The Invisible Hand

Renate Wieser
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In their essay Renate Wieser and Julian Rohrhuber look for the «invisible hand» — the self-organisation of individuals which, as Adam Smith argues, reaches a state of balance through self-interest and competition. This rather abstract approach re-exploring one of the sources of contemporary neo-liberal thought is illustrated through with accompanying software, involving a rather ironic use of the visualisation tools of Microsoft Excel.

Their software models a market, producing music as well as the aforementioned excel visualisation. On a meta-level they thus draw a line from the first social theories that accompanied the industrial revolution (Smith) to the recent period where the social theory of post-fordistic production and less-industrial production emerged (von Neumann). Their position has some intended humour, but it is nonetheless undeniable that their market does develop from a disordered mess into harmony, the actors finding their place in a class structure and together producing a subtle, charming tune.

Where is the invisible hand guiding their market towards such harmony? We need look no further than Wieser and Rohrhuber themselves, gods over markets running to their own rules and conditions. However this need not make their market a false analogy to the 'real' markets. Indeed recent thinking considers economics itself as performative. That is, economic models do not only describe economics, but /instruct/ them, by providing traders with rules to

follow. Consequently, the traders activities, and the behaviours of the market as a whole change to match the model. We may then draw an analogy between the activities of economists and programmers, giving us an interesting position from which to consider Wieser's and Rohrhuber's work.

Francis Hunger, Alex McLean

Thus every Part was full of Vice,
Yet the whole Mass a Paradice;
Flatter'd in Peace, and fear'd in Wars
They were th'Esteem of Foreigners,
And lavish of their Wealth and Lives,
The Ballance of all other Hives.
Such were the Blessings of that State;
Their Crimes conspired to make 'em Great;
And Vertue, who from Politicks
Had learn'd a Thousand cunning Tricks,
Was, by their happy Influence,
Made Friends with Vice: And ever since
The worst of all the Multitude
Did something for the common Good.

This was the State's Craft, that maintain'd
The Whole, of which each Part complain'd:
This, as in Musick Harmony,
Made Jarrings in the Main agree;
Parties directly opposite
Assist each oth'r, as 'twere for Spight'
And Temp'rance with Sobriety
Serve Drunkenness and Gluttonny.»

(from: The Fable Of The Bees, Mandeville, 1705)

Adam Smith is commonly known to have coined the term *The Invisible Hand of the Market,* a term that since has had a most prosperous career. In his writings, however, it appears rather infrequently — it can be found exactly three times, once in his «*The History of Astronomy*» (written in the 1750's), once again in «*The Theory of Moral Sentiments*» (1759) and, at last in «*An Inquiry into the Nature and Causes of the Wealth of Nations*» (1776). Despite its apparent unimportance, this term seems to be a very effective metaphor for what is now the wide spread belief in the self-organizing power of trade markets. While Adam Smith is usually seen as a father figure of liberalism, his own work is somewhat contradictory. This has led to a wide variety of readings of the «Invisible Hand», which range from the more well-known metaphor of self-regulation of trade markets to much less metaphoric versions of divine intervention.[1]

The law of nature and the nature of society

In 18th century Britain, the complexities of industrialization had led to the emergence of numerous networks of economic relations, which gave rise to various strategies of how to improve their prosperity. Impressed by the productivity of divided labour, Smith tries to provide a theory that explains the genesis of order from such complexity, and gives advice how economy should be organized.

About a century earlier, Isaac Newton had been successful in explaining a multitude of phenomena by simple laws of nature. This possibility of reduction had considerable relevance in the dispute about the role of god in the world: Is the order in nature a sign of the presence of god in his creation or is it a sign of the perfection with which he has forged its laws, so that it runs smoothly like a flawless clock? It became a foundation for science to be on the lookout not for god's deeds, but for the laws he has left us to find.

The idea of the world as a self-regulating automaton has thus become a commonplace motive of scientific thought, which is a basis for Smith's economic theory of human behaviour. Though this is not stated explicitly, Smith obviously applies the Newtonian state-of-the-art methodology to a new field, which he calls 'science of wealth'. Here, the law of nature isn't concerned with gravity, mass and space, but with the basic traits of human behaviour.[2] The Invisible Hand appears here in the context of a description of unintended perfection that he discovers in economic functionality:

«*[Every individual...] neither intends to promote the public interest, nor knows how much he is promoting it. By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain; and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest, he frequently promotes that of the society more effectually than when he really intends to promote it.*»[3] (*An Inquiry into the Nature and Causes of the Wealth of Nations*)

In agreement with what Thomas Hobbes described as «homo homini lupus»,[4] it is self-interest which is the most basic human motivation. This, according to Smith, causes the natural desire to «better oneself». For him, the source of all virtues such as prudence can be efficiently traced back to this «natural selfishness», so that even rapacity is considered valuable.[5] But while self-interest is usually found to be rather unsocial, for Smith it is the source of interaction with anonymous society, like a «gravitational force».[6] In this system benevolence emerges without intention because the individuals' egoism is mediated by a field of competition. Only if both competition and self-interest are

unrestrained does the automaton of society yield what it was intended to. Fascinated by the discovery of the natural law that structures social order, Smith writes: «*The perfection of police, the extension of trade and manufactures, are noble and magnificent objects. The contemplation of them pleases us, and we are interested in whatever can tend to advance them. They make part of the great system of government, and the wheels of the political machine seem to move with more harmony and ease by means of them. We take pleasure in beholding the perfection of so beautiful and grand a system, and we are uneasy till we remove any obstruction that can in the least disturb or encumber the regularity of its motions.*»[7] (*The Theory of Moral Sentiments*)

Part of this fascination, that has becomes so widespread towards the end of the 20th century, is the view that this process does not need any intervention apart from the liberation, the surrender to this «law of human nature». In such a system there is no need for regulation of interaction to achieve an ordered society. Rather order is caused unintentionally, due to the well-adjusted design of nature. Hence, order and morality should not be searched for by each individual, but emerge automatically due to the higher rationality of nature. This higher organization is justified by the sovereignty of 'natural laws', which demand a 'laissez-faire' approach in order not to spoil this 'plan of nature'. According to this view, it is enough to understand the basic local truths (self-interest and competition) to realize the complex order of nature, without understanding it. The notion of balancing forces and a state of stability is identified with a natural, immanent order that is beyond critique — the Invisible Hand gives every individual his proper, 'emergent' place in society.[8]

«*The rich only select from the heap what is most precious and agreeable. They consume little more than the poor, and in spite of their natural selfishness and rapacity, though they mean only their own convenien-*

cy, though the sole end which they propose from the labours of all the thousands whom they employ, be the gratification of their own vain and insatiable desires, they divide with the poor the produce of all their improvements. They are led by an invisible hand to make nearly the same distribution of the necessaries of life, which would have been made, had the earth been divided into equal portions among all its inhabitants, and thus without intending it, without knowing it, advance the interest of the society, and afford means to the multiplication of the species. When Providence divided the earth among a few lordly masters, it neither forgot nor abandoned those who seemed to have been left out in the partition. These last too enjoy their share of all that it produces. [...]»[9] (*TMS*)

Decentralization and the reason of reproduction

The Smithian concept of global order from balance of local forces is often seen as the origin of decentralized, bottom-up approaches, where collective responsibility is moved away from the individual. Proclaiming the end of the era of the «centralized mindset», Resnick, in his popular book «*Turtles, termites, and traffic jams*», finds a paradigm-shift in all areas of human culture such as education, technology, politics, biology, scientific reasoning and theory of mind.[10] This change of view is interpreted as a struggle against a «*bias toward centralized theories [that] can be seen throughout the history of science*»,[11] a struggle against the power of institutions, against control, and often appears to be a struggle against power in general. To Resnick, artificial life systems (like StarLogo, the system he introduces) are interesting because they promote de-centralized thinking.

Another common train of thought identifies the «bottom-up» approach as inherently non-ideological.[12] In her article, «*The Invisible Hand and the Cunning of Reason*», the economist Ullmann-Margalit endeavors to differentiate between a «conser-

vative» and a «non-ideological» use of what she calls «invisible-hand explanations». She complains that the Invisible Hand is used by conservative enemies of liberalism to justify the institutions of society as the outcome of a natural law that should therefore be accepted as given. According to her, the biological type of explanation (which refers to natural selection), is non-ideological, because it does not refer to the *history*, to the diachronic emergence of present structures (and therefore not Hegelian), but only to the *endurance* of synchronic relations within the present-day structure. The principle of the «survival of the fittest» is the remedy against all teleology: «*Only when an invisible-hand mechanism can be pointed to, can the spell of an explanation that postulates a creator, a designer, or a conspiracy be effectively broken.*»[13]

For Resnick it is rather a challenge to begin to understand emergent phenomena, but in his view centralized and self-organized models are strictly opposed. As a model intended to explain a behaviour within any kind of social or natural order, he finds a major difference if this model is constructed as a top-down or a bottom-up approach. Staying with the Smithian model, it is through the self-regulating benefit of competition, that every individual finds his place in society and therefore it is not necessary to express any critique about the allotment of wealth or the functionality of the system. Smith continues to write about those who «*have been left out*» (quote above continues):

«*[...] In what constitutes the real happiness of human life, they are in no respect inferior to those who would seem so much above them. In ease of body and peace of mind, all the different ranks of life are nearly upon a level, and the beggar, who suns himself by the side of the highway, possesses that security which kings are fighting for.*»[14]

It is Foucault who points out a commonplace blind spot in the definition of power as regulative, as marking «*the delimitation*

between what is allowed and what is forbidden».[15] He states that «*in the 17th and 18th century there were numerous inventions in the forms of power*»,[16] and he emphasizes that the central aim of power was not to forbid or to regulate, but to increase efficiency and productivity.[17]

Showing that the identification with law and power has its origins in the discourse of the time from the middle ages to the 18th century, he explains that «*the bourgeoisie and the monarchy managed to establish [...] a form of power that presented itself as law and that gave itself, as language or discourse, the vocabulary of law. When the bourgeoisie finally got rid of the monarchic power it did so with help of this jurisdictional discourse (which was, in fact, the discourse of monarchy), and now turning it against monarchy itself.*»[18] The techniques of power were transformed to provide more thorough and efficient ways of control. This was achieved by converting inhibitive sanctioning to productive sanctioning on the one hand, and by focusing the techniques of power towards the individual on the other.

These techniques can be seen as directed towards the body and towards life: «*There are two revolutions in the technology of power: the discovery of discipline and the discovery of regulation, the perfection of anatomic politics and the perfection of biopolitics. With the 18th century, life becomes an object of power.*»[19] We can see that for Smith self-discipline is an effect of competition, individual productivity and self-reproduction can be seen as an effect of self-interest. The discovery of reproduction as a political factor coincides with the fascination of life as reproduction. «*Then try to make them breed*», the Queen of France is said to have answered Descartes, when he tried to convince her that animals are mere automata. This royal argumentation became an essential attractor in 19th century vitalism debate and it reappeared in the early history of computing. Attempting to find a way to understand

life, John von Neumann tried to break down the complexity of organic processes into the most elementary principles, so that he could bring them into a formalized system. In his 1939 paper «*A model of General Economic Equilibrium*», he had worked out a formal proof that an economy theoretically can reach an equilibrium point and still be growing and he transformed labour into a fully reproducible resource, human capital. His later paper «*A General and Logical Theory of Automata*» (from 1951) can be characterized by a very similar fascination with self-reproduction. Here, he tries to formalize the problem of «complication», which can be regarded as a synonym for structural productivity.

«We are all inclined to suspect in a vague way the existence of a concept «complication.» [...] When an automaton performs certain operations, they must be expected to be of a lower' degree of complication than the automaton itself. In particular, if an automaton has the ability to construct another one, there must be a decrease in complication as we go from the parent to the construct. [...] Although this has some indefinite plausibility to it, it is in clear contradiction with the most obvious things that go on in nature. Organisms reproduce themselves, that is, they produce new organisms with no decrease in complexity.»[20]

The superior power behind the Invisible Hand

Comparing Adam Smiths' economic theory with explanations found in the context of artificial life, a specific understanding of *emergence* appears to be common to both. This understanding draws a line between the simple rules of individual behaviour to the entirety that can be discovered by applying these rules. The Invisible Hand conceptualizes this entirety as a state of balance, as a perfect social order where everybody is given his very own place. To explain how this state of balance is possible, Smith's Invisible Hand becomes that of a providential designer:[21] *«The ancient stoics were of opinion, that as the world was governed by the*

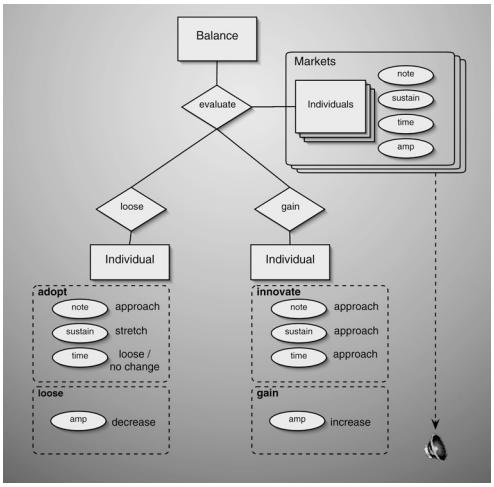
all-ruling providence of a wise, powerful, and good God, every single event ought to be regarded, as making a necessary part of the plan of the universe, and as tending to promote the general order and happiness of the whole: that the vices and follies of mankind, therefore, made as necessary a part of this plan as their wisdom or their virtue; and by that eternal art which educes good from ill, were made to tend equally to the prosperity and perfection of the great system of nature.»[22](TMS)

The agency of the Invisible Hand has a hidden, cunning character that is inescapable and can only be realized by accepting it as given. It is a representation of the perfection in which the efficient causes are tuned to the final causes,[23] and the balanced order this system strives towards is thus due to divine providence. Invisibility and unrepresentability are the results of the perfection that characterizes the «*cause of causes*». For Smith competitive society provides the highest authority of justice: It is the onlooker, the «*impartial spectator*» of the public that induces its representation into each individual, «*the man within the breast*»,[24] which brings about individual morality. This impartiality and rationality is thus naturalized as an effect of self-interest in a competitive interaction of ignorant, but pre-existing subjects. Therefore the notion of the Invisible Hand works not only in an anonymous field, but very much in the individual realm.

The Invisible Hand Machine
Renate Wieser, Julian Rohrhuber

http://akustik.hfbk.net/naui.html

For the piece «Invisible Hand Machine», we have developed an economic model which implements a somewhat cartoonified, but serious functionality of a «free» market. Like maybe every


Balance
Markets
note
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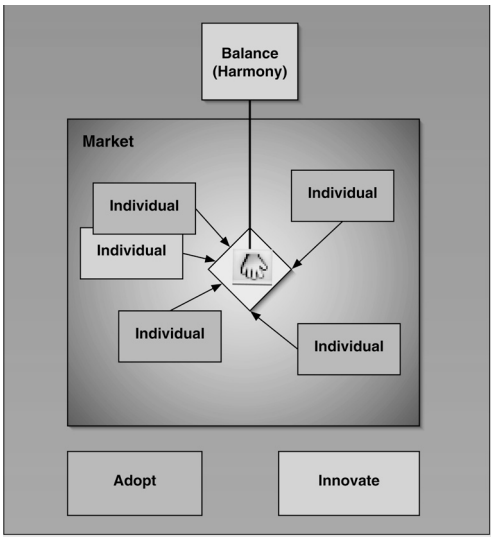
1


Balance
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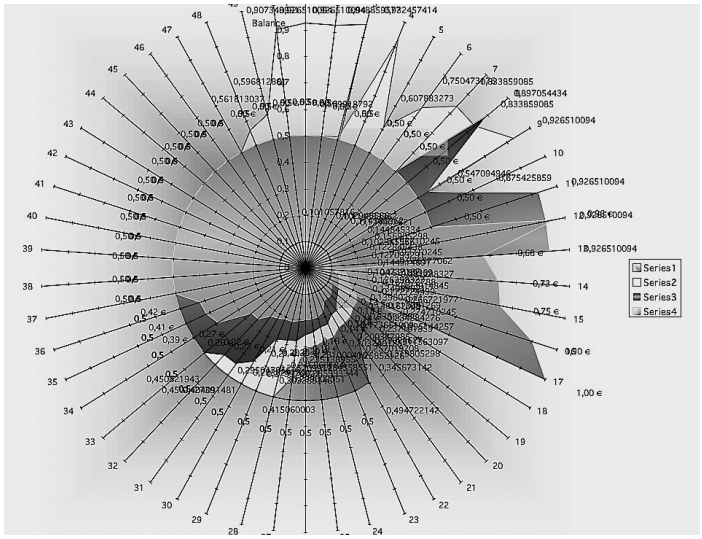
Innovate

2



3

cartoon, it exaggerates a mechanical model that ones mind produced as a description of how one sees the world.

Self-interest and competition, the basic forces of human society, are realized as the strive for amplitude and adjustedness to time and frequency. A market consists of a swarm of short elementary sound grains (individuals) spread over both points in time and frequencies. These individuals compete against each other for fitness (*see code below*). This fitness is objectified by a state of balance of each market, that consists in appropriate frequencies, note lengths and times. (fig.1)

In a group of competitors, randomly chosen from their value class, the individual which is closest to a proper point in time (demand) will gain, the others will loose. Gaining means that it gains in amplitude, and may innovate, i.e. approaching the desired frequency and note length. Loosing means that it looses amplitude, and it has to adopt, i.e. approaching the desired frequency and stretching out in time. In a set of markets, the economy, this means that one part of the individuals slowly adopt to a soft melodic accompaniment, whereas the other (much smaller) part innovates and reaches the desired melodic form. The system asymptotically reaches balance over time, due to the marvelous workings of the invisible hand (fig.2)

As Microsoft Excel has proved to be a tool of great explanatory value, we output the economic data to a program that keeps an Excel graph up to date . This graphics illustrates the circularity and centeredness of economic equilibrium. (fig.3) The emphasis of perfection and purity in both graphics and sound will form the aesthetic background for a very linear storytelling which aims the audience to finally feel the «excellence of balance». Maybe after having outlived this purification, we can then get rid of it.

```
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
Individual {
    var <>note, <>sustain, <>pointInTime, <>amp;
    var <>timeAdopt = 0.0;
    var <>pan;
    var <>wert, <>klasse; // 3 Klassen (0..2)
          // [ ... ]
          gain {
          amp = blend(amp, maxAmp, ampRatio); // produce amplitude
    }
    loose {
          amp = blend(amp, 0.0, ampRatio); // consume amplitude
    }
    adopt { arg balance;
          var index = balance.rightIndexFor(this);
          var rightTime = balance.times[index];
          var rightNote = balance.notes[index];
          var shouldHaveTime = blend(pointInTime, rightTime,
    timeRatio);
          var delta = pointInTime - shouldHaveTime;
          // chord: choose by inner id (hash)
          if(rightNote.isSequenceableCollection) { rightNote =
    rightNote.wrapAt(this.hash) };
          pointInTime = (pointInTime + (delta *
    looseTimeWhenAdopt)).clip(0, 1); // loose time.

          sustain = min(sustain + delta.abs, 0.3);
          note = blend(note, rightNote, noteRatio);
    }
    innovate { arg balance;
          var index = balance.rightIndexFor(this);
          var rightTime = balance.times[index];
          var rightNote = balance.notes[index];
          var rightSustain = balance.sustains[index];

          // chord: choose by inner id (hash)
          if(rightNote.isSequenceableCollection) { rightNote =
    rightNote.wrapAt(this.hash) };
    // step is faster if distance is bigger. we have to support
    young inovative men
          pointInTime = blend(pointInTime, rightTime, timeRatio);
          note = blend(note, rightNote, noteRatio);
          if(absdif(note, rightNote) < 0.5) { note = rightNote }; //
    snap to quarter note difference
          sustain = blend(sustain, rightSustain, susRatio);
    }
    realTime {
          ^(pointInTime + timeAdopt).max(0)
    }
    >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
```

References:

Alvey, James E., 1991, «*Mechanical and Biological Analogies in Adam Smith*», Research Paper No. 348, School of Economic and Financial Studies, Macquarie University.

Alvey, James E., 2003, «*Adam Smith, optimist or pessimist?: a new problem concerning the teleological basis of commercial society*», Ashgate Publishing Ltd.

Binswanger Hans Christoph, 1998, «*Die Glaubensgemeinschaft der Ökonomen*», Gerling Akademie Verlag.

D'Agata and Freni, 2003, «*The structure of growth models: A comparative survey*» in « N. Salvadori (Ed) «*The Theory of Economic Growth: A Classical Perspective*», Elgar, Aldershot.

Foucault, Michel, 2005, «*Die Maschen der Macht*» in: *Schriften*. Vierter Band. Frankfurt/M.: Suhrkamp 2005, p.224–244

Hopp, Stefan, 2004, «*Die unsichtbare Hand – und vier Versuche, sie sichtbar zu machen*» (Diss. Otto-Friedrich-Universität Bamberg)

Neumann, John von, 1938, «*Über ein ökonomisches Gleichgewichtssystem und eine Verallgemeinerung des Brouwerschen Fixpunktsatzes*» in: «*Ergebnisse eines mathematischen Seminars*», K. Menger (ed.), Vienna. (translated to English as «*A model of General Economic Equilibrium*», in «*The Review of Economic Studies*», Vol. 13, No. 1, 1945–46)

Neumann, John von, 1951, «*The General and Logical Theory of Automata*», in: «*John von Neumann, Collected Works*», A.H. Taub (ed.), Pergamon press.

Resnick, Michael, 1994, «*Turtles, termites, and traffic jams: explorations in massively parallel microworlds*», MIT Press, Cambridge, Massachusetts.

Rothschild, Emma, 1994, «*Adam Smith and The Invisible Hand*», in: *American Economic Review*, Vol. 84.

Smith, Adam, 1759, «*The Theory of Moral Sentiments*», http://www.econlib.org/library/Smith/smMS.html

Smith, Adam, 1776, «*An Inquiry into the Nature and Causes of the Wealth of Nations*», http://www.gutenberg.org/etext/3300

Ullmann-Margalit, Edna, 1999, «*The invisible hand and the cunning of reason*», in: *Liberalism and Its Practice*, ed. Dan Avnon, Avner De-Shalit, Routledge (UK).

Zuidhof, Peter-Wim, 2003, «*Of Invisible Hands and the Irony of Sovereignty*», Rotterdam, http://www.fhk.eur.nl/personal/zuidhof/

1 see Zuidhof, 2003, for an excellent overview of the different interpretations. Emma Rothschild suggests that Smith must have known the uses of the term *Invisible Hand* in Shakespeare and Ovid, which is clearly associated with murder there: *«with thy bloody and invisible hand»* (Macbeth, Act III, Scene II). see Rothschild 1994.

2 see e.g. Alvey, 2003, p. 54ff.

3 Adam Smith, 1759, *The Theory of Moral Sentiments* IV.I.10. (we refer to the author's indexing system)

4 Thomas Hobbes, Leviathan, 1651: *«man is wolf to man»* or also *«bellum omnium contra omnes» («the war of all against all.»)*. The former originates from the 3rd century BC comedian Plautus' play Asinaria, where a master refuses to lend money to a slave: *«Man is no man, but a wolf. Not a man, when he doesn't know what kind of person the other is.»*

5 Adam Smith, 1759 (*«The Theory of Moral Sentiments»),* IV.I.10.

6 see e.g. Alvey 1991.

7 Adam Smith, 1759 (*«The Theory of Moral Sentiments»),* IV.I.I.I

8 ee e.g. Alvey 2003, p.63.

9 Adam Smith, 1759 (*«The Theory of Moral Sentiments»),* IV.I.10.

10 Resnick refers to Smith: *«Of course, interest in decentralization is not entirely new. More than two hundred years ago, Adam Smith made a forceful argument against centralized government control of economy. [...] He used the image of the «invisible hand» to drive home the radical idea that economic order and justice can be achieved (and, in fact, are more likely to be achieved) without centralized control of the economy.»* (Resnick 1994, p.7)

11 see Ullmann-Margalit, 1999.

12 Resnick, 1994, p. 4f.

13 Ullmann-Margalit, 1999, p. 66.

14 Adam Smith, 1759 (*«The Theory of Moral Sentiments»),* IV.I.10.

15 Foucault, 2005, p. 225 (quotes translated from the German edition by the authors).

16 ibd, p. 232.

17 ibd. p. 229.

18 ibd. p. 227.

19 ibd., p. 236.

20 von Neumann 1951, p. 312. The motive of self-preservation through reproduction reappears in the characterization of artificial life in his cellular automata: Groups of «cells» that can sustain their structure across iterations are «alive».

21 Goethe, who also worked as an economic advisor, alludes to Adam Smith's belief when he lets Mephistopheles speak about the emergence of morality (Binswanger 1998): *«Part of that Power, not understood, Which always wills the Bad, and always works the Good.»* (*Faust* I)

22 Adam Smith, 1759 (*«The Theory of Moral Sentiments»),* I.II.24.

23 see Alvey, 2003, p. 54ff

24 it is maybe not surprising that this *«impartial spectator» also represents the télos of society.* Adam Smith, 1759 (*«TheTheory of Moral Sentiments»),* VI.I.12