The Law of Everything (aka Lagrangian) in eight equations?

$$\mathcal{L} = \sqrt{-g}\left(g_{\mu\nu}R^{\mu\nu} - 2\kappa\mathcal{L}_E\right)d^4x_\mu$$

where g is the usual metric tensor, R the Ricci tensor, and κ is Einstein's gravitational constant (as in Moshe Carmeli, Classical Fields, equation 3.3.3), and:

$$\mathcal{L}_{\mathrm{E}} = \mathcal{L}_W + \mathcal{L}_B + \mathcal{L}_l + \mathcal{L}_r - V$$

$$\mathcal{L}_W = \tfrac{1}{4}F_{\mu\nu}\cdot F^{\mu\nu} \quad (\text{i.e. } \tfrac{1}{4}F^a_{\mu\nu}F^{a\mu\nu})$$

$$F_{\mu\nu} = \partial_\mu W_\nu - \partial_\nu W_\mu + gW_\mu \times W_\nu$$

$$\mathcal{L}_B = -\tfrac{1}{4}(\partial_\mu B_\nu - \partial_\nu B_\mu)(\partial^\mu B^\nu - \partial^\nu B^\mu),$$

$$\mathcal{L}_l = c_l\left|(\partial_\mu - \tfrac{i}{2}g\tau\cdot W_\mu - \tfrac{i}{2}g' B_\mu)\varphi\right|^2$$

$$\mathcal{L}_W = c_r\left|(\partial_\mu - \tfrac{i}{2}g' B_\mu)Q\right|^2$$

$$V = \lambda_1(Q^2 - F_1^2) + \lambda_2(\varphi^2 - F_2^2)$$

where the underlying fields are W_μ^a, B_μ, Q^a and φ^a, where g, g', λ_1,λ_2,F_1 and F_2 are parameters and τ the usual set of 4 Pauli matrices, as in Electroweak Theory.

The Lagrange-Euler equations applied to this Lagrangian give us a set of partial differential equations (PDE). The question is: could it be that these PDE are the "law of everything," the underlying laws of physics? Could it be that the types and masses of particles we observe in nature, and that those strange statistics from quantum theory that we do see in nature, are all just emergent, statistical outcomes which could be derived from this Lagrangian and the "solitons' which come out of it?

So far as I know, it may be true. Some aspects I have studied in great detail, and others I am hoping others will nail down in a more rigorous mathematical way (under standards more rigorous than the usual standards in complex quantum theories). I would guess that it would be "true," with minor tuning, enough to explain all the things people have laboratory data on. **IF** empirical data should someday compel us to prefer, say, Moffat's theory of gravity to Einstein's, it would be easy enough to update this accordingly.

Further comments:

(1) Big Picture…

As Bayesian, I now assess about a 5% probability that this is the correct "law of everything." Of things which are well-specified today, the next most probable possibility would be this system, upgraded to replace general relativity with Moffat's theory of gravity. The two other possible candidates, the canonical "standard model" with Hawkings gravity, or n-brane theory, both have less than 1% probability of being the ultimate truth, in my view, in part because of aspects noted in the accompanying slides. The greatest probability is that the Lagrangian of the universe is something which has not been written down by anyone as yet.

(2) Ansatz…

As I study this, I am further struck by how much of what we need to explain, like electron spin, is an emergent result from this kind of simple thing, as summarized in my scribd paper on quantization. It seems most likely to me at present that both this system, and the BPS monopole system, do possess continuous variational solitons following a simple "spherically symmetric" ansatz. Here the obvious starting point is to study:

$$\varphi^a = x_a H_\varphi(r)$$

$$Q^a = x_a H_Q(r)$$

$$W_0^a = x_a J_W(r)$$

$$W_i^a = \varepsilon_{aij} x_j K_W(r)$$

$$B_0 = J_B(r)$$

$$B_i = x_i K_B(r)$$

This is such a simple-minded extension of the ansatz which has worked in the Prasad-Sommerfield work, but still it may well work here as well, to locate the family of variational solitons which may underlie most of what we see in our universe. (And of course, both this system and our universe have a few other interesting tricky things at the fringe, like neutrinos and unstable excited states, though most of what we see in the latter case may simply be bound states of such variational solitons.) If it does not work… well, I hope that the effort to insert this into the PDE will suggest a minor tweak.

As with the BPS system, solutions with axial symmetry may also be of interest. But analyzing the properties of the "spherically symmetric" solutions is the clear first order of business.