

# THE ANTHROSPHERE

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We will create life from inanimate compounds, and we will find life on Mars or in space. But the life that more immediately interests me lies between these extremes, in the middle range we all inhabit between our genes and our stars. It is the thin bleeding line within the thin blue line, the anthroposphere within the biosphere, the part of the material world in which we live out our lives. It is us.

And we are rapidly and inexorably changing. I do not mean that our numbers are exploding, a topic that has been attracting attention since Malthus. I mean a very modern and massive set of changes in the composition of the human population.

The global population stood at one million in 10,000 BC, fifty million at 1000 BC, and three-hundred-ten million in AD 1000. It stood at about one billion in 1800, 1.65 billion in 1900, and six billion in 2000. Analysis of these macrohistorical trends in human population usually focuses on this population growth and on the "demographic transition" underlying it.

During the first stage of the demographic transition, life—as Hobbes rightly suggested—was nasty, brutish, and short. There was a balance between birthrates and death rates, and both were very high (thirty to fifty per thousand people per year). The hu-

man population grew less than 0.05 percent annually, with a doubling time of over a thousand years. This state of affairs was true of all human populations everywhere, until the late eighteenth century.

Then, during the second stage, the death rate began to decline—first in northwestern Europe, but then spreading over the next hundred years to the south and east. The decline in the death rate was due initially to improvements in food supply and in public health, both of which reduced mortality, particularly in childhood. As a consequence, there was a population explosion.

During the third stage, birthrates dropped for the first time in human history. The prior decline in childhood mortality probably prompted parents to realize that they did not need as many children; and increasing urbanization, increasing female literacy, and (eventually) contraceptive technology also played a part.

Finally, during the fourth stage—in which the developed world currently finds itself—there is renewed stability. Birth and death rates are again in balance, but now both are relatively low. Causes of mortality have shifted from the premodern pattern dominated by infectious diseases, perinatal diseases, and nutritional diseases to one dominated by chronic diseases, mental illnesses, and behavioral conditions.

This broad story, however, conceals as much as it reveals. There are other demographic developments worldwide beyond the increasing overall size of the population, developments that are still unfolding and that matter much more. Changes in four aspects of population structure are key: (1) sex ratio, (2) age structure, (3) kinship systems, and (4) income distribution.

Sex ratios are becoming increasingly unbalanced in many parts of the world, especially in China and India (which account for 37 percent of the global population). The normal sex ratio at birth is roughly one-hundred-six males for every hundred females, but it may soon be as high as one-hundred-twenty for

young people in China, or as high as one-hundred-eleven in India. This shift, much discussed, may arise from preferential abortion or the neglect of baby girls relative to boys. Gender imbalance may also have other determinants, such as large-scale migration of one or the other sex in search of work. This shift has numerous implications. For example, given the historical role of females as caregivers to elderly parents, a shortage of women to fill this role will induce large-scale social adjustments. Moreover, an excess of low-status men unable to find wives results in an easy (and large) pool of recruits for extremism and violence.

This shift in gender ratios may have other, less heralded implications. Some of my own work has suggested that this shift may actually shorten men's lives, reversing some of the historic progress we have made. Across a range of species, skewed sex ratios result in intensified competition for sexual partners, and this induces stress for the supernumerary sex. In humans, it seems, a 5 percent excess of males at the time of sexual maturity shortens the survival of men by about three months in late life, which is a very substantial loss.

On the other hand, the population worldwide is getting older, especially in the developed world. Globally, the United Nations estimates that the proportion of people aged sixty and over will double between 2000 and 2050, from 10 percent to 21 percent, and the proportion of children will drop from 30 percent to 21 percent. This change also has numerous implications, including for the "dependency ratio," meaning that fewer young people are available to provide for the medical and economic needs of the elderly. Much less heralded is the fact that war is a young person's activity, and it is entirely likely that as populations age, they may become less aggressive.

The changing nature of kinship networks, such as the growth in blended families—whether due to changing divorce patterns in the developed world or AIDS killing off parents in Africa—affects the network of obligations and entitlements within fami-

lies. Changing kinship systems in modern American society (with complex mixtures of remarried and cohabiting couples, half-siblings, step-siblings, and so on) profoundly affect caregiving, retirement, and bequests. Who cares for Grandma? Who gets her money when she dies?

Finally, it is not just the balance between males and females, or young and old, that is changing but also the balance between rich and poor. Income inequality is reaching historic heights throughout the world. One percent of the world's people receives 57 percent of the income. Income inequality in the United States is presently at its highest recorded levels, exceeding even the Roaring Twenties. And while economic development in China has proceeded with astonishing rapidity, income is not evenly distributed; the prospects for conflict in that country as a result seem very high in the coming decades.

Since we have no real predators, a key feature of the human environment is other humans. In our rush to focus on threats such as global warming and environmental degradation, we should not ignore this fact. It is well to look around at who, and not just what, surrounds us. Population structure will change everything. Our health, wealth, and peace depend on it.