

Torgler, Benno

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**Symbiotics > economics?**

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Center for Research in Economics, Management and the Arts

## Symbiotics > Economics?

Working Paper No. 2021-15

CREMA Südstrasse 11 CH - 8008 Zürich [www.crema-research.ch](http://www.crema-research.ch)

# Symbiotics > Economics?

Benno Torgler<sup>1,2,3\*</sup>

<sup>1</sup> School of Economics and Finance, Queensland University of Technology, 2 George St,  
Brisbane QLD 4000, Australia

<sup>2</sup> Centre for Behavioural Economics, Society and Technology (BEST), 2 George St, Brisbane  
QLD 4000, Australia

<sup>3</sup> CREMA – Centre for Research in Economics, Management, and the Arts, Südstrasse 11,  
CH-8008 Zürich, Switzerland

**Abstract:** This paper begins with a discussion on James Buchanan’s suggestion to replace the word “economics” with “symbiotics”, viewing human behavior through the window of *exchange* rather than *choice*. Although our current textbooks – such as those by Daron Acemoglu, David Laibson, and John A. List (Microeconomics and Macroeconomics) – tend to over-emphasize choice rather than exchange, a look at documents published in Scopus during the past 70 years indicates that exchange is equally well represented throughout those years. More fundamentally, words such as choice or exchange are kind of “suitcase-like” words that conceal the complexity of very different things and concepts whose relationship we often do not sufficiently discuss or comprehend. As Richard Feynman, Marvin Minsky, and Aaron Sloman remind us, there is a difference between the name of a thing and what actually goes on. To make this point, the paper looks at the *mechanism* and *machinery* of decision-making to highlight that mechanisms can be *programmed*; in the process, reviving old AI ideas such as the General Problem Solver developed by Allen Newell, Clifford Shaw, and Herbert Simon, or Marvin Minsky’s “Prediction Machine”. The paper finishes by discussing not only the benefits of viewing an economic system through the lens of exchange, and therefore mutual aid, reciprocity, and redistribution, but also by emphasizing – as Kenneth Boulding has shown us – that social life is full of one-way transfers which are essential to a deeper understanding of our political economy and non-market machinery.

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\* Email: benno.torgler@qut.edu.au. For valuable comments or research support thanks are due to Steve Bickley, Ho Fai Chan, Alison Macintyre and Manuela Torgler.

A centipede was happy – quite!  
Until a toad in fun  
Said, "Pray, which leg moves after which?"  
This raised her doubts to such a pitch,  
She fell exhausted in the ditch  
Not knowing how to run.

*The Centipede's Dilemma* possibly attributed to Katherine Craster

Almost 60 years ago, in his 1963 Presidential Address to the Southern Economic Association (SEA) entitled "What Should Economists Do?" (Buchanan 1964), James Buchanan declared that if we were able to wipe the slate clean, we should get rid of the word "economics" and replace it with "catallactics" or better "symbiotics". He stressed that symbiotics – defined as "the study of the association between dissimilar organisms" (p. 217) – conveys what is central to our discipline, namely that it draws attention to the unique relationship involving a cooperative association of individuals that is mutually beneficial to all parties in the form of exchange, trade, or agreement, even when individual interests are different: "it concentrates on Adam Smith's 'invisible hand,' which so few non-economists properly understand" (p. 217). Buchanan advocated that the "theory of choice must be removed from its position of eminence in the economist's thought process" (p. 217). He criticized that it "assumes no special role for the economist, as opposed to any other scientist who examines human behavior" (p. 217). He therefore recommended that we modify our thought processes and "look at the same phenomena through 'another window'" (p. 217). That is, the one of *exchange* rather than *choice*. He specifically blamed Lord Robbins for impeding our field rather than advancing it with the way he defined the economic problem. In the first chapter of his famous book "An Essay on the Nature and Significance of Economic Science" (first published in 1932), Lord Robbins stated that being turned out of Paradise and having neither eternal life nor unlimited means of gratification caused economists to study the disposal of scarce means:

But when time and the means for achieving ends are limited *and* capable of alternative application, *and* the ends are capable of being distinguished in order of importance, then behaviour necessarily assumes the form of choice. Every act which involves time and scarce means for the achievement of one end involves the relinquishment of their use for the achievement of another. It has an economic aspect (Robbins 1984, Third Edition, p. 14).

Thus, for Lord Robbins, "[e]conomics is the science which studies human behaviour as a relationship between ends and scarce means which have alternative uses" (p. 16). What it means is that the economic problem becomes a "problem of *allocation*, made necessary by the

fact of *scarcity*, the necessity to *choose* (Buchanan 1964, p. 214). Buchanan criticized that with such a mindset, our “subject field is a problem or set of problems, not a characteristic form of human activity” (p. 214). Consequently, “[o]ur whole study becomes one of applied maximization of a relatively simple computational sort... in the mathematics of social engineering (p. 216). In a reprint of Robbins’s book William Baumol (1984) classified the book as a

dangerous revolutionary document. It caused an upheaval in the settled habits of thought of professional economists very soon after its appearance, and it engendered controversy which has not yet abated – controversy which continues to be creative now as it was then (p. vii).

In general, the discussion of a potential name change for the field is not new. Buchanan (1964) is not the only economist to reference Archbishop Whately’s proposal to rename economics as catallactics; Lord Robbins (1984) himself acknowledges the renaming proposal as *Science of Catallactics or the Science of Exchange* in his Richard T. Ely Lecture *Economics and Political Economy*, pointing out that

I should certainly agree that, even where there is no market, the economic aspects of decisions and activities concerning scarce means and time can be regarded as the exchange of one state of affairs for another; and I think that this approach leads to very deep insights” (p. xiii).

But he also expresses concerns that this approach does not make

sufficiently clear the conditions which lead to exchange, whether actual or implied. But this, of course, is what the definition in terms of behaviour conditioned by scarcity specifically does – scarcity being conceived as the relationship between objectives, either personal or collective, and the means of satisfying them (p. xiii).

Hayek (1990) also noted that on several occasions, there were suggestions that the “working of the market” be called “catallactics” which comes from the classical Greek word for bartering or exchanging (*katalattein*). He admitted that,

I have fallen somewhat in love with this word since discovering that in ancient Greek, in addition to ‘exchanging’, it also meant ‘to admit into the community’ and ‘to change from enemy into friends’. I have therefore proposed that we call the game of the market, by which we can induce the stranger to welcome and serve us, the ‘game of catallaxy’ (p. 60).

This led him to revise his thinking on the definition of economics:

I now find somewhat misleading the definition of the science of economics as ‘the study of the disposal of scarce means towards the realization of given ends’, which has been so effectively expounded by Lord Robbins and which I should long have defended. It seems to me appropriate only to that preliminary part of catallactics which consists in the study of what has sometimes been called ‘simple economies’ and to which also Aristotle’s *Oeconomica* is exclusively devoted: the study of the dispositions of a single household or firm, sometimes described as the economic calculus or the pure logic of choice. (What is now called economics but had better be described as catallactics Aristotle describes as *chrematistike* or the science of wealth.) The reason why Robbins’ widely accepted definition now seems to me to be misleading is that the ends which a catallaxy serve are not given in their totality to anyone, that is, are not known either to any individual participant in the process or to the scientist studying it (p. 90, see footnote 21).

Influenced by Buchanan, Boettke et al. (2012) categorize Nobelists into “mainline” economists – classified as those who tend to view economics as the science of exchange in the tradition of Adam Smith – and “mainstream” economists who focus more on choice rather exchange; although, a clear-cut classification of Nobelists might present a challenge due to the highly versatile nature of their scholarship. While such classifications can be useful for an empirical analysis and gives us a useful way to think, dividing into two camps can also be dangerous since humans have a natural urge to apply a “dumbbell” mentality; as Minsky (1985) demonstrated, this can lead to false analogies and constrained thinking. Arranging scholars along a spectrum would be more appropriate but is very hard to do. In their descriptive study, Boettke et al. (2012) find that mainline economists performed better in terms of citations between 1970 to 2007, indicating that they had more impact than mainstream economists. However, I remain skeptical that relying on a limited number of outstanding scholars is sufficient in appreciating the importance of the difference between “choice” and “exchange”. Understanding our economic thinking or the foundation of economic knowledge is a huge challenge. An interesting avenue, in my opinion, is to investigate how we communicate economics to the future generations of economists; thus, textbooks could be a valuable source of further insights. For example, while skimming through Acemoglu, Laibson, and List’s (2018) widely used textbook *Microeconomics* (second edition), the importance of the element of “choice” is quickly apparent (in particular when looking at Chapter 1):

Chapter 1: *Principles and Practice of Economics*, first page: “In this chapter, we introduce you to the economic way of thinking about the world. Economists study the choices that people

make, from big decisions like choosing a career to daily decisions like logging onto Facebook. To understand those choices, they often focus on the costs and benefits involved” (p. 2).

Next page: “In fact, economists think of almost all human behavior as the outcome of choices... Saying that economics is all about choices is an easy way to remember what economics is. To give you a more precise definition, we first need to introduce two important concepts: *economic agents* and *resource allocation*” (p. 3).

“An economic agent is an individual or a group that makes choices” (p. 3).

“**Economics** is the study of how agents choose to allocate scarce resources and how those choices affect society” (p. 4).

“Our earlier examples all emphasized people’s *choices*, and choices play a key role in the formal definition of economics” (p. 4).

“Economics study the original choice and its multiple consequences for other people in the world” (p. 4).

“We now have an idea of what economics is about: people’s choices” (p. 5).

Now, what about “exchange”? The word “exchange” appears rather later, first mentioned theoretically<sup>1</sup> on page 54 when talking about trade-offs: “As the price of downtown apartments rises, only workers with the highest opportunity cost of time will be willing to rent them. Most other workers will choose to move farther away and accept the consequences of a longer commute. That’s a trade-off—more time commuting in exchange for a lower monthly rent”. The actual link to markets appears on p. 59: “We focus on the discussion on markets in which all exchange occurs voluntarily at flexible prices determined by market forces (in contrast to prices fixed by the government)”. After that, a discussion on terms of trade is noted (p. 179), and a discussion on transaction costs associated with making an economic exchange (p. 209). The *Macroeconomics* version is very similar (e.g., Acemoglu, Laibson, and List 2016); it also starts with the chapter *The Principles and Practice of Economics* and discusses the same concepts (see, pp. 87, 93, etc.).

I feel there is no need to go further to obtain an intuition about the relative importance of “choice” versus “exchange”, particularly when looking at their first chapter (as mentioned

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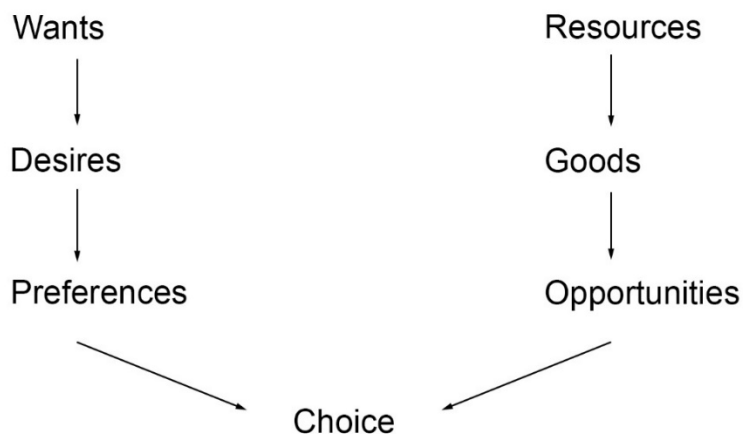
<sup>1</sup> Excluding the wording New York Stock Exchange (p. 14) and the problem set question (“You have 40,000 frequent flier miles. You could exchange your miles for a round-trip ticket to Bermuda over spring break. Does that mean your flight to Bermuda would be free? Explain your reasoning.”, p. 18).

before). Future studies could obviously do a much better job at detailed discussions of the content from those and other textbooks, via a systematic analysis of the present and the past.

## A World of Differences

Without question, choice – defined as the action of making a decision – is central to economics. As Mundell (1968) stresses, the “act of choice integrates the psychological categories of wants, desires, and preferences with the objective categories of resources, goods, and opportunities” (p. 8). Wants produce desires, which are transformed into preferences. On the other hand, resources produce goods, and such goods are transformed into opportunities. Joining preferences with opportunity then leads to the act of choice (*Figure 1*).

Figure 1: Complexity of Choice



Source: Mundell (1968, p. 9).

But what looks simple in *Figure 1* is in fact full of complexities, as Robert Mundell (1968, pp. 5-6) humorously demonstrates with reference to goods:

Free goods, scarce goods  
 Goods made for market  
 Public goods, private goods  
 Goods made in Chile.

There are necessities, luxuries  
 Snob goods of Veblen  
 There are war goods, peace goods  
 Goods sent to Vietnam.

There are present goods, future goods



Consumer goods and capital  
Wholesale goods and wholesome goods  
Goods not for children.

There are stolen goods, hot goods  
Used goods and services  
Intermediate goods and final goods  
Goods made for retail.

Dry goods, Hong Kong goods  
Import goods with taxes  
Traded goods, home goods  
Goods made with axes.

Substitutes, complements  
Bread, butter, and cheese  
Superior goods, inferior goods  
Goods made for deepfreeze.

Outputs, inputs  
Goods and factors  
Inventions, patents  
Plays by actors.

Goodness!

Thus, the words shown in Figure 1 are suitcase-like words that describe a variety of different processes, concealing the complexity of a very broad and diverse range of things whose relationships are not that easy to comprehend. Minsky (2006) reminds us that instead of asking what the very vague suitcase-like word means, we should examine when, how, and why people use those suitcase-like words – because a clear definition can sometimes make things worse, particularly if we are not fully sure that our ideas are correct (p. 95). In a commentary on Max Velmans (1991) article “Is Human Information Processing Conscious?” in *Behavioral and Brain Sciences*, Aaron Sloman (1991) stresses that

the word ‘consciousness’ is associated with too many muddled ideas... People who discuss consciousness delude themselves in thinking that they know what they are talking about... it is not just one thing, but many different things muddled together... We don’t yet have an adequate understanding of the issues: We don’t know what the relevant capabilities of human beings and other animals are; we don’t know what functional decomposition (i.e., what sort of architecture) underlies these abilities and we don’t know what sorts of mechanisms (electrical, chemical, neuronal, software, or whatever) are capable of producing such functionality. Claiming to know what consciousness is by attending to it is no more convincing than claiming to know what spatial locations are by attending to them. Attending doesn’t answer questions about identity: “When is another thing the same place (or mental state) as the one attended to?” has different

answers depending on what relationships are in question. A fly, a mouse, and a person may all be aware of a moving object: Is that the same state? ... If we give up the idea of a unique referent, we can instead survey relevant phenomena, analyse their relationships to other capabilities, and then attempt to come up with explanatory designs (p. 694)

Sloman (1991) further suggests devising *mechanisms* that are able to generate such capabilities, meaning that we should look at various subsystems that produce or control actions. In this sense, if we can create it, we must therefore demonstrate at least some elementary form of understanding and this is ultimately progress towards a deeper (and more ambitious) comprehension of what it means to be a human. I will therefore focus on the *mechanism* and *machinery* of decision-making by discussing how one can try to *program* it and therefore to get insights into *the procedural* aspects of choice; offering detailed discussion of some AI ideas mostly neglected by economics, despite Herb Simon's pioneering contribution to this area of research. In the next sub-section, I will provide an overview of Newell, Shaw, and Simon's (1959)<sup>2</sup> General Problem-Solving (GPS) program, which had a substantial impact on the development of AI and the AI field in general.

### **The General Problem-Solving (GPS) Program**

The development of the GPS was part of an agenda to understand information processing and human problem solving. A problem exists when a problem solver *desires* some outcome or state of affairs that he or she does not immediately have or know how to attain. The psychology of choice also uses the concept of aspiration level (Simon 1996) – the existence of which economists are well-aware (see, e.g., happiness and well-being literature). Put simply, if achievement > aspiration, we are satisfied; but if aspiration > achievement, we are dissatisfied and we search for a new alternative (Simon 1996, p. 30). Similarly, the philosophy of desire has a long history in emphasizing the relevance of such a difference. For example, Aristotle points out in *Nicomachean Ethics*, Book IX (Friendship), Chapter 1 that “[d]ifferences arise when what they get is something different and not what they desire; for it is like getting nothing at all when we do not get what we aim at” (Aristotle 2009, p. 163). In the preface of his book *Homo Prospectus* (coauthored with Peter Railton, Roy F. Baumeister, and Chandra Sripada), Seligman (2016) argues that we should be called *Homo Prospectus* due to our ability to be

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<sup>2</sup> See also Newell and Simon's (1959) article GPS, A Program that Simulates Human Thought in the excellent edited volume *Computers and Thought* by Edward Feigenbaum and Julian Feldman.

guided by imagining alternatives that stretch into the future, making “the aspiration of wisdom a reality” (p. x), while *Homo Psychologicus* is just “a prison of the past and the present” (x). As Minsky (2006) points out, “to think about changing the way things are, we have to imagine how they might be” (p. 93). For Railton (2016), anticipation is at the core of effective learning as it allows us and other animals to “detect error and *metabolize* experience into useable information” (p. 6). GPS as a program internalized that problem solving, requiring the repeated use of available information, which discloses more information until a way of attaining the solution is finally found. Newell et al. (1959) see heuristics as all kinds of information, and therefore as tools that aid your discovery or solution process, although success is not guaranteed. Now the GPS program operates in terms of *objects* and *operators*, as various problems or required tasks in our environment can easily be formulated in terms of objects and operators (see pp. 3-4):

Objects: Characterized by the features and the differences between pairs of objects. For example, chess positions can be classified as objects.

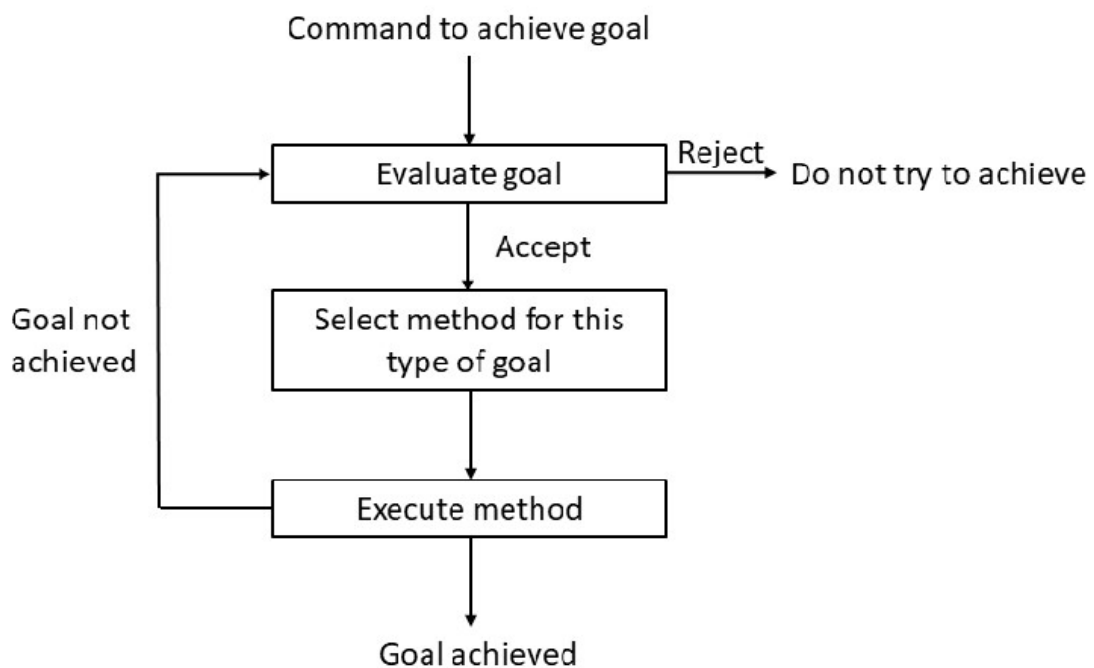
Operators: Something applied to certain objects to produce different objects. In chess, legal moves can be identified as operators. As a consequence, the moves produce new positions (objects). The problem in chess is to get from a given object (current position) to an object having a specific feature (position in which the opponent’s King faces checkmate).

“The core of GPS consists” as the authors stress “of some general, but fairly powerful, problem-solving heuristics” (p. 5) applied in a specific problem domain. Thus, the subject matter depends on the task to be carried out; or, the problem at hand defines the problem-solving heuristics. Now, to specify problems and subproblems, GPS has a set of goal types, such as finding a way to transform object a into b and apply operator q to represent the operation (p. 6). The execution of the GPS is shown in *Figure 2*. As goals often require a set of easier goals, GPS applies the “principle of subgoal reduction”, which means that in order to make progress the final achievement goal is substituted with a set of subgoals that are easier to achieve (p. 8).

Newell et al.’s program was therefore highly recursive, combining goals and methods into organized systems of heuristics, which was an important innovation at that time compared with other programs dealing with chess or checkers. The strategic context of chess and checkers was an important playground for AI scholars (see, e.g., Rasskin-Gutman 2009), culminating in IBM Deep Blue’s win over Kasparov in 1997; the defeat of Korean grandmaster Lee Sedol in

Go in 2016; and later in 2017 Google’s AI AlphaGo win against Ke Jie (who was ranked number 1 in Go). According to Simon and Munakata (1997), one of the most important features of Deep Blue was “its ability to notice patterns of pieces distinguishing one kind of position from another and to use different weights for features in evaluating positions of different character” (p. 23). As they note, this indicates the importance of knowledge in AI systems for recognition of cues, and the ability to access knowledge that is linked to a particular kind of situation.

Figure 2: GPS Organizational Execution



Source: Reproduced from Newell, Shaw, and Simon (1959, p. 7).

GPS used means-ends systems of problem-solving heuristics, classifying “things in terms of the functions they serve, and oscillating among ends, functions required, and means that perform them” (p. 9). In *Nicomachean Ethics* (Book III: Moral Virtue, Chapter 3), Aristotle (2009) again pointed out that

[w]e deliberate not about ends, but about means... They assume the end and consider how and by what means it is to be attained; and if it seems to be produced by several means they consider

by which it is most easily and best produced, while if it is achieved by one only they consider how it will be achieved by this and by what means this will be achieved, till they come to the first cause, which in the order of discovery is last (p. 220).

As Minsky (2006, p. 192) points out, “every difference it needs to reduce becomes another subgoal for it”. Here an example, adapted from Newell et al.’s (1959) paper: Assume I want to go the AEA Annual Meeting in Boston in 2022 while living in Hamden Connecticut. What is the difference between what I have and what I want? One of distance between Hamden and Boston (road distance of 131.7 miles). What changes distance? My car. But my (old) car – a Pontiac Grand Am – doesn’t work. What’s needed to make it work? A new battery. What has new batteries? An auto care repair shop at Dixwell Avenue. I want the repair shop to put in a new battery; but the shop doesn’t know I need one. What is the difference? One of communication. What allows communication? A mobile phone... etc. This brings us to the important aspect of difference. Your daily actions are full of scripts and having an active goal means running a difference-engine like process (Minsky 2006, p. 194). To go to the AEA meeting with my car, (Minsky 2006, p. 193) I need to:

Leave home. Lock the door.

Walk to the car.

Scrape frost off the car windshield (January in Connecticut!).

Walk to the driver’s side of car.

Use a key to unlock the door.

Enter, sit down, close door.

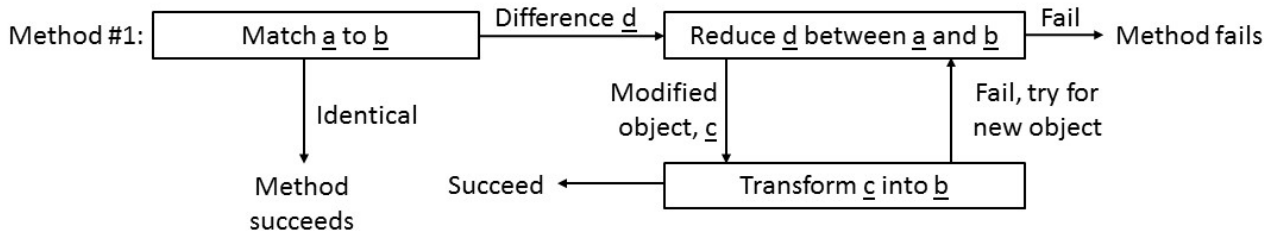
Fasten seat belt, check fuel.

Look ahead. Start the car.

This is why Minsky (1986) – who was very impressed by GPS’s simplicity and beauty – calls it the difference-engine in homage to Charles Babbage’s calculating machine. The means-ends systems of heuristics assume (Newell et al., 1959, pp. 9-11):

Method #1: “If an object is given that is not the desired one, differences will be detectable between the available object and the desired object” (p. 9) (*Figure 3*). Or in other words: Match object a and b to find a difference, d, between them. This allows to achieve Type #1 goal) (p. 9). Method #1 also sets up the Type #3 subgoal of reducing d (see *Figure 4*), and setting up Type #1 subgoal that transforms c into b. If successful Type #1 is achieved (pp. 9-10).

Figure 3: Transforming object a into object b (Type #1 goal)

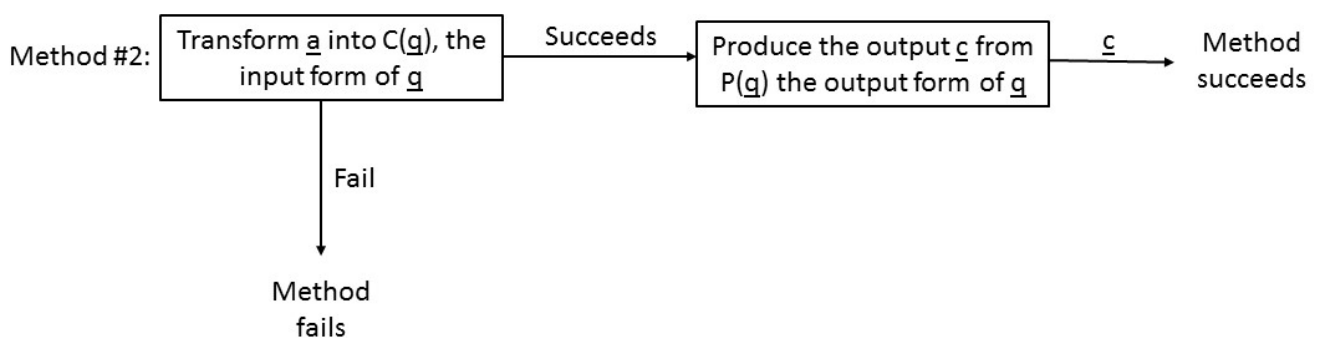


Source: Reproduced from Newell et al. (1959, p. 10).

Method # 2: “Operators affect some features of their operands and leave others unchanged” (p. 9).

Thus, “operators can be characterized by the changes they produce and can be used to try to eliminate differences between the objects to which they are applied and desired objects” (p. 9). Method #2 consists of: Determining if the operator can be applied via setting up a Type #1 goal that allows transforming a into  $C(q)$ , the input form of q. If successful, the output object c is produced from  $P(q)$  which is the output form of q. Thus, the operator has two forms, one describing the input and the other one the output (p. 11) (see Figure 4).

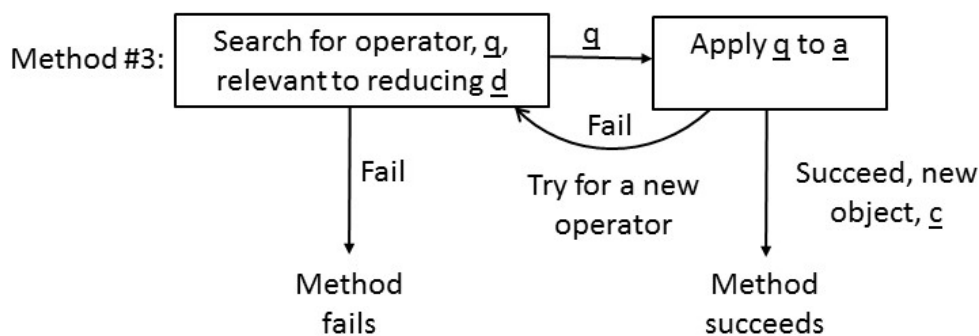
Figure 4: Applying operator q to object a (Type #2 goal)



Source: Reproduced from Newell et al. (1959, p. 10).

Method #3: To achieve a Type #3 goal Method #3 searches for an operator that is relevant to reduce the difference,  $\underline{d}$  (Figure 5). If an operator is found, Type #2 goal is set up applying the operator which if successful procures the modified object (p. 11).

Figure 5: Reducing the difference,  $\underline{d}$ , between object  $\underline{a}$  and object  $\underline{b}$  (Type #3 goal)



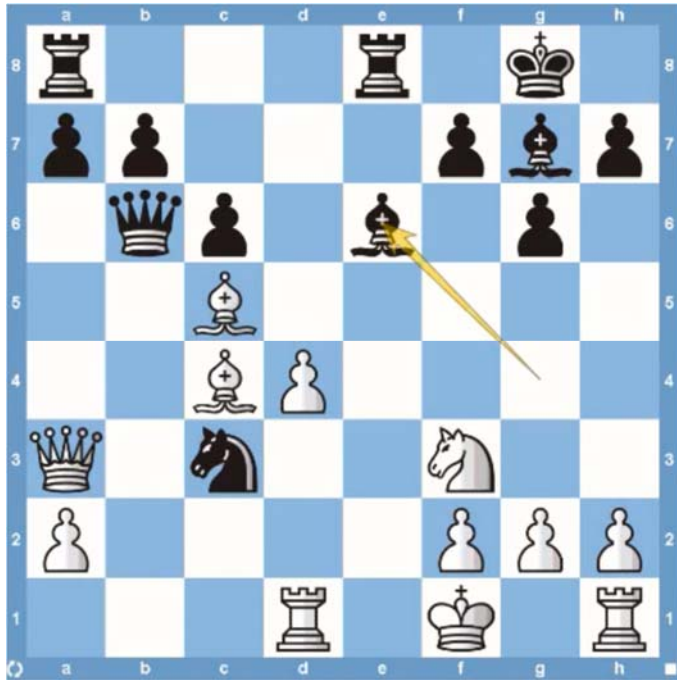
Source: Reproduced from Newell et al. (1959, p. 10).

At every step, this process compares its description of the present and future desired situation, produces a list of differences between them, focuses on the most serious difference, and applies a specific technique designed to reduce this type of difference. Success means that it reduces the most serious difference, while failure means that the system goes back and tries a different technique (Minsky 2006, pp. 188-189). However, the GPS fails to take into account that removing the most significant difference can also make things worse in the long run (Minsky 2006, p. 191), as every individual who has played chess can testify. Or, it may be the other way round. In the *Game of the Century* – in which the 13-year-old Bobby Fischer won against Donald Byrne – Fischer’s sacrificial play led to a queen loss on move 17. But this allowed Fischer to get a rook, two bishops, and a pawn; thereby coordinating his pieces for a checkmate while Byrne’s queen sat useless on the other side of the board. Fischer was able to get past a short-term loss to achieve a larger future gain<sup>3</sup>. His strategy was hailed as the greatest sacrifice

<sup>3</sup> For a good discussion see [The Game of the Century \(chess\) - Wikipedia](#)

in the history of chess (see Figure 6 (Fischer playing Black) for the essential move in the game<sup>4</sup>).

Figure 6: Essential Move in the Game of the Century



Source: Selected out of [Game of the Century - Bobby Fischer vs Donald Byrne - YouTube](#)

According to Minsky (2006, p. 191) this limitation

led Newell and Simon to move in other research directions, as seen in Newell 1972. I think they should have persisted, by adding more reflective levels to the basic Difference-Engine scheme – because one could argue that the system got stuck because it was not equipped with ways to reflect on its own performance, the way that people can “stop to think” about the methods that they have been using.

Learning requires understanding which of the higher-level decisions in your chess play helped to reach your winning positions, and – when a goal is achieved – assigning credit for this to the higher-levels (Minsky 2006). Thus, the problem of playing good chess is complex or an ultra-complicated problem requiring a computer programmed *to learn* to play good chess (Newell 1954, p. 2). Furthermore, Newell (1954) stresses, that

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<sup>4</sup> [Game of the Century - Bobby Fischer vs Donald Byrne - YouTube](#)



[i]t is extremely doubtful whether there is enough information in “win, lose, or draw” when referred to the whole play of the game to permit any learning at all over available time scales. There is too much behavior. For learning to take place each play of the game must yield much more information. This is exactly what is achieved by breaking the problem into components. The unit of success is the goal. If a goal is achieved its subgoals are reinforced; if not, they are inhibited. (Actually, what is reinforced is the transformation rule that provided the subgoal.) This is so whether the game is ultimately won or lost. Each play gives learning information about each goal that is generated. This is also true of the other kinds of structure: every tactic that is created provides information about the success or failure of tactic search rules; every opponent’s action provides information about success or failure of likelihood inferences; and so on. The amount of information relevant to learning increases directly with the number of mechanisms in the chess playing machine (pp. 22-23)

In general, the “single-mindedness” of GPS opened new research paths, including into consideration of human cognitive characteristics such as distractibility (Newell 1994, p. 227)<sup>5</sup>. Allen Newell, John Laird, and Paul Rosenbloom developed Soar, an architecture for general intelligence that behaves intelligently (not completely rational via approximating knowledge levels); is goal oriented, interrupt driven, adaptive (does not have to be programmed to behave); autonomous (therefore also unconscious); does not have deliberate access to all that it knows<sup>6</sup>; does not know how it does things (e.g., learned procedures are non-articulable); has meta-awareness or reflection (able to step back and examine what it is doing); and is distractable (Newell 1994, p.227).

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<sup>5</sup> Pamela McCorduck (2004) in her wonderful book *Machines Who Think*: “GPS sounds almost ridiculously simple, but in fact we see just such reasoning in everyday life... I have before me a self-help book that promises to help me manage my time better: its technique is pure GPS. Another book, called *The Universal Traveler* (Koberg and Bagnall, 1972) and subtitled *A Soft-Systems Guide to: Creativity, Problem-Solving and the Process of Reaching Goals*, is both a charming and useful handbook, drawing from many different sources, as its rich bibliography attests. But its methods, its underlying model, and much of its language is GPS... When Newell and Simon predicted in 1957 that psychology would grasp the information-processing model as a useful way of explaining and understanding human cognitive behavior, they did not expect to find it filtering down to popular self-help books in less than twenty years. In fact, the very view that techniques exist for improving one’s creativity is still repugnant to some people. They’d be outraged if their physician still practiced medicine as it was done in Galen’s time, but they hold that creative behavior, on the other hand, is mystical, unknowable, and therefore inaccessible to improvement. You’ve got it or you don’t. The GPS point of view—the entire assumption of artificial intelligence as a field—is contrary to this belief (pp.248-249).

<sup>6</sup> Hayek (1933), for example, criticizes that “we still refuse to recognise that the spontaneous interplay of the actions of individuals may produce something that which is not the deliberate object of their actions but an organism in which every part performs a necessary function for the continuance of the whole, without any human mind having devised it” (p. 130).

## Marvin Minsky's Prediction Machine

Desire can be experienced or expressed through phenomena such as frustrations, satisfactions, or disappointments, but Minsky (2006, pp. 188-195) tries to go beyond words by describing the *underlying machinery*. For example, he explains that “a system will seem to have a goal when it persists at applying different techniques until the present situation changes into a certain other condition” (p. 187). It is possible to criticize that a difference-engine is a *wanting machine* and that the goal is just one part: namely the *aim*, a current description of a future situation. Running the process means that a goal becomes an *active* goal, in that it tries to change things to fit the future description (Minsky 2006, p. 190). It is safe to say that a mind is an aggregate of interacting parts or components, and the interaction between parts of mind is triggered by difference (Bateson 2002, p. 85). Thus, if you see the mind as a “society of minds”, which are made of smaller processes that we can call agents, we can argue that some kind of subagents are aroused by a difference between the actual and desired situation. Those subagents then act to try to diminish the difference that aroused them (Minsky 1986, pp. 17, 78). Moreover, many things that we do are due to processes with no goals or goals that we are not aware of (p. 190). Minsky (1986) tries to describe the complexity of having a goal in the following way, taking into account the *functionality*:

A ‘goal-driven’ system does not seem to react directly to the stimuli or situations it encounters. Instead, it treats the things it finds as objects to exploit, avoid, or ignore, as though it were concerned with something else that doesn’t yet exist. When any disturbance or obstacle diverts a goal-directed system from its course, that system seems to try to remove the interference, go around it, or turn it to some advantage.

As Minsky (2006) stresses, the beauty of explaining the functions of goals, intentions, or motives is that enables us to answer questions such as: “What makes some goals strong and others weak? What are the feelings that accompany them? What could make an impulse ‘too strong to resist?’ What makes certain goals ‘active’ now? What determines how long they’ll persist?” (p. 188). There are actual inputs that define a situation, and ideal inputs that describe goal-descriptions. Such a difference-engine displays the traits of aim, persistence, and resourcefulness, which explains the functions of what we call motives and goals (Minsky 2006, p. 188). You begin with an aim, which is a description of a certain possible future situation, recognizing some differences between the current situation and that of other certain conditions. To act, it is necessary to be equipped with some methods that allow you to reduce those kinds of differences. You also need persistence in the process of applying those methods, so as to be

able to change what is *now* into what you *want*. Having a goal then means that a difference-engine is actively working to remove the difference. For Minsky, the GPS was the first machine that was able to clearly display those three traits (p. 188).

But, how can you develop a machinery for making plans, something that GPS failed to do? How can you achieve more complex goals? Now assume you are now in Boston and just a street away from where the 2022 AEA Annual Meeting is held. You need to choose whether or not to cross the street using the following rules (see Minsky 2006, p. 135):

*If a car is approaching, Do retreat.*

*If in street, Do cross the street<sup>7</sup>.*

However, as Minsky points out, if you are to make such a decision, you need to predict and compare the possible futures of those actions (Minsky 2006, p. 135):

*If crossing the street and Do retreat, Then arrive a bit later for the AEA Conference.*

*If in street and Do cross, Then arrive on time.*

*If in street and Do cross, Then suffer a serious injury.*

By looking ahead, you can then mentally compare the difference between “may be injured” (action 1) to “may be delayed” (action 2). As many problems cannot be solved in one or two steps, search heuristics are needed, for example, using commonsense knowledge. You require not only deliberate thinking (besides learned and instinctive reactions) but also reflective higher-level thinking (see Minsky 2006, p. 143). Your chosen option of not being late due to being first presenter at the coming conference session comes at the risk of being hit by the car, and you assume that you will move fast enough. But you should have realized that your knee injury from playing indoor soccer had decreased your agility, so you should have changed your priorities.

You may also self-reflect. Just imagining that you fail to turn up to the session may be so uncomfortable that it makes you feel sick. Or perhaps you self-consciously reflect: What would my academic colleagues, peer and friends think if I miss the session? (for a discussion

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<sup>7</sup> Or image while driving to Boston with the car you think about an overtaking manoeuvre that means temporarily cross into the opposite lane of traffic facing an oncoming vehicle. You need to judge whether it is safe to overtake or not (avoid a head-on collision) which requires the use of counterfactual reasoning (for a general discussion see Costello and McCarthy 1999). In the US in 2018, there were 709 deaths due to passing another vehicle (injuries: 20,000) (NHTSA 2020). Those examples show the usefulness of considering counterfactuals in our ordinary life.

on self-reflection, see Minsky 2006, pp. 148). So, you engage in different kinds of thinking as discussed by Minsky (1986, p. 238) such as:

**Predicting:** To the extent that you can predict how various actions will affect you being at your 2022 AEA session you can also avoid the expense and risk of actually performing particular actions.

**Expecting:** If you expect that waiting for the car to pass will produce a delay, preventing you being on time for your presentation – but it actually produced a circumstance in which you were on time – you can try to explain what went wrong with your expectations (e.g., your watch was imprecise (ahead of the actual time)).

**Wanting:** If you are in a situation of being late but you wish to be on time, it may help to remember ways to remove or reduce differences (e.g., running instead of walking to the presentation room).

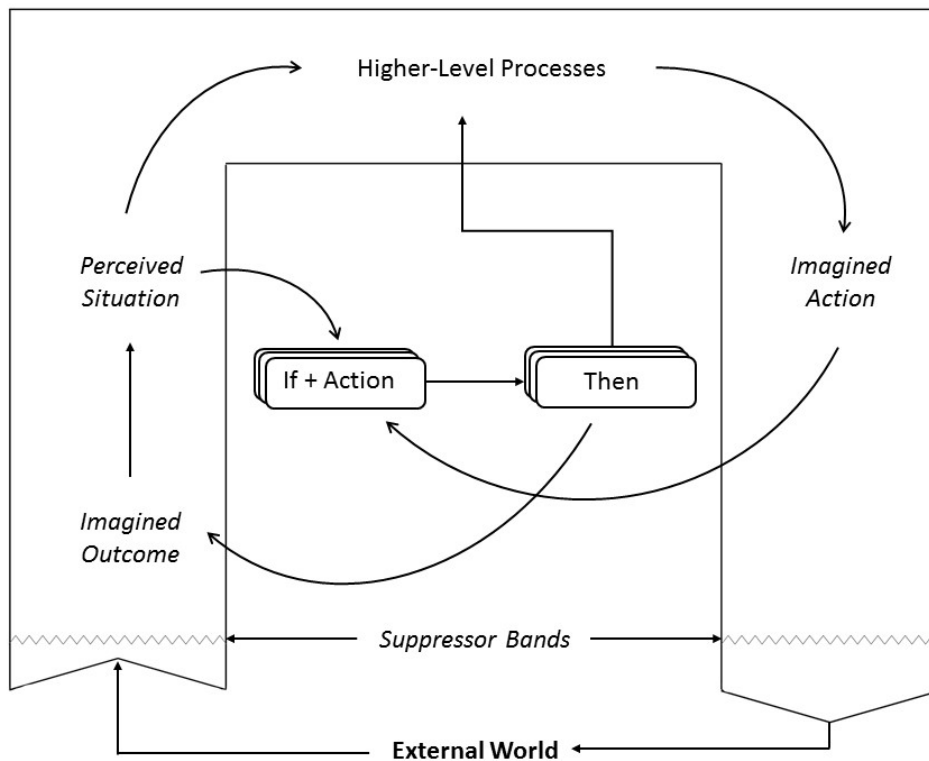
**Escaping, attacking and defending:**

If presenting at the AEA meeting causes a disturbing type of difference (e.g., presentation was not as well received as you expected), you can try to improve matters by finding some actions that counteract or oppose that (e.g., increasing the quality of your contribution).

*Figure 7* presents Minsky's Prediction Machine. You need higher-level processes, descriptions, or resources to form and keep track of your plans (higher-level representation of what the future of your actions should or ought to look like). Thus, they depend on our wishes, fears, and larger-scale plans (Minsky 2006, p. 219). For example, reflective thinking may emerge when our usual systems start to fail (e.g., fear of not making it to the AEA presentation). According to Minsky (2006, see pp. 130-131) there are five or six major levels of processes or mental activities: instinctive reactions that are inborn (you hear a car and turn your head because we are born with survival instincts), learned reaction (you were well-trained since childhood to carefully following traffic safety procedures), deliberate thinking (you are already thinking how to begin your AEA presentation), and reflective thinking and self-conscious reflection (as discussed beforehand). Whenever you ask *what would happen if*, or if you express hope, desire, or fear, you envisage something that has not yet happened, you imagine a possible future (Minsky 2006, p. 131). Imagining means that you are not just using *If* Situation and Goal

→ **Do** Action, but also **If** Situation + **Do** Action → Result (Minsky 2006, pp. 132-133). You compare (as demonstrated previously) how your potential actions may lead to a result of either be injured (*action 1*) or be late to the presentation (*action 2*). You therefore represent and compare alternatives, which means you are deliberating about represented future possibilities.

Figure 7: Minsky’s Prediction Machine



Source: Reproduced from Minsky (2006, p. 159).

Planning therefore requires mechanisms for exploring *hypothetical* possibilities (Sloman and Chrisley 2004) or conduct as discussed before counterfactual reasoning (Pearl and Mackenzie 2018)<sup>8</sup>, and can involve several deliberative mechanisms as listed by Sloman and Chrisley 2004, p. 24), for example,

- the forms of representations used (e.g., logical, pictorial, activation vectors – some with and some without compositional semantics);

<sup>8</sup> “[C]ounterfactuals are an essential part of how humans learn about the world and how our actions affect it. While we can never walk down both the paths that diverge in a wood, in a great many cases we can know, with some degree of confidence, what lies down each” (Pearl and Mackenzie 2018, p. 296).

- whether they use external representations, as in trail-blazing or keeping a diary;
- the algorithms/mechanisms available for manipulating representations;
- the number of possibilities that can be represented simultaneously (working memory capacity);
- the depth of 'look-ahead' in planning;
- the syntactic depth of descriptions and plans;
- the ability to represent future, past, concealed, or remote present objects or events;
- the ability to represent possible actions of other agents;
- the ability to represent mental states of others (linked to meta-management, below);
- the ability to represent abstract entities (numbers, rules, proofs);
- the ability to learn, in various ways;
- the variety of perceptual mechanisms (see below).

One of the problems of a deliberative system is that it can get stuck in loops or repeat the same unsuccessful attempt to solve a sub-problem. For example, you are stressed that your car (which you expect to take you to the AEA meeting) is not working. You therefore call the number of an auto repair service that you found on the Internet, but you call repeatedly as you are unable to reach a person. How do you avoid getting stuck in such a loop? One way is to have a parallel sub-system monitoring and evaluating the deliberative processes, i.e., *meta-management* (Sloman and Chrisley 2004). If the system detects something bad happening (not being able to contact the auto repair service), then it may be able to interrupt and re-direct the process (e.g., check whether the number is correct or search for another auto repair service). For that to happen, emotions play a crucial role (e.g., anger and frustration of not being able to reach someone). Damasio (1994) refers to the following experience with a patient who had ventromedial prefrontal damage:

I was discussing with the same patient when his next visit to the laboratory should take place. I suggested two alternative dates, both in the coming month and just a few days apart from each other. The patient pulled out his appointment book and began consulting the calendar. The behavior that ensued, which was witnessed by several investigators, was remarkable. For the better part of a half-hour, the patient enumerated reasons for and against each of the two dates: previous engagements, proximity to other engagements, possible meteorological conditions, virtually anything that one could reasonably think about concerning a simple date. Just as calmly as he had driven over the ice, and recounted that episode, he was now walking us through a tiresome cost-benefit analysis, an endless outlining and fruitless comparison of options and possible consequences (p. 193).

In this situation, the patient did not experience the usual feelings of, for example, embarrassment or shame that would normally stop our search process. Emotions are a mechanism for bounded rationality, guiding the individual to exercise a sensible decision-making process by focusing thoughts and actions on something that needs attention right now (higher priority) (Simon 1983). Your frustration about not reaching someone in the first auto repair shop contacted led you to the solution of finding another auto repair service that actually answered your phone call, which allowed you to get closer to your goal of reaching the AEA conference on time.

Minsky also introduced the concept of a pair of Suppressor Bands – these are required when imagining future conditions as you do not want that such imagined counterfactual scenarios already replaced your current present condition before you make a choice (*Figure 7*). You wait and perform further imagined actions till you have *enough* other options to choose from. This means that you need to disconnect your mind so you are able to stop and think before selecting which action to take (Minsky 2006, p.p. 159-160).

Sloman and Chrisley (2004) also argue that monitoring of intermediate stages takes place in perceptual processes or actions, which means that there is an arrow going from perceptions to higher-level processes:

Examples would be the ability to attend to fine details of one's perceptual experience instead of only noticing things perceived in the environment; and the ability to attend to fine details of actions one is performing, such as using proprioceptive information to attend to when exactly one bends or straightens one's knees while walking (p. 26).

Overall, this section also tried to exemplify that economics can benefit from a detailed study of cognitive architectures as AI has developed and is developing very interesting contributions beyond what I have discussed here (for an overview see Bach 2009) and that some fields have failed to recognize or internalize. As Bach (2009) stresses a field's credibility may be

*due to* their focus on an area that allows a homogenous methodology and thus, the growth and establishment of scientific routines, communities, and rules of advancement. But this strictness comes at a price: the individual fields tend to diverge, not just in the content that they capture, but also in the ways they produce and compare results. Thus, it not only becomes difficult to bridge the terminological gaps and methodological differences in order to gain an integrative understanding of an individual phenomenon – the results from different disciplines might completely resist attempts at translation beyond a shallow and superficial level (pp. 7-8).

But other fields such as economics may help in making, for example, cognitive architectures empirically accessible which remains one of the key challenges. Thus, as economists we may benefit from studying carefully how cognitive architectures can enrich the promise and practice of economics.

## The Power Exchange and Beyond

It is not only *choice*, but also *transaction* and *exchange* that are essential to our lives. We live in a crowded world, with the benefits and inconveniences large crowds imply. People possess different abilities and resources, and they want to consume goods in different proportions. Different tastes and endowment give rise to diversity, and diversity opens up the possibility of profitable trade... The act of trade is the act of making transactions (Mundell 1968, p. 11),

and are constantly in an exchange:

Conversation is an exchange of amusement or information. A treaty is an exchange of concessions of commitments. Love is an exchange of pleasure. The price of an object of group of objects is what is given up for it (Mundell 1968, p. 11).

Money or monetary exchange provides some means of tacit knowledge communication that we cannot convey via language in the context of economic decision-making, which allows – as Horwitz (1992) points out – the formation of creative, complex, and coordinated social orders: “it provides us with a means of communication that enables us to make our, admittedly fragmentary and uncertain, knowledge of our preferences and abilities available in a form that is socially accessible” (Horwitz 1992, p. 212). Exchange develops when there are mutually agreeable roles: “You do something that I want and I’ll do something that you want” (Boulding 1970, p. 9). In his book *The Passions and the Interests: Political Arguments for Capitalism before Its Triumph*, Hirschman (1977) refers to the idea that commerce acts as a *douceur*<sup>9</sup>, counteracting passions. He cites Jacques Savary’s seventeenth century textbook for businessmen that stressed that

[Divine Providence]<sup>10</sup> has not willed for everything that is needed for life to be found in the same spot. It has dispersed its gifts so that men would trade together and so that the mutual

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<sup>9</sup> Douceur conveys sweetness, softness, calm and gentleness.

<sup>10</sup> Hirschman also points out that in the early eighteenth century Giambattista Vico already articulated the idea of the invisible hand: “Out of ferocity, avarice, and ambition, the three vices which lead all mankind astray, [society] makes national defense, commerce, and politics, and thereby causes the strength, the wealth, and the wisdom of



need which they have to help one another would establish ties of friendship among them. *This continuous exchange of all the comforts of life constitutes commerce and this commerce makes for all the gentleness (douceur) of life* (Hirschman 1977, pp. 59-60).

Similarly, Hirschman (1977) refers to Montesquieu's *Esprit des lois*:

[i]t is almost a general rule that wherever the ways of man are gentle (*moeurs douces*) there is commerce; and wherever there is commerce, there the ways of men are gentle" (Hirschman 1977, p. 60)

Exchange as a field of research is not uniquely populated by economists. Various other fields such as anthropology, psychology, political sciences, philosophy, or sociology have significantly contributed to an understanding of social exchange for quite a while, particularly within the social interaction literature (for an overview, see, e.g., Parsons 1968), the work around social exchange theory (see Homans 1961, Blau 1964, Emerson 1976, Cook 2001, Gregory 2001a), systems analyses of political life (Easton 1965) or political exchange (Illchman and Uphoff 1969). With an ultimate interest in the study of face-to-face interactions and the praise of Thomas Schelling as "the damn best observer of people I have ever known"<sup>11</sup>, Erving Goffman (1963) points out in his book *Behavior in Public Places* that

[e]ven when two persons have great moral cause for mutual animosity they are likely to be willing to exchange a few civil words if brought together unavoidably. And even when they are not on talking terms, they may still feel an uncontrollable urge to exchange recognitional nods when brought together. This minimal courtesy has a special significance for us, for a failure to exchange this kind of greeting exposes such persons to the situation at large as two persons who are filled with hostility to each other, and not with the mood of the social occasion (p. 116).

Marcel Mauss (1966) – the sociologist and anthropologist<sup>12</sup>; nephew of Émile Durkheim; and author of the famous and highly cited book *The Gift: Forms and Functions of Exchange in Archaic Societies* – offers a systematic and comparative study of gift exchange customs demonstrating that an exchange of goods is also a moral transaction that maintains human relationships between individuals and groups (see also Evans-Pritchard 1966)<sup>13</sup>.

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the republics; out of these three great vices which would certainly destroy man on earth, society thus causes the civil happiness to emerge. This principle proves the existence of divine providence: through its intelligent laws the passions of men who are entirely occupied by the pursuit of their private utility are transformed into a civil order which permits men to live in human society (p. 17)".

<sup>11</sup> See [conversation here](#), min. 14:50-22:25

<sup>12</sup> See also Gregory (2001b) for an overview of exchange in anthropology.

<sup>13</sup> For a good overview on gift giving including a detailed model of the gift exchange process, see Sherry (1983).

Anthropologists have long documented the symbolical dimension of exchanging objects in which reciprocity and resolving oppositions play a substantial role. Schieffelin (1980) note that

it may indeed be possible to elucidate the basis for different types of exchange from the way the norm of reciprocity is grounded in other underlying structures of cultural thought. To do so would provide a new basis upon which the relation of social order to exchange processes in different cultures can be compared and related to one another. What is required is that investigations of exchange take account of the basis for a people's understanding of social reciprocity in terms of systematic symbolic analysis (p. 515).

Thus, exchange not only covers market exchange, but also reciprocity and redistribution (Polanyi, 2001). As Karl Polanyi shows, reciprocity and redistribution are equally important to ensure the working of an economic system. It is only in recent decades that economists have progressed on the topic of reciprocity, often via the use of experiments (see, e.g., Fehr and Gächter, 1998, 2000). The level of those three modes (reciprocal, redistributive, and market) define the functioning and integrative nature of the economy (Codere 1968).

In general, the phenomenon of mutual aid between humans (as well as other animals) is essential for understanding the struggle for existence and adverse circumstances (Kropotkin 1902). In his book *The Descent of Man*, Darwin (1871/2009) refers to the power of sympathy, mutual aid, and reciprocity:

for we are led by the hope of receiving good in return to perform acts of sympathetic kindness to others; and there can be no doubt that the feeling of sympathy is much strengthened by habit. In however complex a manner this feeling may have originated, as it is one of high importance to all those animals which aid and defend each other, it will have been increased, through natural selection; for those communities, which included the greatest number of the most sympathetic members, would flourish best and rear the greatest number of offspring (p. 82).

Thus, habits of mutual aid increase fitness. "Sociality", Kropotkin (1902) writes, "is as much a law of nature as mutual struggle" (p. 4). Bowles and Gintis (2011) acknowledge that Kropotkin's work has taught us "a kinder, gentler view of the evolutionary process in opposition to the then popular dog-eat-dog Social Darwinist claims about what natural selection entails for human behavior" (p. 7). Kropotkin (1902) provided many historical examples of mutual aid, referring to the practices of common agriculture and communal cultivation (see pp. 75-77) that were later explored in more detail by Elinor Ostrom. In recent years, the question of why we cooperate has become a very important topic in social science

(e.g., Henrich and Henrich 2007, Tomasello 2009, Bowles and Gintis 2011, Henrich 2016, Christakis 2019).

From such a perspective, a move closer towards “symbiotics” is appealing; although, per se, even without a clean slate, scientific field names can change. The term “economics” has only been used in English since the 1890s; before that it was political economy, which represented the importance of connecting the study of the economy with political life and society’s institutions (Sandmo 2011). Furthermore, the term served as a reminder that the field’s central task was to provide governments with a better foundation for the conduct of economic policy, whereas the change to economics reduced the impression that economics is mainly in the service of the government (Sandmo 2011). However, a shift from “economics” to “symbiotics” seems more radical. Name changes themselves are a fascinating area of exploration (Hough 2016). Throughout history, mountains have had different names as people living on the several sides of a mountain were very poorly connected, and several of the world’s best-known peaks are reflections of the history of European colonialism (Drummond 2016). Street name changes are one of the most common variations, often linked to changes in government and regimes (Neethling 2016) as names and language are related to identity (Aldrin 2016). Previous examples are seen in East Berlin before and after the German reunification (Azaryahu 1997), post-socialist change in Central and Eastern Europe or Former Soviet Union in general (Light 2004), post-World War II in Germany, and post-Apartheid South Africa (Swart 2008). Buchanan (1964) refers to Irving Babbitt who may have said that “revolutions begin in dictionaries” (p. 217). For Lefebvre (1991)

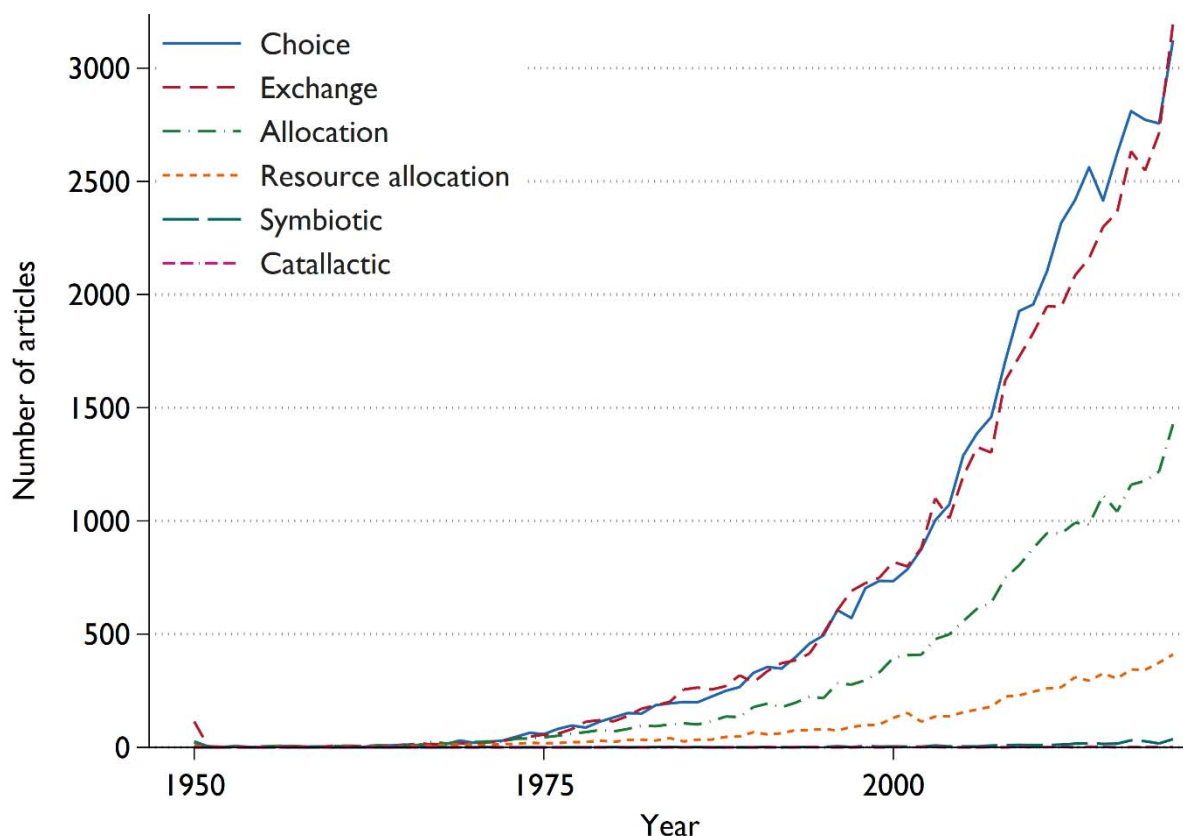
[a] social transformation, to be truly revolutionary in character must manifest a creative capacity in its effects on daily life, on language and on space – though its impact need not occur at the same time, or with equal force, in each of these areas (p. 54).

So far, the wording “symbiotics” has not yet received a lot of attention from economists. At best, some economists such Bhagwati (2002) or Bayoumi and Eichengreen (1997) refer to symbiotic relationships. An interesting picture emerges (see Figure 8) upon conducting a “brute force” in Scopus<sup>14</sup> (accessed March 8, 2021), searching for documents with any of the words “choice”, “exchange”, “allocation”, “resource allocation”, “symbiotic”, and “catallactic” in an article title, abstract, or listed as keywords in the area of economics, econometrics, or finance.

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<sup>14</sup> Query ‘TITLE-ABS-KEY (WORD\_OF\_INTEREST) AND SUBJAREA (ECON)’

Figure 8: The importance of Terms in Economic Documents using Scopus (1950-2020)



Looking at the number of documents (articles, books, book chapter, reviews, editorials, and other post-publication communications), the pattern for “choice” and “exchange” is almost identical over time, with a small advantage for “choice” (in total 48,485 for choice compared to 46,143 for exchange). In comparison, “allocation” (21,757 documents) or “resource allocation” (6,578) reports a decent number of documents, but substantially fewer than “choice” and “exchange”. Finally, there is not much activity with respect to symbiotic (301 cases) and catallactic (22). Thus, “exchange” and “choice” seem to have a similar relative importance at least as shown with such a brute force approach. In general, the use of symbiotics and *symbiosis* is more common in biology, although it is also employed with adjustments. Lynn Margulis (1998) defines *Symbiosis* as a “system in which members of different species live in physical contact” (p. 5). Gilbert, Sapp and Tauber (2012) stress that a symbiotic view of life is becoming a core principle of contemporary biology, replacing the conception of individuality:

The discovery of symbiosis throughout the animal kingdom is fundamentally transforming the classical conception of an insular individuality into one in which interactive relationships among species blurs the boundaries of the organism and obscures the notion of essential identity (p. 326).

## **Grants Economics**

However useful as a concept, Buchanan's emphasis on exchange is still too narrow for economics, as it implies that we exclude the relevance of one-way transfers in economics. Social life is full of one-way transfers – grants – discussed at length by Kenneth Boulding in his book *A Preface to Grants Economics: The Economy of Love and Fear* (Boulding 1981). Interestingly, the grants economy concept was not well received, as Boulding recounts:

One of the odd things about the grants economy concept is that it seems to arouse great anxiety and hostility among many more traditional economists. I admit I am a little puzzled by this, as grants economics seems to me a very natural and obvious extension of the existing frame of thought in economics and in the social sciences generally. Indeed, the whole concept seems so obvious that it is hard to believe that it has not been developed before. The very hostility that the concept arouses, however, suggests that there is enough novelty in it at least to upset those whose economics is confined very strictly to the concepts of the exchange economy (p. 21).

Boulding shows that grants are composed of two elements, one arising out of the threat system (fear) and one out of the integrative system (love). Thus, grants are not always made out of benevolence, as grants always imply a superior status of the grantor relative to the recipient (p. 26). A grantor will also work hard to maintain the credibility of threats or use it for reasons of benevolence, such as when parents give negative grants (via punishment) in the hope that the child will learn a lesson, which then may increase the child's future welfare (p. 27). In general, the building up of an integrative structure is one of the most important aspects of the grant economy, creating community, identity, and commitment (pp. 32-33), possibly being able to "attract through its institutions that minimum of loyalty, devotion, and affection necessary to maintain them" (p. 33); for Boulding (1981), this was a superior approach to institutions organized mainly through exchange. However, as he notes, it not always easy to distinguish grants from exchange. Is the support of children by parents (particularly in traditional societies) a deferred exchange? Is gift giving a subtle psychological transfer (e.g., via respect, status, affection, prestige etc.)? How can we classify such informal understanding?

Boulding strongly emphasizes the importance of grants as a core element in the area of political economy:

Economics has a theory of the firm, as it exists in an exchange economy; it has no theory of a foundation and no very good theory of a government as an economic organization, partly because of its neglect of the grants concept (Boulding 1981, p. 8).

For him, “without the grants concept any kind of organization would be incomprehensible” (p. 9). He also sees the importance of the grant concept in public finance and the provision of public goods. Grants are not arbitrary distortions of the equilibrium produced by the operation of an exchange economy, but rather “part of the mixture of benevolence, malevolence, and demand for public goods” (p. 11).

## **Concluding Remarks**

Buchanan (1964) admits that his attempt to encourage our profession to look at the same phenomena through another window is an act of *persuasion*, and therefore not free of values – some of which others may not support. As we know, science is an ongoing adventure in the search for truth, requiring us to guard against taking as given our tools of thought and exploration. It is not a bad thing to clean our own windows from time to time for clarity, or to add new windows to illuminate our edifice. But balancing out those different tools of thought and exploration is not an easy task. Minsky (1986) warns us of the danger of being drawn into dumbbell or dualism schemas. Dualism is a strangely dangerous creature that attracts and enchants us like the Sirens in Greek mythology, along with the risk of ending up shipwrecked. But, when Kohn (2004) compares what he calls the “value paradigm” to the “exchange paradigm”, he argues that hybrid theorizing is a mistake as each approach produces a very different positive economics: “two theoretical approaches stem from very different assumptions about the *nature* of the outcome of individual interaction” (p. 308). However, the interconnectivity of economic process does place a tax on dualism. For example, Walter Eucken attacks the dualism of the *Methodenstreit* between the historical school around Gustav von Schmoller (that favored a more holistic approach centered on the national level), and the

Austrian school associated with Menger (that emphasized theoretical economics over historical economics via economic individualism and abstraction in theory)<sup>15</sup>:

This dualism can only be overcome when it is fully realized what serious damage it has done and is doing. As is well known, more recent developments in scientific method have not followed in the path of Menger, Rickert and Windelband. These divisions in the sciences are not admitted, nor are their allegedly different objectives. There is but one world the problems of which it is the aim of all sciences to understand. Menger's division is, so to speak, a “literary” one and has its place only in books, with no significance in the real world. So let us now drop this philosophical and methodological criticism of “dualism” and confine ourselves strictly to economic problems (Eucken 1950, p. 56).

Nevertheless, as dualism constantly emerges in economics as well as in other sciences, it is important to ask how dualism affects the ability to solve real problems in economics and beyond. In the end, economics is about studying how society works (Sandmo 2011). Any such debates need to be guided by common sense, particularly when faced with specific puzzles or challenges. We are all well-aware of the *Paradox of Value* in the history of economic thought. Adam Smith introduced in his *Wealth of Nation* (Book I, Chapter IV) the following theoretical discussion between “value in use” and “value in exchange”:

The things which have the greatest value in use have frequently little or no value in exchange; and, on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water: but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it (p. 48).

However, he failed to solve such an alleged paradox by developing a satisfactory theory of demand that helps clarifying the relevance of demand in the formation of prices (Sandmo 2011) although Adam Smith noted that demand for precious metals such as diamonds and gold “arises partly from their utility and partly from their beauty” (p. 241). Schumpeter (1986) also pointed out that,

“[t]he Italians from Davanzati on were the first to realize explicitly how the Paradox of Value...can be solved and that it does not bar the way toward a theory of exchange value based upon value in use. The astounding fact that both Smith and Ricardo thought it did is, however,

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<sup>15</sup> See Morgan (2003). According to the Austrian school, value resides in the human actor, the subject of economic activity rather than in the object (e.g., goods and services) of activity and is therefore inseparable from the human actor’s intent (Bellante 2005, p. 198).

seen in its fully significance only if we add that, for the century and a half after Davanzi, a lengthy list of writers might be compiled who understood quite well precisely how the element of utility enters into the process of pricing... Galiani answers the question on what this value depends by Utility and Scarcity (*utilità e rarità*), and proceeds to develop these concepts in much the same way in which I suspect they are explained in many an elementary course today. Utility is not usefulness as understood by the observer—‘useful’ in the economist’s sense is everything that produces pleasure (*piacere*) or procures welfare (*felicità*)... What separates Galiani from Jevons and Menger is, first, that he lacked the concept of marginal utility—though the concept of relative scarcity comes pretty near it—and, second, that he failed to apply his analysis to the problems of cost and of distribution (pp. 286-287).

If dualism creeps into textbooks, we run the risk that the next generation of scholars will lack the tools and insights necessary to interpret the intricate phenomena that the first generation was keen to describe, understand, and filter out. In addition, as Hayek (1933) stressed, “[i]t takes a long time to rebuild the structure of a science if one starts by revising the fundamental concepts” (p. 24). Furthermore, many conceptions we use in social science such as love, consciousness, intelligence, thinking, emotion, and even choice or exchange are suitcase-like words. They help us communicate, but they are problematic as they conceal their actual complexity. As a consequence, we struggle to identify and understand a large range of different things and their relationships; and they handicap us by often preserving outdated concepts (Minsky 2006). It therefore helps to pay attention to the *mechanisms* and find suitable ways to *represent* and *program*<sup>16</sup> them.

It is not strictly necessary to define a suitcase-like word, but rather analyze its *role*, *structure*, and *functionality* as Sloman and Chrisley (2004, pp. 11-12) did for the suitcase-like word “information”. You progress scientifically by analyzing

- the variety of *types* of information there are
- the kinds of *forms* they can take
- the kinds of *relations* that can hold between information items
- the means of *acquiring* information,
- the means of *manipulating* information
- the means of *storing* information
- the means of *communicating* information

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<sup>16</sup> Minsky (2006) on love: “When a person you know has fallen in love, it’s almost as though someone new has emerged – a person who thinks in other ways, with altered goals and priorities. It’s almost as though a switch had been thrown and a different program has started to run” (p. 12).



- the *purposes* for which information can be used
- the *variety* of ways of using information

Gregory Bateson (2002) argues that the world of mental and biological systems is “a zigzag ladder of dialectic between form and process” (p. 182). And in his article *What is Science?* Feynman (1969) recounts a story of his vacation up in the Catskill Mountains. After one Sunday afternoon during which fathers took their kids for a walk in the woods (they had to go back to New York as they worked during the weekend) the following event occurred:

The next day, Monday, we were playing in the fields and this boy said to me, ‘See that bird standing on the stump there? What’s the name of it?’ I said, ‘I haven’t got the slightest idea.’ He said, ‘It’s a brown-throated thrush. Your father doesn’t teach you much about science’. I smiled to myself, because my father had already taught me that [the name] doesn’t tell me anything about the bird. He taught me ‘See that bird? It’s a brown-throated thrush, but in Germany it’s called a [H]alsenflugel, and in Chinese they call it a chung ling and even if you know all those names for it, you still know nothing about the bird – you only know something about people; what they call that bird. Now that thrush sings, and teaches its young to fly, and flies so many miles away during the summer across the country, and nobody knows how it finds its way,’ and so forth. *There is a difference between the name of the thing and what goes on* (p. 316, emphasis added).

Finally, if we follow Buchanan’s recommendation to look through the window of exchange, we will fail to see that the world is a combination of grants and exchange, as Kenneth Boulding has shown so convincingly:

[t]he critical question for the human race today, therefore, is, [h]ow can we make the best of what may be quite a bad job and move toward that organization of world society that will make spaceship earth tolerable?... I believe that the problem of the relative role of grants and exchange in the world of the future is one of the most crucial elements in determining the nature of the movement toward the spaceship earth and even in determining the possibility of attaining it (Boulding 1981, p. 137).

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