consequence, masses follow the increased curving of space time and "disappear", fall into the black hole and stop to emit light, i. e., information, and are out of reach for our perception: we lack knowledge of what is going on within a black hole. Going in line with Steven Hawking, over time, black holes emit energies, get smaller and at a critical point stop to bind the mass enclosed [6]. As a consequence, the black holes explode and, thus, may give rise for a subsequent universe (big bang). Thus, black holes may serve as the germ cells of a new universe. However, this relates to theory of physics and mathematics (surgery with numbers and equations). Why should a surgeon care about black holes?

The above findings explain that masses (suns, planets, etc.) can be considered as condensations of space time, themselves unfolding the ongoing change of space time. As such, masses decrease the speed of time. Therefore, highly sensitive watches assessed that time passes slower on the surface of our earth, when compared to a position high up in the mountains (where space time geometry is different) [5, 6]. Thus, time passes different at a satellite, when compared to a place in your car. As a consequence the space time characteristics and differences between earth and the satellite have to be considered for the global positioning system (GPS). Otherwise you may fail to reach your target address by 10 km or more.

Taken together, energy of the macrocosmos manifests within a large spectrum of highly fascinating perceptions, including suns, planets, solar systems, galaxies, and the extremity of black holes and gravitational waves: when stars collapse they shake the space time; as a consequence gravitational waves spread out at the speed of light [6]. In contrast to photons, gravitational waves do not pass through space (against the background of space), they *are* space, they change the geometry of space time, they alter the curving of the space time and pass through masses with the speed of light (also through the readers of this article, without being felt, since we have no perception for gravitational waves). Such phenomena have recently been assessed for the first time (LIGO project) and represent a great candidate for the next physics Nobel prize in 2018 [7].

As such we may return to our initial question: what is life?

Life is cytohumoral orchestration within space time (approximation 2).

Diving into the quantum world

Quantum mechanics deals with the structure, elements, and functions of our microcosmos, i. e., with atoms. Quantum physics is all about probabilities where the standard model describes that the nucleus of the atom is made up of protons, neutrons, around which the electrons "circulate" [8]. Furthermore, smaller components are assessed, including quarks, gluons (the glue between the very small amigos), neutrinos, Higgs bosons, fermions, and many more are suggested to be detected in the future [6]. In contrast to the macrocosmos, what happens in quantum physics is that the particles are *very short lived* (nanoseconds and much less), that the state of these particles only can be given in the form of probabilities (Erwin Schrödinger's wave function), and that our interaction with these particles (i. e., measurement) alters their behavior [8]. In fact, the particles of the quantum world only exists during a measurement [6, 8]. As such we only can assess either the position or the momentum of such a particle (Werner Heisenberg principle, Paul A. M. Dirac equations) [8]. Next

let us see what a measurement may do with a given quantum particle.

Measurement means that we *interact* with the particle [8]. During this interaction we apply energy to the particle [9]. As such, the energy of the particle may transiently increase to a certain critical level. We have learnt that energy equals mass and that mass curves the space time geometry [5, 6, 9]. As such the measurement of a particle may foster the following sequence of quantum events (i. e., at the level of the particle space time geometry) [9]:

1. The measurement transiently increases the energy, as such the particle speeds up, flies away, and disappears from our perception.
2. If we still want to assess the position of the particle, we have to apply more energy; this means that we increase the *mass of the particle*.
3. At a particular point, the enlarged mass of the particle increases the curving of *quantum space time geometry* around the respective particle.
4. The increased curving of the quantum space time increases the *quantum gravity*.
5. Increase of quantum gravity (quantum pace time curving) above a critical level inhibits the emission of information from the particle (measurable impulses of energy, light).
6. As such, the measurement-induced increase of microgravity (quantum gravity) induces the formation of a *miniblack hole*: we stop to gain information on the position (x) and the momentum (p) of a given particle (electron, neutrino, gluon, fermion, Higgs boson, etc.).
7. Since we lack the respective information, the particle vanishes from our perception. This is why the quantum world appears to be granulated and *finite*. The critical diameter where particle information may vanish has been calculated to equal the Planck length 10^{-33} cm. To be honest: this is very small. But it proves that the world is grained (i. e., not a continuum), finite (not endless, infinite), and can be described to be composed of minimal quanta of energy: the quanta of space (Planck length), minimal quanta of action (Planck's action quantum *h*), quanta of the electromagnetic field (photons), and the largest speed for the exchange and transmission of any information is the velocity of light (c). As a consequence, the probabilities of the quantum world remain to be described (M. Bronstein, E. Schrödinger, W. Heisenberg) [9]. That's quantum life. How do the above suggestions affect our question? As such we may address the question: what is life?

Life is quantum space time based cytohumoral orchestration (approximation 3).

Time vanishes to return

Surgery deals with inflammation and cancer; inflammation and cancer happen in man and start at the quantum level. The role of time remains to be considered.

We describe our observations along time (Fig. 1). But: what is time? How do we measure time? We measure time, using a *clock*. A clock consists of a hand which moves around the dial (from XII to I, from I to II, from II to III, etc.). What exactly happens, when we measure time?

When we measure *time*, we compare the change of the position of a given piece of matter (particle) within space versus the movement of the hand of the watch along the dial (Fig. 1): as the dial moves from the position I to the position III, the piece of matter moves from position A to position B, where the distance between A and B may be for example 10 m. Essentially spoken, what you do is to compare one movement, one change vs. another movement, change *within* space, i. e., against the background of space (x, y, z). According to an agreement, the movement of the hand of the clock describes *time*. Therefore, the movement of the piece of matter can be assessed vs. time. However, in fact, what you do is to compare the position change (Δ x, y, z) of one perception vs. the position change of another perception within space. And this consideration is the basis for the assumption that time does not exist. And essentially we only describe one change vs. another change. Furthermore, change only develops in the presence of *interaction*. There is no change without interaction, there is no perception without interaction, and there is no information without interaction. Therefore, one single particle per se does not have space time ("No man is an island") (Fig. 2). Space time, i. e., gravity evolves if two particles interact to exchange information (e. g., during a mea-

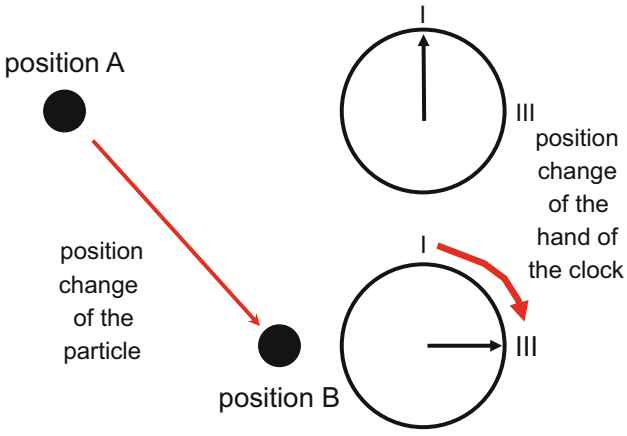

Fig. 1 The image aims to depict what happens when we measure time: we compare the position change of a particle against its background (table, surface, space) vs. the position change of the hand of the watch against the background of the dial. Due to convention, the position change of the hand of the watch indicates time, as described in the text

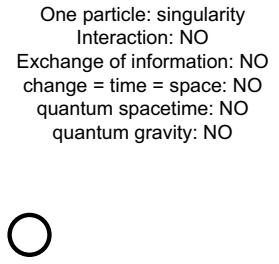

Fig. 2 A single quantum particle lacks space, time, quantum gravity, exchange of information, and interaction. Development of time, space, gravity requires interaction, exchange of information, i. e., more than 1 particle, as described in the text. As such, measurement, i. e., the interaction with the particle, creates manifestations of energy quanta, including quantum space, time, and gravity, as outlined in the text

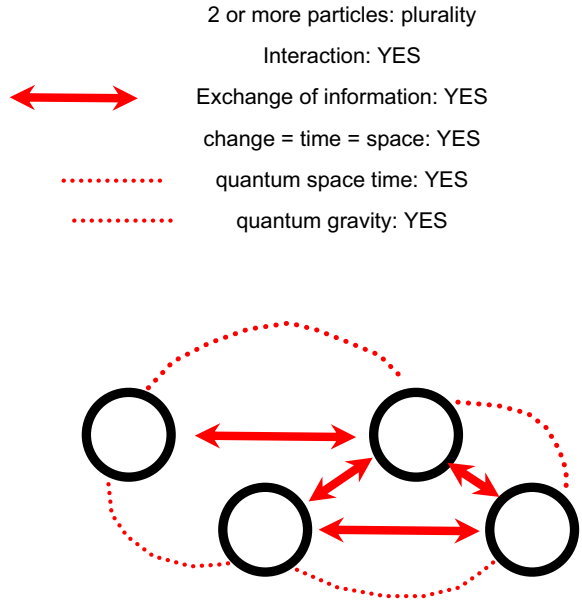

Fig. 3 Two and more quantum particles foster interaction, exchange of information, and thus create quantum space time, which is quantum gravity. The idea that quantum time and space are made up of quanta is described in the text

surement) (Fig. 3). Quantum space time, i. e., quantum gravity increases as the number of interactions unfold, i. e., as the number of interacting particles increases (Fig. 3). *Interaction equals exchange of information.* As such quantum gravity equals processing of information. Each interaction evolves within a particular quantum gravity horizon. Therefore, the equations of quantum gravity by Carlo Rovelli, Lee Smolin, and other twisted minds suggest omitting time [6, 9]. Time is a change that should be equally treated at the same level like other changes. There exists no preferred, absolute coordinate system. As such time (the movement of the hand against the dial of the watch; Fig. 1) is to be treated equally like other changes (movement of a mass, particle, etc.). At this point Carlo Rovelli suggests to leave out time and indicates that space time equals quantum gravity [6, 9]. Here, we simply compare changes and probabilities at the quantum level, e. g., how two particles interact, exchange information (Figs. 2 and 3). The consequence of the above considerations for our question remains to be questioned: what is life at the quantum level?

Life is quantum gravity based cytohumoral information orchestration (approximation 4.1).

Dead matter equals quantum gravity *cytohumoral-negative* information orchestration (approximation 4.2).

The above approximation aims to describe an idea which helps to differentiate and compare living and dead matter at the smallest level, i. e., the quantum level. Physics and mathematics will foster a more detailed description, using respective equations. These equations will talk about granularity, quantum gravity, i. e., change vs. change, without time. Why? As outlined above, there exists no preferred, absolute coordinate system and there exists no preferred type of change—all changes and information are equally considered. The change of the position of the hand against the background of the clock dial is not handled with preference vs. the change of the position of another "particle". As such, time disappears; what remains is the comparison of changes. In the absence of a possibility for comparison, quantum gravity vanishes: no man is an island.

Therefore, at the smallest dimensions of quantum physics, it becomes clear that particles represent the quanta of quantum fields [6, 9]. Essentially nature seems to be made up of quantum fields (gravitational, electromagnetic fields) and their respective quanta (photons, electrons, fermions, Higgs bosons, gluons, etc.). So what? How do the above considerations translate into our daily praxis, surgery, diagnosis, treatment, and management of disease?

At present, the macrocosmos is best taken by the space time gravity theory: matter orchestrates the curving of the space time, which itself tells the matter how and where to move [5, 6]. *The concept of time is essential, extremely useful, and required for the description of the macrocosmos* (our world, life, surgeries). There is nothing wrong about talking about time. Time is used to monitor the quality of surgical therapies in our daily clinical routine and to assess the outcome of studies in the field of surgical science and oncology. However, we have to keep in mind that we can not directly measure time, we simply compare changes (movement of shadows, hands of the clock, stars, planets, moon, zodiacs, etc. vs. the aging of man, vascular pulses, heartbeat, bowel movement, reflux episodes, etc.) [6, 9].

The quantum gravity theory (± loops, strings) aims to describe the quantum microcosmos. The fascinating quantum world is granulated, discrete, *finite*, and made up of miniquanta of energy (space, time,

electromagnetic, Planck constant *h*, Planck length 10^{-33} cm, velocity of light) [6, 8, 9]. As soon as miniquanta of energy interact with each other, they orchestrate information: quanta of minispace time, i. e., quantum gravity (Fig. 3). Against the background of quantum space time (gravity) evolve electromagnetic phenomena (Fig. 1,2 and 3). It remains to be awaited which model will stand the test of time: the string theory or the loop quantum gravity theory, or a combination of both? Here we return to our question: what is life with inclusion of quantum theory?

Life is quantum field based cytohumoral information orchestration (approximation 5.1).

Dead matter equals quantum field *cytohumoral-negative* information orchestration (approximation 5.2).

In the next issue of *European Surgery*, we will address in as much the above considerations may contribute to improve our understanding of disease. Most importantly we will examine if disease follows a separate quantum space time (i. e., quantum gravity), when compared to normal tissue? Does temperature affect the geometry of quantum gravity and space time? May differences of quantum gravity explain phenomena of oncology, cardiovascular, and functional disorders? How does the concept of *quantum gravity based cytohumoral information orchestration* translate into diagnosis, treatment, and management of disease? Stay tuned, foster to prosper, let your sun shine, and do not stop asking questions: no man is an island.

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