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THE CREATION AND BREAKING OF SYMMETRIES   -

SYNERGETIC SELF-ORGANIZING PROCESSES

IN ELEMENTARY-PARTICLE PHYSICS

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Summary.

It is shown how **isolable elementary particles are generated out of fundamental dynamic constituents by synergetic self-organizing-processes.** Our starting point is the quality of quarks to be dynamic constituents of hadrons, but not to appear as isolable. For the physics of elementary-particles, we establish a **constituent-phase** where so-called **"gene-quarks"** (denoted as F) exist with Fermi-statistics and intrinsic length dimension of $-\frac{1}{2}$ (and thus not isolable). The gene-quarks interact dynamically via self-interaction $(D\,F = F\,\bar{F}\,F)$. By the type of self-interaction and by this intrinsic length dimension of $-\frac{1}{2}$ the Fermi-statistical **constituent-phase is purely dynamic.** The internal degrees of freedom of symmetry are not virulent. The self-interaction is interpreted by Wilson's point-splitting. On the assumption that the coupling constant must have dimension zero - for reasons of renormalisation - and that the gene-quarks have the dimension $-\frac{1}{2}$, it is only the type of interaction mentioned above, which can appear during the constituent-phase. It is deduced that **the self-interaction of the gene-quarks incites the** synergetic **self-organizing-processes generating gauge-bosons of the dimension -1 out of the 2-combination of gene-quarks.** The gauge-bosons have the corresponding gauge-symmetries. Thus there is no need to establish gauge-fields and gauge-symmetries, but they are created out of the fundamental gene-quarks via self-organizing-processes. The self-organizing-process thus incites a transition from the Fermi-phase of the gene-quarks to the boson-phase of the gauge-bosons. In this way the fundamental phase-transition is produced. Then it is shown that the self-organizing-processes do not only generate observable matter (e.g. gauge-bosons), but that **simultaneously with the process mass is being created.** Here the Wilson point-splitting is analysed and it is demonstrated, how **the point-splitting leads** by the self-organizing-process **to the point-curvature.** This bending of the space-time-structure leads to the production of mass. Simultaneously the **production of mass leads to the breaking of symmetry.** This allows a detailed explanation of the symmetry-breaking mechanism. Some remarks are made along this line of argument possibly leading to the quantitative fixing of the relativistic symmetry as well as to the quantitative fixing of the structure of internal symmetries. The 4-structure of self-interaction in the constituent-phase of the gene-quarks is reflected via the self-organizing-processes in the external degrees of freedom - in the form of 4-dimensionality of space-time - as well as in the internal degree of freedom in the 4-componant-structure of the observable fermions. It is only through the self-organizing-process that the relativistic and the internal symmetries are realised.

Biological processes
Chemical processes
Many body physics
Atomic physics
Nuclear physics

Higher self-org.proc. $\longrightarrow$ higher sym.

The structure of the self-organizing process in elementary-particle physics

observable-phase

$\hat{F}\dots B\dots$ $\hat{F}\dots B\dots\hat{F}\dots$

-gauge-sym. (created by self-org.)
-creation of point-curvature
 (dyn.conseq.of Wilson's point-splitting)
-bending of space-time
= creation of mass = breaking of symmetry

Boson-phase   observ.Fermions
$B=(F\,F)$=gauge-boson $F=(F\,\bar{F}\,F)=$
     of dim -1 $= $ dim $-\frac{1}{2}$

$DF = F \cdot B$ $DF =(F\,\bar{F}\,F)$
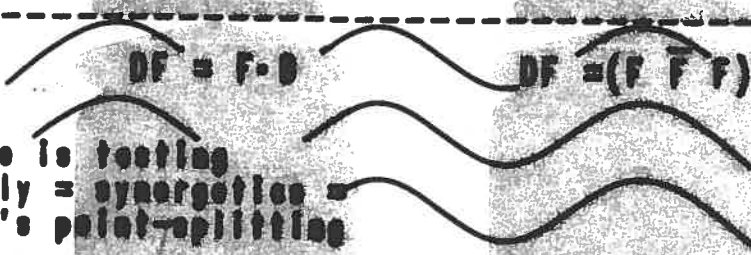
The nature is testing
permanently = synergetics =
= Wilsons's point-splitting

$DF = F\,\bar{F}\,F$ $DF = F\,\bar{F}\,F$

Fermi-phase
gene-quarks

$DF = F\,\bar{F}\,F$

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constituent-phase

observable-phase
-observable Bosons B
-observable Fermions F
 (dim $-\frac{1}{2}$)
-creation of symmetry
-creation of mass
-breaking of symmetry
-the 4-structur F^4
 of self-interact.
 of F $\to$ 4-dim. of X,
 4-comp.of F

self-organizing process
(incited by the
self-interaction
$DF = F\,\bar{F}\,F$ of the
gene-quarks + wilson's
point-splitting)

constituent-phase
-purely dynamic
 fermi-phase
-dynamic gene-quarks
 (not isolable) with dim $-\frac{1}{2}$
 and self-interaction
$DF = F\,\bar{F}\,F$

unique $\hat{=}$ dimensionless of the
 coupling constant
-the space-time structure
 is not quantitatively fixed
-the internal degree of freedom
 is not quantitatively fixed