

**GLOBAL POPULATION BLOW-UP
AND AFTER**

**FROM THE DEMOGRAPHIC REVOLUTION
TO**

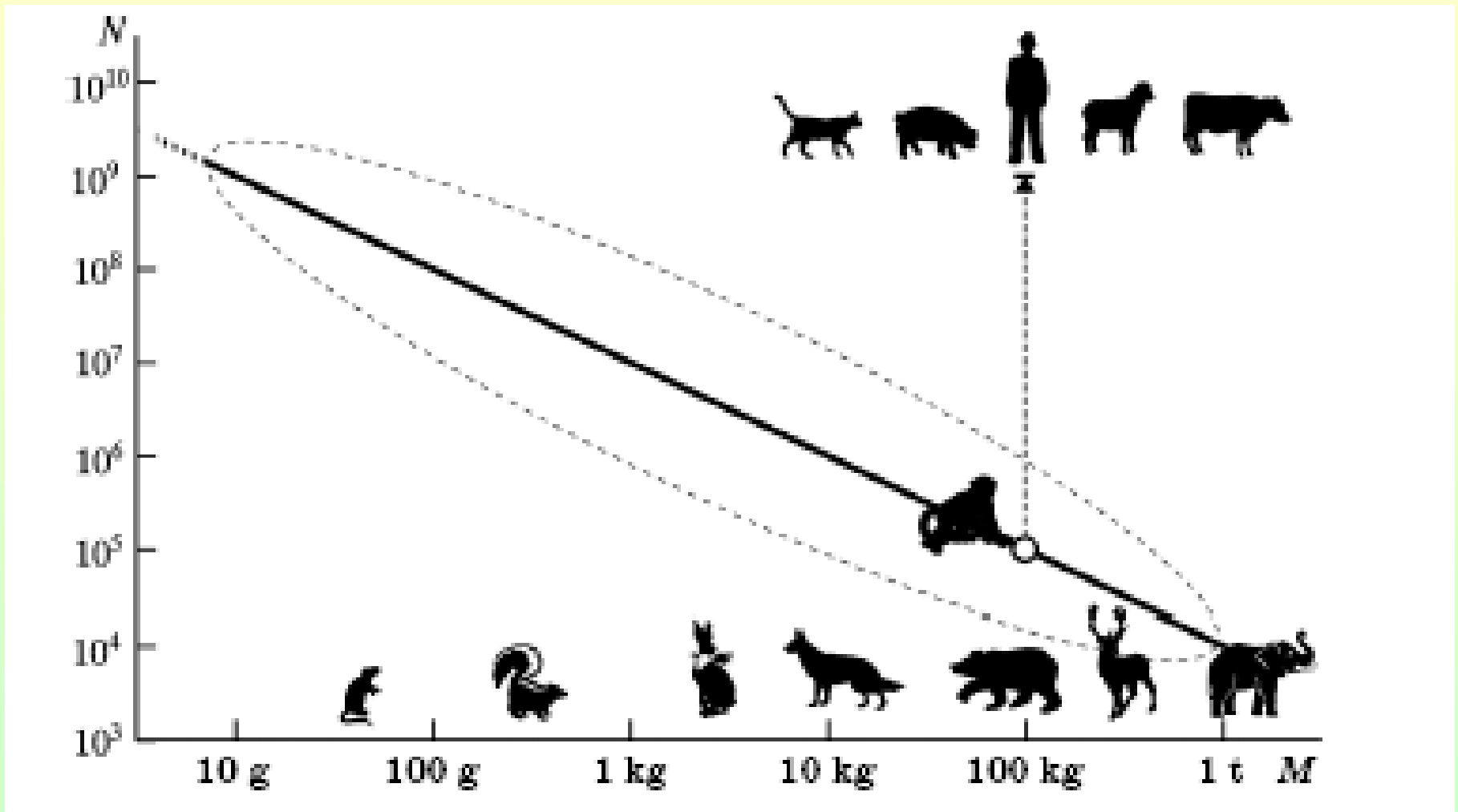
A KNOWLEDGE-BASED SOCIETY

Sergey P. Kapitza

Institute for Physical Problems

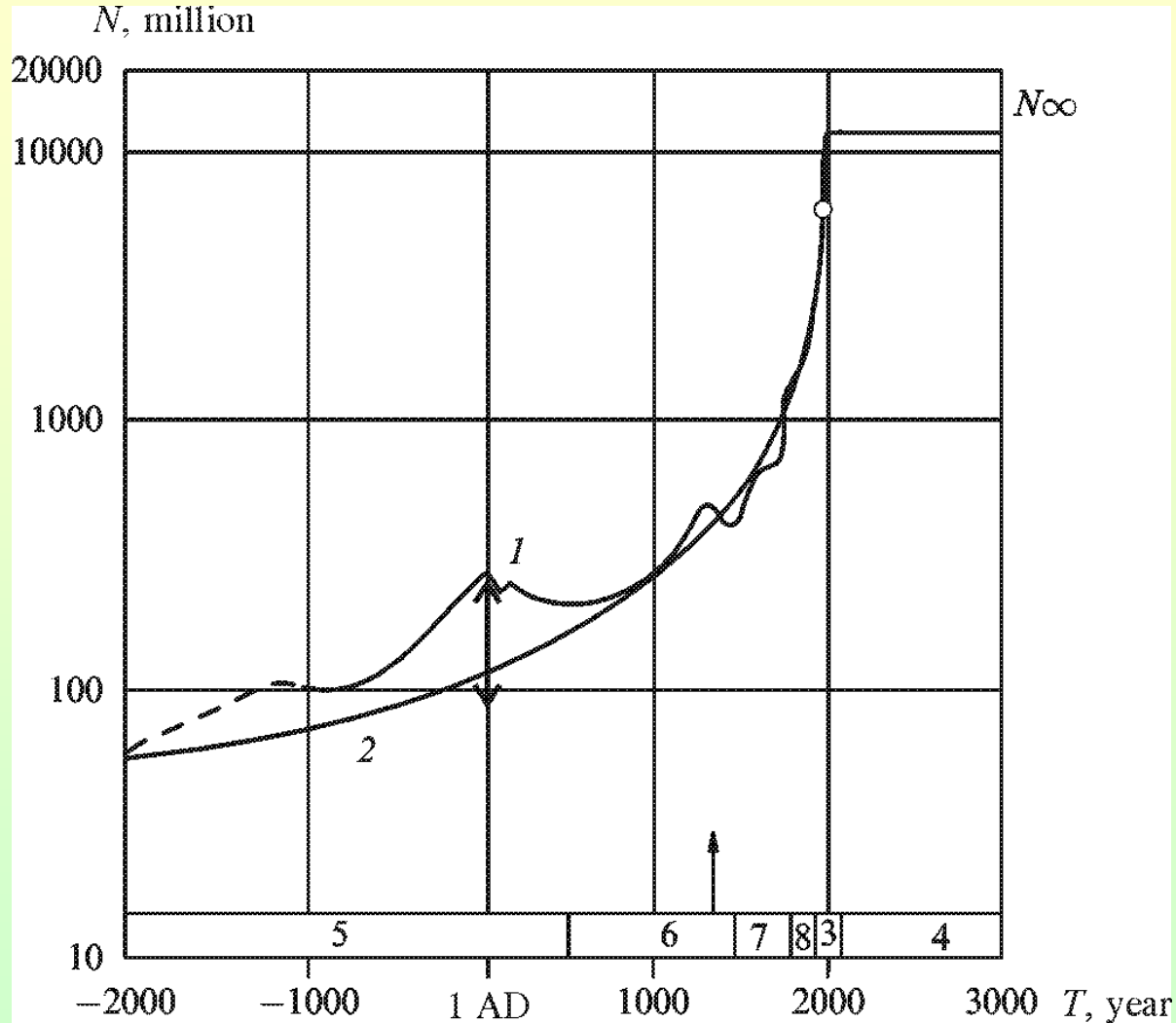
Russian Academy of Sciences, Moscow

HOW MANY PEOPLE ARE THERE ON EARTH?



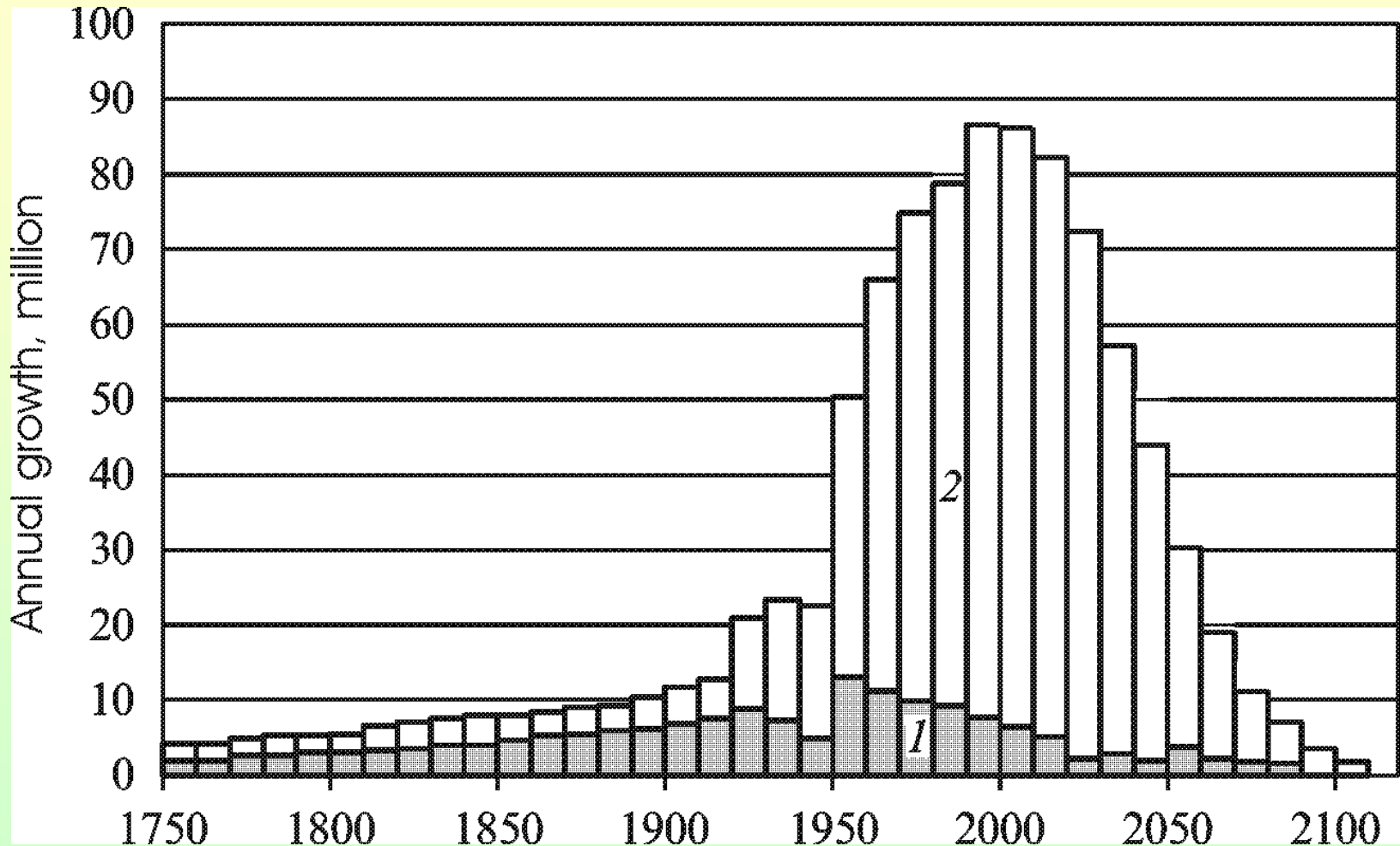
NUMBERS OF A GENERA DEPENDING ON BODY WEIGHT

WORLD POPULATION FROM 2000 BC TO 3000 AD



1 – DATA OF BIRABEN, 2 – BLOW-UP, 3 – DEMOGRAPHIC TRANSITION, 4 – STABILIZED POPULATION
 5 – ANCIENT WORLD, 6 – MIDDLE AGES, 7 – MODERNITY, 8 – RECENT HISTORY, \uparrow – THE PLAGUE 1348

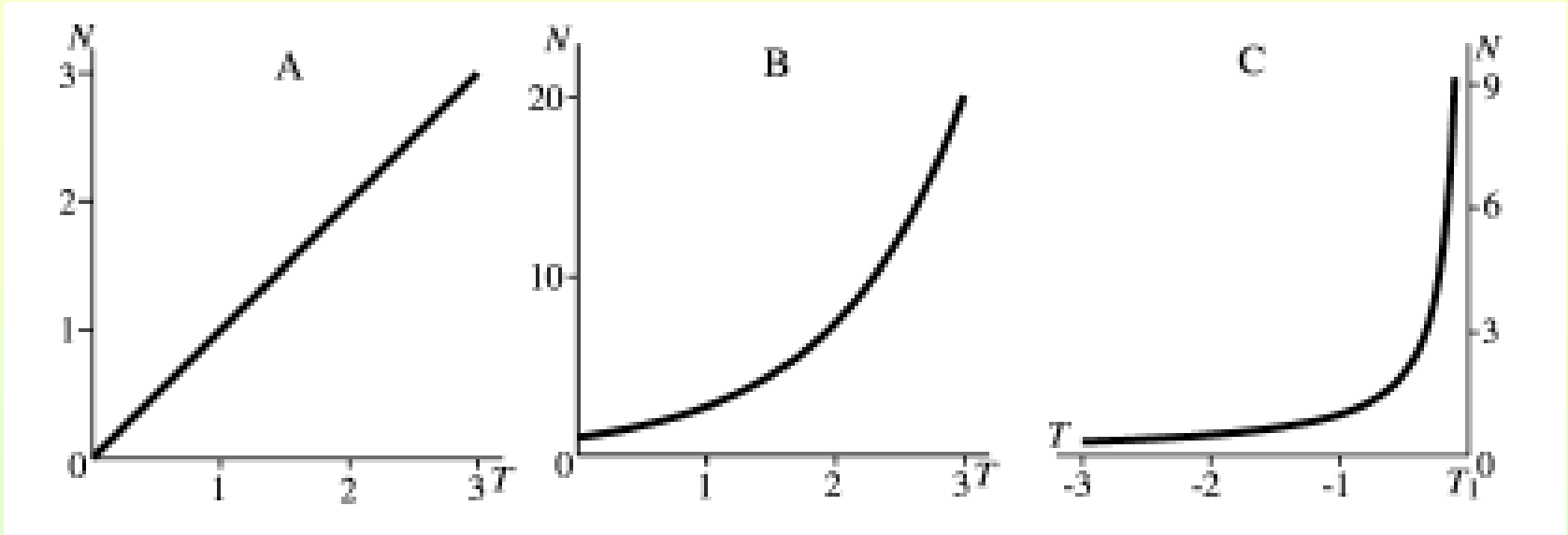
GLOBAL DEMOGRAPHIC TRANSITION



ANNUAL GROWTH AVERAGED OVER A DECADE

1 – DEVELOPED AND 2 – DEVELOPING COUNTRIES

LINEAR, EXPONENTIAL AND HYPERBOLIC GROWTH



$$\frac{dN}{dT} = A \quad N = AT \quad \frac{dN}{dT} = \frac{N}{\tau} \quad N = N_0 \exp T/\tau \quad \frac{dN}{dT} = \frac{N^2}{C} \quad N = \frac{C}{T_1 - T}$$

REGULARIZING GROWTH AT THE SINGULARITY: $T_1 \quad \frac{dN}{dT} = \frac{C}{(T_1 - T)^2} \quad \frac{dN}{dT} = \frac{C}{(T_1 - T)^2 + \tau^2}$

INSTANTANEOUS EXPONENT IS THE AGE OF THE EPOCH: $T_E = T_1 - T$

LINEAR AND HYPERBOLIC GROWTH ARE SELF-SIMILAR.

PRINCIPAL RESULTS OF THE THEORY

- POPULATION IS THE DOMINANT VARIABLE, DETERMINING THE GROSS PATTERN OF GROWTH, THE PARAMETER OF ORDER. THE LARGE PARAMETER K DETERMINES ALL RESULTS OF THEORY.
- THIS IS EXPRESSED AS THE PRINCIPLE OF THE DEMOGRAPHIC IMPERATIVE, INSTEAD OF THE POPULATION PRINCIPLE OF MALTHUS, BY WHICH GROWTH IS LIMITED BY RESOURCES.
- GROWTH IS CULMINATED BY THE DEMOGRAPHIC TRANSITION. IT IS SIMILAR TO A SHOCK WAVE IN SUPERSONIC FLOW AND ITS DURATION IS LIMITED BY THE 'MICROSCOPIC' TIME OF THE PHENOMENOLOGICAL THEORY – THE HUMAN LIFE SPAN.
- GLOBAL POPULATION WILL BE LIMITED AT 10 – 12 BILLION AND THE NUMBER OF PEOPLE, WHO EVER LIVED IS ~ 100 BILLION.
- INTERNAL FACTORS STABILIZE GROWTH, SEEN IN THE GLOBAL CULTURAL AND DEMOGRAPHIC CYCLES INDICATING STABILITY. IT ARE THESE FACTORS, WHICH DETERMINE THE 'LIMITS OF GROWTH,' AND NOT RESOURCES OR THE ENVIRONMENT.

FORECASTS OF THE THEORY

- AFTER THE TRANSITION AN EPOCH OF EQUILIBRIUM WITH A ZERO GROWTH RATE IS TO BE EXPECTED.
- UP TO TRANSITION INEQUALITIES AND INEQUITIES ARE TO GROW, WITH A CRISIS OF FAMILY AND GOVERNANCE. AFTER THE TRANSITION A TRANQUIL PHASE MAY BE EXPECTED.
- DEVELOPED COUNTRIES ARE NOW FACING THE **TFR** CRISIS. HOW WILL IT BE RESOLVED IN THE FUTURE?
- CAN WE EXPECT LESS STRESS AND MILITANCE IN THIS NEW STAGE OF HISTORY.
WILL THE QUALITY OF LIFE IN A KNOWLEDGE SOCIETY BECOME THE FINAL DESTINY OF MAN?

PROBLEMS OF META-ECONOMICS

- RIGHT FROM THE BEGINNING, GROWTH OF MANKIND WAS DETERMINED BY GENERALIZED INFORMATIONAL FACTORS, WHICH MODERATED SOCIAL EVOLUTION AND ECONOMIC DEVELOPMENT.
- THE GLOBAL SYSTEM IS FAR FROM EQUILIBRIUM, – HENCE GROWTH OF INEQUITIES. HOW CAN WE THEN RECONCILE THE THEORY OF GROWTH WITH VALRASIAN ECONOMICS, BASED ON THE CONCEPT OF A SLOWLY CHANGING STATE IN EQUILIBRIUM?
- WILL THE FUTURE BE DETERMINED BY THE ‘SOFTWARE’ – CULTURE OF AN INFORMATION DOMINATED WORLD, RATHER THAN ITS HARDWARE?

MAIN PUBLICATIONS

- Kapitza S.P. The phenomenological theory of world population growth. «Physics-uspekhi», Vol. 146, N1, 63-80, 1996
- Kapitza S.P. Global population blow-up and after. The demographic revolution and information society. Report to the Club of Rome. Hamburg, 256pp. 2006
- Kapitza S.P. The statistical theory of global population growth. In «Formal description of evolving systems». Eds. J.Nation et al., Kluwer Academic Publishers, 2003

WE SHOULD THANK GOD THE
CREATOR FOR ALL THAT IS SIMPLE
IS TRUE, AND THAT ALL THINGS
COMPLICATED ARE NOT TRUE.

Grigorii Skovoroda

18th century Ukrainian philosopher