Vladas Vanagas: An Appreciation

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For far too long access to the scientific achievements of persons working under the umbrella of the Former Soviet Union was difficult and often impossible to those of us working in the West. These diffuculties were both linguistic and political. I was first aware of the work of the research group in Vilnius with the publication of the translation from the Russian of *The Theory of Angular Momentum* by Yutsis[*sic*], Levinson and Vanagas by the Israel Translation Programme in 1962*. This book became very well known and was the forerunner of many modern treatments of the diagrammatic representation of the quantum theory of angular momentum doing for angular momentum what Feynman did for perturbation theory. Indeed as Judd[1] noted the two are closely connected. The central theorems of the book by Jucys, Levinson and Vanagas are widely quoted in the literature and are affectionately known as the JLV theorems[2].

My awareness of JLV led me to visit Vilnius in 1968. At that time organising such a visit was non-trivial. I travelled from Warsaw to Vilnius by a train headed by a magnificent steam engine with a large red star at the front. The train stopped at, what was then, the Soviet border and the officers boarding the train were perplexed by my copy of Littlewood's book[3] together with my lecture notes. The train was delayed while attempts were made to assess the literature. Finally the literature was returned and the train proceeded to Vilnius. I gave a series of eight lectures largely on the application of Littlewood's theory of group characters and symmetric groups. There was one person in the audience who obviously knew the subject almost totally - Vladas Vanagas. He was developing his work on algebraic nuclear theory.

I do not think Vanagas attached great importance to the JLV book even though it was an influential work. It was preparatory to his work on algebraic nuclear theory that was to occupy him right to the end of his life and I am sure he regarded it of greater significance than JLV. Vanagas's work on algebraic nuclear theory was wide ranging and the subject of most of his published work. Much of his work is summarised in two outstanding books[4,5], both published in Russian and regrettably to this day there is no English version available.

The first book, completed in 1969 but not published till 1971, opens with an outline of the basic theory of the symmetric group and tensor spaces of the unitary groups with many practical examples of calculations of such things as inner and outer products, inner and outer plethysms, explicit formulae for symmetric group characters etc. One of his great strengths was in his realisation of the significance of group theoretical methods in physics and their practical implementation. This is clearly shown in his subsequent chapters where he outlines the theory of coefficients of fractional parentage and his generalisation of the work of JLV on angular momentum coupling coefficients to those of group structures more general than just $SO(3)$. The whole method of classifying many-particle states using group theory and then applying it to the calculation of matrix elements is presented with unusual clarity as are the methods of obtaining relevant branching rules etc. All illustrated by tabulated examples. Unlike in many theoretical treatments, Vanagas emphasised practical calculation with application to actual nuclei. His over-riding ambition was to understand the microscopic foundations of nuclear models.

His second and final book was published in 1988. In between he had had some opportunities to travel and to start to interact with scientists outside his immediate environs. Thus in 1977 he was able to give a series of lectures on the Microscopic Nuclear Theory in Toronto[6] outlining his approach to collective motion in nuclei. It was this approach that dominates the second book. Again one sees the emphasis on group structures. Whereas in the first book there is no mention of the non-compact

* The transliteration of Jucys to Yutsis resulted in an amusing incident. I quoted this book in my book *Spectroscopic Properties of Rare Earths* referring in the text to Jucys. One reviewer felt I should have known that the correct spelling was Yutsis!

groups the intervening years has led him to a detailed study of the non-compact group $Sp(2n, R)$ which is applied to the symplectic model of nuclei and provides the route to understanding the connections between shell- and collective-models of nuclei at a microscopic level. Vanagas's dream would appear to have been to complete a microscopic description of nuclei and it was the fulfillment of that dream that occupied him to the end of his life.

In 1988 I received from Vladas an enthusiastic letter suggesting that with the onset of perestroika and the consequential freeing up of travel I should visit him again in Vilnius (In spite of perestroika the *airmail* letter took six months to reach New Zealand). This possibility was of great interest to me as I had developed a substantial interest in applications of non-compact groups. I next received an e-mail from Vladas from Yale University saying he was visiting there and wanted to establish e-mail contact. Shortly thereafter I received an e-mail message from Da Hsuan Feng informing of the unexpected death of Vladas. Thus ended Vladas's dream as did mine of seeing him once again in Vilnius.

We all have our dreams and our lives would be dull without them. Some dreams are realised in our lifetime. Some dreams are often too momentous to be realised in one lifetime. Such, I believe were the dreams of Vladas Vanagas. But the world is richer for such dreams and certainly for people such as Vladas. We are all confined by the particular epoch in which we live. To some there are great opportunities waiting to be grasped while to others in different circumstances the opportunities are denied them for no reason of their own making. Vladas achieved much in his lifetime of which he could be justly proud. To me the tragedy is that given different circumstances he would have had the capability of realising more, perhaps even the fulfillment, of his dream. How much richer lives we would all have had had people such as Vladas been able to have worked to their full capacity in a freer environment. Vladas left us in changing times at a time he was looking forward to the benefits of losing the constraints of the past. Science is international and knows no borders. For science to develop it is necessary to have an atmosphere that permits free discussion and the exchange of ideas. We can all rejoice that many of the barriers of the past are lifted. Vladas left just at the time computers and the internet were beginning as a means of communication across borders. I am sure that that is the world Vladas would have enjoyed and would have contributed to in his own way.

References

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