An Interview with Izu Vaisman

Professor Vaisman, you are a distinguished mathematician who has published lots of research papers and several books. Would you like to elaborate on your mathematical beginnings and the development of your career?

I am born in Romania and my mathematical education was in that country, at the University of Jassy, where I graduated (equivalent to the MSc degree) in 1959, I obtained a doctorate in mathematics (equivalent to a PhD degree) in 1965, and I was a faculty member from 1959 until 1976.

The university of Jassy had a known school of differential geometry which from the 1920's to the 1950's specialized mainly in the study of the differential geometry of geometric objects (curves, surfaces, line congruences, etc.) in various spaces of Klein's Erlangen Programme, such as projective, affine, centro-affine, etc. More general spaces, on the line of E. Cartan's works, were also studied there. Then, in the late 1950's and in the 1960's a sharp change to modern differential geometry (differentiable manifolds, global problems) occurred.

Accordingly, I wrote a thesis on projective-symplectic differential geometry, where I developed a theory of curves, surfaces, etc. in an odd-dimensional, projective space, endowed with an invariant, bilinear, nondegenerate, skew-symmetric form in the homogeneous coordinates, and I also discussed manifolds with the tangent spaces equipped as above, and with a corresponding connection, à la Cartan. This thesis explains my later interest in the geometry of the symplectic and Poisson manifolds.

Then, I changed my research subject and studied various structures on differentiable manifolds: foliations (cohomology of differential forms, conformal foliations, etc.), locally conformal Kähler structures, which were not studied seriously before and turned out to be important in the study of the complex surfaces in particular, symplectic structures (geometric quantization, Maslov classes, symplectic connections, Lagrangian foliations) and Poisson structures (Poisson cohomology, Poisson-Nijenhuis structures, etc.).

In 1976, when my main research subject was locally conformal Kähler geometry, I emigrated from Romania to Israel. Here, I was nominated full professor at the Department of Mathematics of the University of Haifa, and I am still holding this position now. It was a crucial point in my career since it allowed me free contacts with the international mathematical community. I was able to travel a lot and visit important mathematical centers. Paris, Berkeley and Oxford were among these, as well as many universities in France, U.S.A., Canada, Spain, Italy, Belgium, Japan, etc. Modern mathematical research is best done within the framework of such contacts.

Izu Vaisman

I am working in the field of mathematics, doing research and teaching undergraduate and graduate courses, for over fourty years now. I published more than one hundred research articles and a few research monographs and textbooks. I can say that this is a demanding but intellectually rewarding activity, and I believe that, should I start my life again, I would most probably choose the same profession.

Besides yours I can mention a few names of israeli mathematicians of outstanding reputation. For instance I have attended talks by Saharon Shelah and Aner Shalev at important international meetings. How is israeli mathematics doing these days?

Israeli mathematics was and is characterized by the effort to achieve excellence, by incorporation in the main stream research, by openness, and by involvement in the activity of the best mathematical centers worldwide.

All along its history, the Israeli mathematical community was a mixture between an immigrational influx and a local component, educated in the Israeli universities. In particular, in the latest years, a number of first class Jewish mathematicians from the former Soviet Union

have joined Israeli universities. On the other hand, usually, the fresh PhD graduates of the Israeli universities are taking jobs in foreign countries (the U.S.A., mainly) and, after having got an important research and teaching experience there, may later return to Israel. In these ways, Israeli mathematics is strongly connected with the places where the main stream of today mathematics is produced.

We had and we have very good schools of combinatorics, logic, algebra, functional analysis, partial differential equations, and others, in Israel. And, now, more fields are flourishing, such as algebraic geometry, low-dimensional topology, global analysis, symplectic geometry, applied mathematics, etc. Overall, in Israel we have a very active mathematical life, and a very strong research.

However, like all over the world, many mathematically gifted young students prefer computer science as a career, wanting a field with plenty of well paid jobs. In the same time, funding of theoretical research, and of pure mathematics in particular, is more difficult than funding of applied computer science research, seen as immediately profitable to industry and governments. These two processes have a negative influence on the mathematics departments in universities, and on mathematical research.

The Wolf prize for mathematics is really prestigious. Has it had any significant impact on israeli mathematics?

The Wolf prize is an international prize. It is awarded by the Israeli parliament, the Kneseth, following proposals from all over the world, in a process similar to that used for the Nobel prizes, because this was the way the donor wanted it to be. The benefit of Israeli mathematics is that the award of the Wolf prizes leads to visits of famous mathematicians, and strengthens our contacts with the first class world mathematics. On the other hand, the Wolf foundation also provides some funding for mathematical research, postdoctorate grants, etc.

You have written books on symplectic geometry. On the other hand Dusa McDuff and Dietmar Salamon wrote "An introduction to symplectic topology". Could you please make the distinction between symplectic geometry and symplectic topology precise to our nonexpert readers?

Since you want an explanation for a non expert, let me first tell that symplectic geometry and topology is a field of mathematics which studies symplectic manifolds and generalizations, these being objects which the non expert should think of as phase spaces of mechanical systems. There is a large overlap between symplectic geometry and symplectic topology. My feeling about the difference between the two is as follows. Symplectic topology is the study of the category of symplectic manifolds and their natural equivalences (symplectomorphisms). The main interest of symplectic topology is in the global invariants, which are able to distinguish diffeomorphic, symplectically nonequivalent manifolds. Such invariants were discovered in the 1980's and their study is based on hard analysis. In symplectic geometry, I include the general study of symplectic manifolds and their generalizations, under all the aspects which are of interest either in mathematics itself or in applications to mathematical physics. This means that I also include aspects of a differential geometric character, quantization theories and so on. Let me add the remark that, more generally, what differentiates differential geometry from differential topology is the presence of curvature phenomena.

You are now in Portugal lecturing an introductory course on Poisson and symplectic geometry. How does this type of activity fit in your mathematical work? Do you enjoy it? Do you regard it as a form of leading the way as far as the younger ones are concerned?

I enjoy very much being here in Coimbra and lecturing at the summer course, and I want to express my gratitude to the organizers for having invited me here. I am quite sure that this kind of meetings can be of a real help in the formation of the young generation of researchers, since it may open a new perspective to those who participate.

Izu Vaisman was born in Jassy, Romania. He studied Maths at the local university where he obtained his PhD in 1965. He stayed on as a member of the staff until 1976 when he left for Israel. He has been Full Professor at the University of Haifa since then.

Professor Vaisman has published more than 100 research papers in Differential Geometry and has written 8 books at both textbook and research monograph levels.

In September 1999 Professor Vaisman was in Coimbra to lecture a 12 hour course on *Poisson and Symplectic Geometry* in the Summer School on Differential Geometry organized by CIM.