

# *Quanta Mathematica Instrumentalis!*

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## **Abstract**

*Quanta mathematica instrumentalis*, from Latin, might mean *How much mathematics for physical applications*. But we try to give this expression another meaning.

We discuss how mathematics and its instrumental nature could serve as paradigm for other human activities and science in general. We introduce notions of higher observer and field of information. We discuss question why we are to study and develop mathematics more diligently than we do in natural way.

**Key words:** mathematics, theoretical physics, quantum mechanics, field of information, vision, theorem/quantum windows, consciousness

## **Introduction**

Simplest translation and interpretation of Latin phrase *Quanta mathematica instrumentalis* would be – how much mathematics for applications. It is the classical standpoint for physical science that mathematics serve for physics as application, and this thesis has served good enough for quite a long time, and it worked well without perceivable faults until quantum mechanics. Many scientists tend to think that, after quantum mechanics has appeared, this general statement hasn't changed radically, i.e., mathematics was and remains to be applicational instrumentality for exact sciences.

But after articles of Dirac (1) and Wigner (2) something has changed, or at least signals for such changes have emerged: an awareness has come that mathematics works as something more independent and significant than simply applicational tool for other sciences. What is that? But before we try to answer such a question we must somehow estimate, are we ready to raise it at all? Maybe we must be aware that just

mathematics is that that show us way further and further, and we are only to follow, but not to raise questions or pretend of having ready answers? Yes, maybe we must say – mathematics is more clever than mathematicians. And this to use not simply as form of rhetoric: it must be accepted as working instrument and signpost.

### **Do we know what is mathematics? May we know what is mathematics?**

On nature of mathematics there are many texts written. And usually when enlightened people speak about this topics they have in mind they know what is mathematics. Yes, the problem might be only how to express what they think mathematics is – so think these same people. But is it true that we “know what is mathematics”, that we have objective background to claim that we know? What if behind we name mathematics stands something quite unknown and quite weird – much more weird than quantum mechanics, say? In our articles (3; 4; 5; 6) we argue for a new approach on to what could be mathematics actually.

The approach we suggest is to use formula “Mathematics is cleverer than mathematicians”. By it we assume that mathematics itself is that shows way for mathematicians and not otherwise. No one could have predicted anything where mathematics are leading us. Always there has been right other way – it is mathematics that has showed and shows further steps for it to develop. And arguing this way we don’t use only some rhetoric without consequences. We say that this is general paradigm of research subject we recognize as mathematics. It doesn’t matter that after some unpredicted results in mathematics we start to build predictions on next steps. Sooner or later our “theories” where mathematics should lead us break down. Thus, the only way to “communicate” with mathematics as subject is to develop it step by step and find from mathematics itself what there goes where.

But mathematicians would say that just this they are doing. Yes, mathematics develops successfully so that mathematicians have already discovered this peculiarity about mathematics that it as if itself shows where to go further.

But actually there is ways how to characterize objectively what mathematics is, and it is by discovering its character of instrumentality.

Yes, mathematics may be considered as instrumentality where new sets of instruments are developed using already built instruments, and so on. Mathematics fits in this definition of instrumentality because it is self-content, i.e., all facts of mathematics are get in mathematical way. In this way mathematics as if differs from other sciences where no one other science may argue for its self-content nature as purely as mathematics. This fact has raised for mathematics image or percept of not being science at all but only some way of thinking. But arguing in this direction actually leads us to deadlock. We must think other way. Following the way of thinking of linguist Benjamin L. Whorf who said that linguistics can’t be separated from consciousness (7) we might be forced to apply this same formula for

mathematics too and say – mathematics is not separable from consciousness. The only problem there – how mathematics is connected with consciousness. In (3; 4; 8; 5; 6) we tried to go into problem directly.

### **Mathematics is not arbitrary reasoning**

Might be mathematics considered as cognitive activity? But, considering mathematics as cognitive activity we have some danger that leads aside from real nature of mathematics. And this is because of the use of axiomatic in mathematics. Many mathematicians think that mathematics is too arbitrary with regard axioms are chosen in it and thus mathematics can't be anything except way of reasoning at all. We argue that this way of reasoning about mathematics and its nature is simply misleading and is not confirmed by the history of mathematics itself.

The main argument against mathematics being arbitrary way of thinking we raise by theoretical physics and the role of mathematics there. Dirac (1) turned our attention that behind mathematics could be something quite unknown. Wigner in (2) argues that mathematics with its *unreasonable effectiveness* is subject of much deeper investigation. But who tried to explain these phenomena raised by Dirac and Wigner? In (5) we try to point out direction for such explanation. Is it too fantastic?

How to answer to Dirac and Wigner? We usually speak about mathematics first and then about role of mathematics in physics. But couldn't be more correctly to do this in other direction, namely, ask what is role of physics in mathematics? We usually explain this very simply: yes, of course, mathematics takes its pictures from nature. But we say, no, there is deeper connection, mathematics is connected with physics in so deeply a way that we must apply very simple formula *mathematics = physics* (4). Or, at least, considering both subjects we must say that mathematics is something that completely depends from physics, not in reverse, and this we deduce from what goes on with mathematics in theoretical physics and in quantum mechanics particularly and not in other way.

But let us continue our argument with mathematics as instrumentality and its self-content nature. What we do in mathematics is its extension by discoveries via its instrumentality. This instrumentality is not only of cognitive nature or arbitrary product of cognition, but it manifests the cognition itself as we try to show in (5). Thus, mathematics is both cognitive and physical science. But, maybe our arguing in this direction is too radical? For that reason it is useful to note that mathematics may be considered as instrumentality in very natural way not appealing to these new approaches we mention in this article. And just this instrumentality aspect of whole mathematical science we are going to use in our argument further. We use in title expression *Quanta mathematica instrumentalis* to say what these words mean directly in Latin – How much mathematics there that arise in its natural way mathematics being instrumentality for its own development.

But we are going to add some other aspect to this title, scilicet, via role of quantum mechanics. We told about this in (8). We said that most queer aspect of quantum mechanics is what role mathematics plays there. Traditionally quantum mechanics is considered as weird discipline due to its discontent with classical physics. We say that aspect of mathematics in quantum mechanics is much more “weird” and this weirdness is not yet fully recognized by contemporary physicists.

### **Is mathematics intrinsic part of consciousness and cognition or only product of reasoning?**

Traditionally mathematics has been considered only as product of reasoning. If someone has tried to ascribe to mathematics some deeper participation in nature then usually this has been nominated as Platonism, but not much asking how or in what way this implication could have been achieved. Benjamin Lee Whorf on what concerns nature of languages have advanced idea that language activity in human beings are intertwined with consciousness and even with physical reality and can't be separated as independent cognitive activity, but rather it builds the cognition itself (7). We go further and say the same about mathematics and say even more: mathematics and language ability are built on common base and apparatus, and we call this apparatus theorem windows or quantum windows (5; 9). This apparatus by its nature is both cognitive and natural physical. In this way we try to unite consciousness and material world but in way saying that theorem/quantum windows are primary, and consciousness and material world are derived from, these both being different reference systems, i.e., consciousness being our inner reference system, and material world being our outer reference system. We may add that somewhere outside maybe there is some really material world detached from consciousness, but we access it only via this trinity of theorem/quantum windows with its inner and outer reference systems.

### **On theorem windows or quantum windows as new observer level**

In (5) we suggested to consider as base of both consciousness and observable world these new items – theorem windows or quantum windows. Moreover, we suggest to consider these windows as new observer level that is not accessible directly by human being but only via his cognitive activity and human body functionality. We suggest to use new observer principle in physics, i.e., with saying that theorem/quantum windows are new observer level that differs from the observer used in physics up to now, but, in order to maintain connection with contemporary science and not to appear in some area of scientific phantasy we suggest to apply strong and weak variation of this principle. We say that by weak principle nature behaves as if such observer could exist in nature, but contemporary science doesn't give us possibility to detect its proper nature more closely (8). By strong variation of

this principle we remain to assumption of existence of these theorem/quantum windows behind consciousness and what we perceive as nature.

### **Instrumentality of mathematics as objective reality**

The instrumentality that we discover in mathematics is always treated more or less as some objectivity. Otherwise we couldn't explain why we/mathematicians so diligently write books of mathematics, collect already proved theorems and theories, consider all this as proper ground to move more and more deeply in some unknown world where mathematics and its discoveries are leading us. We properly call it world of mathematics. Intuitively we consider mathematical world as some proper world of its own rules and nature, and we don't consider it as some mirage depending only from arbitrary basic assumptions/axioms. Why we tend to think in this way? Who suggests us to think this way? Some say this is intuition that compels us to think like this. There could be other, we would say, deeper explanation. Peripheral knowledge and/or Akashic knowledge is that what prompts us to think properly in this case, although we do not want to recognized this directly/openly. Let us name only one case, i.e., that of four dimensional case in low-dimensional topology. Four color theorem, Hadwiger conjecture and Poincaré conjecture, the hardness to prove these facts is objectivity that has been proved by effort of hundreds of mathematicians that has required time more than hundred years. The solution of these problems and developments into these directions promise to give many very rich new ways in mathematics. Mathematics promises to be more and more interesting and these deeper and deeper interests don't resemble the rambling of insanes and lunatics in the dusk, but most victories of triumphant mind.

### **From instrumentality in mathematics to instrumentality in whatever else in science**

But, once we manage to notice the instrumental nature of mathematics we may go further and observe: in technical progress and technologies we have the same - whatever there is of instrumental nature directly, i.e., simpler instrumentality serve as necessary base for more complex instrumentality.

And one more area is very essential for our building of argumentation of instrumentality, scilicet, experimental physics that builds equipment for physical experiment is completely instrumental, where simpler equipment helps to build more and more complex one. Physics with its interpretational "power" remains somewhere in background: experimental equipment and its ability to fix physical quantity or quality is "absolute truth" there, but physical interpretations, "explanations of what goes on", are of secondhand utility, which physicists sometime relay too much upon.

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But let us go further and ask - What about instrumental nature of science in general? To give simple allusion we suggest to consider science consisting of two parts - instrumental and universalizing/conceptualizing. We may say even simpler: let us separate instrumental part and what remains outside we attribute to that second part of universalization/conceptualization. One may ask what is instrumental part of science: there are indirect ways to establish this - instrumental part of science is that what develops mostly dynamically. Just instrumentality in science goes on and on, and develops as if without obstacles and hindrances with increasing speed if considering development of science in some wider timescale. What don't want to develop so smoothly are our wishes to push science according our whims and fancies, but not where it may develop objectively.

What we may conclude from what we said? If science is really forwarded and developed then this forwarded part necessarily is instrumental part too, because only instrumentality could procure for science its development. Not our any "cleverness" or whatever else we could suggest from our virtues or good qualities, but only step by step development from tools and by tools taken from this same science we are pushing forward.

Why only instrumentality procures progress in science? In article (3) entitled "Our Ability to Research Comes Before Understanding of What We Research" we gave explanation already in the title - we simply don't understand what we research, but providence gives in our hands (and heads) tools necessary for research, and, if we only give way providence to push us forward in this way, then we see progress in science. But, what concerns understanding of what goes on in our research we didn't have neither in times of Plato and Aristotle, nor today. Why? We gave reasons for that in this same article (3).

But some forms of understanding we gain nevertheless, see (3). Thus, Aristotle gave name to his logical method Organon (10), what means in Greek *instrument*. Further, Frances Bacon pointed out necessity of experimental support of scientific thought (11), thus giving us allusion to second instrumentality for science. Tertium Organum tried to give Ouspensky by hinting to numina which shouldn't be ignored by considering phenomena (12). In (3) we said that now we have Quartum Organum emerged in appearance of quantum mechanics. This fourth step, quantum mechanics, indicates us that we must say farewells to understanding of whatever in science, remaining content with instrumentality that Providence provides for us in abundance. And Providence is not stingy and closefisted, but provides for those devoted in quantum mechanics with abundance in highest precision of data and methods.

Now, looking backwards onto science in past from where we are now with our quantum mechanics experience as Tertium Organum we may see that it is easier to explain where we something couldn't understand than where we still have claims about deep understanding asking - maybe all these claims of our knowledge are to

be reconsidered? It seems now clearly that we are to distinguish more instruments which have given us what we consider as knowledge, but this knowledge itself should be impeached and queried more and more.

### **Within two levels of observer or within the well of field of information**

In articles (3; 4; 5) we tried to give model of how instrumental nature of science could be explained. We argued that we are to discover new level of observer that is not accessible for us now directly, but we access it indirectly via our research abilities that provides so richly us, human beings, with instrumentality. We have reached level of consciousness and awareness that gave us all we have acquired in physical science due to some understanding of how to build correctly principle of observer, and how to ground on it our physical knowledge. But this all worked with success until quantum mechanics. Now we are to notice that before us is higher level of observer that is not accessible in the way we were used to, say, simply by looking or sensing via our anatomical instruments of our senses.

But this higher observer not only provides us with information. After all, why we were to be supplied with such information? But we may guess other way there being around. We gain this information as side effect of something else.

What else?

First. Of how we are built by worlds of higher level. Second. Of existence of field of information that provides us with resources of existence as form of life. Third. Of how we are supported as form of life with respect to this higher observer. Fourth. Of how we are built with respect to this higher observer.

On what level of our guess we must stop? Fourth guess says little except that such level of observer is distinguishable and exists in some assumable sense. Third level says that we are to speak of how life is organized between us and "observable" world. But second guess says something more: that this higher level of observer works on informational levels of much more organized structure than that we recognize in us as anatomical structures with respect to inorganic world. With fourth guess way may want to say that this life organization from above is maybe of hierarchical structure.

In articles (3; 4) we stay on guess of field of information. Actually, we see other way to this guess, scilicet, via our vision. Contemporary science considers sense of vision and what we see via vision as pertaining to two distinct areas of science, i.e., sense of vision is anatomical instrumentality, and what we see, outer world, may be attributed to, say, physics. Now, when we come to our guess of new level of observer, we may notice that vision may be considered quite in other way. First of all it isn't any more dissected into two areas of sciences, anatomical functionality and physical reality, but are now pertaining to some integral functionality on this higher

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level of observer, but which comes via field of information to us in a dissected way via two functionalities, one that provides us built in functionality of anatomical vision, and other that provides us functionality of what we see as pictures of outer world. Thereby these two functionalities represent actually one common functionality on level of higher observer. For this reason, this level of observer we find adequate to designate as higher, because it is as if more primary of what we perceive on our conventional level of observer.

Coming to this level of understanding we are describing here, some might better understand our wish to speak about well of field of information. First of all, field of information expresses the fact that the functionality that works on this higher level of observer is much more organized than that we may find in our direct observation, and this higher organized information is just this that provides us so richly with scientific instruments if only we are sufficiently diligent to inquire after these instruments. Secondly, we may speak about being in well of field of information because we may with easy guess that we are on the very button of some imaginable well where well's upper part may be on level of this higher observer. Thus, we may imagine us as being living creatures that can't access this upper part of this well of field of information. What if we could? We were as gods? Now, if we have image of well of field of information, then way may assume that this higher observer is actually structured hierarchically, and this well has as if several levels within. With these levels we might associate hierarchical multiplicity of life organization (5). But here we are not going deeper in such our guesses.

### **Vision as functionality of field of information of higher observer**

How to check rationality of the ideas around this new observer we try to introduce? We mean that easiest way would be to check via vision as integral objectivity, but not consisting from two detached parts - anatomy and physics. Pictures provided by vision and what we see possess aspect of wholeness. Thus, we are to describe them mathematically correspondingly, as holograms or distributions, or find other appropriate way (5). Discoveries of Pribram might directly show that vision is to be considered more in holographic context than reductional physics is possible to give (13).

### **Returnig to mathematics and its role there**

Why we started with mathematics when starting this discussion on possible new observer level in nature? According our insight we present here mathematics would be almost the only thing that leads us into these new realms. We might argue otherwise and ask: why we haven't discovered all this before? Our answer would be simple: we are too far from this possible observer to catch it in any way directly. The only way it shows up is via peripheral knowledge or Akashic knowledge or religious



reasoning or like way which all are too far from scientific way of thinking as we understand it now. Only after quantum mechanics came into existence we noticed that something radically has changed and something appropriate should be applied to cope with this new situation. And because of this all this argumentation that we have used in this article. But returning to what we started we are to say that mathematics is that instrumentality that shows up something that might directly pertain to this higher level of observer. Mathematical structuring shows *the freedom of motion* in the most general sense that works on levels not only in this world but in higher too. In (14) we suggested to designate this freedom of motion as *Motion*. After all, what we designate as mathematics with our present experience there might be only some start point into some unknown world that should reveal before us with going deeper and deeper in it. For that reason mathematics would be subject that we should research with much more diligence than we are done there before. For that reason next section of our discussion.

### **Why we should study mathematics more and more, and which risks we have on this way there?**

Mathematics as independent science develops according its own rules. First of all, mathematics may be developed only by people who are sufficiently talented and even more important, who are sufficiently prepared for this purpose. Moreover, mathematics main discoveries are done by highest gifted people there who are very few in number. But even under these conditions mathematical development may be doomed by some outer aspects which we want to designate as highest risks.

First of all there are not popular theories, say, like our approach, that would prompt to increase development of mathematics by some special efforts. Next, if such theories were or appeared, who would care for procuring of such special efforts? Simply asking, who would pay for all this? To make such efforts there should be very clear reasons for this. We think that we are very far from such cleverness.

And more, there are processes that make worse the actual state of mathematics. We may name two, for example. First is understanding of what is mathematics in context of Gödel like theorems and axiomatic nature of mathematics. These aspects tend to assess mathematics as arbitrary reasoning with diminished sense of accumulating of its facts more and more. Second risk is connected with growing role of programming in all areas. First, programming entices people that would be good mathematicians. Second, programming activity tries, deliberately or directly, replace mathematics with offals produced by programmers.

### **Mathematics as form of awareness of human being**

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Mathematics along with linguistics are human faculties, but they differ. Linguistics comes as ability to use language to every human being. What concerns mathematics its faculty don't come to every human being except some basic level with ability to easy acquire skills to count and calculate and understand some basic geometric notions. What we acquire in school is that mathematics that comes to us *gratis* to all. If we want more mathematics we are to make hard efforts that are made easier only for those who are highly gifted, and so on and so on. Mathematical gifts may be compared with some ladder in higher and higher realms of its understanding, but this same picture of ladder depicts for us levels of awareness that are objectivity of our mind with respect to higher levels of observer. Thus, we have all some base level of awareness that is given us from nature and it consists from language ability and some additional in form of mathematical gift and some developed mathematical ability in our lifetime. Now, knowing this, we might ask: - are we developing or evolving in a longer time scale as form of life, or staying where we are?

The question is very interesting if we consider in context what had to say us in this respect Rudolf Steiner. He gave us allusion that between states of being alive human beings are in contact what he called animal world, where mathematics was present as some objective functionality (15). It may be that contemporary science sooner or later would come to point where it might take what said R. Steiner with much seriousness.

## Conclusions

Mathematics as paradigmatic case of human activity is considered and suggested to be taken as base for our cognition. Moreover, it prompts us to come to conclusion that higher observer level or levels exist that signals us of its presence via mathematical instrumentality we acquire. Doing this our way presented in this article we go away from traditional physics and its attempts to solve problems in traditional way, say, as in (16). But we hope that we conclude way that is already started by series of investigators, say, as, e.g., David Bohm (17), Roger Penrose (18), Kerson Huang (19), Bernard Haisch (20), Dean Radin (21) and G. Dlyasin (22). We hope that we conclude way of many researchers of past (23; 24) who suspected already then the necessity of this way suggested by us.

*Quanta Mathematica Instrumentalis* has two meanings. Firstly, it says, how much there is mathematics that serve for us as much deeper source to be investigated and to be understood. Secondly, it says that quantum mechanics as instrumentality shows us that all science should be reconsidered and restructured on base of mathematics as indicator of higher form of observer.

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