G. RAJASEKARAN

Brief statement of the major scientific contributions

- With Prof. R.H. Dalitz, Rajasekaran showed that a pole of the S matrix is in general followed by a retinue of poles[1–3]. This discovery of "shadow poles" not only removed a serious obstacle to the application of broken stymmetry to particle physics but also leads to a reformulation of a basic tenet of the S matrix theory.

- Even in the early days of the quark model, he envisaged the possibility of "molecular hadrons" and formulated an empirical test for their identification[4–6]. This has become an important topic of current research.

- He pointed out [7] that the current $\times$ current theory of weak interactions violated CPT invariance, unless it was properly symmetrised. (The erroneous unsymmetrised form is used by some authors even now!)

- He was a very early proponent of gauge theory and was actively involved[8,9] in it much before it got accepted as the new paradigm of High Energy Physics. His lectures [8] were the very first connected account of a number of topics containing the ingredients that make up the present-day Standard Model of High Energy Physics.

- He conjectured[8] the confinement of massless Yang-Mills quanta even before the advent of QCD.

- The first model-independent analysis of the neutral current weak interaction was performed by him and K.V.L. Sarma[10]. The equations derived by them (subsequently called "Master Equations" by J.J. Sakurai) played a crucial role in pinning down the coupling constants of this new interaction.

- The remarkable properties of broken-colour QCD with intergrally-charged quarks were elucidated by him and Probir Roy[11–13].

- With his collaborators T. Jayaraman, S. Lakshmi Bala and S.D. Rindani, he tested the viability of the above non-standard QCD in a variety of "jet" experiments[14–16]. Their studies have steadily uncovered one loop-hole after another in the experimental tests cited in support of the standard QCD.

- His work[17] with T. Jayaraman and S.D. Rindani revealed new effects invalidating the time-honoured Equivalent Photon Method, for the production of charged particles of spin $> \frac{1}{2}$.

- With A.K. Mishra, he has discovered[21–24] many new forms of quantum statistics (such as orthostatistics, null statistics, etc.). Their theory of generalized Fock spaces has enlarged the framework within which familiar quantum field theory and statistical mechanics reside. Many new algebras also were constructed. With the resurgence of interest in noncommutative spaces in quantum gravity and string theory, these new algebras and new Fock spaces are likely to have added significance.

- When neutrino oscillations were discovered in the 90's, his group at IMSc was one of the earliest to undertake a comprehensive study of both solar and atmospheric neutrino oscillations within a three-neutrino framework[25,26].

- His group[27] was the first to analyze within the three-neutrino framework the CHOOZ reactor neutrino data that came in 1997 and show that the reactor neutrino angle was smaller than 12 degrees. This upper limit remained as our only information on this crucial angle for more than 15 years until it was determined by the Daya Bay and RENO experiments in 2012 to be 9 degrees, not far away from the upper limit. The sizable value of this angle is not only important for CP violation in the lepton sector, but also is crucial for the success of the INO experiment on the mass hierarchy.

- With Ernest Ma[28], he constructed a model for the neutrino mass matrix based on A_4 symmetry, which later become a very popular model in neutrino physics.

- With MVN Murthy[32] he has reinterpreted the anomalous Kolar events observed in the 60's and 70's as the decays of dark matter particles. Along with collaborators[33] he is proposing an experiment at INO to confront this hypothesis.

- Over the years, in addition to research, a large part of his time and energy have been spent in lecturing to students and writing reviews for their benefit. Refs (18,19,20,29,30,31) are a sample.

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