The last term in the renormalization group equation is peculiar to gauge theories. As a consequence of Equation 2.14 we have that

$$\delta(g,\alpha) = -\frac{\alpha_u}{Z_3^2}\,\mu\,\frac{\partial Z_3}{\partial\mu}\bigg|_{g_\mu,\alpha_u,\Lambda \text{ fixed}} = -2\alpha\gamma(g,\alpha) \tag{2.21}$$

The renormalization group equations assume a particularly simple form in Landau gauge where $\alpha_u = \alpha = 0$, for in that gauge $\delta = 0$. This is a reflection of the fact that the longitudinal part of the vector propagator vanishes in this gauge, and a change in renormalization point does not change the gauge parameter. In the following we shall often restrict ourselves to this gauge. Ultimately we are interested in the physical consequences of these theories which are determined by gauge invariant amplitudes. For such amplitudes the change in gauge parameter can be reabsorbed by a change in coupling and scale of fields. This is explained in some detail in Appendix I, where we also show that the lowest order terms (of order g^3) in $\beta(g,\alpha)$ are independent of α.

The utility of the renormalization group equations is that they determine the change in the Green's functions as we scale all momenta uniformly. Consider the 1PI amplitudes $\Gamma^{(n)}(\lambda p_1, \lambda p_2 .., \lambda p_n; g, \mu)$ (in Landau gauge), where p_i is some set of non-exceptional Euclidean momenta, and λ is a non-vanishing parameter. Pure dimensional analysis implies that:

$$\Gamma^{(n)}(\lambda p_i, .. \lambda p_n; g, \mu) = \mu^{4-n}\Gamma^{(n)}\left(\frac{\lambda p_1}{\mu}, .., \frac{\lambda p_n}{\mu}\right) \tag{2.22}$$