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1. Ordinary spin glass:
 - (a) Examples: spin glass as magnetic system. Consists of magnetized regions with varying direction of static magnetization.
 - (b) Large number of almost degenerate ground states are minima of free energy. The notion of frustration catches this property. Spin glass energy landscape. Free energy has valleys inside valleys. Fractal structure.
 - (c) Parisi understood spin glasses mathematically. The space for the minima of free energy allows ultrametric topology: also p-adic topologies are ultrametric. In ultrametric topology the length $d(A-B)$ smaller than $\text{Min}(d(A), d(B))$: topology is non-Archimedean. Concrete definition of distance: define the distance along given path between A and B as height of the highest valley along path. Define the distance between A and B as minimum of this distance over all paths, just like ordinary geodesic distance. This metric is ultrametric.
 - (d) Parisi's model was based on replica method. One assumes that also the parameters of the Hamiltonian defining a model of magnetic system have thermodynamical distribution. One obtains formally large number of replicas of the original thermodynamical systems. Probability distributions for probability distributions.
 - (e) Breaking of ergodicity as outcome: time evolution of single member of ensemble does not define probability distribution of states equal to that of ensemble.
 2. In TGD vacuum degeneracy of Kähler action is the source of 4-D spin glass degeneracy.
 - (a) Vacuum extremals representable as graphs of a map from $M^4 \rightarrow CP_2$ have huge degeneracy. Entire sub-theory with space-time surfaces having at most 2-D Lagrangian manifold as CP_2 projection are vacuum extremals with vanishing induced Kähler form so that Kähler gauge potential is pure gauge. Time evolution is non-determinism for the vacuum extremals. Symplectic transformations of CP_2 give new Lagrangian manifolds defining this kind of degeneracy.
 - (b) For non-vacuum extremal symplectic transformations do not leave action invariant but act as isometries of world of classical worlds (WCW). Classical gravitation breaks the gauge symmetry to dynamical symmetry acting as isometries of WCW.
 - (c) Large class of preferred extremals are obtained as small deformations of vacuum extremals. 4-D spin glass landscape for the maxima of the exponent of Kähler function defining vacuum functional "square root" of exponent of free energy in square root of thermodynamics inspired by ZEO.
 - (d) The space of maxima of Kähler function would replace free energy landscape and p-adic metrics strongly suggests them as topologies for regions of the space of the maxima. The non-determinism of preferred extremals would make the spin glass property 4-D and correlate with the non-determinism of p-adic differential equations.
 - (e) Note that in real topology the space of maxima is discrete just as the space of possibly infinitely long series of binary digits is discrete. In p-adic topology this space is however smooth just like 2-adic numbers formed by these series and binary cutoff which can be arbitrary good approximation brings in discreteness.
 - (f) The non-determinism reflected as possibility of having several maxima of Kähler function connecting given 3-surface at boundary of CD to several alternative 3-surfaces such that non-determinism appears in the interior as multi-furcation of preferred extremal could serve as space-time correlate for quantum non-determinism.
 - (g) This p-adicity is in principle independent of fundamental p-adicity postulated at space-time level to serve as correlate for cognition by generalizing the notion of number so that also p-adic space-time sheets become possible in the generalization of imbedding space obtained by gluing together real and various p-adic imbedding spaces along common rationals.
 - (h) An interesting question is whether p-adic thermodynamics used to calculate elementary particle masses could be seen as application made possible by 4-D spin glass degeneracy or by fundamental p-adicity.

3. Is the 4-D spin glass degeneracy visible at the level of effective space-time of GRT obtained by replacing many-sheeted space-time with M^4 and its metric with sum of M^4 metric and deviations from it for various space-time sheet having non-empty projection to the region of M^4 considered and performing quantum average?
 - (a) To test this picture experimentally, one must be able to avoid many-sheetedness.
 - (b) In living matter the visibility of 4-D spin glass property is especially suggestive. Consider only non-deterministic behavior of living systems.