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Nov 2001

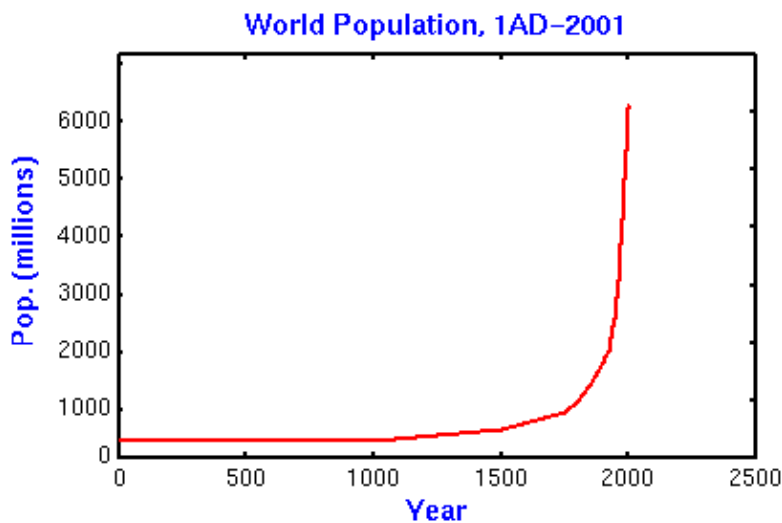
News

Population ex–explosion?



Along with nuclear proliferation and the deteriorating condition of the natural environment, human population growth has become an issue of significant public concern during the past century. With the global population increasing at an ever–accelerating rate, how can the world continue to support its freight of humanity?

Certainly, the increasing rate of population growth over the last two millennia paints an alarming picture. The graph below shows global population levels from the year 1AD until the present. (Note that figures prior to 1950 are historical estimates, as exact data doesn't exist). This graph shows a classic exponential growth in population levels. Projecting this curve into the future suggests that global population levels will continue to rocket upwards.



World Population 1AD–2001 (UN historical estimates, 1995)

However, researchers have recently suggested in the scientific journal Nature that global population levels may actually cease growing before the end of this century, and even begin to decline. This represents a radical departure from current trends. Should mathematicians be alarmed about the statistical abilities of these researchers?

When maths is not enough

From the time of Thomas Malthus, the father of modern population studies, researchers been developing and refining mathematical models of how populations grow. Unfortunately, the core difficulty lies not in developing and applying the models themselves, but in working out what numbers to feed into them.

Many factors have a bearing on population levels. Even small changes in factors such as female fertility and infant/child mortality can have a huge effect in the longer term. The challenge for population prediction is not in understanding what numerical effect these factors have. Rather, it is in predicting how these factors themselves are going to change over time.

Fertility rates, for example, are strongly affected by issues such as economic resources, access to contraception and availability of education for women. These influencing factors are themselves affected by all kinds of economic, social and political conditions, both local and global, which can change in sudden and unexpected ways. Similarly, average lifespan has a significant effect on overall population levels and can change suddenly due to unexpected medical advances or sudden epidemics of disease (such as the current devastating effect of HIV/AIDS in some areas).

Predicting future population levels is difficult because it involves predicting how statistical measures such as birth and death rates are likely to change over time. This involves making huge assumptions about social and political conditions, and about how these conditions might change and the effects this might have. Although the statistical calculations themselves may not be hugely difficult, reasonable prediction of population levels in the long term is almost impossible for the mathematician who is not also an expert in economics, sociology and political science.

Kona Macphee



Plus is part of the family of activities in the Millennium Mathematics Project, which also includes the NRICH and MOTIVATE sites.