functional of 1PI's. It is an immediate consequence of this definition that:

$$\Gamma^{(n)}(p_1,\ldots,p_n;v) = \sum_0^\infty \frac{v^j}{j}\,\Gamma^{(n+j)}\,(p_1,\ldots,p_n;o,\ldots,o;o) \tag{6.1}$$

where on the right hand side of (6.1) the $\Gamma^{(n+j)}$ are the Greens functions of the symmetric theory with j insertions of the scalar field carrying zero momentum. Now, by simple power counting the 1PI's $\Gamma^{(n+j)}$ are less and less divergent in the ultraviolet region as j increases, so that the ultraviolet behavior of (6.1) is controlled by the first term; i.e. by the ultraviolet behavior of the summetric theory. Thus the desirable properties of the symmetric theories discussed below will remain intact in the presence of symmetry breaking.

Before we plunge into the analysis an overview is in order. In the case of pure gauge theories asymptotic freedom provides no constraint. When the theories include fermions a weak constraint (not too many fermion multiplets) must be satisfied. On the other hand the requirement of asymptotic freedom will severely constrain gauge theories involving scalar particles. This is because such particles will necessarily have their own self couplings. One must therefore investigate the asymptotic freedom of these new (dimensionless) coupling constants. It is well known that a scalar field by itself, with a $\lambda\phi^4$ coupling is not asymptotically free. Therefore the only hope is that the gauge mesons will help render the fixed point $\lambda = 0$ ultraviolet stable. This turns out to be very difficult to achieve -