

## CONCLUSION

The main idea on which this dissertation work is based is the preon model of Rajpoot and Samuel. Using it we have analysed the mechanism of the different classes of interactions of elementary particles. Thus we have analysed the strong interactions (16 in no.) weak interactions (26), discussed the reasons for forbidden interactions (28), incorporated the baryon number changing interactions at the GUT scale (13) and speculated a new class of generation changing horizontal interactions (18) within the framework of grand unified theories. One will immediately notice the absence of the electromagnetic interactions in the above list. This is not to deny their importance, but we have circumvented them to keep the analysis simple. The electromagnetic interactions are mediated by photons which carry the quantum numbers of the vacuum. The photon is formed, along with the  $Z^0$ , as a neutral eigenstate and an orthogonal combination of  $W_L^0$ ,  $W_R^0$  and  $U_{L+R}^0$  as pointed-out by Rajpoot and Samuel in their article<sup>14</sup>. This demands that we have a neutral eigenstate orthogonal to  $Z^0$  representing the photon which in turn requires a more careful construction of  $Z^0$  itself, whereas we have opted for a workable form.

The preon model of Rajpoot and Samuel is still at the level of hypothesis. No deeper theoretical justification as yet has been offered. This fact has compelled our exploration to be at the descriptive analytical level.

Nevertheless, in seeking the consistency of the preon model as applied to mechanism of elementary particle interactions, we have put in by hand the new generation quantum number  $G$ . Observing that the transitions involving the quarks in the same family are favoured compared to the ones involving

the different families, as evident from the Kobayashi-Maskawa matrix, we tried to link this with a systematic violation of the generation quantum number. We have also proposed a general selection rule for weak interactions. More work in this direction is indicated.

In the course of analysis, we have found that the so called the horizontal interactions among the respective members of the three families can be shown to be mediated by the F-vector bosons. The F mediated interactions can be of two types :

1. Those involving a violation of generation quantum number.

and

2. Those conserving it.

We have found that the interactions of the second type can receive a contribution from weak processes occurring in other channels. This gives us a basis for the calling first type of interactions as pure and the second as the mixed. Since the F mediated interactions involve heavy quarks and leptons, we may expect them to occur at very high energies. Hopefully, these may form a 'green oasis' in the 'desert' region.

In future we hope to build up a mathematical formalism of the preon structure, which will reproduce the results of the standard model, hopefully substantiate the predictions of the grand unified theories and give some new insights in the structure of matter.

