The Sarfatti Lectures 4

I paraphrase Robert Gilmore, freely adapting his original from “Catastrophe Theory for Scientists and Engineers” (p. 15) to my post-quantum theory.

The canonical forms for the post-quantum potential Q* are obtained after a smooth change of coordinate variables in configuration space. Q* has the canonical form

$$Q^* \doteq y_1$$

at non-critical points on the sentient mental landscape where the gradient flow of the material configuration system point X(t) is nonvanishing.

Q* has the canonical form

$$Q^* \doteq \sum_{i=1}^{n} \lambda_i y_i^2$$

where λ_i are the eigenvalues of the stability matrix (Hessian)

$$Q^*_{ij} = \frac{\partial^2 Q^*}{\partial x_i \partial x_j}$$

at Morse critical points where

$$\nabla Q^* = 0$$
$$Det Q^*_{ij} \neq 0$$

This assumes a flat configuration space with a trivial connection. If the connection is nontrivial, corresponding to curvature and torsion in the configuration space, then we need to use covariant derivatives from the connection instead of ordinary partial derivatives. The eigenvalues λ_i can be chosen to have p “time” values of –1 and q “space” values of +1, where p + q = n, to give a Morse p-saddle in the n-dimensional configuration space’s mental landscape on which X(t) moves. The motion of X(t), the control point, also modifies the shape of the landscape. This is post-quantum back-action absent in orthodox quantum theory.

Q* has the canonical form

$$Q^*\{x; X(t)\} \doteq f_{NM}\{y_1[x, X(t)], \ldots y_\ell[x, X(t)]; X(t)\} + \sum_{j=\ell+1}^{n} \lambda_j[X(t)] y_j[x]^2$$

at non-Morse critical points where

$$\nabla Q^* = 0$$
$$Det Q^*_{ij} = 0$$

We need to examine this closely. The first term on the RHS is from the ℓ stability eigenvalues λ_i that vanish for particular points on the material configuration trajectory X(t) that is coevolving with the Q* landscape. Note that the ℓ ”bad” coordinates $y_i[x, X(t)]$ whose stability eigenvalues

λ_i [X(t)] = 0

depend on *both* the actual path X(t) of the material configuration (i.e. “source point” for the wave function) that Q* is piloting as well as the “field point” x. In contrast, the n- ℓ ”good” coordinates $y_j(x)$ only depend on the field point x. Their nonvanishing stability eigenvalues only depend on the source point X(t).

The local qualitative properties of any potential (i.e., “landscape”), i.e. any 0-form whose exterior derivative 1-form is a generalized “force” on the system point at a single point in configuration space, are governed by the lowest degree terms of its Taylor series expansion about that chosen point. When that potential depends on the actual path X(t) of the system point it is piloting (i.e., “back-action”) so do its Taylor series coefficients. Certain choices of points on the path X(t) may cause these lowest degree terms to vanish. Then the qualitative properties of the landscape also change. A generalized coordinate transformation can then be introduced to transform away the remaining higher degree terms in the Taylor expansion. This last step is analogous to Einstein’s use of the equivalence principle in general relativity to go to the flat tangent space of curved space-time i.e. local Lorentz inertial frames of free float. The lowest degree nonvanishing terms that remain determine the qualitative properties of the landscape at a point. These terms are called the “germ of the landscape”. The germ resides between the lowest degree terms which are killed off by the control system point X(t) and the higher order terms which are killed off by the generalized coordinate transformation. The physical meaning of this quantum configuration space version of Einstein’s equivalence principle between gravitation and inertia in ordinary classical 3D space is not yet adequately understood. It suggests a connection between consciousness and gravity. The relation to the Penrose conjecture connecting consciousness to gravity is not known yet.

When the germ is linear, use the Implicit Function Theorem. When the germ is a non-degenerate quadratic form, i.e. none of the stability eigenvalues vanish, use the Morse lemma. Einstein’s general relativity as a classical limit may correspond to this non-catastrophic special case. Modanese has introduced macroscopic quantum coherent catastrophes, i.e. “metric instabilities” into Einstein’s classical limit. When the germ contains a degenerate quadratic form from the vanishing of stability eigenvalues, we have a “catastrophe” and we need the “Splitting Lemma”.

Given a general coordinate transformation in n-dimensional configuration space, it is locally reversible with an inverse when the determinant of the Jacobian determinant does not vanish. This is a consequence of the Inverse Function Theorem. The general nonlinear coordinate transformation can be broken apart into a sequence of three simpler transformations. First a simple rigid displacement of the origin of coordinates. Second a non-rigid rotation with a stretch of the coordinates. Third a nonlinear axis-preserving the origin. We then have to distinguish active from passive transformations.