

# Re: An Invitation to Quantum Mathematics

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*Source:* <http://sci.tech-archive.net/Archive/sci.math/2006-11/msg05184.html>

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- *From:* "Mpilot" <[mobilepilot@xxxxxxxxxx](mailto:mobilepilot@xxxxxxxxxx)>
  - *Date:* 19 Nov 2006 09:29:01 -0800
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No. They are angular momentum.

I have defined Quantum Information as the most elementary "virtual parts" of our Universe. So the mentioned spin  $J_x$ ,  $J_y$  and  $J_z$  is also incorporated in these quantum bits of Quantum Information.

Timothy Golden BandTechnology.com wrote:

Mpilot wrote:

Will you please discuss  $J_x$ ,  $J_y$ , and  $J_z$  ?

If we define Information (bits) as the most elementary parts in our Universe, we can ask the question whether information resides in points of non-analyticity or if information is more distributed in nature, which relates to the wave-particle duality of light.

If we define your  $J_z$  the axis of points of "non-analyticity", Information as your  $J_y$  axis and Physical entropy  $S$  as your  $J_x$ -axis, we can define a Dynamic Theory of Information and Entropy.

Opinions on the Physical Nature of Information have tended to be contradictory. One view is that information is inherent to points of non-analyticity ("virtual particles"), whereas others consider information to be more distributed in nature. Such considerations are akin of the wave-particle duality, with the question of which of the 2 complements best characterises information.

Timothy Golden BandTechnology.com wrote:

Mpilot wrote:

Let me try to clarify the above given statements.

It turns out that fundamental notions and results of classical

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mathematics do have substantial quantum analogues. You can say that these classical notions represent a small classical part of a huge quantum iceberg. To comprehend all of this iceberg we must replace functions lying in the foundation of the notions (results, methods, problems) with operators. The question is how to perform such quantization in practice for a concrete notion taken from some area of mathematics. Often it is not clear in advance what to do and different people can give you different suggestions.

However, some conformity has been established. For instance, the book by Connes is especially impressive. It is a main source for quantum mathematics.

Let me concentrate on the theory of normed spaces. There are no other normed spaces, but function spaces. Thus every normed space coincides with some space of bounded functions endowed with the uniform norm. Being spaces of functions automatically become spaces of operators.

The essential new phenomena of quantum mathematics appear when we move from linear operators to multilinear operators. In principle, the relations between quantum and classical functional analysis are similar to those between quantum and classical physics. On one hand, the things in classical science (notions, facts, methods) have meaningful quantum analogues, which allow to better understand their classical prototypes. On the other hand, quantum science comes across essentially new phenomena not encountered in classical science.

Timothy Golden BandTechnology.com  
wrote:

## Re: An Invitation to Quantum Mathematics

Mpilot wrote:

Quantum  
Mathematics  
is the  
mathematical  
apparatus of  
quantum  
mechanics.

What is the  
essence of  
this  
mathematical  
ideology ?

We can say  
quantum  
mathematics  
emerges  
from the  
classical  
mathematics  
after  
replacing  
functions by  
operators.  
The  
outstanding  
role of  
functions in  
classical  
mathematics  
with the  
pointwise  
commutative  
multiplication  
is passed in  
quantum  
mathematics  
to operators  
with their  
non-commutative  
multiplication  
(composition).

The  
following 2  
statements  
serve as a

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"guide to  
action":  
\* Classical  
Mathematics  
deals  
exclusively  
with spaces  
of functions  
and  
its main  
structure is  
the uniform  
norm.  
\* Quantum  
Mathematics  
deals with  
the spaces  
of operators  
and the  
main  
structure is  
the quantum  
norm.

Will you please discuss  $J_x$ ,  
 $J_y$ , and  $J_z$  ?

-Tim

I probably would not pass a test on the multilinear function's  
norm  
space but I'm getting some of the gist. And you are  
addressing the  
classical/quantum correspondence which I appreciate.  
When a physicist is concerned about a free particle in one of  
these  
situations and comes up with these complex probability  
distributions  
and they have already expressed the particles behavior in  
terms of  
momentum and position what right have they to reintroduce  
in angular  
momentum atop this free point particle's trajectory? I fail to  
see the  
classical interpretation of this. It seems to me more like  
attributing  
additional degrees of freedom in a flase way.

-Tim

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No. They are angular momentum.

I Believe the simpler form is just  $L$  in the standard developments, but they go to  $J$  after introducing spin. I hope to understand how they develop this theory. I am entirely open to not understanding the problem and so my question may be phrased inadequately. The phrase "angular momentum" is at the heart of the problem. As I go over the treatments I see momentum equations developed and then angular momentum equations developed. I am left with the impression that they have superposed these two to get results and I question the validity of that, particularly in light of the correspondence principle which you have a keen awareness of.

-Tim