V. MODELS AND APPLICATIONS

In order to construct realistic non-abelian gauge models of the strong interactions one must confront the issue of symmetry breaking. The standard means of breaking the gauge symmetry is to introduce scalar mesons explicitly into the Lagrangian. As will be explained in Section VI it is very difficult to preserve asymptotic freedom while incorporating scalar mesons, and perhaps impossible to include enough scalars to completely break the gauge symmetry. This is not too disappointing since the explicit introduction of scalar mesons, whose only role is to break the symmetry, is not very pleasing. An alternative is that the gauge symmetry is dynamically broken. In other words, a composite Goldstone-boson is formed and is eaten up by the usual Higgs mechanism[40]. Another possibility is that <u>the gauge symmetry is exact</u>! At first sight this would appear ridiculous since it would imply the existence of massless, strongly coupled vestor mesons. However in asymptotically free theories these naive expectations might be wrong. There may be little connection between the "Free" Lagrangian and the spectrum of states.

The possibility of dynamically induced spontaneous symmetry breaking has been considered by many authors[43,44], although no realistic model has been constructed which does not involve fundamental scalar fields. Of particular interest is the work of Coleman and Weinberg[44]. They shown that theories involving massless particles often become unstable, due to infrared singularities, and exhibit spontaneous symmetry breaking. The infrared singularities of a Yang-Mills theory are particularly