ON THE POSSIBLE REASONS FOR THE HYPEREXPONENTIAL GROWTH OF THE EARTH POPULATION

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A new model of the Earth population growth is offered. It shows that the hyperbolic growth presents the transition period between zero growth (after filling its own ecological niche) to the exponential one. The difficult problem of explaining the hyperbolic growth in the XVIII-XX cc. is discussed.

H. Foerster (1960) and S. Hoerner (1963) have shown that the growth of the overall number of Earth population (up to the 60-s of the XX century) can be approximated with good precision by a hyperbolical formula

$$N = N_m / (t - t_m), \tag{1}$$

were N is the Earth population, t – time (in years), $t_m \sim$ 2025-2028 ye. S.P. Kapitza (1996, 2001) and a number of other scientists have interpreted this formula as the solution of the differential equation

$$dN / dt = aN^2. \tag{2}$$

The existing interpretation of non-additive growth of Earth population do not quite correlate with real demographic processes. A new explanation of

formula (1) is offered on the basis of exchange models of information which is conducive to the expansion of the ecological (technological) niche of people habitation, both inside individual societies and among them. If it goes about an united population then the main equation system is as follows

$$dN/dt = r N (1 - N/K) \qquad\qquad (3)$$

$$dK/dt = b N^2 \quad \text{or} \quad dK/dt = b KN,$$

According to the suggested model the hyperbolic growth is registered during a long period of the transition from zero growth (after filling its own ecological niche) to the exponential one (for example see below).
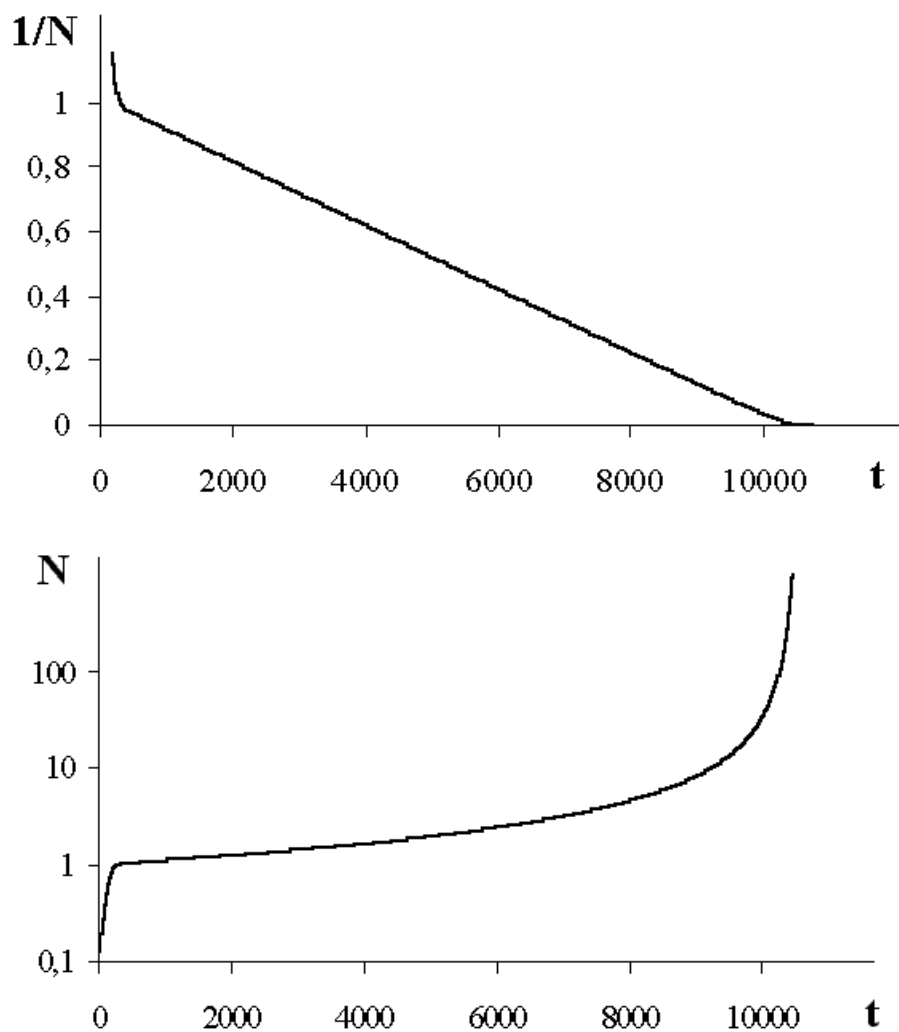
However, the rapid growth of the Earth's population during the XVIII-XX centuries cannot be fully explained by this model. The actual reasons for the rapid growth include:

− combination of formerly registered phenomena, namely a high degree of demographic cycles synchrony, deteriorating nutrition of China and India population and so on;

− new phenomena which are not related directly to the demographic behavior, first of all, the disappearance of aggressive nomadic groups on the outskirts of the known world which prevented the expansion of agrarian communities; the stabilizing influence of the European colonialism;

− innovations coming from the Western countries where the characteristics of the population grows differed considerably from (1) and (3).

According to a possible interpretations the population growth at that time was determined by a certain compound of the two tendencies – the old one and the new one which can be approximately rendered by some formula of the type:

$$N = \Sigma\, n_{0i} \exp(b_i + \exp(a\,(t - t_{0i}))), \qquad (4)$$

were the second exponent renders the exponential growth of innovations in advanced countries which are passed on to the rest of the world. Formula (4) in a wide range of parameter values is well approximated by a hyperbole (1). All the same, the nearness of N_m and t_m values for both hyperbolic lines (traditional society; XVIII-XX centuries) remains a problem requiring further investigations.