Joel Feldman

Physics, mathematics and computer science belong to my favourite subjects in school and are definitely sciences that I would like to study at university. That is why I think the work and research that Joel Feldman does is really interesting. He is a mathematician and a mathematical physicist. He did his bachelor's degree in 1970 at the University of Toronto and his masters and PhD at Harvard University in 1971 and 1974. He has made important contributions to quantum field theory, many-body theory, Schrödinger operator theory, the theory of infinite genus Riemann surfaces and on Fermi liquids. His research on Fermi liquids and infinite genus Riemann surfaces was done in collaboration with Horst Knörrer and Eugene Trubowitz. Over the years professor Feldman won many prizes because of his outstanding contributions in Mathematics and Theoretical Physics and is a part of the Royal Society of Canada. In 1996 he won the John L. Synge Award, in 2004 he won the Jeffery-Williams Prize and in 2007 he won the CRM-Fields-PIMS Prize together with CAP-CRM in Theoretical and Mathematical Physics.

But why are contributions to research in physics so important? How do they help to push humanity forward? Physics helps us understand the nature of the universe. It helps us understand why certain things work the way they work. Take, for example, the European robin. At first glance, it seems like an ordinary bird. But once we start asking how is it possible that during winter the bird is able to find its way to southern Europe and back, things start to get weird, because the answer to this question lies in the mysterious realm of quantum mechanics. We still don't fully understand how it works, but there are theories that it has something to do with quantum entanglement, which was mathematically proven by John Bell in 1964. And discoveries like these can lead to many improvements in modern medicine or technology. But it is not only about physics. Mathematics plays a big part in the discoveries, because it is mathematics that helps us make the complicated processes more understandable. Mathematics is the ultimate language that everyone understands when it comes to science.

As stated above, quantum physics is a big field of physics. One part of quantum physics is the quantum field theory, which is one of the best theories about reality that we have right now. Quantum field theory sees the universe not as made of particles but rather as fields. There are twelve matter fields that we know about, four force fields, and there is also the Higgs field. The particles that we observe in atoms are just ripples or vibrations in these fields. Quantum field theory is also one of the most precise theories that exists. When we compare our mathematical and experimental results that we get from the theory, the results are nearly the same, which is astonishing. Joel Feldman has made big contributions to the mathematical part of quantum field theory. Right now, quantum field theory is considered to be the best and right way of talking about the universe on a fundamental level. But still, the fluctuations of these fields is really hard to understand and is still an unsolved mystery.

Mathematical physics is not the only part in which Joel Feldman has done some research. He also did a lot of research on Riemann surfaces. Generally, Riemann surfaces are made when we try to make an inverse function of a complex function. If we take the function $f(z) = z^2$, we find that the two outputs $1 + i$ and $-1 - i$ map to the same input of $2i$. But for this kind of function we need two branches of the complex plane. By doing this we obtain a structure that is impossible in our three-dimensional space. And this is true for all Riemann surfaces: we can only make a shadow or projection of these surfaces. Riemann surfaces live in a higher dimension. Riemann surfaces can also have different genus. Joel Feldman has specifically done research on Riemann surface of infinite genus.

Joel Feldman has made many important contribution to the fields of mathematics and mathematical physics. All these contributions help to push research of new technologies even further. It doesn't matter if it is in mathematical physics or just purely mathematics. But the nicest thing about the research is the people that are doing it. After contacting Joel Feldman directly to ask him some questions about his research he didn't have a problem answering. It doesn't matter that he wasn't able to explain his complicated research to a high school student. Purely the fact that he took his time to at least try and write back to a completely strange person is really nice and inspired me to study physics or mathematics even more. But it also inspired me to try and take my time to read through countless articles and try to get a grasp of the research that Joel Feldman does.

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