GOD-ICS. ON FUNDAMENTAL INFORMATION FIELD QUEST

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Abstract: Further progress in AI research requires more complete and comprehensive study of information interactions in nature, not confined to psyche and intellect of individuals. One should not ignore evidences in favor of "unconventional" information interactions. The paper deals with two aspects of this research: from the viewpoint of physics of the microworld, and improving accuracy and correctness of the experimental studies. Is introduced the concept of "natural science" God - God-ICS. Are examined some arguments in favor of fundamental information field existence. Is considered the concept of non-locality, introduced in quantum mechanics, "spooky action at a distance" and experiments admittedly demonstrating their reality. Proposed is an idea of the RNG-controlled two-slit experiment. The relation between reality and modeling it theories is specified, which quantum mechanics still manages to safely get around. Critically considered is one of the well-documented experiments on registration of psychic phenomena, identified is the need for careful research and parameters selection for control random sequences. Ignoring this aspect may lead to erroneous conclusions regarding the "detection" of phenomena on the verge of accuracy and reliability of measurements, uncertainties in their statistical representativeness. Proposals for further research in this area are formulated.

Keywords: philosophy, noosphere, esotericism, intangible world, mystic theories, consciousness, mind-matter interaction, quantum mechanics, nonlocality.

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It is often stated that of all the theories proposed in this [20th] century, the silliest is quantum theory. In fact, some say that the only thing that quantum theory has going for it is that it is unquestionably correct.

Michio Kaku, Hyperspace

Introduction

Almost in all spheres of human activity contemporary technical progress leaves far behind the wildest fantasies of science fiction writers. Only AI, generally speaking, fails to demonstrate stunning breakthrough achievements. I thought that maybe we failed to take into consideration or underestimated something important in the domain of our research. Probably, we are not fully aware about deep information processes in humans, human societies, physical world, noosphere. It appeared that, besides psychology and neurobiology, beyond scientific approach to Nature cognition, there exist impressive stratum of esoteric teachings and traditions, which are also trying to explore human beings in the context of their relationships to nature and other humans.

Immersion in esotericism [Lozovskiy, 2003-2010] shed upon me, some light concerning its problem domain. It became clear that human psyche and mentality has outstanding neurosomatic influence on one's body and integral personal functionality. Thus, meditation, autosuggestion, broad spectrum of practices in altered states of consciousness can stimulate overall health improvement and even cure some functional disorders. Official neurology and psychiatry gradually change their until recently negative attitude to these practices. But one problem turned out to be a hard nut. And that was the problem of God. Recently [Lozovskiy, 2007b] I tried to consider it from different viewpoints. The most constructive approach to the concept of God turned out to be the concept of God-ICS.

God-ICS - Information & Control System

I nominate as determining two of the most "God-like" concepts: information and control. What would be (presumably existing) God, we must agree that these concepts should be leading. God having no control ability...(?) And is it possible to manage without information, without actual knowledge? This question is clearly purely rhetorical. We can endow God with many other properties and values, but these two are undoubtedly absolutely necessary. In addition, it is to a certain extent, an attempt to speak more precisely - avoiding talk about omniscient and omnipotent God, karma, destiny, etc. On the one hand, this approximation implements generally adopted ideas about God, but on the other - they admit experimental verification. This is something that other definitions of God miss: the real possibility of materialistic confirmation of its existence.

Let us define **"Bioinformatics"** as unconventional information exchange between living organisms, or between a living organism and inanimate object that cannot be attributed to well-known for today science techniques with the help of optical, acoustic and electromagnetic waves and other means of "classical" media based interaction.

Esoteric sources are full of manifestations of Esoteric Phenomena, Extrasensory Perception (EP, ESP): telepathy (information exchange between higher mammals, including humans) and clairvoyance (the ability of a person "to see with their mind's eye" something that is outside the capabilities of conventional sight), remote viewing. Sometimes occurs the term "clairsentient" - when a person allegedly receive information from those areas of knowledge, where they are not specialist. Often is mentioned extremely large distance between the sender and the recipient of telepathic information, which, considering signal attenuation and the allowable noise levels may be many times higher than the capabilities of traditional communication systems. Moreover, there are rumors about independence of telepathic communications from distance. Many talk about the possible existence of a certain Fundamental Information Field (FIF), which supposedly captures all the informational events on Earth, and to which is possible, in principle, to apply for the necessary information. Thus, it is instructive to define such prospective entity: *God-ICS (Information & Control System)* which "handles" data and knowledge base: FIF and admittedly is able to organize (and control) processes ("physical laws") in the Universe.

It is easy to spot suspicious resemblance between the notion of FIF and ideosphere (cultural) [Lozovskiy, 2003]. If the latter is an indisputable part of our noosphere, the existence of FIF should be shown through reliable natural science experiments. Unfortunately, majority of the currently available evidences of EP, particularly, telepathy and clairvoyance, upon closer examination raise serious doubts concerning their authenticity. Solution there can be only one - holding a pure experiment, excluding uncertain results and sensory leakage (information transfer through ordinary sensory channels).

Discovery of FIF would entail a number of fundamental issues: concerning the language and encoding methods used, discovering the material carrier of this information and so on.

Idealistic approach to universe genesis and foundation seems to be unreasonable. Suppose that God is "the world programmer" and material world is only programs in the Divine Computer. Even in this case this computer and its "programmer" should be material. In other words, it turns out that the materialistic approach has no alternatives.

Proposed approach to the concept of God-ICS seems to be very helpful. First, it stipulates the mandatory functions, which must necessarily be present at supreme "divine" level. Secondly, appears a real possibility to prove the existence of such God by a natural science experiment. At, least, we are talking about the first issue - information storage and handling which should be necessarily present if EP exist in reality. Despite abundant "evidences" that existence of these phenomena have already been "scientifically proven", in my opinion, it is far not so.

In my God-ICS hypothesis there is certain questionable issue. It is assumed that experiment on EP should be performed in the process of interaction between humans. Therefore, if the experiment would be crowned with success, we will get answer concerning abilities of persons involved, and not God. The question arises: how then we may say that this is, at least, "God-supported" activity? I would say that the informational impact on the world by God, should be limited within the level of humans and higher mammals. The rest of the world obeys to physical and chemical laws.

The second issue: suppose the recipients in EP experiments hopelessly fail. Opponents will immediately argue: just the language of God is not available to mortals, even psychics. But then - with whom God communicates in such incomprehensible language? With another God? Himself? Then the following argument: if these prospective exchanges of information do not affect the physical world and the psyche of people - we can assume that these processes are simply absent. Any study begins with the detection of a miracle - violations of the causal chain of events which cannot be explained at an affordable level of knowledge. No effect - there is no reason to look for cause.

Besides efforts for God-ICS disclosing, it is instructive to note the following. Assume for a moment that the existence of God-ICS is confirmed. It will mean that in nature there are real tangible aspects of his existence. Thus, theoretical physicists have to give a reasonable formal theory, experimental physicists - invent, implement and evaluate experiments, which would confirm these theories.

If and when such efforts succeed, the concept of God-ICS will be demystified and it will peacefully dwell within the materialistic paradigm.

Morphogenetic, or Akashic Field

The general conception of Fundamental Information Field (FIF) is very popular among esoteric authors. Here is idea of morphic field which is being developed by Rupert Sheldrake:

"The morphic fields of social groups connect together members of the group even when they are many miles apart, and provide channels of communication through which organisms can stay in touch at a distance. They help provide an explanation for telepathy. There is now good evidence that many species of animals are telepathic, and telepathy seems to be a normal means of animal communication... Telepathy is normal not

paranormal, natural not supernatural, and is also common between people, especially people who know each other well" [Sheldrake].

Ervin Laszlo [Laszlo, 2003, 2004] in the quest for "The Integral Theory of Everything" substantiates the existence of a some fundamental field, primordial construction material of the Universe. He uses the term: "Akasha", "Akashic field", or simply "A-field": "In the Sanskrit and Indian cultures, Akasha is an all-encompassing medium that underlies all things and becomes all things. It is real, but so subtle that it cannot be perceived until it becomes the many things that populate the manifest world... According to the philosophers of India, the whole universe is composed of two materials, one of which they call Akasha. It is the omnipresent, all-penetrating existence. Everything that has form, everything that is the result of combination, is evolved out of this Akasha.

... In the case of the field that could account for the presence of information in nature, the evidence is the puzzling, quasi-instant form of coherence that comes to light in the physical, cosmological, and biological sciences, as well as in consciousness research. These phenomena call for an explanation, and the simplest and most logical explanation is a field that links the entities that prove to be nonlocally coherent.

... Although fields, like other entities, are not to be multiplied beyond the scope of necessity, it seems evident that a further field is required to account for the special kind of coherence revealed at all scales and domains of nature, from the microdomain of quanta, through the mesodomain of life, to the macrodomain of the cosmos.

... Scientists now realize that space is not empty, and what is called the quantum vacuum is in fact a cosmic plenum. It is a fundamental medium that recalls the ancient concept of Akasha... In the next development of science, the A-field will join the currently known universal fields: the G-field, the EM-field, the Higgs field, and the locally effective but universally present strong and weak nuclear fields.

...In this concept the universe is a highly integrated, coherent system: a "supermacroscopic quantum system." Its crucial feature is in-formation that is generated, conserved, and conveyed, and links all its parts. This feature is entirely decisive. It transforms a universe that is blindly groping its way from one phase of its evolution to the next into a strongly interconnected system that builds on the in-formation it has already generated".

Frankly speaking, substantiations underlying the possible existence of FIF, morphogenic, Akashic, Ganzfeld, torsion, ether and many other hypotheses about Universe foundations seems very problematic. My opinion is that to these studies should not be indiscriminately glued the label of pseudoscience erecting quantum mechanics (QM) on an inaccessible for criticism the sacred pedestal on which earlier dwelt classical physics.

The fundamental question to be answered by physics - classical, quantum or some future, which will come to augment them - is a question of existence of non-local, long-range communications and interactions - not **at** the level of mathematical formalism, but at the level of immediate physical reality. Unfortunately, it is not so easy. Too many inaccuracies, contradictions and just unfounded claims have grouped around these issues. I believe that the problem lies in the fact that some researchers neglect the relation between reality, pseudo-physical model and the mathematic formalism in the process of world cognition. This issue I am going to elaborate on below.

Double-slit Experiment

Physics is not that place, where miracles and paradoxes feel themselves carefree and comfortable. Miracles are natural phase of research efforts. After encountering a miracle researcher works out its explanation or develops a new natural science theory. Sound science should expel paradoxes and contradictions from its body. Thus was in "classical" physics until quantum mechanics (QM) sprang into existence. Even more... QM until these days has

no sound interpretation adopted by majority of physicists. Calculations performed according to its formulas give excellent results when applied to experimental data without self evident model explanation - as it was in good old times of classic physics. To Richard Feynman belongs the authoritative affirmation: "I think I can safely say that nobody understands quantum mechanics". David Mermin confessed: "If I were forced to sum up in one sentence what the Copenhagen interpretation says to me, it would be "Shut up and calculate!"" The most provocative issue of QM is its relationship with the concepts of information and consciousness. That is why I became interested in QM. My initial impressions concerning these issues were presented in [Lozovskiy, 2009].

Consider the classic double-slit experiment (Fig. 1). The source of tiny particles emits them one by one toward a plate (wall) with two slots: 1 and 2. After flying through them they hit the screen (backstop).



Fig. 1 Double-slit experiment; influence of detector

In microworld particles have also wave properties. The famous particle-wave dualism... In any case, if we do not misuse our curiosity about which slot each particle flies through, our particles will behave like waves: on the backstop screen will clearly develop density fringes (right graph) - the traditional interference pattern (IP). Here the mystery arise. When we deal with waves on water surface, it is quite natural to observe IP between two wave sources. Would be our two slots subjected, say, to light ray - we could consider them as two secondary sources of light giving IP on the screen. But we manipulate with solitary particles. With what they interfere during their flight to the screen? The second enigma is: electrons (or photons) are emitted from the source as particles. And they hit the screen as particles - leaving the corresponding trace. Where from comes its wave-like behavior? QM has its answer: movement of particles is done in accordance with wave function... which collapses to the specific particle when hitting the screen... So, the particle during its flight is sort of wave... which comes through both slots simultaneously.

If we do not like the idea of, say, electron coming simultaneously through both slots and will put some detector - it will inform us quite intelligibly that it passed through slot 1, or if not - it is evident that it has went through the slot 2. Fine! But in that case the IP will be gone: we will register the sum of two smooth particle distributions: P1 and P2 - behind slot 1 and 2 respectively. Here appears an esoteric idea about influence of our consciousness, our attention on physical world: if we expect from particles wavelike behavior - they are waves. If we consider them to be particles - they silently obey.

Materialistic approach to this experiment inclines us to believe that probably not our consciousness, attention or attitude influences our research facility, but quite mundane things: detectors, for example. Inserting bulky thing into our device inevitably changes its internal geometry, resonance characteristics, disrupts oscillations, drastically changes the state of our micro particles - and IP disappears. It would be quite plausible assumption -

to hold to the idea of particles following all their way from the source to the target. Thus, appearance of IP itself could be the joint effect of our device geometry and specific distortions of particles' trajectory.

In any case, it would be instructive to study in detail the mechanism of experimenter influence on the experiment. First of all, one could place into the installation dummy sensors that are identical in size and material to the real ones. Then - install sensors not connecting them to the recording equipment. Then perform the experiment in automatic regime in experimenter's absence. I have no information if anybody performed such tests in reality, not as Gedankenexperiment.

However, this simple "classical" explanation hangs in the air when considering more sophisticated experimental installations - a delayed choice quantum erasers, for example. This experiment is very popular among QM-physicists. But before that we should clarify the notions of non-locality and the possibility of "spooky actions at a distance", as A.Einstein used to call them.

Non-locality and No-communication Theorem. Spooky Actions and Communications

I touched this issue earlier [Lozovskiy, 2009]. In two words, non-locality is an exotic notion introduced in QM. Physicists believe that it accompanies the phenomenon of entanglement. According to Wikipedia, "quantum entanglement is a property of the quantum mechanical state of a system containing two or more objects, where the objects that make up the system are linked in such a way that the quantum state of any of them cannot be adequately described without full mention of the others, even if the individual objects are spatially separated". According to Copenhagen interpretation of QM, spatially separated entangled objects have no hidden parameters, for example, electron spins (if they were spin-entangled). Objects can be billion light years apart, still (from QM viewpoint) they remain one unified object. The measurement of spin for one object makes the other object **at the same moment** obtain the complementary spin value. This outcome suggests transmission of information over any distance at superluminal speed, which is impossible according to the STR - **special theory of relativity**. It is really strange: laws of STR and of QM - both accepted theories - are mutually contradictive. Einstein mocked at QM calling such effects "spooky action at a distance". Of course, in this vein, we could talk also about spooky communications... And it would be the long searched support for esoteric ideas about reality of EP.

One more argument against the feasibility of EP stems from no-communication theorem [Peres, Terno, 2004]. Considering the possibility of instantaneous interaction between distant partners: Bob and Alice, they prove: "The statistics of Bob's result are not affected at all by what Alice may simultaneously do somewhere else. This proves that ... indeed is a sufficient condition for no instantaneous information transfer". The same conclusion can be found in Wikipedia: "In quantum information theory, a no-communication theorem is a result which gives conditions under which instantaneous transfer of information between two observers is impossible. These results can be applied to understand the so-called paradoxes in quantum mechanics such as the EPR paradox or violations of local realism obtained in tests of Bell's theorem. In these experiments, the no-communication theorem shows that failure of local realism does not lead to what could be referred to as "spooky communication at a distance"".

Thus, at the moment we have not received convincing evidence from physics on feasibility of EP.

A Delayed Choice Quantum Eraser

Let us consider the paper [Kim et.al, Rhodes, 2000], which includes fragments of original paper by Y-H.Kim with his co-authors and analytic remarks done by Ross Rhodes. The illustrations are taken from their paper.



Fig. 2 Delayed Choice Quantum Eraser

The schematic diagram of the experimental setup is shown in Fig. 2. Solitary photons from a pump laser are randomly one by one scattered onto optical crystals: **A** and **B** which play the role of double slits. Their output are the pairs of orthogonally polarized entangled signal-idler photons. Signal photons fly upwards towards detector D_0 and produce an IP which can be displayed. Their entangled twins - idler photons run their path downwards to the prism PS. When an idler photon hits the upper face of the prism, we know that they both with twin signal photon left the slit **B**. If an idler photon hits the lower face of the prism - it means that it and the corresponding signal photon were produced by the slit **A**. Here's how exceedingly carefully is generated in the installation which-path information about the slit which provided each signal photon directed to the detector D_0 .

The idler photons next encounter beamsplitters: BSA or BSB which in 50% cases reflect these photons towards the detectors D_3 or D_4 leaving which-path information intact, otherwise they pass through towards the mirrors M_A or M_B . There they get into the quantum eraser scheme with the detectors: D_1 and D_2 . Eraser scheme also uses 50/50% beamsplitter **BS**. When detector D_1 receives some idler photon - there is no means to say which slit (**A** or **B**) produced it: it might came from M_B mirror signaling that its source was slit B, or it might came due reflection from the mirror M_A . And it would mean - from **A**-slit. Thus, which-path information is efficiently erased: remains only the synchronizing pulse signaling about arrival of the corresponding signal photon to detector D_0 . Detector records the resulting integrated graph that depict all signal photons and can be scanned along its x-axis by a step motor. Coincidence Circuit allows one to select from the general flow of signals to D_0 - only those signals, which meet the conditions specified by the experimenter. The experimental setup ensures that **this which-path information for the signal photons is obtained or erased only after the signal photon has been detected and the information is winging its way toward the Coincidence Circuit**.

The detection event at detectors D_3 or D_4 gives us which-path information about a photon that was previously registered at detector D_0 . The scanning has registered where it hit D_0 – along the D_0 *x*-axis. But when we

correlate the later detection of the idler at D_3 or D_4 , with that previous detection at D_0 , we now know postfactum (!) that the photon registered at D_0 came from either region A or region B of the crystal.

Experimenter obtains specific graphs extracted from the "raw" D_0 mess: R (Fig. 3) - obtained on the basis of signals from quantum eraser (D_1 or D_2) and R_{WP} (Fig. 4) - correlated with the signals from which-path detectors (D_3 or D_4).



Fig. 3 Interference pattern *R* - no which-path information



This experiment is much more accurate than the basic double-slit experiment. Following Ross Rhodes, let us reconsider the main stages of the experiment.

- 1. "The entangled pair leaves either region A or region B. The signal photon heads off to detector D_0 , and the idler photon heads off to the interferometer.
- 2. The signal photon is registered and scanned at detector D_0 according to its position. This information is sent on its way to the Coincidence Circuit.

The idler photon reaches the first pair of beamsplitters, BSA, BSB. There, QM makes a choice which direction the idler photon will go – either to detectors D_3 , D_4 ; or to the quantum eraser BS and on to detectors D_1 , D_2 .

(a) If the idler photon is shunted to detectors D_3 , D4, it is detected with which-path information intact. Then and only then do we know which-path information for its twin signal photon that already has been detected, scanned, registered and recorded at D_0 , or:

(b) If the idler photon passes through to detectors D_1 , D_2 , it is detected with no which-path information (the which-path information having been "erased" at BS).

The Coincidence Circuit correlates the arrival of a signal photon at detector D_0 with the arrival of its twin at D_1 , D_2 , D_3 , or D_4 . If the correlation is with an idler arriving at D_3 or D_4 , then we know (after-the-fact) the which-path information of the signal photon that arrived earlier at D_0 . If the correlation is with an idler arriving at D_1 or D_2 , then we have no which-path information for the signal photon that arrived earlier at D_0 .

Upon accessing the information gathered by the Coincidence Circuit, we the observer are shocked to learn that the pattern shown by the positions registered at D_0 at #2 depends entirely on the information gathered later at #4 and available to us at the conclusion of the experiment".

In this accurate and sensible description Ross formulated one questionable item, namely, #7. Future can have no effect on the past. The detection time of the signal photon (D_0) is 8 ns earlier than that of the idler. Really, at moment #2 signal photon places itself peacefully on the detector D_0 screen. And nothing can change this situation. Nevertheless, one can make the following remarks.

Kim and his co-authors in their paper specify that detectors D_1 - D4 were positioned ≈ 2.5 m. away from the slit than the signal detector D_0 - that gives the mentioned time delay of 8 ns, while the crucial event happens much earlier: when the idler photons interact with beamsplitters **BSA** or **BSB** - either they pass through them to the quantum eraser scheme, or they are reflected towards detectors D_3 or D_4 which provide which-path information. So we have no certitude: whether at this moment the corresponding signal photon had already struck its D_0 target, or not yet.

- 1. Authors do not give sensible explanation to this experiment. They write: "... experimental results, ...are all consistent with prediction... To explain the experimental results, a standard quantum mechanical calculation is presented..." The blatant demonstration of the Mermin's slogan: "Shut up and calculate!"
- 2. If the experimental setup did not contain flaws or inaccuracies, the reader should start to believe that entangled pairs of signal and idler photons really behave coherently: if there exist which-path information, the signal twin behaves itself as a particle. And if not - as a wave-model subjected entity participating in building IP. This is in contradiction with No-communication theorem.

Evaluating the considered experiment, we must recognize its accuracy and wit. Unfortunately, its authors failed to present a meaningful explanation of the observed effect, while at the same time exposing the contradictions between QM and STR. Though, I think, allegedly demonstrated correlation, synchronicity in the behavior of entangled photon pairs is an argument in favor of the reality of the existence of non-local effects. This is precisely the consideration that could support the existence of FIF - some or other sort.

Nostalgia for Hidden Variables

Idea of hidden variables at the microcosm level was desperately supported by Albert Einstein. In contrast to Copenhagen interpretation of QM which considered the properties of particles appearing during the measurement, Einstein believed that properties of physical objects should be their unalienable feature. He believed that QM rejecting this idea is incomplete. These prospective properties were named *"hidden variables"*. In theoretical physics, Bell's theorem (a.k.a. Bell's inequality) [Bell] loosely state that no physical theory of local hidden variables can reproduce all of the predictions of quantum mechanics. Experiments of Alain Aspect showed: "The violation of Bell's inequality, with strict relativistic separation between the chosen measurements, means that it is impossible to maintain the image 'à la Einstein' where correlations are explained by common properties determined at the common source and subsequently carried along by each photon... In some sense, both photons keep in contact through space and time" [Aspect]. Subsequent experiments of various researchers showed that this conclusion is correct.

But... but believing in this brings us to strange deductions: keeping the contact through space at superluminal speed is "spooky actions at a distance" as Einstein called it... It brings to us marvelous, magic effects with which we have met earlier in this paper considering a delayed choice quantum eraser [Kim et.al, Rhodes, 2000].

There is evident remedy against such quantum magic. It is that same officially rejected idea of hidden variables. I cannot give neither theoretical, nor experimental confirmations of this desperate proposal, but such hypothesis can swap away this strange and self-contradictory magic.

Let us return to Fig. 2. The key elements for our consideration are two beamsplitters: **BSA** and **BSB**. If idler **A** or **B** photon passes through any beamsplitter it will be captured by quantum eraser scheme. Coincidence circuit will be activated, and the corresponding signal photon which up to this point went upwards will be registered by detector D_0 , as participating in building IP. If **BSA** or **BSB** will reflect an idler photon towards D_3 or D_4 detectors - which-path information remains intact, and corresponding signal photon should "become" non-pattern one. Thus, in reality D_0 registers the mixture of IP and non-IP photons. Coincidence circuit helps separate these pictures.

What can pull off veil of mystery off this experiment? Just simple assumption. Assume that photons have certain hidden discriminating parameter with only two possible states: S = 0 and S = 1 with equal probability of occurrence: 50%. Idle and signal photons should have identical **S**. Next, let's beamsplitters let pass idle photons through (which-path information erased) if S = 0, and reflect (which-path information kept) if S = 1. Their signal twins behave themselves differently: if S = 0, they participate in IP creation, otherwise - not. The behavior of the experimental setup is exactly the same as presented before, but all the mysticism evaporates without a trace. Discriminating hidden variables eliminate the issue of the causality violation and of consciousness influence on photon's behavior.

Of course, the whole experiment is not explained in details yet. The mechanism of possible interaction of photons under control of prospective **S**-parameter is to be found, but the reward for this would be banishing mysticism from physics. Decent deal, right?

The issue of possible rehabilitation of the hidden variables idea attracts more and more researchers; see, for example, [Hemmick].

RNG Double-slit Experiment

Reticence, obscurity and contradictions of the many experimental setups have led me to propose more thoroughly controlled version of double-slit experiment (Fig. 5). Instead of using one electron gun irradiating double-slit shield, two guns are provided, each one sending electrons to only one slit. If in traditional scheme slits are chosen at random angles, in proposed setup this process can be under control.



Fig. 5 RNG Experiment

The experiment itself comprises the following steps and considerations.

- 1. Generation of electrons is done one by one. Experiment is conducted during time period required for perfect depiction of IP (or unimodal distribution) on the target screen.
- 2. Choosing upper or lower gun is done under control of physical RNG, say, on the base of Zener diode. Thus we have absolutely no possibility to obtain which-path information. Functionality of such RNG-guns is exactly equivalent to traditional setups used in classical experiments, when some electrons settle themselves on the shield, some fly through one slot, while others through the second. If no magic involved, at this stage we should see the classic IP (having no which-path information).
- 3. Physical RNG is replaced by pseudorandom subroutine with uniform 0 ... 1 (upper ... lower slit) distribution. Of course, its randomness should be carefully tested. Physically, nothing has changed in functionality. If IP disappears it would mean that *electrons have wits and suspiciousness* ...
- 4. Next, we register the gun's control series in computer memory. By the way, it could be done in both configurations: not only for pseudo RNG, but for physical one all the same.
- 5. At last, physicist-specialist comes to computer and studies the whole protocol of the experiment. Here we can simulate any experiment of "delayed" collapse type resembling also that of Wigner's friend Schrödinger's cat variety. Namely, let technical assistant comes to the computer display and prepares protocol printouts. Then assistant handles the protocol to the specialist, and experimental results can be analyzed thoroughly in completeness. Hope, all this magic will have absolutely no influence on the results of the experiment.

Perception, Paradigms, Pseudo-physics, Formal Models of Reality and Gedanken Experiments

I sincerely believe these issues are trivial. Astonishing is their apparent neglect from the side of some specialists. Consider relationship between some applied formal theory and reality (Fig. 6). The leading role in the process of reality cognition plays the choice of paradigms for perception of its entities and phenomena. It is done on the purposes-oriented basis including means of monitoring the process and performing the necessary measurements. Next comes the model level. Model is a physical, semiotic (in computer memory) or mental (in the researcher's consciousness) construct which supposedly captures essential for the investigation features of the phenomena being studied. Model reflects researcher's understanding of the phenomena, and, of course, even having common specific paradigm, there may exist different models presumably explaining its "internal interactions".

On the top level may reside some formal theory which is the basis for exact calculations. Since we are discussing not purely mathematical theories, but theories of applied character, such theory not only should be internally non-contradictive, but it should be in good correspondence with processes in its application domain: physical reality, in our case. That is why so important is interpretation of the theory - presentation of its model, relation with a huge bulk of proven and verified physical theories and natural science laws, answering innumerable bulk of why- type questions.

QM is a strange exception in this respect. That is why Richard Feynman said: "I think I can safely say that nobody understands quantum mechanics". Due to the complexity, high cost, technical difficulties, and often even impossibility under the current state of technology to perform these or other subtle physical experiments sometimes resort to so-called Gedanken (thought) experiments. The well known example is EPR-experiment [Einstein et al, 1935]. In my opinion, such subterfuge only creates the appearance of modeling, experimenting

within reality domain. Natural science experiments put to practical test the adequacy of a theory to physical reality, help to identify factors that were not taken into account or improperly reflected by the theory. Gedanken experiments solve neither of these problems - they just illustrate, retell formal theory with the help of thought example. Of course, results of such "experiment" coincide with theoretical predictions, by definition - there is no other alternative.



Fig. 6 Relation of formal theory to physical reality

That is why [Kim et.al, Rhodes, 2000] could not explain results of their magical experiment. They just managed to point out that their results are in exact correspondence with QM theoretical predictions.

The most serious drawback of this state of affairs lies in the temptation for theorists to project mathematical formalism of the theory directly onto the physical reality level. Really: "*In the beginning was the Word, and the Word was God*" - John 1:1 (1611 King James Bible). That is how idealism and religious legends find their way to modern physics, alas!

An example of these mechanical substitutions of "legal" pseudo-physical model by pure mathematics are many. Consider already mentioned here book [Laszlo, 2004]. The author discusses measurements on two entangled particles: A and B in Gedanken experiment EPR from [Einstein et al, 1935].

"Every measurement on one particle yields a complementary outcome in the measurement on the other. It appears that the measurement of particle **A** has an instantaneous effect on **B**, causing its spin-wave function to collapse into the complementary state. The measurement on **A** does not merely reveal an already established state of B: it actually produces that state".

Neither Copenhagen interpretation, nor Laslo do not give the explanation: how measurement can produce something which was absent before the act of measurement. By the way, no-communication theorem [Peres, Terno, 2004] prohibits influences of measuring state of one particle on the state of its entangled twin.

"An instantaneous effect propagates from A to B, conveying precise information on what is being measured.

B "knows" when **A** is measured, for what parameter, and with what result, for it assumes its own state accordingly. A nonlocal connection links **A** and **B**, notwithstanding the distance that separates them".

That is how mysticism crawls into physics. QM-adepts cannot explain, why more "natural" representation is faulty: both particles from the moment of their preparation already had complementary, but unknown to experimenter spins. Measurement of spins are done corresponding to the axis of detector. Its cosine projection is detected $(+\frac{1}{2}\hbar \text{ or } -\frac{1}{2}\hbar)$ and depending on its sign, the result of measurement is "up" or "down". According to the particle preparation procedure, it is evident at the same moment and without any new actions that spin of the other particle is "down" or "up" - respectively. This approach does not require superluminal information (or action) transactions across gigantic distances. No violations of STR.

"Experiments performed in the 1980s by Alain Aspect and collaborators and repeated by Nicolas Gisin in 1997 show that the speed with which the effect is transmitted is mind-boggling. In Aspect's experiments the communication between particles twelve meters apart was estimated at less than one billionth of a second, about twenty times faster than the speed with which light travels in empty space, and in Gisin's experiment particles ten kilometers apart appeared to be in communication 20,000 times faster than the velocity of light, relativity theory's supposedly unbreakable speed barrier".

Much more natural explanation to these fantastic results is to explain them as just measurement errors: in ideal case, the "velocity of state propagation" should be infinite revealing zero time lag. But the real, not perfect quality of installations and measurement instruments used gave 20 times in one experiment and 20,000 times in other faster than light velocity. And it is quite understandable: if accuracy of measurement remains unchanged, increase in distance will lead to growth of "experimentally proven" speed of information exchange "between the particles" that we observe in the above quotation.

"The experiments also show that the connection between the particles is not transmitted by conventional means through the measuring apparatus; it is intrinsic to the particles themselves. The particles are "entangled": their correlation is not sensitive either to distance in space or to difference in time".

Right! No information in reality cannot be transmitted faster than light. If something is - it means that it is not information transfer, but something else... By the way, even QM itself does not promise the possibility of such transfers. Such is reality.

Until now physicist violently argue about "real" sense of J.Bell theorem and what proved the famous experiment of A.Aspect. The arguments concerns the existence of "hidden parameters" (for example, intrinsic spin of electrons). QM paradigm, is said, precludes it... but instead we obtain a handful of mystical or marvelous explanations, or no explanations at all. That is the price.

А был ли мальчик? Was there Really a Boy?

It is not a joke and far not the trivial question [Gorky]. I mean - all this fuss about reality of EP, FIF. Are there reliable natural science evidences that all these phenomena, experiences like telepathy, remote viewing, clairvoyance et al. really exist besides the artifacts in psychological sphere of humans with its aberrations, hallucinations and natural flaws of subject's memory? "Official" academic science says: - *No!* Dissidents and enthusiasts say: - *Of course, yesss! And it is scientifically proven!* Nevertheless, up to now I have no satisfactory, from my point of view, evidences concerning the existence of EP. But I am also against the orthodox and the

demagogic position of sweeping and absolute denying the possibility of the existence of phenomena unknown to science. Enthusiasts and proponents of alternative viewpoints should have the possibility to perform their studies, while their findings should be carefully and professionally considered by the scientific community. As an example of interesting study I decided to take [Bem, 2011].

Daryl gave the following definition of psi-phenomena: "The term psi denotes anomalous processes of information or energy transfer that are currently unexplained in terms of known physical or biological mechanisms... Alleged psi phenomena include telepathy, the apparent transfer of information from one person to another without the mediation of any known channel of sensory communication; clairvoyance (sometimes called remote viewing), the apparent perception of objects or events that do not provide a stimulus to the known senses; psychokinesis, the apparent influence of thoughts or intentions on physical or biological processes; and precognition (conscious cognitive awareness) or premonition (affective apprehension) of a future event that could not otherwise be anticipated through any known inferential process - the anomalous retroactive influence of some future event on an individual's current responses". This definition also precognition and premonition (I failed to confidently distinguish one from the other) - influence of future events on the subject's current state of consciousness. In the situation when there are absent reliable proofs of existence for narrower phenomenon: EP, study precognition - seems to me to violate the natural order of exploration. But, in any case, Daryl's experiments are interesting, and it would be instructive to investigate them. One of his experiments was dedicated to "precognitive detection of erotic stimuli". The following description of Daryl's setup is an abridged quotation from his paper.

"On each trial of the experiment, pictures of two curtains will appear on the screen side by side. One of them has a picture behind it; the other has a blank wall behind it. Your task is to click on the curtain that you feel has the picture behind it. The curtain will then open, permitting you to see if you selected the correct. There will be 36 trials in all. Several of the pictures contain explicit erotic images. Each session of the experiment included both erotic and nonerotic pictures randomly intermixed, and the main psi hypothesis was that participants would be able to identify the position of the hidden erotic picture significantly more often than chance (50%).

From the participants' point of view, this procedure appears to test for clairvoyance. That is, they were told that a picture was hidden behind one of the curtains and their challenge was to guess correctly which curtain concealed the picture. In fact, however, neither the picture itself nor its left/right position was determined until after the participant recorded his or her guess, making the procedure a test of detecting a future event, that is, a test of precognition.

Across all 100 sessions, participants correctly identified the future position of the erotic pictures significantly more frequently than the 50% hit rate expected by chance: 53.1%. In contrast, their hit rate on the nonerotic pictures did not differ significantly from chance: 49.8%. Because erotic and nonerotic trials were randomly interspersed in the trial sequence, this significant difference also serves to rule out the possibility that the significant hit rate on erotic pictures was an artifact of inadequate randomization of their left/right positions".

Let us remember: the duration of the session for each of the subjects was only 36 presentations of stimuli. Quite meaningfully sounds the last sentence of this quote - on the possible artifacts of inadequate randomization. What is striking - clearly insufficient number of stimuli presentations during each session. The researcher evidently decided to chase two... no, - four hares. Some sessions included pictures of erotic, neutral, just positive or negative content. Each type consisted of ridiculously small amount of pictures of each type: 18, or even 12. Daryl

even did not monitored the real behavior or RNGs on such short sequences. Below I will discuss this issue in more detail.

In what concerns explanation of results obtained, the author points out four possible explanations:

- 1. Precognition or retroactive influence: The participant is, in fact, accessing information yet to be determined in the future, implying that the direction of the causal arrow has been reversed.
- 2. Clairvoyance/remote viewing: The participant is accessing already-determined information in real time, information that is stored in the computer.
- 3. Psychokinesis: The participant is actually influencing the RNG's placements of the targets.
- 4. Artifactual correlation: The output from the RNG is inadequately randomized, containing patterns that fortuitously match participants' response biases. This produces a spurious correlation between the participant's guesses and the computer's placements of the target picture.

I think that the closest to reality and mostly determinative was the 4th alternative. It is very symptomatic that many researchers of EP always detect tiny confirmations of their hypotheses. It looks, at least, strange. For example, Daryl invited a hundred of subjects without serious preliminary testing of their EP-abilities. Receiving absolutely unconvincing success rate in favor of his hypothesis, he did not manage to choose the talented "shamans", witches or clairvoyants from them - in order to obtain much more persuasive rate, say, about 75-80% or even more instead of very modest 53.1%. It would efficiently and convincingly plugged the throat to the criticism of such sort.

This consideration so absorbed me that I stopped scrutinizing the subsequent experiments presented in this paper, and decided to see how different RNGs behave themselves in reality. From the very beginning I was under the spell of worshiping the "physical" RNG in comparison to software pseudo-RNG (PRNG) ersatz. One of the argument is that PRNG generates "not genuine", "not QM-based" deterministic algorithmic number sequence. Of course, the first thing that occurred to me - to use simple household tools. Coin tossing was outright rejected, due to the obvious effect of many anthropogenic factors influencing the process of getting a result. At last, the following RNGs were chosen for experimental investigation.

Spinning coin on a saucer (RNG1). It was done with the help of two fingers from the both hands. In the process of rotating coin was moving across the saucer surface and sometimes reflected from its rim before the fall. Heads were interpreted as 1, tails - as 0. I used 1 DM coin, 1982 y., 23.5 mm in diameter, 1.9 mm thick.

 Throwing cubic die (RNG2). Die was a 15 mm cube of hard plastic, each face of which was marked with symbols from 1 to 6. Even characters matched odd ones on opposite faces. Die was placed in a plastic disposable cup, which was covered with hand on top and vigorously shaken several times. Then hand was withdrawn and mark on the upper face was observed. Odd marks were interpreted as 1, even - as 0. Expectation for such procedure should tend to value: 50% for each of the values: 0 and 1.

Throwing 3 cubic dice (RNG3). Three identical dice were placed in the same cup, shaken and upper faces of them were observed. Evaluation was done according to majoritarian principle: if the number of odd faces was more than even, it resulted in "1", otherwise it was interpreted as "0". Evidently, such method also should asymptotically tend to 50% for each result.

Digital timer [KENKO] (RNG4). A Quartz clock with LCD indicator, was switched to the timer mode. Taken into account was only the last digit from the indicator: hundredths of a second. Timer was started and at arbitrary moment of time its indication was manually stopped. The value of rightmost digit was read from the indicator. As

they were progressing at the speed: 100 per second, it was reasonable to expect equal probability of occurrence for odd (encoded: 1) and even (encoded: 0) digits. After that indication was released - until the need for next random digit reading.

PRNG (PRNG5). Software pseudo-random number generator = RANDBETWEEN (0, 1) from Open Office 3.2.1, giving the sequence of 1 and 0.

PRNG (Scorcher-PRNG). [Scorcher-PRNG] - convenient program for generation of pseudo-random number sequences.

But my investigation started rather traditionally - in the search of possible correlation between RNG and my conscious (subliminal(?)) decisions.

Experiment 1. Trying to Correlate Personal Evaluations with RNG Stimuli

I intentionally use here the term "correlate" instead of three possible alternatives by [Bem, 2011] pointed at earlier: precognition, clairvoyance or psychokinesis. At current level of our knowledge it would be splendid to find them, at least altogether, leaving their discrimination to further studies.

In the experiment was used RNG1 - coin spinning on the saucer. While the coin spun, I guessed one of possible outcomes: 0 or 1 (Fig. 7).

Statistical behavior of studied sequences was controlled using Cumulative Sliding Statistics (CSS):



$$CSS(F_n) = \frac{100}{n} \sum_{i=1}^{n} F_i$$
 (%)

Fig. 7 Trying to correlate personal evaluations with RNG stimuli

The first thing to be mentioned is disgusting quality of RNG1: in the course of 400 iterations its CSS had evident tendency to approach the value 63.75% - instead of expected 50%. I think that probably the coin was a clipping from the cone - it made it more often fall on the same side. Although visually this defect was unnoticeable. The quality of my "correlative recognitions" was 54.25%. It is noticeably more than 53.1% reported by Daryl. Being absolutely no psychic myself, I "shown" evidently better results. Alas, due the defective RNG, they could have much more prosaic explanation.

A subject subconsciously adapts their responses to the statistics of stimuli presentations. Just imagine - presentation is the stable sequence of 1: 1, 1, 1, ... Of course, the subject very soon will follow the same sequence, and its CSS would be very steeply approach 100% of correct guesses.

Experiment 2. Trying to Mirror RNG Behavior

This experiment was also based on RNG1. And there were no esotericism or mysticism involved at all. I just mechanically replicated the RNG reading, produced at previous step. It means that if RNG generates a continuous sequence of 0 or 1, the subject will effectively mechanically follow it improving the quality of correct guesses (Fig. 8).



Fig. 8 Guessing the face of spinned coin

As easily can be seen, CSS value of RNG1, as in previous experiment (63.75%), approaches the close value: 61.5%. It definitely indicates that RNG1 quality is unacceptable for delicate experiments with barely perceptible results in the vicinity of accuracy and reliability of measurements. The second outcome of this experiment is the CSS value for "guess" curve: it approaches here 53% - very close to Daryl's 53.1%.

Both experiments: 1 and 2 show very unstable CSS values for the initial RNG readings. They may present values: 39-55% (Fig. 7), 60-75% (Fig. 8) for sequences up to 60 iterations. Daryl in his experiments used 32 iterations.

That's why I stopped the further study of esoteric experimental results reported by [Bem, 2011] and turned to exploration of several other RNGs.

Exploring RNGs Behavior

As we have seen already, the quality of RNG has enormous influence on the results of experiments with "subtle energies" - Ganzfeld. Researchers should be very careful when they report their findings without the meticulous testing of their statistics. Let us take a look at Fig. 9, where are depicted the results of measuring CSS for four RNGs.





Here is the table, which includes a sample of several CSS values for six experimental RNGs. Even sketchy evaluation of it and graphs on Fig. 9 brought me to the following conclusions.

RNG tested	CSS (%) for 6 tested RNGs averaged over a different number of iterations								
	36	100	200	300	400	500	600	1000	10000
RNG1 Spinning coin on a saucer	44	52	62	64	64	51	43		
RNG2 Throwing cubic die	64	52	52	52	52	51	50		
RNG3 Throwing 3 cubic dice	53	53	55	54	55	53	52		
RNG4 Digital timer	58	57	55	51	50	49	49		
PRNG5	58	42	48	50	48	49	50		
Scorcher-PRNG	38 - 58	50	45	48	47	47	48	49.6	50.32

Not apparent superiority of physical RNG over PRNG can be seen. There is no visible or philosophical advantages of random processes before pseudorandom. In addition, primary, and intermediate states of PRNG is easy to randomize. I do not think that there are objective methods, which would distinguish such sequence from the "natural" random.

- 1. It is senseless to evaluate any subtle effects on the basis of randomized experiments with number of iteration less than several hundred for two alternatives.
- 2. One should pay serious attention to the quality of random series, which is almost never done in "esoteric" experiments. It is not less important that in cryptographic applications. CSS is necessary but far not a sufficient indicator [NIST Test, 2010]. This conclusion parallels the opinion of Ray Hyman. "My analysis demonstrated that certain flaws, especially quality of randomization, did correlate with outcome. Successful outcomes correlated with inadequate methodology" [Hyman]. "In Hyman's view, 58% of the studies used inadequate randomization procedures" [Carroll].

Conclusion

If AI is going to simulate and enhance human ability of information processing, close attention should be paid to much broader spectrum of information handling aspects on the social and noospheric level. Science should not ignore evidences from its outsiders, including certain esoteric teachings. Physicists are already trying to develop theories of prospective fundamental information field, finding, as they suppose, some parallels between physics of microworld and ancient esoteric traditions. This problem naturally splits into two directions:

- working out physical background for "nonclassical" information exchange (esoteric phenomena: EP);
- studying available experimental evidences in support of EP, implementation of accurate and precise experimental tests of EP-phenomena.

In this regard, on the basis of the presented study can be made the following conclusions.

- 1. Unfortunately, the most authoritative and adopted by physicists quantum mechanics is very uncertain and contradictive in the issues of nonlocality, nonlocal interactions and information exchange. EP, as it can be understood from esoteric folklore, can be based only on nonclassical information exchange.
- 2. One should develop and implement reliable experimental setups for studying problems of entanglement and nonlocality. Among interesting phenomena is the problem of delayed choice quantum erasing.
- 3. In the paper was proposed experimental setup: RNG Double-slit, which presumably could help in answering some questions concerning wave-particle duality in the microworld.
- 4. Experimenting with EP detection and investigation requires RNG of very high quality. One should necessary and carefully test them before using in experiments according to several parameters, besides cumulative sliding statistics. Uncontrollably long sequences of identical figures should be avoided.
- 5. Number of iterations during EP experimenting should be sufficient for obtaining reliable results. For two stimuli it should be not less than several hundred.
- Today became popular studies of EP where on the basis of theoretic statistic considerations are reported results with negligible effect. Such studies are very unconvincing. It would be instructive to choose best EP operators and try to achieve much more impressive figures, say: 70-90% (if the expectation is 50%).
- 7. Pseudo-RNG sometimes should be preferred for EP experimenting: their quality can exceed the quality of physical RNG.

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