

# Sex, Economics & Evolution

## Malthus, Darwin, and the descent of economics

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THE MALTHUSIAN doctrine of overpopulation continues to distort both the social sciences and the problem-solving aspirations of policy-makers.

Malthus's Principle of Population continues to masquerade as science when, as Malthus himself pointed out in the opening paragraphs of his famous essay, the theory is unsupported by facts. Why is it that a theory that was

undocumented in its time and remains without scientific corroboration continues to inform the public debate and social policy of modern times? Probably, argues Dr. Remoff, because, although it is wrong, it is easy to understand.

The notion that poverty was due to unrestrained reproduction among low income families is a myth, but it fatally influenced Charles Darwin's theory of evolution. It has also prejudiced the development of economics.

Dr. Remoff challenges the Theory of Natural Selection's focus on Darwin's embrace of the doomsday philosophies of the Reverend

Thomas Malthus. She explores ways in which the theory of evolution could be strengthened by a correct understanding of economic behaviour. And economics could be enriched by an equivalent understanding of the laws of biology, which would relocate economics in nature.

Under-development in the Third World, and the global environmental crisis, require rational strategies for reform: these are most likely to be delivered once scientists appreciate that land is the missing link between economics and biology.

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CHARLES DARWIN, the father of modern biology, and Thomas Malthus, the first professional economist, are responsible for a curious link between the two sciences that has served neither field well. Darwin is best known for his Theory of Evolution, Malthus for his Principle of Population. Darwin credits Malthus's arguments about the tendency of populations to expand beyond the means for their support with enabling him to formulate the Theory of Natural Selection.

There is gentle irony in the fact that Malthus, the minister, enabled Darwin, the empiricist, to remove the study of the origin of all life from the realm of religion and make it the province of science. The irony continues in that evolution, the fact of which has been established beyond doubt, is, even in the 21st century, subject to attack by those whose essential motivation is religious.<sup>1</sup>

Malthus remains associated with his enduring, though misguided, predictions about demographic increase. However, he also wrote an essay on the Law of Rent, which affords the tools for clarifying the issues that concerned him. David Ricardo, another early economist, responded to flaws in Malthus's description of the Law of Rent with the treatise, *The Principles of Political Economy and Taxation*, for which he subsequently became famous. Ricardo had a much surer grasp of the subject than did Malthus. Henry George, in the United States, picked up the Law of Rent where Ricardo left off. But George did more than simply build a logical model that demonstrated how any increase in productivity flowed to the landlord, not to labour or capital: he also offered a solution that respected the right to privately held title in land.

The Law of Rent, as developed by George, offers both wonderfully consistent internal logic and testable hypotheses. Nonetheless, it has never played a central role in the public debate and social policy of modern times. The Law of Rent, even though correct, remains largely unknown. In part, this is because the logic of the Law of Rent requires careful thought before one fully grasps its far-reaching implications. It can't be explained in a sentence as can the Principle of Population.

SCIENTIFIC THEORIES do not occur in a vacuum. Social bias **Sex and social bias** influences which theories are likely to win support and which, although potentially useful, are ultimately rejected. Darwin's Theory of Sexual Selection is at least as important in explaining speciation events as is natural selection, and yet it was never as enthusiastically received. This was a lifelong disappointment and puzzle to Darwin.

Darwin's own attitudes toward female intelligence, reflecting as they did the assumptions of Victorian England, may have played an unwitting part in the lukewarm reception granted this important theory. Sexual selection almost always operates through a system of female choice. In the

book devoted to elucidating the evolutionary importance of sexual selection, *The Descent of Man and Selection in Relation to Sex*, Darwin says, "Hence the females have the opportunity of selecting one out of several males, on the supposition that their mental capacity suffices for the exertion of a choice".<sup>2</sup> Darwin is talking here of all animals, not just human ones. However, his endorsement of intelligence in human females is not much more enthusiastic. He likens human intelligence to a secondary sexual character and claims that it is "transmitted more fully to the male than to the female offspring".<sup>3</sup>

Although natural selection was controversial for theological reasons, its scientific base in Malthus's *Principle of Population* was generally unchallenged. By the time *The Origin of Species* was published, Malthus's demographic conclusions were more than 70 years old, but intervening socioeconomic conditions in Ireland – rapid population increase, growing poverty and, in 1846, the first of the potato famines – kept his predictions firmly in the public mind.

Evolutionary theory, dealing as it does with an animal's ability to exploit available resources, needs to take a species' economic strategies into account. It is regrettable that Malthus was the economist Darwin embraced. David Ricardo, writing in 1817, had a far better understanding of human economic adaptations than did Malthus.

Ricardo warned of the economic distortions that result when we ignore our special relationship with land and other natural resources. In *The Principles of Political Economy and Taxation*, Ricardo sees an England divided into different classes. Industrialists. Landowners. Labourers. The wealth of nations is not evenly distributed among the various groups. The landlord, because of his monopolistic ability to deny others access to the raw materials necessary to life, finds his interests opposed to those of every other class of society.

As the title of his book suggests, Ricardo describes the impact of various systems of taxation on the distribution of wealth. Despite the fact that he recognises the penalty to labour that is introduced when one fails to draw a distinction between taxing land and taxing the improvements on that land, he fails to use that distinction to provide a remedy. Nonetheless, by focusing on the importance of differentiating between that which is naturally created and that which is the product of human effort, he keeps the Law of Rent anchored in its biological roots. Land is something special. Land is something different. Land is not created by human enterprise, although such enterprise may improve its yield. By recognising the distinction between land and other forms of capital, Ricardo ties economics securely to its base in nature.

Land and all naturally occurring resources are finite. Wealth is created by the application of human labour to nature's bounty. Free markets aren't

free as long as monopoly holdings in land prevent all people from having equal access to the source of wealth.

ECONOMICS was not dubbed the dismal science until the Rev. Thomas Robert Malthus published, in 1798, *An Essay on the Principle of Population as It Affects the Future Improvement of Society*. Malthus sets out to demonstrate why “the power of population is infinitely greater than the power in the earth to produce subsistence for man. Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio”.<sup>4</sup> It may sound scientifically rigorous, but it was not. **The Principle of Population**

In the introductory paragraph to his famous treatise, Malthus apologises that the rush into print prevented him from supporting his argument with facts. However, the lack of empirical evidence appeared not to shake his confidence in its truth. “He [Malthus, speaking of himself] presumes, however, that the facts which he has adduced will be found to form no inconsiderable evidence for the truth of his opinion respecting the future improvement of mankind. As the Author contemplates this opinion at present, little more appears to be necessary than a plain statement, in addition to the most cursory view of society, to establish it.”<sup>5</sup>

It was fortunate for Malthus, and unfortunate for impoverished people then and ever since, that his reading public appeared to demand no more rigorous support for his statements than he, himself, did. No “scientific” theory is as easy to sell as one that plays to existing social prejudices. This seems to be especially true when the behaviour viewed as reckless or damaging is associated with a social class other than the author’s own. When the behaviour in question is somebody else’s *reproductive* behaviour, any hope for a responsible investigation flies out the window. As a result, the assumption that children cause poverty is rarely challenged.

In fact, poverty causes children. I will argue that increasing the birth rate when access to resources is precarious is a biologically *adaptive* response for human beings. If we want birth rates to decline, we need to address flaws in our *economic* system, not flaws in our *reproductive* response to economic inequity.

LET’S START with the famous statement about the distinction between geometrical and arithmetical. Even though its truth has since been negated, a Malthusian bias continues to inform or, more accurately, misinform many public policy decisions. What Malthus is really saying, wrapped in the guise of pseudo-science, is that *the earth is finite and people aren’t*. There would be no debate if he had gone no further. But he did go further, and the silly claim that populations increase **Natural and artificial scarcities**

geometrically while subsistence increases only arithmetically remains at the heart of dire predictions about the dangers inherent in population growth. This way of thinking enables us to avoid addressing the root causes of poverty as well as diverting attention away from the serious threat to our environmental health caused by wasteful over-consumption.

There was just enough truth in the Malthusian observation to inhibit those investigating such matters from looking further. If he had confined his focus to the finite quality of nature's resources, we might not continue to chase the red herring of overpopulation. Instead, we could concentrate on the *artificial* scarcities that occur when we fail to oblige consumers to defray the social and environmental costs of their consumption.

But Malthus was not arguing for social change or economic justice. He simply wanted to elucidate the workings of a divinely-inspired system that already existed. He assumes that the laws supporting his theory have been fixed by "that Being who first arranged the system of the universe, and for the advantage of his creatures, still executes, according to fixed laws, all its various operations".<sup>6</sup> The apparent purpose of the Creator was not to remove evil from the world.

Life is, generally speaking, a blessing independent of future state. It is a gift the vicious would not throw away, even if they had no fear of death. The partial pain, therefore, that is inflicted by the supreme Creator, while he is forming numberless beings to a capacity for the highest enjoyments, is but the dust in the balance in comparison to the happiness that is communicated, and we have every reason to think that there is no more evil in the world than is absolutely necessary as one of the ingredients in the mighty process.<sup>7</sup>

For Malthus, suffering acts as "an excitement to exertion" since the quantity of evil "diminishes or increases with the indolence of man".<sup>8</sup> In other words, the hope of escaping the heavy yoke of poverty is the motivation that precedes achievement in those who are somehow able to sidestep its burdens. The poor will always be with us. Their existence is necessary to inspire others to rise in their station in life. If Voltaire had not published *Candide* 38 years before Malthus published his *Principle of Population*, I would be certain the good reverend was the inspiration for Doctor Pangloss.

**The Law of Rent** MALTHUS MAINTAINS that he is motivated "solely by love of truth, and not by any prejudices against any particular set of men".<sup>9</sup>

His intentions were noble, but he was unable to hold to them throughout his career. By the time he published *Principles of Political Economy* in 1820, he had taken the gloves off. Now he was more than ready to place much of the blame for the impoverished conditions he documented in Ireland squarely on the Irish themselves.

I find his willingness to blame the victim in Ireland interesting in light of the fact that, in an 1808 anonymous book review, Malthus suggested a Land Tax as a solution to the Irish problem. What happened between the publication of this review in 1808 and the publication of the *Principles of Political Economy* in 1820? How could a man familiar with the Law of Rent and its economic implications fail to consistently champion the right of access to natural resources?

Malthus was familiar with the Law of Rent. In 1815, he published *An Inquiry into the Nature of Rent and the Principles by Which It Is Regulated*. In this pamphlet he gives what, at first reading, is a fairly accurate definition of the Law of Rent. However, just a couple of paragraphs later he claims that those who write about rent make the mistake of ascribing to land ownership the characteristics of a monopoly.

Malthus goes to great pains to point out the ways in which land ownership cannot be a monopoly. He entirely misses the artificial scarcity created by monopoly holdings. He confuses the land itself with the produce grown on it. What led him astray? Why was he able to ignore the flaws in his own rational process? The human brain is a trickster. It is often far better at rationalisation than it is at reason. It was Malthus's commitment to his *Principle of Population* that enabled rationalisation to trump reason. "The cause of the high price of the necessaries of life above the cost of their production, is to be found in their abundance rather than their scarcity."<sup>10</sup> Even those who argue that the Law of Supply and Demand fails to account for all the variables in human decision-making would have difficulty accepting any argument based on the line of reasoning contained in the above quote.

The reason the argument in this essay on rent (which was written in response to the debate over the Corn Laws) is so flawed is that Malthus insists that "it is physically impossible that the number of demanders should increase, while the quantity of produce diminishes, as the demanders only exist by means of this produce".<sup>11</sup> It is this erroneous understanding that allows Malthus to claim that land cannot meet the conditions of monopoly. He assumes that humans exist in a state where populations increase in response to abundant food supplies. Therefore, the demanders exist only because produce is abundant. Don't try to impose logic on the argument. It makes sense only to someone already blinded by the brilliance of his own ideas.

Despite the wisdom contained in that anonymous book review, Malthus was neither looking for a corrective to existing poverty nor willing to allow that Ricardo's distinction between land and the produce grown on it might have some validity. By the end of his career, he took strong exception to Ricardo's indictment of the landlord.

**Infection of scientific theories** MALTHUS'S reading public largely embraced his *Principle of Population*. Although it was not until he published the *Principles of Political Economy* that he turned to Ireland for documentation, the social climate was ready for his line of reasoning. The English were tired of being blamed for the "Irish problem". Thanks to Malthus, there was now justification for ignoring the role monopoly landholding had played in the poverty in Ireland and elsewhere. Guilt is an uncomfortable emotion. How much easier to blame the Irish, to blame the poor, for their failure to practice the necessary restraint in "indoor activities" and for their "very general prevalence of habits of indolence". Scientific theories are not immune to infection by social prejudices.

By the time Malthus's *Principles of Political Economy* was published, his emphasis is focused squarely on the dangers of excessive population growth. In fact, he goes so far as to argue that not all segments of society could enjoy economic plenty. He uses formulations drawn from early models of the Law of Rent to justify a theory of wages that makes the minimum cost of subsistence an acceptable wage standard. Malthus incorrectly believed that given the means, human populations would rapidly increase beyond what ecologists now call the carrying capacity of their environmental niche.

Ricardo sees land as one of the three factors of production – land, labour, capital – but Malthus considers land largely in terms of the rate at which it can be brought *into* production. Economics was heading for the first of its wrong turns, for that distinction is an important one. Land is not simply another form of capital. No naturally occurring resource is created by human labour. And every naturally occurring resource is, like land, absolutely finite.

Not only is land finite, but the speculative withholding of land from full and productive use actually *reduces* the amount of land available for cultivation. In order to keep land fully productive and able to feed people, it is necessary to hold firmly to the distinctive nature of land as one of the three factors of economics. For when that distinction is honoured and understood, it becomes apparent that the speculative withholding of land can be countered only by the *public* collection of the economic rent. In what could almost be called a self-fulfilling prophecy, Malthus was ignoring the Law of Rent and taking economics down an errant path.

Unfortunately that wrong turn was given the weight of scientific authority when Charles Darwin, arguably the father of modern biology, allowed Thomas Malthus to inspire the greatest scientific theory of its time. Only Einstein's subsequent Theory of Relativity can claim to have had as great an impact on our understanding of the world.

WE ARE ALL familiar with the story of how Darwin, after 20 years of scrupulous research and data collection, was forced to publish *The Origin of Species* (1859) when he learned that Alfred Russel Wallace had independently formulated his own theory of natural selection. **The Origin of Species**

Unfortunately, Wallace, like Darwin, claimed that the writings of Thomas Malthus provided the flash of insight that revealed the mechanism through which species would be shaped and selected. However, Wallace, unlike Darwin, later repudiated Malthus's demographic pronouncements and looked to political economy for solutions to the problem of poverty and overpopulation. In an interesting aside to evolutionary theory, by 1885 Wallace was quoted as saying:

I hold with Henry George, that at the back of every great social evil will be found a great political wrong. Let us seek out the wrong thing, and fearlessly put it right; and we shall then find that man is not so completely out of harmony with the universe in which he exists that thousands must starve in the midst of plenty, and that the actual producers of wealth in the wealthiest country in the world must continue to live without enjoying a fair and adequate share of the wealth which they create. <sup>12</sup>

But by the time Wallace came to this view, the Malthusian distortion in the Theory of Evolution was well established and Malthus himself was dead and beyond any attempt at persuasion.

Just as economics was losing its base in biology, the Theory of Evolution was incorporating the worst of economic thought as one of its underlying tenets. It is an error that remains unchallenged by modern biologists, even though Darwin himself was aware of the uncomfortable corner into which his embrace of Malthusian theory had forced him.

The social thought of the time was infecting its scientific theories. Interestingly enough, all three men – Malthus, Darwin, Wallace – understood that when it came to humans, there were exceptions to the unlimited population growth predicted by Malthusian theory.

Malthus claimed to base his theory on data from the real world, but a close examination of his evidence reveals more contradictions than we would comfortably accept from science today. The Irish were indeed impoverished. Population growth was indeed explosive. However, just because two events occur together in time, one cannot assume a causal relationship. Malthus is pushed to some interesting conclusions in his efforts to prove that population pressure causes poverty. If there is a causal relationship between population growth and poverty at all, it is much more likely to be poverty that is the cause and population growth the effect.

**The potato famine in Ireland** AT THE TIME Malthus conducted his research, the Irish peasants were subsisting almost entirely on potatoes. He concludes that it was this subsistence diet which made the increase in the number of peasants possible.

With regard to potatoes, we have very near to us an opportunity of their becoming the vegetable food of the great mass of people. The population of Ireland has increased faster during the last hundred years than that of any other country of Europe: and under its actual government this fact cannot be rationally accounted for, but from the introduction and gradual extension of the use of the potato. I am persuaded, that had it not been for the potato, the population of Ireland would not much more than doubled, instead of much more than quadrupled, during the last century.<sup>13</sup>

Malthus is on very shaky ground. He starts with an assumption that human populations will increase, given the means, and then looks at what is a diet inferior to the one that existed before absentee landlords severed the natural connection between people and their means of subsistence. He concludes that it is this inferior diet that made the growth possible. The potato was a subsistence diet. The Irish did continue to produce more varied foodstuffs, but those products were exported to England.

Actually, Malthus was not entirely off base in his praise of the potato as the food that supported Irish population growth. Recent research on the nutritional value of the potato makes it clear that if one must subsist on a diet based on a single provision, the potato is a good choice. Although Malthus could not have been aware of the nutritional complexity of the potato, it is that complexity which enabled the Irish to thrive until their crops were decimated by the blight. The general health of the pre-famine Irish may fairly be attributed to the potato.

The dramatic increase in population, however, was rooted in factors that had more to do with poverty than with plenty. During the famine years, the grain that the English government sent to replace the loss of the primary foodstuff of a nation of disenfranchised peasants, was too little, too late. Even if the first cornmeal had arrived in a timely fashion, it alone lacked the range of nutrients found in the potato and would have only postponed the tragedy, not prevented it.

When the first of the potato famines struck in 1846, it seemed to affirm the dire predictions of Malthus. Ireland appeared to be a perfect example of selection operating at the extremes. Small wonder that Darwin and Wallace looked at the potato famine and found in the writings of Malthus the mechanism by which natural selection would operate. Here was a population that had expanded beyond the means of support, thereby allowing the blind hand of nature to weed the unfit from the fit. Malthus, having died in 1834, was not around to claim validation for his theory.

However, the deaths of over a million Irish people did not validate the Malthusian premise. The famine began with a natural disaster in the form of a potato blight, a blight whose spread was made all the more rapid and devastating by the lack of diversified planting. What happened in Ireland resulted from the collision of a natural disaster with a political one, and the biased hand of politics was more responsible for all those deaths than was the unbiased influence of natural selection.

The Irish continued to grow enough to feed themselves throughout the potato famines. Ireland remained a net exporter of food, but the Irish crops went to feed others. When you don't own your own land, your survival choices are limited.

MALTHUS was not unaware of the economic distortions produced by land monopoly in Ireland. He continues his paragraph on the relationship between population growth and the potato by discussing the way in which population growth affects property values and ultimately ends up depressing wages. **Demographic pressure increased rents**

This increase of population has prevented lands from being thrown out of cultivation, or given greater value to natural pasture, at the same time it has occasioned a great fall in the money wages of labour. This fall, experience tells us, has not been accompanied by a proportionate rise in profits, and the consequence is a considerable rise in rents. The wheat, oats and cattle of Ireland are sold to England, and bear English money prices, while they are cultivated and tended by labour paid at half the money price; a state of things which must generally increase the revenue derived from profits, or the revenue derived from rents; and practical information assures us, that it is the latter which has derived the greatest benefit from it.<sup>14</sup>

The Law of Rent was easier to document empirically than was the Principle of Population. When Malthus looked at his native England, exceptions to the Principle of Population were everywhere. If his hypothesis that populations will expand geometrically given the means is correct, then we ought to see the greatest population increases where we find the greatest means. In fact, even Malthus found the opposite to be the case. What does he do with this conflicting evidence? He explains it away. He argues that an increase in real wages or in the power to command "a large portion of the necessities of life"<sup>15</sup> could actually have two vastly different results. The first was an increase in population; the second was "a decided improvement in the modes of subsistence, and in the conveniences and comforts enjoyed without a proportionate acceleration in the rate of increase".<sup>16</sup> He acknowledges that "among the circumstances which contribute to the character first described, the most efficient will be found to be despotism, oppression and ignorance: among those which contribute to the latter character, civil and political liberty and education".<sup>17</sup>

**Progress and Poverty** IF MALTHUS wanted a hypothesis that would be validated by measurements based on empirical observation, he would have done well to stick with the Law of Rent. Whenever the political structures of society encourage monopoly holdings in land or the other natural resources necessary to life, poverty will increase even in nations otherwise characterised by extreme wealth. The American economist Henry George, building on the work of Ricardo, developed this theory with flawless logic and eloquence in his 1879 classic, *Progress and Poverty*.

George's hypothesis is testable. The failure of modern social and economic theorists to undertake the studies that would demonstrate its truth may in large part be due to a psychological tendency to believe that one's own good fortune is the result of superior ability, hard work, and perhaps just a measure of luck. Those blessed with the leisure and resources necessary to conduct economic research unconsciously buy into the Horatio Alger myth. Is it an accident of bad timing that Alger's novels were contemporary with the writings of Henry George? Both authors enjoyed a huge following. If social prejudices were not actively distorting scientific thought, they almost certainly had a hand in influencing the topics selected for research.

At this point, we recall the social prejudices of Thomas Malthus. Although he acknowledges that at least some of the blame for population increase fell to the political systems, he continually returns to the "very general prevalence of habits of indolence"<sup>18</sup> in Ireland to make the case for his Principle of Population. Malthus's statistics carelessly slip between claiming that the potato made the population increase possible and faulting the Irish character for the nation's poverty.

The water got a lot muddier when Malthus looked at his native island. During the first half of the 18th century, the price of wheat in England and Scotland fell at the same time as wages rose. The worker could now buy a full peck of wheat with a day's wages as contrasted to only two-third's of a peck in the 60 years preceding this period. According to Malthus's theory, population should have increased; it did not. As Malthus himself points out, increased resources "did not produce an increase in population, but a great alteration for the better in the food, dress, and houses of the lower classes of society, in that country".<sup>19</sup>

**Land links economics and biology** DARWIN was misled when he allowed Malthus to influence his understanding of natural selection. How much better for both economics and biology it would have been if he had turned instead to Ricardo.

The vital link between economics and biology is land. Land is the regulating mechanism that holds both population growth and

environmental destruction in check. This is my fundamental argument. Once a person's *natural* right of access to the resources on which life depends is distorted by systems of ownership that create landless classes, the alienated classes can be forced to work for subsistence wages. But there is more to the argument. In humans, a natural, *biologically adaptive* reaction to such a state of affairs is for those deprived of a reliable access to material resources to increase the sheer numbers of their offspring.

Malthus tied expanding populations to material progress at a time when the English citizenry was awed by the dawning of the industrial age. It was not difficult to convince the general public that the increase in productivity made possible by the mushroom-like growth of technological advance was also responsible for the growth of population that was so apparent in the industrial cities. However, no one questioned why population growth was largely restricted to the classes working at subsistence level. By contrast, those whose fortunes were expanding demonstrated a *decrease* in family size.

Too few people bothered to question the predictive value of Malthus's statistics. Once Darwin gave the theory the weight of scientific plausibility, by claiming it had inspired his understanding of the mechanism of natural selection, it was too late to turn back. While the pious may have been distressed by the uncomfortable notion that they were descended from apes, the budding social Darwinists were only too happy to seize on Darwin's own confusion between possession of wealth and biological success. The ruthless exploitation of the landless classes in the factories and mills could be justified. This was nature red in tooth and claw. This was Darwin's "struggle for existence". The wealthy somehow deserved the excess rewards that fell their way. All this was proof of their biological superiority.

IN *The Origin of Species*, aware of the controversy that his theory would provoke, Darwin omitted explicit discussion of the origin of humankind. He saved that topic for his later book, *The Descent of Man and Selection in Relation to Sex*. Bear the full title in mind. It is often referred to simply as *The Descent of Man*, but in this book, Darwin makes a strong case for the influence of sexual selection in human evolution. It is an emphasis that has unfortunately been dismissed. By restoring sexual selection to its central role in human development, I hope to save Darwin from the dilemma into which he had been forced by his reliance on Malthus.

## The Descent of Man

What was Darwin's Malthusian Dilemma? The conclusion to which the Malthusian dependence on numbers forced him was squarely at odds with his observations of human reproductive behaviour in the world around him. Malthus had not been concerned with evolution; he had been

concerned with overpopulation. His approach was not scientific. It was based on sweeping generalisations that resisted empirical documentation.

Darwin, on the other hand, paid exquisite attention to detail. He was an excellent researcher, a meticulous gatherer of data who corresponded widely with other naturalists and added their observations to his own. His books offer a brilliantly developed case of how, under a system of natural selection, one could account for the variation seen between members of closely related species. He relied heavily on statistics gathered while working as a naturalist on the sailing vessel, the HMS Beagle. It was here that he was exposed to the now famous Galapagos Islands. He was fascinated to observe how geographic isolation resulted in species that, while obviously related to those on land, were distinctly different from their cousins.

In the opening pages of *The Origin of Species*, he writes:

This is the doctrine of Malthus, applied to the whole animal and vegetable kingdom. As many more individuals of each species are born than can possibly survive; and as, consequently there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving and thus be naturally selected.<sup>20</sup>

Darwin's view of natural selection was heavily dependent on numbers. He recognised that there were random variations in form, and he believed that natural selection worked on these variations through competition for scarce resources. The more favourably adapted forms survived, while their ancestors perished. It was purely a numbers game. The best adapted had more children and crowded out and replaced those that were less fertile.

Almost everywhere he looked, he found support for his new theory. Humans were the lone exception, and it puzzled and dismayed him. Natural selection favoured the most fit, the best adapted. Humans were obviously high on the evolutionary scale. We were, in the eyes of his fellow Victorians, the crowning glory of God's creation. Darwin, however, rejected notions of divine intervention in the human condition. He insisted we were animals shaped by the same forces of nature that shaped the complex and teeming world of flora and fauna. How, then, can we explain our failure to follow the rules of his new game?

Darwin is obviously troubled as he summarises, in *The Descent of Man*, the findings of his research and that of some of his contemporaries.

A most important obstacle in civilised countries to an increase in the number of men of a superior class has been...the fact that the very poor and reckless, who are often degraded by vice, almost invariably marry early, while the careful and frugal, who are otherwise virtuous, marry late in life, so that they will be able to support themselves and their children in comfort. Those who marry early produce

within a given period not only a greater number of generations, but, as shown by Dr. Duncan, they produce many more children. The children, moreover, that are born by mothers during the prime of life are heavier and larger, and therefore more probably vigorous, than those born at other periods. Thus the reckless, degraded, and often vicious members of a society, tend to increase at a quicker rate than the provident and generally virtuous members. Or as Mr. Greg puts the case: "The careless, squalid, unambitious Irishman multiplies like rabbits; the frugal, foreseeing, self-respecting, ambitious Scot, stern in his morality, sagacious and disciplined in his intelligence, passes his best years in struggle and in celibacy, marries late and leaves few behind him. Given a land originally peopled by a thousand Saxons and a thousand Celts – and in a dozen generations five-sixths of the population would be Celts, but five-sixths of the property, of the power, of the intellect, would belong to the one sixth of Saxons that remained. In the eternal struggle for existence it would be the inferior and less favoured race that had prevailed – and prevailed not by virtue of its good qualities but of its faults".<sup>21</sup>

Those worrisome Irish and their exploding populations were causing trouble again! The social and political biases of the day were not limited to Malthus. What is going on here? Whatever it is, it is not natural selection as inspired by Malthus and envisioned by Darwin. Darwin could only conclude that this aberrant behaviour must be fairly recent in our history and would have to be adjusted for; otherwise, our species would "retrograde". He warns: "We must remember that progress is no invariable rule".<sup>22</sup>

THE PRINCIPLE OF POPULATION is hard to document empirically. What these and other researchers clearly do document is a correlation between poverty and large populations. Is there a predictive hypothesis somewhere in all of this? I suspect that the Law of Rent could better explain the situation than the Principle of Population. In any country where one-sixth of the population controls five-sixths of the property, there is going to be poverty. Where we find poverty, we also find high birth rates. Such a situation makes excellent evolutionary sense. When conditions are extreme, when humans lack a control of resources adequate to insure that at least some of their offspring will survive to reproductive maturity, the biologically adaptive response is to have more children.

Darwin's Theory of Evolution cannot adequately account for his own observations of human behaviour. Not only that, but modern researchers have had to introduce adjustments in order to make sense of the behaviour of most sexually reproducing species.

What was Darwin's major contribution? Was it to present the exact mechanism whereby evolution occurred? No. Darwin was unaware of the work of Gregor Mendel (1822-1884), the Austrian monk who developed the laws of heredity. Although Darwin argues that natural selection acts

**The poor  
get children**

upon variations that afforded the individual possessing them some advantage, he knew nothing of genes as the unit of inheritance and the source of variation. Darwin's main contribution was to initiate widespread acceptance of the fact that the earth was very much older than previously assumed. It was to demonstrate that within this expanded time frame there was ample opportunity for the kind of gradual adaptation to the environment that resulted in distinct species. No longer did we need to rely on the notion of divine intervention to explain the previously unexplainable. The study of the origins of life was removed from the sphere of religion and placed in the hands of science. There is no small irony in the fact that Malthus, the man Darwin claimed inspired him and the man I claim led him astray, was a man of the cloth.

The theory of evolution is here to stay. There is no doubt that species have evolved over time. Evolution remains theoretical only in that there is still more to learn about the exact process by which species are shaped. Natural selection and sexual selection are important evolutionary engines. However, as we learn more about the human genome, we will learn more about the multiple forces that have shaped us. We have far fewer genes (only about 30,000) than the 100,000 predicted by most biologists prior to the recent cracking of our genetic code. I suspect that within the so-called "junk DNA", loaded as it is with bacterial footprints, we will eventually find a road map to our development as a species. Current research on wasps suggests that bacteria may have played an important part in the speciation of at least two closely related members of the wasp family. The bacterial infection that prevents these two species of wasps from interbreeding suggests the complexity of the forces that give rise to new forms of life. Evolution is not just about numbers.

Darwin looked at human behaviour and failed to perceive that a link was missing in his theory. Instead, he had to assume that humans were somehow operating against their evolutionary self-interest, and that if we did not correct this aberrant behaviour, it would be to the detriment of us all. But something *was* missing in his theory. It was an understanding of the importance of economic behaviour.

**The evolution of sexual reproduction** THE INSISTENCE that evolutionary change occurs as a result of competition over scarce resources, with victory going to those who produce the *most* offspring, may actually interfere with our ability to grasp the way life works. The force of this assumption is so strong that we refuse to abandon it even when we are unable to document it empirically.

For the basic tenets of natural selection to be supported in all species, we would have to confirm the evolutionary advantage of maximising numbers of offspring as well as establish death rate control

of populations. Ecologists will readily admit the difficulties in confirming death rate control of populations, especially of populations of large mammals. In addition, very few animals actually achieve their full reproductive potential. There appear to be internal regulating factors that hold population size in check before it reaches Malthusian proportions.

Why won't we abandon the hard to prove assumption inspired by Malthus? I suspect social bias may once again be shaping scientific theory. Creationists have sought at every turn to discredit the theory of evolution. No respectable scientist wants to contribute to their campaign by giving them even the smallest piece of ammunition. This is unfortunate, because the theory will be strengthened, not weakened, by any understanding that increases its descriptive and predictive value. The *fact* of evolution is well established. It is the *process* that would benefit from some fine-tuning.

By failing to fully understand the intricacies of the evolutionary process, we seriously hamper the search for solutions to real world problems such as poverty, environmental destruction, ecological imbalance, economic dysfunction, and unchecked population growth in some segments of society. The problems I have listed are, at heart, *biological* problems, and unless we get our biology straight, economists and social planners may make things worse before they make them better.

One of the first problems that modern biologists had to address in the numbers game as played by Darwinists was how to explain the evolution of sexual reproduction. Once we understood the mechanism of the gene, a simple mathematical formula for reproductive success was:

$$\text{reproductive success} = \text{gene frequency} (R S = G F)$$

By the time this simple formula came into play, consensus had formed around the idea that the unit on which selection pressure operates is not a species, is not a population, is not even an individual, but is the gene; hence  $R S = G F$ .

This formula works very well in species characterised by asexual reproduction. It breaks down when it is applied to sexually reproducing species. Why? Because meiosis, a special type of cell division found in gamete production, consists of two stages and one of them is *reductional*. In other words, each sperm or egg cell contains only half of the total number of genes of the parent. If evolutionary success is determined by gene frequency, it is hard to explain the evolution of a reproductive strategy that effectively throws away half of its genes before it even begins reproducing. This is the famous, and problematic, cost of meiosis.

John Maynard Smith was the first to ask: "Why sex?" His question

inspired a flurry of responses and touched off some of the most exciting dialogue in theoretical biology. The explanations either made reference to the value of the genetic variability made possible by recombination, or they looked at specific life history models for the species in question and demonstrated how the recombination contributed to a more reliable control of the resources necessary for life. In other words, they looked at the economic behaviour of individuals.

These explanations worked for some species, but were less successful in others. G. C. Williams carefully traced through the mathematics involved in calculating the costs of sexual reproduction. While he was able to demonstrate the adaptive value of sex in a number of species, he concluded it must be a disadvantage in low fecundity organisms such as many insects and vertebrates. We are faced with a dilemma. Given the low birth rate of the human species, its evolutionary success is hard to explain. Williams says:

A commonly assumed measure of population success and well-being is simply the number of individuals. This parameter may sometimes be satisfying and useful, e.g., in comparisons of genetically different fruit fly populations in identical environments. In its crude form, I doubt many people would find this definition consistently acceptable. Is the fox population less successful than the more numerous rabbits on which it feeds? The mere use of numbers as an indication of adaptedness can be made more generally valid by the introduction of various "adjustments".<sup>23</sup>

The puzzle has been to explain our success as a species in the light of our failure to play by Darwin's rules in the numbers game. Part of the problem has been that we have tried to explain a qualitative phenomenon by recourse to a quantitative one. Reproductive success in the Darwinian sense meant numbers. Evolutionary success for most of us is not a tally of how many of us there are but of what those of us who are here are doing. If we measured evolutionary success in terms of sheer numbers, the members of the marine plankton would rank far ahead of us, even though, as Williams points out, "many of them are scarcely different from their ancestors in the English chalk".<sup>24</sup>

There is a solution. Robert Trivers, whose work with the lizard, *Anolis garmani*, provided me with the flash of insight that resolves all these dilemmas, focused on the role of female choice in determining reproductive success. Trivers demonstrates that in this species of lizard, the females select as their sexual and reproductive partners the largest of the available males. He argues that, by their very size, the selected males demonstrate an edge when it comes to resource accruing ability. A system of sexual selection operating through female choice appears to be making appraisals about the economic ability of the potential mates.

G.C. WILLIAMS was correct in pointing out that while determining success by counting the number of individuals in two separate populations of the same species might be useful, the measure was less meaningful when determining the relative success of different species. The "adjustments" he proposed were all economic measures. Trivers introduced the concept of Resource Accruing Ability. That innovation enabled me to understand that there was something missing in the Reproductive Success equals Gene Frequency formula. **Resource accruing opportunity**

A more accurate formula would be: Reproductive Success equals Gene Frequency multiplied by the Resource Accruing Ability of the gene in question.  $RS = GF \times RAA$ . However, to make the formula universal, I talk of Resource Accruing *Opportunity*. The species for which this adjustment is most necessary is our own. Humans are characterised by behavioural *plasticity*. We make complex appraisals of multitudes of factors influencing our survival opportunities and adjust our behaviour accordingly.<sup>25</sup> The crucial factor is not that some genes possess innate resource accruing ability but that varying social and political scenarios either expand or limit the resource accruing *opportunities* of those genes.

In all species *except our own*, the Resource Accruing Opportunity between one member of the species and another is pretty much a constant. Even the variations between the lizards measured by Trivers were slight and not of the magnitude that would interfere with the predictive value of the original formula. Resource Accruing Opportunity in most species is limited to the amount an individual consumes in food or in nesting materials. In any formula containing a constant, the constant can be dropped without affecting the solution. So Darwin's *implied* formula would work for every species except *Homo sapiens*.

By introducing R A O into the formula, we are able to resolve the problem of comparing the success of the fox population to "the more numerous rabbits on which it feeds". But more important, we are able to understand why humans who have a reliable control of resources are able to lower their birthrate and thereby enhance, not endanger, their reproductive success.

The reason a Darwinian appraisal of evolutionary success based on numbers has been so enduring is that *it has predictive value in all species except the human one*. Darwin need not have worried. Our troubling behaviour is not recent in origin. Our species is not going to "retrograde" unless we correct the tendency of the poor to have many children while the rich have few. In fact, as I have argued elsewhere,<sup>26</sup> *sexual selection for economic skill is the engine that drove human evolution and is responsible for the speed with which we evolved*.

**Sexual  
selection  
and female  
choice**

DARWIN WRITES at length about sexual selection in *The Origin of Species*, but he holds that it is responsible largely for differences in secondary sex characteristics. In this first book, in an attempt to help the reader gain comfort with the notion of change by focusing on familiar examples, he also devotes many pages to documenting the role of animal husbandry in creating varieties within a species.

We are all well acquainted with how rapidly such externally imposed selection shapes distinct breeds of dogs, for instance.

Modern biologists are mistaken to dismiss the difference between natural and sexual selection. Natural selection may be dependent on numbers. It may determine which members of a species survive. Sexual selection determines which members get born and with what traits. Consider it to be a system similar to the one imposed by animal breeders. However, under an authentic system of sexual selection, the animal itself picks the traits important to its survival. This is what humans have done throughout our evolutionary history. We have gone animal husbandry one better. We have made the selection force internal rather than external. We control our own destiny, and we do it with sexual selection operating through a system of female choice. *The loss imposed on us by the cost of meiosis is nothing compared to the gain made possible by a reproductive strategy based in sexual selection as practiced by the female of the species.*

Neo-Darwinians may largely dismiss sexual selection. Darwin did not. In the preface to the second edition of *The Descent of Man and Selection in Relation to Sex*, he states:

[I]t has been said by several critics that when I found that many details of structure in man could not be explained through natural selection, I invented sexual selection; I gave, however, a tolerably clear sketch of this principle in the first edition of the "Origin of Species," and I there stated that it was applicable to man. This subject of sexual selection has been treated at full length in the present work, simply because an opportunity was here first afforded me. I have been struck by the likeness of the many half-favourable criticisms on sexual selection, with those which appeared at first on natural selection; such as it would explain some few details, but was certainly not applicable to the extent to which I have employed it. My conviction of the power of sexual selection remains unshaken; but it is probable, or almost certain, that several of my conclusions will hereafter be found erroneous; this can hardly fail to be the case in the first treatment of a subject. When naturalists have become familiar with the idea of sexual selection, it will, as I believe, be much more largely accepted ...<sup>27</sup>

Darwin was wrong on this last point. Sexual selection never achieved the acceptance afforded the more Malthusian concept of natural selection. Natural selection with its dependence on a push against the limits of subsistence won the favour of 19th century thinkers. Sexual selection did

not. Was it easier for the Victorian mind to accept the moral tone of a theory that sketched doom in unchecked population growth, especially as evidenced by the supposedly morally lax Irish, than it was to accept the innate power of the female in the process of sexual selection? Darwin was very clear that it was the female of the species whose tastes shaped those traits molded by sexual selection. However, not even Darwin was willing to grant his female contemporaries this power. He concluded that although female choice had no doubt been a force in our distant forebears or even among "primitive" tribes, it no longer operated in civilised society.

DARWIN HAS MODERN support for his recognition of the power of sexual selection. The first chapter in most population genetics textbooks begins with the 1908 Hardy-Weinberg Law. This algebraic formula is concerned with the equilibrium of gene frequencies in large populations of any given species. Evolution is defined as a change in gene frequency from one generation to the next. The mathematical formula states that after one generation of random mating, gene frequencies remain constant in future generations.

### **The Hardy-Weinberg Law**

The implications of the formula are anything but simple. Exercise after exercise demonstrates how very difficult it is for evolution to occur when the two conditions of the formula are met: when populations are large, and when they are mating at random. Even when death rate control acts on certain phenotypic types, evolution proceeds very slowly under random mating. For example, suppose that in a species with a generational span of thirty years, every individual carrying a double recessive trait was eliminated. It would require 1,500 years to reduce the frequency of the recessive gene by half. Of course, in evolutionary time, 1,500 years is less than the blink of an eye. But death rate control is rarely this consistently thorough over a span of 1,500 years. Given the long generational spans exhibited by humans, it is difficult to explain the rapidity of our evolution relying only on natural selection.

However, not all populations are large, and neo-Darwinians have latched onto a truth first proposed by the great man himself: evolution is more likely to occur in small, geographically isolated groups. The Hardy-Weinberg Law offers the mathematical proof to validate this observation. It also corroborates another of Darwin's observations, the role of sexual selection in shaping evolution, particularly human evolution. Hardy-Weinberg, by insisting on a system of random mating, acknowledges that deviations from random mating can change gene frequencies from one generation to the next and can be the force behind evolutionary change. For some reason, this aspect of the formula tends to be ignored.

In fact, the Hardy-Weinberg Law offers eloquent testimony to the power of sexual selection to shape evolution. Furthermore, it does not take

small geographically isolated populations for it to happen, although any modification would admittedly be more rapid under those conditions. Deviations from random mating result in changes in gene frequency from one generation to the next, and deviations from random mating are, in effect, the result of sexual selection. Now sometimes, as in the case of the examples from animal husbandry offered by Darwin, these deviations from random mating are externally imposed. But sometimes they are not, and when they are not, when they are the result of reproductive decisions made by the animals themselves, they are examples of sexual selection at work. Sexual selection is an effective force of evolutionary change.

**Reproductive strategies** HUMANS are the economic animal. We have large brains. We have opposable thumbs. We have upright posture. We have language, a way with symbols, a way with words. We paint on cave walls, on canvas, and on subways. We make music. We sing. We dance. We are tool-makers, weapon-makers even. Our technological skills are legendary. How did we acquire all of these marvellous attributes? I accept that most of them started with genetic mutations. I do not accept that we had to wait for some limiting factor to push us to the razor's edge of survival for natural selection to blindly determine which of the new traits best adapted us to find a way around disaster. It is hard to explain how music could save us from a Malthusian end, but observe any rock musician surrounded by screaming groupies, and we begin to understand the role of sexual selection in driving the evolution of artistic ability.

It is not just secondary sex characteristics that are shaped by sexual selection. It is physical and behavioural traits of every description. It is any trait that might make a male more attractive to a potential sexual partner. (I have dealt with the argument in favour of female versus male choice elsewhere.<sup>28</sup>) The first economic trade could well have been an exchange of meat for sexual access. The reproductive success of females dictates that they should be able to make precise calculations regarding a male's resource accruing abilities and opportunities. Birds do it. Bees do it. *Anolis garmani* do it. And women do it really well. As a result, economic virtuosity is our hallmark as a species. All animals exhibit some type of economic behaviour, but in the rest of the animal kingdom, this activity is practiced only at the most primitive level and consists of gathering food and fashioning basic shelter. Only humans have the ability to control a far greater share of resources than we can ever personally use in an immediate survival sense.

In most species, an individual's economic functioning is basic. Its physical interaction with the world is limited to the food it eats, the air it breathes, the water it drinks, and the materials it uses to modify the world to provide shelter or nest sites. What humans do is so bizarrely complex

as to appear to be a totally different order of behaviour. But do not be so smitten with our technological high jinks that you lose sight of the underlying purpose of all the glitter and razzmatazz. We have elaborated on a very primitive design, but they serve the fundamental biological functions of survival and reproduction.

Reproduction is, of course, essential in any species that is going to both survive and evolve. Humans, however, do not begin to maximise their reproductive potential. In fact, we are better at not having babies than we are at having them. With the evolution of our concealed ovulation, we broke the link between sex and reproduction that is so nearly universal in other species. The link we have not broken and the one that is as central to us as it is to any species on earth is our need to have access to the naturally occurring resources on which our physical survival is dependent.

However, clever creatures that we are, we are skilled at making appraisals of the reliability of our access to those resources and at adjusting our birth rates in response to our assessments. The goal is to ensure that at least some of our children have a chance of reaching the age when they will be capable of passing our genes into the gene pool of the next generation. The formula which works for humans is not  $R S = G F$ , but  $R S = G F \times R A O$ . It makes excellent biological sense for a species whose economic behaviour varies as much between individuals as it does in our own to increase fertility when economic control is tenuous and to decrease it when it seems guaranteed.

Malthus, by his failure to understand human reproductive strategies, launched both economics and biology on the wrong foot. Economics fails to take our biological natures into account, and biology fails to incorporate appraisals of economic control into its calculations of reproductive success. For those who ignore the power of sexual selection and who worship at the shrine of natural selection, large numbers of offspring indicate a superior adaptation to the environment. But when it comes to skill at having and not having babies, humans are a case apart; not because we are less animal in nature, but because the very speed of our evolution indicates a unique twist on the old numbers game. For us, runaway population growth screams of unreliable access to the natural world, not superior adaptation to it.

POPULATION problems are economic problems, not social problems. They are symptomatic of the breakdown of the distributive function of the economic system. Runaway population growth in any segment of the world's population is our dead canary in the coal mine, the early warning that, ignored, may destroy us all.

**Disruption  
of the  
ecological  
balance**

The solution to economic woes is the same as the solution to

environmental ones. We are a species out of ecological control. We poison the air, the water, the soil. We watch in horror as our numbers double, triple, quadruple in ever shorter periods of time. We destroy rain forests and deal carelessly with the fate of other species without understanding their place in the chain of life in which we may well prove to be the weakest link.

The vital connection between economics and biology is land. Land is the regulating factor that holds both population growth and environmental destruction in check. What has happened to distort our innate relationship with the land, with all the natural resources on which life depends? Where did we go astray?

The disruption of our delicate ecological balance began in England in 1366 when the noble landlords reduced the amount of rent they paid to the crown by 4%. Not surprisingly, the amount of tax paid by the labouring class increased by approximately as much. It seems an innocent enough move, but by 1845, the landowner's taxes had decreased by 95% and labour's had increased by 95%.

This "noble" tax revolt culminated in the end of the feudal system. It also, by way of a series of Enclosure Acts, began the worldwide trend toward the private ownership of land. No one would consider feudalism a model for an egalitarian system, but as long as rents paid to the crown were high, the social bond with the land was maintained.

The process of enclosure began in the mid-16th century, and despite often violent protests by those disenfranchised of their access to common ground, continued through the mid-19th century. By the time the process was complete, the right to the private ownership of land was formalised in law. Today, most people accept such ownership as an inalienable right, but, in fact, it is a violation of our deepest biological needs. However, it is not a violation that needs to be abolished in order to be corrected. There is a remedy in the form of a publicly collected payment of economic rent, or natural resource royalty, or user's fee.

When public expenditures are financed entirely through fees levied against environmental destruction and on monopoly holdings in natural resources, it becomes too expensive to destroy the environment, it becomes too expensive to own more land than one can productively use. Such charges make natural resource consumption costly and serve as a market-driven impetus to use naturally occurring wealth productively. Such charges also counteract the *artificial* scarcity of land resulting from the speculative practice of withholding land from use. With monopoly destroyed, land regains its power as the regulating factor that supports human ecological balance. In addition, the resulting increases in productivity are the source of an increase in *real* wealth and would raise the universal standard of living without unduly stressing the environment.

The Law of Rent is determined by the excess of its produce over that which the same application of labour and capital can secure from the least productive land in use. Unless its increase is countered by the collection of that rent in the form of *public revenue*, any increase in productivity will go not to labour in the form of wages, not to capital in the form of interest, but to the landlord as rent.

MONOPOLY holdings not only distort the distributive function of economics, they also trigger the increase in population that is adaptive for humans whenever control over resources becomes tenuous. Human populations were surprisingly stable until 1800. Historian Fernand Braudel describes populations as rising and falling like a series of tides. "This alternate demographic ebb and flow characterised life in former times, which was a series of downward and upward movements, the first almost but not completely cancelling out the second."<sup>29</sup>

**Purposive  
force  
behind  
evolution**

Braudel believes it was the Industrial Revolution with its corresponding increase in material goods that made population increase possible. In this he is arguing from a Malthusian premise, but when one examines the data in support of his case, the strength of his position weakens considerably. His problem is the same one that stumped both Malthus and Darwin: the classes with the least secure access to material plenty were the classes experiencing the greatest increase in population. I strongly suspect that the sudden increase in human populations that characterises the 19th century has more to do with the private ownership of land made legal by the Enclosure Acts than it does with material advances made possible by the Industrial Revolution.

Alfred Russel Wallace, who came so close to being the father of the theory of evolution, claimed, as Darwin did, that Malthus inspired his understanding of how natural selection worked to shape the development of new species. However, toward the end of his life, Wallace had rejected both Thomas Malthus and the idea that natural selection was sufficient to explain the human tendency toward progress. While never entirely abandoning his earlier interest in science, he turned increasingly to Spiritualism in his attempts to understand the world. He had not been completely convinced by Darwin's discussion of animal husbandry and sexual selection. I view that as regrettable, because had he followed Darwin's arguments to their logical conclusions, he would have found a mechanism to explain the fact that evolution appeared to have been purposive, not the result of chance. He felt human development in particular showed evidence not of mere design but of intention.

I have no quarrel with Wallace's embrace of Spiritualism, but it should not be confused with science. We tend to relegate to the realm of religion

that which science cannot explain. Religious insight is based in faith, and faith does not offer many testable hypotheses when it comes to our attempts to understand the workings of the physical world.

I find Wallace's rejection of Malthus more convincing, because, in it, he at least is informed by data based on observation of the world around him. In an interview published in 1912, he is asked about his embrace of Socialism. Wallace did not advocate Henry George's Land Value Taxation as a remedy for the economic distortions imposed by private ownership in land. Instead, he sought to arrive at the same end by proposing a system of Land Nationalisation. In fact, the very man who had seen Malthus writ large in the Irish potato famine, in 1880 wrote a piece titled, "How to Nationalise the Land: A Radical Solution of the Irish Problem". During an interview for *Macmillans Magazine*, he waxed so poetic about the level of prosperity that such a system would yield that the interviewer attempted to pull him back from the brink of utopia by asking, "Under such a scheme, where plenty reigned, would not the population so increase that poverty would eventually come up again?"<sup>30</sup> Wallace said:

The theory propounded by Malthus is the greatest of all delusions. As man develops toward a higher type: as he becomes more civilised, so his fecundity decreases. Low down in the scale of life, birth is limited only by available sustenance. But the higher grows the type, the less is the fecundity. This is true, not only of ascending types in the evolutionary scale, but it is also true of ascending man. The fecundity of the slums is much greater than that of Mayfair. As man progresses in comfort and refinement, he tends to have fewer progeny; as witness the millions in China and India, compared with the almost stationary population of England, and the declining population of France.<sup>31</sup>

Darwin, unlike Wallace, never publicly denounced the Malthusian Principle of Population. However, in a letter dated July 9, 1881, Wallace wrote to Darwin to recommend that he order a copy of Henry George's *Progress and Poverty*, which was first published in 1879. Darwin replied, saying that he would order the book. "But I read many years ago some books on Political Economy, & they produced a disastrous effect on my mind, viz. utterly to distrust my own judgment on the subject & to doubt much everyone's else judgment."<sup>32</sup> It is tempting to suggest that he was here referring to the work of Thomas Malthus. Unfortunately, as least for the linked sciences of biology and economics, the economist Darwin failed to understand may well have been David Ricardo.

Wallace did recognise the folly in Malthusian predictions of ever-expanding populations. He also saw that distortions in the equitable distribution of land led to poverty, but he failed to incorporate these two observations into a scientific theory. Instead, he turned to Spiritualism and to Land Nationalisation. Spiritualism is no substitute for science, and

Land Nationalisation introduces a governmental barrier between market signals and the productive use of natural resources.

WE OF THE 21st century continue to struggle with the twin problems of poverty and population increase. We fail to recognise that what we view as population problems are a biologically adaptive response to economic distortions. Even poverty fails to yield to economic solutions, in part because our economic theories fail to embrace the biological imperative in which they should properly be grounded. So, we turn to religion and surmise that the poor will always be with us.

**Economics  
and  
biology: an  
ecological  
synthesis**

It is a sign of how flawed our understanding of true economic functioning has become when governments argue that we can best ease the burden on the poor by using the taxes imposed on labour to make the wealthy wealthier still. This is an odd twist on redistributive taxation. And when that fails, even a democracy committed by its constitution to honour the separation between church and state wants to direct taxpayer dollars to religious groups so that they can solve the persistent social problems. The biggest tragedy in all of this is that, by surrendering the problems associated with poverty to faith-based organisations, we seem to have abandoned any attempt to understand the link between social problems and economic distortions.

The Law of Rent is not an obsolete theory that works only in pre-industrial economies. To argue that it ignores current data from the Silicon Valley in the United States. Surely the high tech "new economy" as epitomised by Microsoft and other giants in information technology ought to be able to escape the predictions of the Law of Rent if that law is, as many economists argue, applicable only in agricultural economies. A recent article in *The New York Times* (January 15, 2001) confirms the predictions made by Henry George in *Progress and Poverty* (1879).

Growth slowed in Silicon Valley's job market last year, even as housing shortages and transportation bottlenecks became worse for the region that is often held out as the model for the world's economic development. At the same time, the gap widened between the region's richest and poorest households.

... it is the region's ability to provide sufficient housing and transportation for its 2.5 million residents that worried the economists [from Joint Venture: Silicon Valley Network, a nonprofit regional planning group] who wrote the report.

The economists noted that an increasing number of employees cannot afford to live near their jobs and must commute from more rural and less expensive communities that may be several hours away.

And wealth has not been equally distributed.

"While household income for the region's most affluent 20% increased an inflation-adjusted 20% from 1993 to 1999, to \$149,000, the bottom 20% had household income decline 7%, to \$40,000, when adjusted for inflation.

Is there an answer? Ecology may be the field of scientific endeavour best suited to highlighting the innate connection in land between economics and biology. Evolutionary biology will be strengthened when adjustments reflecting economic function become part of our understanding of reproductive success. By acknowledging the importance of access to land, we can break the chains that hobble world economies and condemn some segments to poverty while others enjoy material progress. When that happens, economics will no longer be seen as the dismal science, but will flourish under a system of growth that enables all people to receive full and fair compensation for their efforts.

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