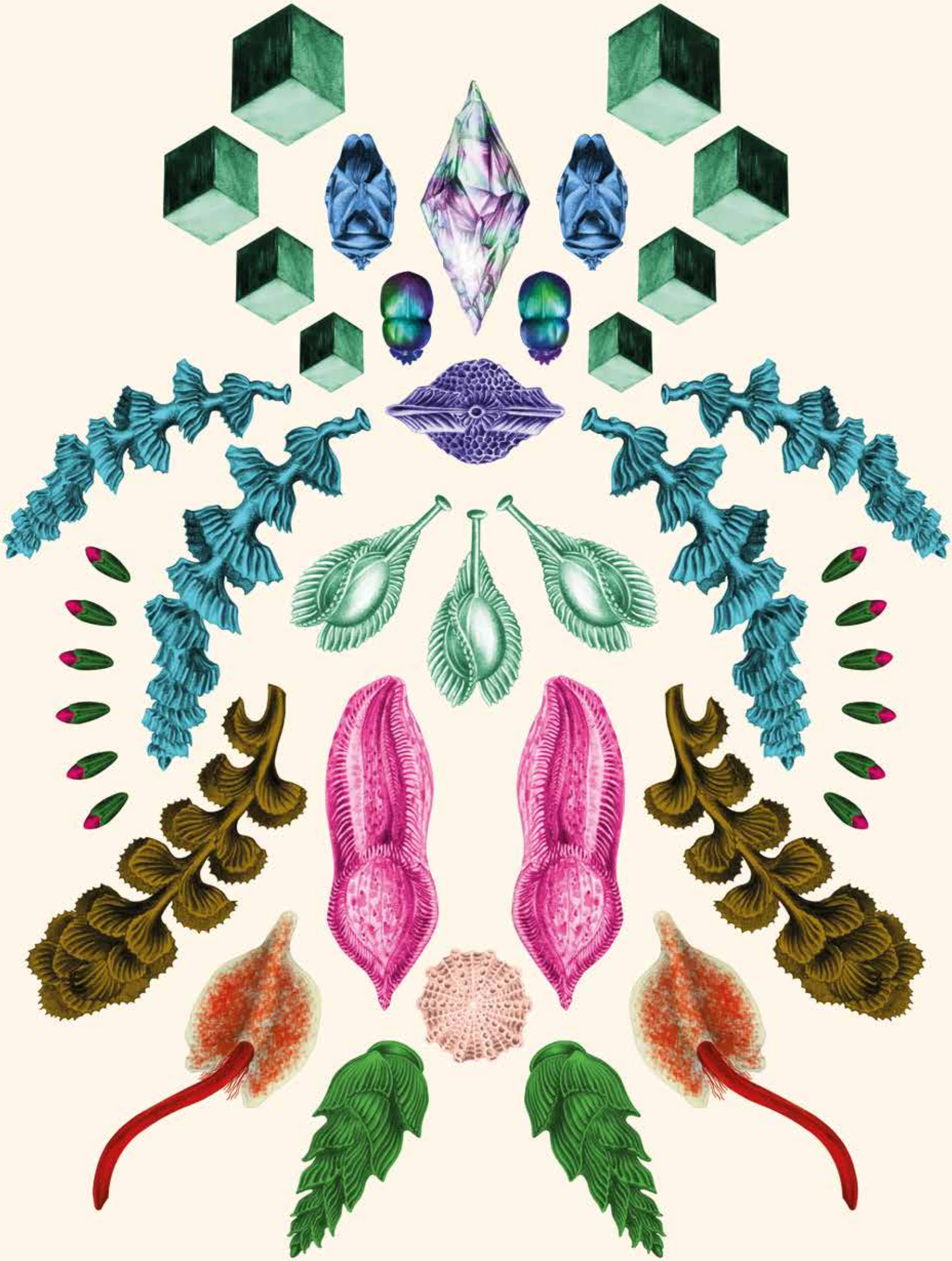

THE APOSTLES OF LINNAEUS AND THE ECONOMY OF NATURE

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The world of Linnaeus and Darwin was one of vast and abundant riches – for Darwin, a time of a burgeoning wealth of varieties and species. For both men, the world they so penetratingly studied was also hypersexualized – in Linnaeus's case, clearly and merrily modeled on the relationship between men and women, almost to the point of parody. The cryptogams were so named, for example, because their "marriage" was secret, unlike the phanerogams with their obvious "sex organs" (stamens and pistils).

But the world that emerges from the studies of Linnaeus and Darwin is also informed by several disciplining circumstances, compelled by a struggle for scant resources in the midst of this cornucopia of varieties and species. Nature not only offers beauty and diversity, it also forces most species to engage in a never-ending struggle for survival under ever-changing circumstances. In this struggle, various forms of conserving physical and mental energy evolve: the colors of a plant or animal, or the willingness and capacity to engage in battle. As everyone knows, some die in the effort, and again, especially in Darwin's observation, not only individuals but entire species die just as new ones arise.

All of this forms a point of departure for the discussion to be conducted here on the general development of the thinking of Linnaeus (and his apostles) and Darwin on the subject of economy. The questions are where this economic thought has taken us, where we are headed now, and where we should be going.

But what do the ideas of Linnaeus and Darwin have to do with the ideas of economy and economics? For that matter, what is economy in the first place?

What is economic thought?

Economic thought revolves around our external living conditions and the choices people make to improve them. It is based on a few simple assumptions: all people want to improve their living conditions; everyone wants to attain the best living conditions possible and maximize their wealth with the least possible effort or, to put it another way, with minimal consumption of energy.

The third assumption is associated with the familiar economic arguments about "opportunity cost". Those who are successful in a particular endeavor to improve their living conditions with minimal sacrifice of opportunity to accomplish another particular endeavor have also minimized the opportunity cost – or the consumption of energy, if you will.

Therein lie economic phenomena! It becomes clear that both Linnaeus's and Darwin's scientific orientations are germane.

One could provide an even broader definition of the objects of economic study, something like what Eli Heckscher once offered: economic activity is everything that has to do with the adjustment of goals to resources. This takes place either through minimization of resource consumption to attain a specific goal or through maximization of the goal in relation to a finite quantity of resources. When we employ such a broad definition, it is possible to discern an economic aspect in almost all types of natural processes and social activities. Animals do not fight for the sake of fighting, and especially not if they feel inferior and believe the battle is hopeless – and a concession also spares the superior animal the consumption of energy that the fight would entail. Some sociologists believe the same applies to people: according to such a theory, only relatively equal parties would engage in conflict with each other. This may not be entirely true, but in

INTRODUCTION

Carl Linnaeus, von Linné after his ennoblement, lived in a globalized time. He was a great traveler: he took his degree as a doctor of medicine in the Netherlands; he explored his native country of Sweden province by province; he sent his apostles far and wide across the world. A couple of them (Solandar and Sparrman) sailed with Captain Cook, another (Thunberg) founded Japanese botany, one (Forsskål) succumbed in present-day Yemen. A few (including Forsskål and Kalm) first traveled across the Baltic from Finland, then a part of the Swedish realm.

And they all did their research and wrote, following the master's precept of writing down everything he saw. They sent their finds home. They named plants according to the Systema Naturae that Linnaeus himself had created in the spirit of the Heavenly Father. They were all men of the Enlightenment, several of them politically radical. One might say that their contributions as wandering scholars formed a school: an Alexander von Humboldt, a Charles Darwin sailed in their figurative wake, as did, in his own way, an even later traveler from the far north, Erik Adolf Nordenskiöld, a Finn by birth who conquered the Northeast Passage and was raised to the baronial rank by the King of Sweden, Sven Hedin, the last Swede to be ennobled, in 1901, and the Norwegian Fritiof Nansen, the recipient of the Nobel Peace Prize for his humanitarian efforts after the First World War.

The published and unpublished writings of his apostles have often been overshadowed by Linnaeus' own scholarly output. That oversight has now been redressed: through a London-based international enterprise carried out over many years and involving numerous scientists and scholars, these writings have been published in eight magnificent volumes and three index books. The publication as a whole was celebrated in November 2012 at a seminar held at the Swedish Riksdag (of which Linnaeus was of course a member in his capacity as a nobleman). Arne Jarrick, professor of history, was one of the speakers on that occasion. Here we have the pleasure of publishing a revised version of his address.

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the ordinary course of things we apply a kind of psychological economy when we say that we "pick our battles". Lowering our expectations now and then to avoid being disappointed if those expectations do not pan out is also wise stewardship of mental energy. And perhaps there is a sort of natural economy involved when the leaves on the trees close their stoma, or in the equipping of certain animal species with camouflage. And so on.

Indeed, the existence of economic activity in nature and society is apparent. Equally apparent are the connections to the plant and animal worlds of Linnaeus and Darwin and their insight that the abundant riches of nature conceal a brutal economy. What brings these natural scientists into the social sciences is thus the simple definition of economy as the doctrine of wise stewardship of scarce resources.

The economic projects of Linnaeus and those of mercantilism

Linnaeus clearly saw the economy of nature, but also engaged in arguments on the nature of economy in the conventional sense of the term.

In Linnaeus's understanding, the economy of nature involved not only a fierce battle for survival, but also a divinely determined and eternally fixed set of species. The world might seem filled with a boundless multiplicity of animals and plants, but in Linnaeus's time, it was truly thought to be limited to a fixed number – as one pondered the question and classified what one saw. And so Linnaeus did, for all he was worth. In this counting, there was a rigorous thrift, a sort of scientific economy, a simple, disciplinary system of classification. The entire classification project was facilitated by the belief in a natural order, an order that according to the doctrine of "physical theology" of the time (which bears a striking resemblance to the current idea of intelligent design) was proof of the existence of God. And order is more economical than disorder. Order is economy. Everyone who spends a disproportionate amount of time looking for keys, eyeglasses, mobile phones, bus cards and the like knows that. In Linnaeus's worldview – shared by most of his contemporaries – one had no choice but to submit to the natural order. Conversely, Linnaeus promoted the idea that nature should be exploited, indeed made subordinate to human interests, subordinate to people's desires to improve their living conditions with the least possible leakage. As Linnaeus saw it, it was actually only through elegantly classified knowledge about nature that social conditions could be improved. In 1746 he wrote: "He who wishes to improve his Private Economy should do so through the understanding of Natural History."[1] How did he arrive at that conclusion? Does it make sense?

HOW LINNAEUS USED his apostles in his endeavors to increase global understanding of nature and to improve the general welfare of Sweden is generally known. They were dispatched as much to study business and trade in remote lands as to identify and bring home foreign plants and animals from every corner of the world. Both tasks were aimed at the improvement of the Swedish economy. The overly optimistic belief that all of these species would be amenable, without much ado, to transplantation to the north was based on the bible-based belief in Noah's Ark, the vessel by which all originally fruitful species everywhere had first been saved and then widely dispersed. If it was possible in pre-archaic times, it should certainly be possible now. The idea behind this dubious transfer of all manner of vegetation was to begin processing products on Swedish soil in order to reduce the exports of raw products. This was a fundamental element of the mercantilist doctrine of the age: in the international zero-sum game, the goal was to maximize exports and minimize imports of processed products, and vice versa for raw products. Linnaeus subscribed to the doctrine and considered the acts of his apostles a way to contribute to the improvement of the country.

The apostles did what they could on their far-flung travels. They recorded everything between heaven and earth, whether they were aware or unaware of the grand plan of which they were part. Nothing was beyond their purview. For example, in his notes from his travels through Russia, Johan Peter Falck reports in text and copious tables on all manner of things: all trades and industries, religious affiliations and diverse other details. From Perm in the western Urals, he relates that the majority are Russians, that beekeeping is popular, that hunting is a winter occupation for many, that mining is the main industry, and so on. And he compiles a tabular lexicon of the languages: Swedish, German, Kyrgyz, Kalmuck. And so it goes, not only with Falck, but everywhere in the travel diaries of the apostles. They all have to do with economy (among other things) and they are ambitious, and yet, in their wealth of detail, they are also uneconomic and overly ambitious – if, at any rate, the aim was to change the world based on an explanation of it, and not on a description on a 1:1 scale.

Under the surface of this drive to improve, however, one can discern a relatively static understanding of the world. This is a reflection of dominant elements of the thinking of the times, both in the idea of the great chain of being and in central elements of mercantilist thought.

WITH ROOTS IN Late Antiquity, the idea of the great chain of being and the divinely determined world order was still a potent concept in the 1700s. It was based on the notion that all species, all types of beings, were equally necessary; that no link could be removed without the chain falling apart. This applied equally to the soulless animals, the bodiless angels, and the body-and-soul package of humans (who therefore, unlike the other beings, were torn between the competing claims of body and soul). It was also premised on the belief that everything had a place in an eternally sovereign hierarchy that cut across from the lower orders to the higher, within and between the species (or however one should classify angels and demons). Herein lay the static: no species could either be added or taken away, and the hierarchy would remain forever unchanged. Linnaeus accepted this tenet and built upon its postulates in his work to classify and name this purportedly immutable world.

The mercantilist doctrine was also highly static and supported by Linnaeus, who was politically aligned with the "Hats".[2] Certainly there was a dynamic idea here about achieving macroeconomic growth in the home country by importing raw materials and exporting processed goods from a strongly subsidized domestic and manufacturing industry, manifest in, among other things, a large gold reserve (which according to Keynes could function as a monetary multiplier), as well as by stimulating population growth. But the price of development in one place was its absence elsewhere.

In this zero-sum game, it was believed that a country with large industrial exports of processed products would fare better than a land with less of the same, and that a populous country would fare better (in war) against a less populous country – an idea propounded repeatedly in other times, as in the Nativism of the 19th century.

Naturally, one can find elements of more genuinely dynamic ideas about growth in this age of mainly static ideas – as one can in most eras. As an example, of his journey to Spitsbergen and the North Pole, Anton Rolandsson Martin writes that "a country that can live from the sea's inexhaustible riches, by which I mean fishing, is among the luckiest in the world." He could have had no presentiments of the radical depletion of ocean fauna in our age, despite our persistent and dangerous delusions about its inexhaustibility.

NEVERTHELESS, LINNAEUS eventually adopted a somewhat more dynamic view of nature and the economy of nature. His reorientation was spurred by the discovery of a modified variant of the common toadflax, incontrovertible evidence of the occurrence of species change and of the genesis of new species, in direct contradiction of the theory of the great and immutable chain of being. At the same time, he believed that a new species could arise only at the expense of an old species – that the number of species remained constant. Such was the divine economy of nature and so firmly rooted was Linnaeus, despite all, in the persistent worldview of the zero-sum game.

Linnaeus's ideas and the acts of his apostles coincide with a general definition of economy as the doctrine of wise stewardship of scarce resources, which could be applied to both nature and human society. But beyond this, the philosophical, economic, and scientific thinking of Linnaeus and his contemporaries was historically distinguished by the belief that resources, as for example the number of species, could normally increase in one place simply by shrinking in another. This static view of the potentialities of being was also part of what was then the oh-so-modern philosophy of the Enlightenment, for which the secularizing idea of good national management for worldly prosperity was, nonetheless, central.

This was the widely held creed of the day, but not yet a doctrine of profligacy. It was still something other than the widely embraced faith in growth from whose modern vantage point this static notion would seem helplessly naïve and outmoded. But was it?

The economic projects of Darwin and those of the classical economists

Darwin has quite a bit in common with Linnaeus: like Linnaeus, Darwin devoted tremendous and successful effort to systematically describing and classifying what he observed in nature.

And yet Darwin differed fundamentally from Linnaeus by virtue of his ingeniously simple, almost tautological idea, which he used to explain the dynamics of nature that Linnaeus had suspected and begun to conceive, but had not recognized. Darwin was not the first to see the evolutionary dynamics of nature – others, including his grandfather Erasmus Darwin, had done so before him. But he was the first (along with Wallace) to identify the simple mechanism, natural selection, that could explain it and which, once identified, seemed so glaringly obvious.

And with that, the great, static chain of being was replaced by the evolutionary tree and the species' divinely and eternally determined number and characteristics were replaced by the constantly ongoing and godless, indeed blind, evolution of species, usually but not always characterized by accelerating differentiation. Linnaeus's stopgap explanation, that the

change he nevertheless observed was a zero-sum game, was no longer necessary.

The theory of natural selection was something truly new in relation to all the variations on theories of heredity that had been in circulation for so long. At the same time, the theory of inheritance of acquired characteristics still enjoyed such high status that Darwin himself continued to believe in it, despite his own discovery of another mechanism. This is apparent when one reads Darwin's treatise *The Descent of Man*. Here he repeatedly avers that natural selection was probably greatly aided "by the inherited effects of the increased or diminished use of the different parts of the body".[3] One example is the use of the organs used for speech, another how the skills of the carpenter are passed on to his children. But the central example is his belief that man could become benevolent by virtue of inherited sympathy, the basis of his theory of group selection.

Mind you, Darwin's belief in a natural world in a state of constant change did not mean that he also believed in an economy in a state of constant growth. On the contrary, he embedded the somber prediction of the classical economists, that by no means everyone would grow to adulthood and successfully reproduce, into his theoretical conception of the brutal economy of nature. Echoes of Malthus are clearly heard in *The Descent of Man*, even though Darwin talked about species where Malthus talked about individuals. Still, Malthus's predictions about individuals were part of his macroeconomic arguments about the prerequisites of improvement, one of the pressing questions of the day. "It has been said", he wrote, "that the great question is now at issue, whether man shall henceforth start forwards with accelerated velocity towards illimitable, and hitherto unconceived improvement, or be condemned to a perpetual oscillation between happiness and misery".[4]

AND THIS IS STILL one of the great questions.

Malthus did not have the answer, but he was not optimistic. He was however soon succeeded by growth-optimistic economists who believed that the Malthusian barriers could be overcome with the aid of technology. It is likely that the introduction of fossil fuels played a critical role for growth as such and for the subsequent belief in perpetual growth. In 1800, two thirds of the global energy regime was still "somatic", that is, the extraction of energy was based essentially on the muscle energy of people and animals. With the advent of non-renewable energy sources, most things were instead based on mechanical energy, on an "extra-somatic energy regime". The stewardship doctrine of absolute scarcity fell back, and the doctrine of profligacy emerged.

A rusted and broken chain of being, replaced by a flourishing tree of evolution. Historic stagnation exchanged for constant movement – in society and in nature. Could it be more dynamic?

Yes.

There is in the interpretation of Darwin – perhaps to some extent in Darwin himself – a static or mechanistic element also found in the infinite faith of economists, of Darwin's time and our own, in what could be extracted from nature. In simplified presentations of the theory of evolution, the environment and the species are often differentiated as fixed units: here the one and there the other. Here is an environment responsible for the selection pressure to which the species must adapt – if they can. In a similar way (although reversed), economists have long regarded nature as the relatively permanent base material, the production factor, from which endless growth would be generated.

And what is wrong with that? The error is that nothing is purely environment or purely species. The species are in constant interplay with one another in such a way that they are subjected and subject one another to mutual selection pressure. As the animals and plants constitute an environment for and occasionally represent selection pressure on us humans, we humans likewise constitute an environment for and selection pressure on them. And so the circle goes round and round. The species are dependent upon the environment abundant in carbon dioxide to which they have contributed with their expiration. The Neolithic revolution, for example, can be regarded partly as the human adaptation to changed circumstances. Partly. But it was also the adaptation of grains to a new selection pressure from humans, which through increasing permanent settlement came to favor a particular grass, emmer wheat, for reasons including the fact that the grains of this particular grass were not released spontaneously from the spikes but had to be harvested.

This is how the dynamic economy of nature works. And it is how the social economy works. Natural resources are not merely a passive production factor to be exploited to further our desires to improve our living conditions, indeed to maximize our prosperity; they can instead be regarded as agents of a kind that affect us and which we affect in a perpetual interplay. This fundamental condition sets such limits for us that the doctrine of profligacy which still dominates our thinking is going to be pulverized by the true scarcity to which it contributes.

Why and where?

The evolution of philosophical, scientific, and economic thought was accompanied by the dissolution of the old static and fundamentally religious idea of the great chain of being. This evolution entailed an unequivocal step forward in humankind's understanding of the world, to which was now ascribed an alternately blind, alternately intentional and human-staged mutability. As species could be replaced by new species, it was now also acknowledged that social positions are liquid. The shoemaker need not, as the Swedish axiom adjures, stick to his last.

But in the midst of the dynamics of the new thinking was found – and is still found – a static view of the relationship between the species and between humankind and nature. It is based on radically increased opportunities to extract wealth from nature combined with never-ending human desires for improved living conditions and our short-sighted, naïve belief that this shall always be, that the golden years will never end – until they actually do.

Why does this self-deception survive, despite millennia of bitter experiences of over-exploitation, the depletion of fish stocks, the destruction of forests, the hunting of large land animals until the last one is killed, and other things humans have done to undermine the basis of their own livelihoods?

One important reason is precisely that we are humans; that we therefore, given our genome, have by cultural means and against all odds, brilliantly withstood the pressure against our existence. Indeed, we have been uniquely successful in increasing our numbers and thus our proportions among the living species on Earth. This is why the doctrine of profligacy, this deep-seated belief in growth, still holds such strong sway over our senses.

But this cannot go on. The extraction of resources is still rising and even though the global rate of population growth is declining, there are still plenty of us who are taking too much from the finite supply, the rich world far more than the impoverished, the wealthiest more than the poorest. In this sense we are still too numerous – if we fail to change in accordance with our insights. It should be possible. As the cultural beings we are, we have the capacity not only to withstand the selection pressure against us, but also to reduce our own selection pressure against the world around us and thus against ourselves, in the dynamic interplay of which we are a part.

According to economic thought, we all want:
- to improve our living conditions;
- to have the best possible living conditions;
- to maximize our prosperity with the least possible effort or, to put it another way, with minimal consumption of energy.

AND WHAT IS THIS, actually? It is to make our lives as pleasurable as possible, for ourselves and for others. To succeed, we must subject the natural prerequisites to the least possible strain. And so economic growth cannot, must not, be the yardstick by which all else is measured.

To move in that direction, we must learn to understand and control our own psychology that drives us to devastate the economy while believing we are maintaining it. And for this, we need a dynamic doctrine of wise stewardship instead of the doctrine of profligacy we have clung to for far too long. In the effort to design such a doctrine, we have a great deal to learn from Linnaeus, Darwin, and others who have determinedly followed in their footsteps in the striving for truth and the good life.

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references

1 Translated from the Swedish quotation provided by Martin Kragh in *De ekonomiska idéernas historia* [The history of economic ideas], Stockholm 2012, p. 76.
2 The "Hats" were an aristocratic political faction in 18th century Sweden who sought to return the country to its former position of influence in the region.
3 Charles Darwin, *The Descent of Man*, New York 1998 (1874), p. 36.
4 Thomas R. Malthus *Population* ("The First Essay"), available at http://artsci.wustl.edu/-anthro/courses/361/malthus.html, accessed 2013-04-07.