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The large-scale structure in the universe : the role of anisotropic and nonGaussian fields

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Modern galaxy redshift surveys (e.g. 2dF, SSDS) have revealed huge concentrations of galaxies with density contrast $n_g/ < n_g > \sim 6$, dubbed "Great Walls" due to their sizes (over 10^9 light years) and geometry. The currently accepted model of the formation of the large-scale structure in the universe is based on the well established premises : about a quarter of the total mass in the universe is in the form of dark matter interacting with the rest matter only gravitationally, the early universe was practically uniform, the structure in the universe has grown from tiny perturbations of density field due to gravitational instability, the perturbation field is a realization of statistically isotropic and homogeneous Gaussian random field. The current measurements show that the inhomogeneities with scales less than $\sim 1.5x10^7$ light years has reached nonlinear stage while the inhomogeneities with greater scales remain in the linear or quasi-linear regimes. No compelling theoretical explanation of almost two orders of magnitude difference between the sizes of "Great Walls" and the scale of nonlinearity has been offered so far. In my talk I will present a dynamical model invoking auxiliary nonGaussian as well Gaussian anisotropic fields derived from the initial Gaussian density perturbation field that play a crucial role in explaining observed nonlinear structures in the $\sim 10^9$ light year range.