

**SARTONIANA**

**Volume 33**

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**Sarton Chair of the History of Science  
Ghent University, Belgium**



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**Volume 33**



**Editors: Robert Rubens and Maarten Van Dyck**

**Sarton Chair of the History of Sciences  
Ghent University, Belgium**

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# Introduction

## R.Rubens

The volume 33 of Sartonianana contains the lectures from the 34th year of Sarton lectures at Ghent University. The first volume englobed two years of lectures. During the academic year 2019-2020 the university had to confront the covid crisis. The latter had an effect upon the Sarton lectures. We therefore had to postpone three lectures to the forthcoming academic year. Only the first six lectures are the content of Sartionana 33.

Sticking to the principles put forward by George Sarton again different fields are represented in the lectures.

The lecture of the chairholder Dr.Knorr-Cetina develops the history of the stockmarket. It highlights the evolution from the Ticker of 1867 to the algorithms used in nowadays market. Furthermore a detailed discussion about the semi-autonomy, the algorithm gives to the machine is evaluated. In the historical essay a large part is also devoted to the importance of Reuter in this endeavour.

The paper by Schmoeckel backs up his critic on the Wax Weber hypothesis concerning the relationship between the modern economy and the Reformation, suggesting a sociological perspective. Based upon a detailed reading and a review of medieval philosophy he details how in medieval society trade also was regulated by canon law. The statement that Petrus de Ancharano already precluded modern prize control by his statement “quod omnes tangit, ab omnibus approbare debet” provides a clear proof.

The overview of the historical development of renal stone surgery in the second half of the twentieth century is the content of the paper by Oosterlinck. It is obvious that due to the technical development of this

field in medicine by engineers and physicists lots of pain and suffering has been avoided.

Ervynck details the history of archaeozoology/zooarchaeology. Through his discussion the difference between the two disciplines becomes obvious. Simultaneously however both endeavours need each other. Both disciplines have a different status nascendi, one being more palaeontological, the other one being more anthropological. They were both reunited in the International Council of Archaeozoology. In the Council the different interests gave again multiple working groups. Reading the paper of Ervynck explains that part of history of science in the recent past.

By reading the lecture of Sass we learn to understand the nature of subjectivity in psychology using masterpieces of international art. By using the paintings of Rembrandt and the quotations from Shakespeare he develops a theory about subjectivity in psychology. Although he recognizes the enormous importance of modern academic experimental psychology he recalls the statements of Smetlund and Cavell. He finishes with an appeal to reintegrate a phenomenological approach in psychology.

The nicely documented study by Hein about the interaction between the oil industry and the town development highlights the evolution of the modern interaction between industry-harbour and people.

May we again hope this volume of Sartoniana helps you to see the broad spectrum that is present in the history of science just as Sarton has wished more than a century ago!

# Laudatio Karin Knorr Cetina

R. Vanderstraeten

It is a pleasure and an honour to be able to introduce the inaugural lecture of Professor Karin Knorr Cetina as the new George Sarton Professor for History of Science. Let me start with a few general remarks.

The nineteenth century, the century in which George Sarton was born, was a dynamic century, certainly for the field of science. This field grew quickly. A variety of new scientific institutions, including Ghent University, were established in the first half of the nineteenth century. Specialization also became the driving force within the field of science. Many new specializations emerged – some of them disappeared again, but many survived and thrived. The social sciences are largely a product of the nineteenth century. Think, for example, of Auguste Comte, whose *Cours de Philosophie Positive*, published in the 1830s and early 1840s, presented a systematic plan for the organization of science, in which sociology was prominently included. Think of Adolphe Quetelet, another famous alumnus of this university and in fact its first Doctor scientiae, who, around the same period of time, devoted much time and energy to the elaboration of, what he called, *physique sociale* or social physics.

It is only near the end of the nineteenth century that the social sciences became academic fields of study, that is fields of study embedded within academic or university systems. The Department of Sociology (or Social Science) of the University of Chicago, arguably the most famous department of sociology in the world, and the Department of which Karin Knorr Cetina currently is the Chair, was founded in 1892. In Brussels, the industrial chemist and ‘enlightened’ politician Ernest Solvay founded in 1894 the *Institut des Sciences Sociales*. A few years later, he tried to make a new

start. He had an *art nouveau* building constructed that was to house a new *Institut de Sociologie Solvay*.

Solvay had far-reaching scientific and social ambitions. He founded and financed two other research institutes in Brussels: one for physiology, and one for physics. He acquired considerable international fame with these initiatives: among the participants of the first Solvay Conference on Physics in Brussels in 1911, for example, were scholars such as Marie Curie, Max Planck and Albert Einstein. Solvay hoped to play a similar role with regard to the development of sociology. His prestigious *Institut de Sociologie* was constructed near Solvay's institute of physiology. The building and its location expressed the importance Solvay accorded to sociology around the turn of the century; sociologists and natural scientists were to be treated on the same footing.

In this time period and in this milieu, Sarton matured intellectually. His own scientific ambitions clearly display the influences of this milieu. When he founded the journal *Isis* in 1913, in Ghent, he was concerned about the growing specialization in science. In his view, the history of science had to provide a *trait d'union* between the increasing number of scientific specializations; it had to shed light on the various interactions and interdependences, on the many commonalities, on "all the bonds that unite the different sciences". Somewhat paradoxically, he claimed that a new specialization – the history of science – was able to counteract the increasing specialization and differentiation within the system of science. But he also believed that this new field of study had to be an interdisciplinary one. He spoke of the history of science as a "psycho-sociological investigation" (Sarton, 1913, p. 9, p. 12). Even in 1952, only a few years before his death, the Harvard Professor Sarton still referred to what he called "my sociology of science" (Sarton, 1952, p. 94).

In the twentieth and twenty-first century, processes of scientific specialization have not come to a stop, quite to the contrary. In fields, such as the history or the sociology of science, much research is conducted about the ways in which science has become organized in different specializations and disciplines. As before, much work in the "psycho-sociological" history of science is undertaken with an interest in understanding the *consequences* of the main structural divisions within the field of science.

Many of the contributions, which Karin Knorr Cetina has made in a period of about five decades, are linked with, but also question this interest in the outcomes of scientific specialization. Instead of dealing with the products of scientific knowledge, Karin Knorr Cetina has invested much work in analyzing the production of scientific knowledge. She has primarily drawn attention to the questions of (a) how we know what we know and (b) how how we know what we know has started to change the world we live in. In the opening pages of *Epistemic Cultures*, her highly influential monograph, which first appeared 20 years ago, and which probably presents her approach most comprehensively, she speaks of her ambition to shed light on the ways science is practiced in “the deep social spaces of modern institutions” (Knorr Cetina, 1999, p. 2). The book itself presents a detailed study of two epistemic cultures, and, more particularly, two scientific laboratory cultures, one in high energy physics and one in molecular biology. This detailed study is built upon lengthy periods of direct observation in different laboratories. It shows how different epistemic cultures determine how we know what we know and how our scientific knowledge determines how we organize the labs we use to do science. Karin Knorr Cetina’s work is focused on contemporary settings. But it has been immediately evident that her approach is opening up new avenues which might also inform historical studies into the genesis of particular epistemic cultures, of particular ways of producing scientific knowledge.

In *Epistemic Cultures*, and much other work, Karin Knorr Cetina is also interested in the ways scientific expertise is changing the world we live in (see also Knorr-Cetina, 1981). It has become common to speak of the “knowledge society”, the “expert society”, or the “risk society”. These labels signal an awareness with the impact of knowledge on society as a whole or specific parts of it. In this regard, too, Karin Knorr Cetina does not treat scientific expertise as a product that is exported and changes society. She rather opens the black box, and looks at the ways in which different scientific devices are used in different social configurations. She looks at the ways in which knowledge is practiced in specific settings, how the world is “reconfigured” in specific epistemic settings. In her more recent research, Karin Knorr Cetina has particularly looked at how new communication media allow for new ways of presenting and dealing with information, and how the increasing relevance of scientific expertise brings in new classes of actors and leads to new types of social relations. Changes in the social networks upon which our world is built are closely

entangled with changes in the kind of expertise that is used to make sense of this world. I believe that Karin Knorr Cetina will today share with us some of her recent research about an increasingly important social sector, which not only has come to rely heavily on specific expert representations of the outside world, but which has also gone through and caused much social turbulence, namely financial markets.

The career of Karin Knorr Cetina spans about half a century. It connects different disciplines, especially anthropology and sociology. It also connects two continents – Europe and the US. She has worked at academic institutions in, among others, Vienna, Bielefeld and Konstanz, as well as Princeton and Chicago. Her publications have been reprinted in readers with so-called “classical texts” in different fields of studies; her work on science has become part of the canon in science studies. The many honours and rewards, which Karin Knorr Cetina has received in the course of the last decades, among which the John Desmond Bernal Distinguished Contribution to the Field Award from the Society for Social Studies of Science, are also testimony to the broad impact of her approach. Given her international and interdisciplinary background and orientation, moreover, I cannot imagine a better choice for the George Sarton Chair for History of Science.

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# Takeover by Science: The Long Contemporary History of Financial Markets

**Karin Knorr Cetina**

“What is the market for you, the price action, individual participants, or what?” I asked.

“Everything. Everything,” RG said.

“Everything? The information?”

“Everything. Everything. How loudly he’s screaming, how excited he gets, who’s selling, who’s buying, where, which center, what central banks are doing, what the large funds are doing, what the press is saying, what’s happening to the CDU, what the Malaysian prime minister is saying, it’s everything – everything all the time.”

RG is a currency trader. When I talked to him at his desk on the trading floor of GB1 in Zurich, he had been in the business for more than fifteen years and traded on several continents. He offered his definition of a market immersed in his activities, eyes glued to the screen, ears picking up what went on around him on the floor, fingers furiously hitting keys or lingering close to the keyboard. He was making deals on the EBS, the electronic broker system, intermittently talking to a contact in Singapore about the situation in Asia on his conversational dealing window and observing “everything” on his six screens – price movements, individual buyers and sellers, central bank activities in various countries, the Malaysian prime minister, a German political party (the CDU). There is much to learn from the market notion he offered. It is curiously inclusive, suggesting that nothing can be excluded from potential market relevance. It is also thoroughly informational: what mattered for him was to know it all, and then to act

upon this knowledge. Instead of pointing to the market as a mechanism of price formation or of the allocation of goods, the way economists might see it, RG points to the market as a system of knowledge and information.

Sweeping and totalizing views of the market came up frequently in descriptions by market insiders in my research – but such views would not have been possible, I claim, before the 1980s. Why not? The market was once not “everything” but a much sparser matrix with many empty cells – containing only what a trader would precariously learn through his or her dealing contacts. If RG had traded then and I had asked him what a market was, he might have answered Hamlet-like, in a much more uncertain, hesitant manner:

“Oh, I don’t know where the market is, first you have to actually find it.”

“The market?” I would ask perplexed, “Is it not the prices? The other participants?”

“But I don’t know who is participating and what the price is,” he might have said. “It changes all the time. So you have to find it all the time. Who actually wants to deal and at what price, where the market is, that is the question.”

In this paper, I make two interrelated arguments. The first is that financial markets are not only economic realities but also variable and complex epistemic configurations that epitomize a particular trajectory in the history of knowledge. This trajectory involves a close alignment between a system of practice (trading) and its *lex mercatoria* and various systems of observation and analysis oriented to epistemic principles, climaxing today in a takeover by science – a takeover so complete in some financial areas that they could no longer operate without it. My second argument is that this trajectory also involves the temporalization of financial markets. I understand temporalization to mean two things. One is that temporal variables take precedence over space, sociality or other organizing principles as these markets move forward and change. The second is the increasing differentiation and articulation of temporal dimensions as markets get more complex.

The trajectory is not linear and the path to the present was not straightforward. At the core of today’s markets is what I call a scoping system – an assemblage of electronic hardware, software and information feeds that gather up the market and stream it onto screens. The system also gathers up

the context; it augments bare market data by the rest of the relevant world – it presents all events, activities and outcomes globally that may become significant to market action and many non-significant events – together they are RG’s “everything”, the referential whole he had projected for him on the six screens he observed. Two major disruptive transformations in trading technology (and several minor ones) have created a situation in which the market need no longer be found but is fully, extensively present on trading floors, right in front of professional traders. One is the invention of the ticker in 1867, a technology that temporalized and visualized an earlier market by displaying the bare essentials of deals (prices, volumes and instruments) in itemized fashion. Though this was a back-looking technology that made market activities visible only after the fact (after deals had been done), it created a common ground (everyone having a ticker could see how the market had evolved) and it displayed the information in a sequential, running manner; it streamed it. I link the second transformation to the invention of computerized trading systems that put things on screen about 100 years later and that became quickly adopted in the FX market which I will take as my main example in 1981. The first such system, suggestively called “Monitor” as in a generalized observer, was the first scoping technology in a broader sense – it gathered up and rendered visually present who was in the market and interested to deal, and it gathered up news – events happening in distant places, the local knowledge the economist Hayek thought important. Monitor became the basis for later more advanced systems of this sort. Both, streamers and scopes were necessary, and had to be combined as they are in electronic markets, to allow the present market to emerge: a market that is all-encompassing, that gushes forward on screen, embodying the passing of events and the opening of opportunities in a global system, and that moves from time zone to time zone with the sun. Before Monitor and its later versions, the foreign exchange market appears to have been a network market: networks of relationship were intrinsic to market behavior and allowed for a measure of market coordination. Networks still play a role today, but something else holds the market together and accounts for its shape: the scoping systems involved, and the continuous observation they require. What emerged is a regime of attention and examination based on an epistemic technology (see Callen 2018:661) that offers data and data analytics as well as narrative understanding and continually invites further measurements and investigations.

There is now a third transformation that has been no less disruptive than the ticker and monitor – the transition to algorithms. They tiptoed into financial markets mostly as execution tools for traders in the late 1990s, then took off much faster after the turn of the century and are now replacing large portions of human traders in the stock market and other markets. As the British Foresight report estimated, 30% of the equity trading volume in the UK and over 60% in the US were generated through high frequency trading by 2012.<sup>1</sup> This number has now topped out at about 50% of trading in the US stock market, and close to 50% in the currency market. High frequency trading is exclusively done by algorithms – no human trader would be able to muster the speed with which deals occur in this area. The Foresight Report laid out the trend toward more algorithmic trading, but also noted that “there are good reasons to expect that, for the next decade or so, the number of human participation in the market will remain significant.” (p.32). This decade is now nearly over, and humans did indeed remain present even in the fastest moving markets. But what the Foresight Report did not anticipate is that the humans involved are in increasing degrees no longer expert traders that learned dealing on the floor and that trade with or against algorithms, but quantitative scientists trained in disciplines such as physics, computer science or mathematics that create and control algorithms as these assume trading. The emergence of an epistemic-mercenary class of quantitative scientists that is taking over trading floors epitomizes the long history of knowledge relations in this field. The appearance on the scene of algorithmic traders also illustrates these epistemic relations – algorithms are after all epistemic things. In addition, it illustrates the rise of a temporal logic peaking today with an emphasis on speed and acceleration.

My argument then is that the changes observed over the last roughly 150 years involve on the one hand radical shifts in the pattern, in the coevolution of financial markets and their environment, in every one of the three transitions mentioned. But I also argue that there were organizing logics in place in all three instances that remained the same, suggesting an overarching development that’s internally quite consistent and coherent. Each of the radical changes can be linked to one of the disruptive technologies mentioned before: the ticker, the computer, and algorithms. All imply transformations in market structure, trading practices and trading agents. But the rise of

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<sup>1</sup> Government office for Science 2012, Foresight. The Future of Computer Trading in Financial Markets. Final Project Report (<http://eprints.lse.ac.uk/62157/> downloaded June 22, 2020).

algorithms also points back to a whole trajectory of preferences, themes and principles that top out today but have been there before, since the earliest shifts in pattern traced here. These organizing logics are a large part of the story of how these markets became reengineered into what they are today. The first logic treats markets as knowledge-dependent and equivalent; it implies an identification of market transactions with information and an early awareness of the advantages data, knowledge, technology and science can bring. The second treats markets as time-dependent and time as a resource and pliable variable that can be manipulated for practical purposes and can also be internally defined and accelerated. “Logics” operate on a discursive level, offering rationalizing and legitimizing arguments (DiMaggio and Powell, 1983) that privilege and defend what they focus on, in this case time and/or knowledge. But once implemented, they have material consequences and drive demands – as when groups of engineers developing an information infrastructure act as a driving force for further such developments. Note that other provinces of the social world that emerged or transformed at about the same time as financial markets such as, in the US, the banking sector, have been driven by quite different principles and don’t share the respective preferences – although there is no reason why epistemic resources, for instance, should not have been of interest to them. My argument is that financial markets fell into the pattern of giving preference to time and science/technology over other considerations with the introduction of the stock ticker at the New York Stock Exchange in 1867. The ticker visualized the market as something that is sequential and processual; it brought it “home,” making it available – ready-to-hand, Heidegger would say – for continued observation and responsiveness. And it displayed a science-based technology (supplemented by the telephone in 1878) as decidedly advantageous – much more so than what one had resorted to in the past, such as better means of transportation.

In the following I begin with the ticker, a streaming technology, and surely one of the earliest large scale “datafication” instruments in the history of science and technology – one that thoroughly transformed financial markets. While the notion of a scope suggests a wide-angle view of the market world and its surrounding context, streaming tickers made the view “live” even before it was wide-angle: they temporalized financial transactions. After discussing the ticker, I will then define scopic media going back to the historical origin of Monitor and the historic alliance between a news provider firm (Reuters) and the foreign exchange market, the earliest and

largest market world-wide to fully adopt such a system and to thrive off it. Streaming continued with Monitor and its successor technologies, but it is now a multiplex phenomenon with many streams of data to observe, keep track of and respond to. The last section defines algorithms and explains in abbreviated manner how they developed and changed. Unlike the ticker, and Monitor, algorithms were not invented and created for financial markets, and they were not an invention of a particular market-oriented group or firm – although the particular algorithms used within these markets surely are specific to them. Thus, our contemporary history has to jump sites so to speak, looking at specific historical problem areas and episodes leading into and defining phase transitions.

## 1. The Ticker as a Streaming Technology

Time is an aspect of everything, one assumes, and everything in human history is on some level a process.<sup>2</sup> But in finance, it is a spatial marketplace we start out with in the backalleys of London in the 18<sup>th</sup> and early 19<sup>th</sup> century, and the early over-the-counter currency market that older market participants recalled was a network market – conceived of in terms of spatially dispersed banks and traders whom one knew and maintained connections with. This concept of a spatial marketplace also dominated the stock market well into the onset of computerization. The ticker, invented in 1867 by Edward Augustin Calahan, defied this common sense idea. It showed that a market, however scattered its participants, was also (and had always been) an action sequence, and the most relevant characteristics of that sequence, the deals and prices, could be noted and displayed on tape with some level of latency in near real time. In fact, the telegraph and the telephone also produced data of such nature (noted by hand on “big sheets” in exchanges in pre-ticker times), but these data arrived sporadically and at irregular intervals and they were error prone and laborious to obtain and note down by hand (Preda 2006: 757, 762). The ticker was not simply a price quoting instrument – it did not for example transmit tradeable or even indicative prices. It rather recorded and broadcast the contemporary market history – it offered a mechanism that visualized that market history efficiently and directly as a continuous price-volume flow. It is for that reason that we can say it temporalized the spatial market and precast the

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<sup>2</sup> See Abbott 2001; 2016.

later, computerized market on screen. The claim here is that this triggered a shift in perception and perspective and reinforced the idea of an abstract temporal and informational market delivered by a mechanism – a perspective expressed in the new practice of continuously watching the tape, in so called “ticker trances” and more generally in the attraction the ticker held for participants until it disappeared into computer screens.

Thus, even without offering transactionable prices the ticker changed market practice and market thinking, extending traders temporal sensitivities and processual vocabulary: the continuously streaming deals drew attention to the process characteristics of the sequence and to its dynamics of movement – features that would likely have remained invisible or unprecise without ticker data. Participants appeared to experience what was on the ticker tape as the market live, and more generally the market as a live object whose rhythms and speed one could watch as it moved. As the first streaming instrument, the ticker showed not only a sequence of trades but also the time intervals between them and with that the speed and vitality of the past market. The speed, vitality, and sequential progression noted below by a trader are all time related concepts. So was the latency advantage the ticker offered to those having the instrument over those who did not: It was clearly much faster to keep an eye on the ticker and form a trading opinion than to obtain the relevant information by phone, telex or earlier available (high latency) technologies. Here is the full quote of a trader’s recollection of what the ticker meant (Quoted from Knorr&Preda 2007):

AP: These electronic tapes –

I1: Okay, running across. Two lines, right? Uh, prices. And you could get the speed idea. And it was live. It was a live tape, you know, going through, and you could watch it...and that was important, because you did get a good rhythm, you know, even better than now in some ways. The running tape, people often used to get upset when it disappeared into the computer screens, because you know (...) you got a great flow. Okay, and you could see how often, if you were looking let’s say, at IBM, and you want to see how often it came up, right? You get a flavor also of the price differentials, who is keeping tight markets. Uh, you could see shorts, which was very important.

The temporal construction of the market as a transaction sequence abstracted away from actual human participants and the subtleties of their

dealing interactions. From the ticker, one got a summary of the market, the outcome of an interaction chain, not a transcript of dealing negotiations and strategies. The human market had been a behavioral spectacle mired in difficulties (Preda 2006). We can assume that this reductive rendering of a human market set it up for gaining speed, but it is not clear that speeding up the market as such in terms of the speed of transactions was a central motivation for the adoption of the ticker. What must surely have been attractive is the speeding up of information transmission that the ticker enabled. Financial markets have a long history of seeking out such time advantages. A story frequently told is that of the carrier pigeons that the Rothschild bank famously used in 1815 to get a head-start on whether Napoleon won or lost the battle of Waterloo – he lost.<sup>3</sup> The bank went short on French bonds before anyone knew the outcome of the battle and made an enormous sum of money. The news agency Reuters set up a carrier pigeon network in London in 1845 to obtain stock market news from Paris – faster than it was apparently possible by train.<sup>4</sup> This sort of speed may indeed “always” have been an important part of reaching a competitive advantage in markets, as Narang (2013:243) argues. But the admirable speed “technologies” such as carrier pigeons mustered could not project a continuous stream of dispersed market events from multiple sources; they could not “scope” the market but rather extended the earlier network market by increasing the distance that could be covered and the speed with which information travelled through network connections.

The references to information above suggest that the ticker was not only a streaming instrument but also already an epistemic technology: it was the key to the continual production of the most fundamental market knowledge – the knowledge “where the market was,” where the prices were, what quantities were available, and who wanted to trade. A financial market, like any market, is not a dyadic person-to-person unit. Much like a language, it is a collective entity encompassing a multitude of actors hidden in space whose identity is for the most part not known to participants. The coordination trick of the ticker was to counteract this dispersion and

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<sup>3</sup> See also ch. 3.

<sup>4</sup> Carrier pigeons had obvious disadvantages as several of them had to be set loose to make sure that one arrived with a message. Still their speed advantages were valued even after the telegraph was invented. For a comparison of different transmission means including horses and the continued use of carrier pigeons even today see <https://sites.google.com/site/etec540telegraph/home/animal-post>, accessed Feb 25, 2018). See also Narang 2013:244 for a version of the Rothschild story.

invisibility. Scopic media ultimately solved this problem about 100 years after the ticker through online trading, but the ticker made a beginning: It was the first dedicated technology that showed the market history as a forward moving sequence “in real (past) time” – as it had just been lived through, transmitted to every trading floor and exchange connected by the instrument. It seems plain that this sort of real time presentation of earlier activities that showed prices was for traders an information baseline crucial to the continuation and extension of market action. From now on participants kept their eyes on the tape when they traded or had someone doing it for them on the floor and mapping the information on boards.

They also soon found ways to extend their observational analysis by various ways of reordering and calculating the data stream. As indicated before, the ticker was presumably the first instance of a technology of datafication – it yielded data that represented an entire population of relevant trades and that could be rearranged according to instruments traded, price developments, quantities traded, trading times and so on to be analyzed with respect to systematic patterns. This was the origin of the emergence of the profession of technical analysts, originally former traders who resolved to devote their attention fully to ticker tape analysis (Preda 2007). It was also an early development of systematic self-observation and research in financial markets that developed “on the ground” roughly 70 years before finance theory began to boom in academia in the 1960s (Jovanovic 2012) – a field science that found a lot to discover in a particular data stream without needing to find and consult other information, and that may have stimulated and sustained the data and research orientations that came later. The ticker also early on became partnered with a news ticker that broadened its information-epistemic role.

It is worthwhile emphasizing after what I said that the temporal and epistemic logic combined forces in this early period of professional financial markets. Knowledge can be developed without consideration for market speed as when economists on and around trading floors in OTC markets look at the macro-economic picture – they are attentive to the times of business cycles and macroeconomic indicators, but hardly to those of trading sequences. And temporal considerations may target the competition (one may want to gain a competitive advantage by being faster) or relate to fairness (everyone should have access to the same data) and transmission cost without consideration of information and knowledge. With the ticker, the

two motivations appear to have become intertwined and they reenforced each other. We will see that during the next two time periods distinguished here, the modes of articulation of the temporal and epistemic vary and become more complex and diverse, but the easy partnership and mutual reenforcement continues. Phrased differently, there is no deeply ambivalent or conflicted relationship between the two logics I distinguished, between the rise of a temporal and epistemic dimension in these markets.

Why did these logics gain traction? A financial market is on a behavioral level a coercive response system whose units are not single actions but transaction responses and response chains – the result of the motivated necessity to continually respond to market movements to avoid losses and realize opportunities; doing nothing in professional financial markets is also a response-reaction. The “reactor” market needs the response presence and re-action and not just an action-commitment by participants to be continued. In such a system, each event, that is each market transaction, is in tendency the direct cause of the one following and the direct result of the one preceding. Being “in the market” means having money and by implication one’s livelihood on the line, and these values may change with every move of the market. Participants can exit the market (sell their positions), but short of exiting, responsiveness to the market is necessary and expected in institutional markets.

It is plausible to assume that the sort of quick (and with algorithmic trading extreme) reactivity that one sees in contemporary human currency markets is neither natural nor inevitable. One hypothesis is that the reactive attitude embodied in financial markets today became possible and took roots together with the temporalization outlined. Consider that there are two presuppositions for responsiveness to work. These are not general conditions that need to be in place for a financial market to come into existence and function at all, such as property rights, contract law, or in currency markets, floating rather than fixed exchange rates. Such conditions, if not fulfilled, have catastrophic consequences: they negate the institution or consequence for which they are a presupposition.<sup>5</sup> What I propose instead is a pragmatic notion of presupposition following the philosopher Stalnaker (1974). In the present case, a pragmatic presupposition refers not to what the market presupposes, but what market actors presuppose when they engage in market

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<sup>5</sup> For example, a we cannot assume a proper market to come into existence if certain rights and obligations are not in place and legally enforceable.

actions. If these actions need to be responsive, they presuppose knowledge of earlier market responses, that's information about what the last market moves were to which a response should be directed. And that information needs not only to be available and communicated, but it needs to be noticed and perceived by the actors in a system. As a consequence, there is, besides the first presupposition of information availability a second pragmatic presupposition – participants are required to continually pay attention to and observe the market.<sup>6</sup> Both presupposition would normally be expected to hold “in the common ground”<sup>7</sup> between market participants, and would be directed to market movements (price actions).

The ticker presumably fulfilled the first presuppositional requirement and evoked and called for the second – to an extent they had not been fulfilled before: the historical record suggests that it was the sudden availability of a response ready market knowledge that led to the eager reception of the instrument, and to the excited attention participants devoted to the ticker tape. That is true of those who had the ticker – those who did not confronted severe disadvantages. As Preda showed (2006), exchanges attempted to monopolize access to the ticker, and members of bucketshops and offsite brokers resorted to desperate and illegal strategies of trying to overhear what went on inside the exchange through closed doors or bribing someone inside to relay the relevant information to them. Pragmatic presuppositions need not produce catastrophe when they are not fulfilled but may produce weaker forms of failure, for example, market missteps or a wash-out of one's position. And a delayed response or non- response by a market participant could easily negatively affect the value of investments.

Let me finish this section on the ticker by summing up the consequences it had. The most important effect was surely that it temporalized the previously spatial marketplace – it datafied it, and with that it readied it for quantitative analysis and scientific treatment. On participants side, with the ticker came the beginnings of a coercive regime of attention – one that eliminated the need to find ways to collect information about where the

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<sup>6</sup> See also chapter 4 and 5 where I have gone to some length in explaining how scopic media attract and afford mass attention to the market. I also argued that given that the market directs mass attention, we can assume a level of attentional integration in a dispersed and mostly anonymous global market.

<sup>7</sup> This is as Stalnaker put it, see Beaver, David I. and Geurts, Bart, “Presupposition”, *The Stanford Encyclopedia of Philosophy* (Winter 2014 Edition), Edward N. Zalta (ed.), URL = <<https://plato.stanford.edu/archives/win2014/entries/presupposition/>>, downloaded Dec 5, 2018 and the works cited in the text.

market was, but enforced the need to watch the ticker tape, the source of information. From the convergence between a market transformed into streaming data and participants' abiding attention to the tape, new forms of analysis and a new profession emerged – that of technical analysts, who took the ticker data and recalculated them for various purposes, including to trace and dissect price movements (chartists). The sociology of financial markets changed too, a further consequence of the ticker: Those exchanges and brokerage houses that had the ticker gained informational advances over those who did not – and with it they gained institutional power and improved their position in the field, while those that did not have the ticker lost out. In other words, a new form of social stratification emerged tied to who had access to the ticker and could monopolize it, and who did not (see also Knorr Cetina and Preda 2007).

## 2. Scopes: the transition to Scopic Media

Now the transition from the ticker to the computer, to putting an intensely observed, partially informationalized but still spatially situated market in terms of actual trading locations entirely on screen, and screens replacing ticker tape and enabling electronic trading. I trace this here for the institutional currency market, by far the largest market worldwide in terms of volume of trading with an average daily turnover of approximately 5.1 trillion U.S. dollars in 2019.<sup>8</sup> It is also likely the earliest market that fully embraced electronic trading within a year of the technology becoming fully functional in 1981; the process appears to have been fraught with resistances and delays in exchange traded markets (see Pardo Guerra 2019). One impressive aspect and driver of the transition to scopic media is the axial alliance between institutional traders, mostly banks, and a technology firm that conceived of its role as fulfilling and providing for all the hard- and software functions the currency market needed – it saw itself as the one stop go to for the market's information needs, took care of transatlantic and national cables and connections for the purpose, and also developed, partly from scratch and partly by making use of existing technologies, the market-visualization and monitoring media that enabled electronic trading. This mercenary alliance with a techno-epistemic company has been the

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<sup>8</sup> See the volume development for all FX transactions: <https://www.statista.com/statistics/247328/activity-per-trading-day-on-the-global-currency-market/>

backbone and driver not only of the transition itself but also of one of its major outcomes, the global synchronization of the FX market. A second outcome is the further emergence and proliferation of temporal strategies and categories instantiated in infrastructural and mediastuctural technologies as well as in the human technology of market participants' behavior and collective arrangements; all aspects of an ecology of time. A dominant dimension across categories is speed – temporalization translates into acceleration in this period but not only into acceleration. Monitor, too, was an epistemic technology – key to the production of market knowledge from the vastness of economic, financial and socio- and geo-political data screens and computers are able to transmit and channel. The technology became a massive enabling force and driver of market changes in the 1970s and 80s, but it also became interwoven with the preference for temporal variables as an organizing principle of the development.

The transformation is, in the FX market, to a large extent a story of Reuters, originally a news company that transformed itself into a financial service company and a high technology company in the 1960s and 70s. Reuters was in many ways as dominating an institution for the over-the-counter currency market as the New York Stock Exchange and the London Stock Exchange were for the stock market. Exchanges are key institutions *in* the market. Once established, they were the places where buy and sell orders would go, prices and trades were brokered, and settlement used to occur. They were also institutions that offered investors and clients some assurance of fair and transparent trading. A corporation such as Reuters is clearly external to the market – as external as regulatory institutions, and on some level as needed and challenged by markets. Economic sociologists have seen the state (regulator and the government) as the central institution that enables, restrains and creates markets (See Fligstein 1996, 2002, Fligstein and McAdam 2012, Pardo-Guerra 2019: ch.7, 292). Following Polanyi (1944), they tend to see markets as embedded in politics, and governments as the part of the environment that most directly affects markets. This is surely plausible for the stock market, an exchange-traded and civic investor-oriented market. In the US, the SEC (Security and Exchange Commission), created after the crash of 1929 by the Securities and Exchange Act of 1934 with the goal to “protect investors, maintain

fair, orderly and efficient markets, and facilitate capital formation,”<sup>9</sup> has held strong oversight of stock markets ever since. But not all markets are alike, and there are long standing differences between exchange-traded and over-the-counter (OTC) markets. If the stock market is “notably regulated” (Pardo Guerra 2019: 288), the Foreign Exchange Market is notably deregulated – not subject to the disclosure requirements and other regulations of enforcement authorities such as the SEC specifically created for that purpose.<sup>10</sup>

Contemporary currency markets have not been so independent of Reuters and similar industries for their economic growth OTC-markets and the part of its environment that counts, we need to look at the technology firms and information, news and analysis providers and the science and engineering behind them rather than to look to governments. Reuters is particularly interesting here, since it is there at the beginning of the contemporary currency market in the 1970s, and is designing, engineering and assembling the infrastructures and central media structures (hardware and software) for its operation. It is also aiming to be a single provider and access point for all the tools the FX market needs, and, following these needs, is setting itself up from the beginning as a global operation. Reuters catapulted itself and the currency market into the late 20<sup>th</sup> and 21<sup>st</sup> century and dominated this worldwide largest and highly profitable institutional financial market for more than a generation. In fact, calling this a form of embeddedness doesn’t quite capture the depth of the alliance and the co-evolution of the FX market and a technology firm in this second phase.

Reuters plunge into financial markets took off from a successful transatlantic deal it made with the North American company Ultronic in 1964 for the rights to use its “Stockmaster” service, a computerized stock exchange quote system, with its North American content in Europe for a share of the profit; Reuters offered its leased high speed circuit across the Atlantic

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<sup>9</sup> U.S. Securities and Exchange Commission, <https://www.sec.gov/Article/whatwedo.html> accessed Jan 22, 2019.

<sup>10</sup> There are several reasons for this, one being that the origin of the OTC market lies with private trading networks; as private markets they are not bound by the standardization requirements of exchanges, can trade unusual quantities and contracts, and prices need not be published. Remaining outside the “limitations” of exchanges is to some degree the reason for their existence. Another is that foreign exchange trading involves issues of national sovereignty and the consent of more than one government to relevant regulation. Thus, the FX market has by and large been pragmatically independent, “has little (if any) supervisory entity regulating its actions,” and “unlike trading in stocks, bonds, and derivatives, trading in currency markets is essentially unregulated” (Osler 2009: 5408).

in return. Stockmaster was, like the ticker, a pre-screen data service. But while the ticker served exchanges, Stockmaster made it possible for someone *remote* from an exchange to access prices as they happened. Ultronic received ticker data from exchanges, processed them in a central computer, and made them available for retrieval via a code by desk units in customers' offices. Traders could also retrieve the latest bid and offer prices if they were an exchange member – and they would be alerted to and could see price changes virtually instantaneously (Ransom 2014:2). The service allowed bank traders and brokers to trade “on more level terms” with exchange members in terms of the speed of access to price information. It was also faster and cheaper than clerks or open phone lines to exchanges and head offices and freed these lines for trading. Brokers could furnish clients with “up to the second” prices – all meaning potentially more trades, more turnover and the overall growth in turnover of the financial markets (Ransom 2014: 3). These details matter, since they explain why Reuters moved so successfully into the Foreign Exchange market – and how the stock exchange and the OTC market were connected in the beginning of currency trading – by a firm setting itself up as a cross-domain “bi-lingual” information service that served over-the-counter bank traders as well as exchanges and bridged the gap and hostilities between the two kinds of market venues – and by Reuters perceiving the usefulness of such a service for the newly emerging currency market.

According to the Reuters archives (particularly Ransom 2014), Stockmaster transformed Reuters financially into an enormously profitable business, and led it to develop a marketing infrastructure and sales force with close contacts in banks, brokerages and telecommunication authorities. Reuters had the exclusive rights to the Ultronic quotation and display systems outside North America, and it forged deals with European and later other exchanges that added their data to the service and opened up new markets. Stockmaster also led Reuters to set up a computer division and data centers in major financial centers, and to hire the technical core that drove the Stockmaster project forward. There were many successive improvements around the stockmaster service between 1964 and 1970, most pathbreaking perhaps the move to Videomaster, essentially Stockmaster on a screen with additional features. “There was not a video screen to be seen in Reuters”

before 1968, and order wires were used instead of email.<sup>11</sup> But by 1970, the first Videomaster installations in Europe were made in Paris and Geneva, offering an impressive 10,000 quotations from 33 markets. At the end of the 1960's, the screen version of Stockmaster and its further developments were well established, and Reuters' computer division's job was declared "done." Reuters moved on and redirected its technical and financial assets to create its next and perhaps most pathbreaking project, Reuters Monitor (Archives 2015:3, 5).

Monitor was designed "to penetrate the huge market for foreign exchange prices." Under the Bretton Woods system, the U.S. dollar's value had been fixed against gold – but it struggled throughout the 1960s and was seen as increasingly overvalued; the result of the cost of Johnson's domestic spending on his Great Society programs, the rise of military spending caused by the Vietnam War, an oil crisis, and other factors.<sup>12</sup> In 1971, Nixon announced the temporary suspension of the dollar's convertibility into gold – a crisis that became permanent and marked the breakdown of the whole system that had existed since 1944. When currencies could move freely against one another from 1973 onward, trading took off, and a new unregulated market emerged – the contemporary foreign exchange market. Reuters perceived the "Nixon shock" and the floating exchange rates that followed as an opportunity (Bartlett 2015:1). It conceived of the Reuter Monitor system in 1972 with the success of Stockmaster in mind as a "Money Rates" service. The design mirrored to some degree the proven Stockmaster system but added new levels of technology, engineering and sales expertise. At the time, neither Apple nor Microsoft had been founded, the design of the Internet as we know it had not started, there was no suitable operating system or high level computer language on which to base the development, Intel had just only launched its first 4-bit microprocessor, and the Google founders had not been born (Bartlett 2015:2-3).

Monitor was a calculated initiative, but not one without risk. Bartlett points out several of these risks (2015:2):

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<sup>11</sup> Reuters and Ultronic had however launched a US business wire of news delivered to teleprinters and videosccreens in 1967 (see Reuters Archives, Reuters technical development chronology 1964-1969:3).

<sup>12</sup> See International Monetary Fund, The end of the Bretton Woods System (1972–81), <https://www.imf.org/external/about/histend.htm>

The market would have to be built from scratch and take account of competitiveness between market players. It challenged the position of existing participants like money brokers.

It needed capital for computers, client equipment, software and hardware development. A considerable bank loan was required, and this was a first for Reuters.

It assumed that some customers would pay for the privilege of advertising their precious buy and sell rates for different currencies, while others would pay to see those rates.

It appeared to run against telecommunications rules about carrying traffic from a third party on a leased line.

It required the development of reliable, efficient software. Reuters expertise had been mainly in hardware.

Reuters assessed the risk by making simulated demonstrations to potential clients using a screen, a keyboard and a tape recorder to simulate the arrival of data from a host – and then took the plunge.

The first screen and keyboard, Trevor Bartlett, head of knowledge management and project leader at Reuters, raved, “was striking, with a brushed aluminium finish, later used in iPhone...The first Apple Macintosh in 1984 had a remarkably similar profile” (2015:3). But despite its glamorous looks at the time, Monitor’s small one device screen was still light-years away from the immersive scopic environments of Reuters’ 2000 and 3000 systems with its many services and functions that followed in the 1990s and after Monitor’s retirement in 1998. There was no real time updating, for example. Banks such as Barclays owned one or more pages of information laid out like a spreadsheet which they contributed and needed to update by specifying the page row and column and data to be displayed. But clients didn’t like spending their time updating Monitor, Bartlett notes, and Reuters sales force had to encourage contributors many times to keep their new rates posted – not an automatic achievement when done by hand. As a consequence of the updating problem, one of the first (hardware) improvements addressed the issue through copying the keyboard input destined for client’s in-house systems. In the end, Monitor’s sales success and the updating delays prompted the integration of Monitor with clients’ own computer systems and trading rooms – most important perhaps through

data feeds, the ability to retrieve and contribute data from client terminals and computers.

But a slick and light Monitor terminal was not enough. Traders wanted to see “dealable” prices on the same screen, as one of Reuters’ product developers at the time and its executive director in the 1990s put it, “so we created the Reuter dealing service which logically culminated in Reuters becoming the electronic broker showing banks the best price in the market for them at any instant.” (Ure: 2015:2). The development of the Reuter Monitor Dealing service “started in earnest” in 1978 – and was expected to go live during 1979. It took until 1981; when it was launched, it combined Monitor data with conversational dealing that enabled FX traders to actually conclude trades over the screen/terminal. Reuters Conversational Dealing was based on what traders had done by phone: dealing with a counterparty via brief communications; an updated version is still used today. But it was certainly faster than dealing by phone. The traders on the floor I observed (between the late 1990s and 2nd decade of 2000) sped things up further when using conversational dealing. They often kept the conversation “open” on screen, thus avoiding that first and last “handshake” of a conversational opening and closing and concluded deals within 3 short lines of text.

The three innovations (Stockmaster, Monitor, and Conversational Dealing) gradually made Reuters more profitable than ever before. In 1963 the company had made a profit of £51,000; in 1973 profits reached more than £709,000; and in 1981 profits were more than £16 million (Read 1999). But one major innovation dominant in the contemporary FX market was still missing, an electronic broker. Started in 1985, it took until 1989 until a phase 1 version named Dealing 2000 was released that only provided indicative, non-dealable prices, and 3 more years until phase 2 offered these prices and eliminated the need for human brokers (Davids 2017:6). Buy and sell prices could be entered directly into the system, which ordered the bids and offers and matched them. “Although D2000-2 and GLOBEX didnt reach their product potential technically they performed to the level required” (Davids 2017:6). One reason for this toned-down assessment regarding the product potential surely was that a consortium of major FX banks, annoyed with the cost of Reuters systems, resolved to create their own electronic matching and dealing system, called Electronic Broker Service (EBS), and started using it in 1993/4. This led to a situation in

which Reuters' version ended up being used for the British Pound and related commonwealth currencies such as the Australian and Canadian Dollar, while EBS was used for continental European as well as Japanese and Chinese currency – by far the larger volume of FX trades. Many of the functions of Reuters' 2000 product series were integrated later in its subsequent Reuters' 3000 platform. Note that FX market is primarily a quote driven market, in contrast to the equity market which can be characterized as an order driven market. Dealers are banks which are both principal and agent in the market – they deal on their own account and on that of customers<sup>13</sup>

As the FX market grew and became truly global, Reuters position as the one-stop go to for the FX market became harder to maintain. Nonetheless, Reuters systems, enhanced by banks' own EBS, remained dominant throughout my own market observations before and after the turn of the century, and they are still dominant in the FX market today, though they may also contain automated dealing – it just featured ever more screens to which banks added an additional Bloomberg terminal and Telerate service on the side. Given its earlier role as a general news provider firm (continuing today), and its competence in transatlantic news transmission, Reuters had been well positioned for the role it played in repurposing and developing the cable and satellite connections and deals with national postal and telecom monopolies that were needed for a global market – and in enabling, shaping and profiting from the transition to computerized trading.

Reuters started the transition to on screen electronic trading and to what I called scopic media off with Monitor. It was, as noted before, a phase transition – it entailed a major reconfiguration of financial markets, and not just a shift to new trading tools and venues. The introduction of the ticker as a device that visualized and streamed the market had changed trading practices, prompted the rapid emergence of a new profession of technical analysts, enhanced the power of exchanges and their members at the cost of offsite trading, and familiarized participants with the market as an abstract flow of transactions and its process characteristics. With electronic trading, the spatial market disappeared into screens where it resurfaced in the aggregate as a mechanism-based collection of sequential bids and offers, done deals, news events, conversational dealing and chatting

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<sup>13</sup> See Financial Stability Board 2014: Foreign Exchange Benchmarks. Final Report. [www.fsb.org/wp-content/uploads/r\\_140930.pdf](http://www.fsb.org/wp-content/uploads/r_140930.pdf)

sequences and commentaries and analysis.<sup>14</sup> A fresh configuration of what a market was and how one traded it ensued. When traders said the market was “everything” – they meant everything on screen, with the core of the market (sequentially scrolling down best bids and offers) embedded in the market’s history and future projection and in an economic, financial, political and social world rendered by newlines, analysis and commentary. Dealing now involved communities of traders linked not by knowing one another, by shared market interpretations, or a shared place, but by the process of watching a market in flux, “flying by” as it constantly transitioned from one price to the next, and from one response challenge to the next. Linked in with the flux, and unable to sign out during their waking hours and even at night, the trading group became a community of time, oriented more to the dynamics of its object of observation than to other traders’ meaning and intentions. The market lost, in this stage, some of its traditional sociological properties but gained epistemic breadth as traders and investors honed observation- and analysis skills and learned to use formal means, for example technical analysis, to describe and predict market behavior. Released from state governance, and without central hierarchies or structures such as exchanges, it was free to mutate into a mediastructure for the streaming and synchronizing of global financial data, thinking and action. One of the characteristic features of this synchronization given the fragmentation elsewhere in markets was the existence of one global price and the elimination of geographical arbitrage.

Synchronization is a form of temporal integration – the achievement of a global co-temporariness of participants in one, momentous, present. It implied moving forward in step, but in analytic time rather than in clock time, within the observed, calculated and responded to beat and rhythm of the market, the pulse and speed of prices and deals as they appear, are replaced and scroll down the screen. Synchronization also involved “handshakes” between time zones: traders received the market from the previous zone by talking it through with a contact in that zone and they passed it on similarly to the next zone; if both zones overlapped for a while, as with London and Zurich on one side of the Atlantic and Wall Street on the other, one did not pass on the market but one still passed on information. And synchronization also meant the integration with historical market data through

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<sup>14</sup> For the details of how this mechanism sorts and orders market data and squeezes the market into form, so to speak, see for example Ch. 7.2.

vastly expanded types of fundamental and technical analysis that extended present market data days, weeks, years and even a generation or two into the past and extrapolated them into the future. But the achievement of temporal synchronization that integrates the global trading group as participants follow the market's upticks and downticks in sync with others also watching the market tick, and that's based on the overlay of standard time with the tact of price differences as the market moves forward, was only one temporal operation. It was accompanied by the speeding up of trading itself and the vast acceleration and re-engineering of new infrastructural connections.

The details of this re-engineering are a topic in its own right and cannot be addressed here. Let me just say that Reuters took care of the infrastructural provisions relevant to the markets it served. Yet this was not, for Reuters, a techno-epistemic venture (Reuters did not build connections but leased and financed them) but a political project, mainly one of overcoming "regulatory hurdles." What the story tells us, though, is that scoping, as an epistemic venture, depended on a vast infrastructure of data servers and transmission – as do the algorithms of the next phase transition, as we shall see. It also tells us that one aspect of the temporal logic, transmission time, remained an issue during this phase of the FX market's development, not because a solution had not been invented or was not available where needed (both landlines and transatlantic links were in place), but partly because monopolistic structures restricted their access and use, and partly because demand exceeded supply at some point and caused "unacceptable" delays. Transmission times were restricted by the speed of lines. When Monitor started, eight customers shared a line that worked at 1200 bits per second and was later enhanced to four customers sharing a line at a speed of 2400 bits per second. The average broadband speed in 2015 in the developed world was 10 million bits per second (White 2015:5). Thus, a large part of the speeding up of financial markets in the last decades has to do with the further development and speeding up of infrastructural connections – a development that would likely have occurred irrespective of financial market needs and pressures.

### 3. Algorithms – the new market actors

The ticker had been an epistemic technology that gave participants essential but minimalist market knowledge – only data on instrument traded, quantity and price, and these were of past trades. In contrast, the scopic media of the second major transition offered lavish amounts of data and seemingly endless possibilities of more: more information, more analysis, more history, more context. If the ticker cut things to a minimum, scopic media allowed maximal flows of market- and contextual processes to converge on screen. But scopic media also offered a venue for human action. Once conversational dealing was feasible and the electronic broker was added, traders could request a trade by a click of a price button or a brief line of talk – and the deal was made within fractions of seconds and registered on screen. After the introduction of Monitor markets were, as noted before, no longer just dispersed networks of interaction but domains spanned and coordinated by a central media - structure and epistemic technology that scoped the territory and displayed it on screen – as a flow of trading opportunities and activities. In the terms used before, financial markets were no longer just a microlevel human interactional institution but had become, in one of its core elements, a media-institution that contained, archived and instigated knowledge – a tableau of global economic intelligence that’s continuously updating and projecting itself forward. The turn to algorithms, the last transformation discussed here, pushes the system “over the edge” of humanness, so to speak. It now relies not only on scopic media as a central observer that projects the market and its context for human participants, it also replaces the human actors at the core of previous financial markets, skilled traders, by synthetic actors. With that, the media institution that originated in the 1980s – and grew as scopic media grew to include more functions – becomes a nearly total, synthetic institution. In this system, central functions such as global connectivity, the scoping of translocally co-occurring<sup>15</sup> phenomena, and the performance of system-specific operations have all been delegated to information and communication media of different types. Algorithms, I want to note here, are specific, agentic things, but they are also epistemic things (Rheinberger 2006) – unfolding objects of knowledge and development in computer

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<sup>15</sup> To note, by co-occurrence here is not co-occurrence in real time but of relevant market and contextual phenomena in an extended present....

science, informatics, artificial intelligence, machine learning. Like the systems of screens, computers and software that monitor and project worlds (scopic media), they too rely on an infrastructure of data centers, servers, and transmission lines to function. In other words, algorithms inhabit an ecology quite different from that of biological humans, often invisible to the latter, but consistent with the ecology of the scopic media. Humans are not “out” in that system, but they are of a “new” kind – new types of experts in new roles, with new task portfolios to perform, in a structurally changed market. Their work fits the media-technological environment in which they are placed together with synthetic actors.<sup>16</sup>

When algorithms become actors this raises questions for participants – when did they become accepted as more than a practical tool, a Siri for human traders to whom tasks can be delegated? It also raises questions for observers and analysts: what prompts us to treat programs as actors rather than as electronic things or steps in a process of automation? Much of the answer to these question hinges on how algorithms are encountered in trading practice and how participants and the engineering side responds to them. It also hinges on a notion that’s at the core of agency, that of autonomy. In some financial markets, for example in high frequency trading, algorithms are the only traders. As we shall see, they are defined as making their own trading decisions and have been granted the autonomy to trade without human interference over substantial periods of time. In other areas they trade alongside and with human traders who often cannot distinguish reliably whether they are trading with an algorithm or a human and who refer to and acknowledge both categories as “traders.” At the same time, we find that algorithms are also routinely paired with humans who are no longer professional traders but “quants” – quantitative scientists holding Ph.D.s in areas such as physics, mathematics or computer science. Algorithms role in markets and the striking consequence of their partnering with humans in configurations that I will call semi-autonomous can’t simply be seen, I maintain, as the routine outcome of technological progress leading toward automation. It entails the acceptance and recognition of synthetic things’ agency, intelligence, trustworthiness, and even as warranted objects of sentiment and attachment. In other words, what comes into play when synthetic objects become agents is processes of evaluation resulting

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<sup>16</sup> The word “synthetic” derives from the Greek *suntheticos*, based on ‘*suntithenai*,’ place together or put together. See <https://www.dictionary.com/browse/synthetic> accessed May 5, 2019.

in these objects acceptance and inclusion in a social order of recognition – a notion intended to capture the human process of “membering” an entity through evaluating it as equivalent or even superior to humans on relevant dimensions. Such evaluations also come with a reevaluation of human actors in the system. For example, the professional skills human traders used to have when they traded lost worth and recognition in recent years, and traders lost their job, or else needed to upgrade their expertise to a level of quantitative science. The quants now on the floor have upgraded task portfolios that require, for the tasks to be accomplished, a Ph.D. in a quantitative science (from a top university, to be sure).

Processes of recognition of equivalence or superiority may be long and involved, and their phases and elements warrant a historical study in its own right. What I can do in this article is put the spotlight on various pathways to recognition that appear evident in financial markets. I will distinguish between several types of capacities, all potentially leading to recognition: The first is operational capacity, leading to the use and acceptance of algorithms as task assistants of sorts that relieve traders from repetitive work. A second type is cognitive capacity: the offloading of thinking from humans to algorithms. Although algorithms’ thinking skills are not based on the same processes as humans’, they can be equivalent in output, as reflected in the term artificial intelligence. I will call the third type a capacity for autonomy. It builds on cognitive capacity but requires more: an offloading of agency exercised in human performances onto algorithms such that the performances can happen without constant human instruction and guidance. A fourth capacity and pathway to recognition is relational. Are algorithms recognized team members, interaction partners, are they conversationalists? In trading fields, relational recognition may include questions of emotional bonds developing between algorithms and humans but also conflictual relationships, as with disruptive, interfering, resistant or maladapted behavior by synthetic actors. Moral and legal recognition, a fifth dimension linked to how human authorities and the state specifically perceive and evaluate algorithms could be added to these pathways, but this has so far created unique difficulties in financial markets on a legal level and will not be treated here. In the following, I will discuss what algorithms are technically speaking and then illustrate the various capacities and pathways to recognition.

### 3.1. What is an Algorithm? The New Infrapersons in Financial Markets

Electronic trading, the sort of trading that became possible with Monitor and dominates since then uses computers to trade, exchange information, chat, and everything else scopic media allow one to do through a screen – but by itself, it is not algorithmic trading. Electronic trading is manual and “high touch”: a trader hits a key to trade what’s on offer on an electronic broker system, which displays the bid and ask prices and volumes onscreen, or a trader sends a message to deal directly with a counterparty using an onscreen conversational dealing system. Electronic trading also can be “medium” or “low” (human) touch, and only then is it algorithmic (and electronic) trading; more or less of the work of human traders – e.g. scanning prices and executing trades – is performed by algo-tools.<sup>17</sup> There are various types of trading based on algorithms; when algorithms do trade execution, for example, the algorithm “is the bullet, not the finger on the trigger”, since the algorithm isn’t making trading decisions.<sup>18</sup> But algorithms that make trading decisions are increasingly common, and are based on models and intake of information. For example, they can to a degree read the news and interpret current events, and in response they can execute a trade and hedge against it. When the algorithm has its finger on the trigger, we can extend the current parlance and describe it as “algo” touch. As I write this, humans still outperform algorithms in analyzing the semantic information carried in human-readable data streams, which range from written stories to audio and video sequences and tweets on social media websites. But news analysis performed by algorithm is a significant focus of research, with the goal of enabling computers not only to understand the numerical information of market prices, but also to understand non-numerical information. As this research advances, we will approach the “algo” touch mode, in which no human trader will be involved in trades, but software agents will be essential. In fact, a Bloomberg headline of October 12, 2016 announced that this time had now come: “Tiny Bank-Beating Trading Firm Doesn’t Use Any Human Traders.” The article referred to the London-based trading firm XTX Markets Ltd., which had emerged as

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<sup>17</sup> For this definition and various types of HFT trading in the FX market, see BIS, “High-frequency trading in the foreign exchange market,” 3, 5.

<sup>18</sup> B. Johnson, *Algorithmic Trading & DMA: An Introduction to Direct Access Trading Strategies* (London: 4Myeloma Press, 2010), 5-7, 12-15.

a “foreign exchange powerhouse” – it had risen to rank 4 in spot currency trading in the Euromoney Institutional Investor’s Annual Survey for 2016 and to rank 9 in the overall FX rankings.<sup>19</sup> Of course, the human touch in this case just tends to shift to another level of activity, that of engineering and monitoring the software programs that trade.

What then is an algorithm? An algorithm is simply a set of instructions for accomplishing a task, according to various definitions. It may be a formula, or a set of rules, a set of steps, or on the most general level an approach to solving a problem. The latter definition sees an algorithm more as an idea behind a set of instructions. There are likely to be many possible solutions to any problem, and for that reason there can be many different algorithms trying to accomplish the same thing. Even when the problem seems as simple as finding an entry in a phone book, there are different ways, as Durbin explains, of solving it: we can start from the beginning and flip pages until we find the name, we can guess where in the book names with the first letter of the entry might appear and flip back and forth till we find it, or we could possibly work with an index, if one exists.<sup>20</sup> On the programming level, an algorithm is a computer code. When you write a program to filter the light in a certain way so as to create a specific photographic effect, you have created an algorithm. The use of algorithms in trading is not new. The Electronic Broker System (EBS) mentioned before is a combination of programs that on the most basic level helps prospective buyers and sellers find one another. It does this by sorting incoming trading requests according to the best bid and ask prices, putting them in a sequence, by distinguishing and adding up volumes, by supplying the next price once a price-volume offer has been consumed, and so on. To do this, it needs criteria and information and the capability to sort, compare, archive, etc. Order-execution, the type of function much delegated to algorithms since they became broadly available, may simply involve order slicing; that is, an algorithm may split a large order into smaller segments of “child orders” that are put on the market (or sent to the exchange) se-

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<sup>19</sup> Euromoney calls XTX Markets is a non-bank liquidity provider, but it’s also described as a spin off of another firm whose co-CEO Zar Amrolia had previously been head of Deutsche Bank’s FX business – when Deutsche Bank had been the leading bank in FX volume. See “All change in 2016 Euromoney’s FX rankings,” p.1, [www.euromoney.com/Article/3556871/All-change-in-the-2016-Euromoney-FX-rankings.html](http://www.euromoney.com/Article/3556871/All-change-in-the-2016-Euromoney-FX-rankings.html) (accessed November 27, 2016)

<sup>20</sup> I take the example from M. Durbin, *All About High Frequency Trading* (New York: McGraw Hill, 2010).

quentially, perhaps every hour. The goal is to reduce the impact one large order can have on the market price of a given security.

This brings us directly to the issue of operational capacities – the creation and evaluation of algorithms as good, perhaps even great instruments to whom work episodes such as the above can be delegated. We won't find job descriptions for software agents on the web, but, computer science itself talks about desirable properties of algorithms and how these properties should be determined. First, design an algorithm or step-by-step procedure for solving the problem, second, analyze the correctness and efficiency of the procedure, third, implement the procedure in some programming language, and fourth, test the implementation.<sup>21</sup> Correctness and efficiency are at the core of an algorithm's operational capacity from an engineering viewpoint it would seem. Analyzing the efficiency has meant, first and foremost, measuring its speed in executing tasks. Speed depends on several factors, for example:

- the size of the input (“searching through a list of length 1,000 takes longer than searching through a list of length 10”)
- the algorithm type (“Unordered-Linear-Search is inherently slower than Binary-Search”)
- the programming language used (“interpreted languages such as Basic are typically slower than compiled languages such as C++”)
- the quality of the implementation (“good, tight code can be much faster than poor, sloppy code”)
- the speed of the computer executing the code

In analyzing the efficiency of an algorithm, Aslam and Fell continue, one typically focuses on the speed of the algorithm as a function of the size of the input on which it is run, and one determines the number of program steps or some count of other computer operations as a function of the input size – the actual time, however, still also depends on the programming language used, the quality of the code produced, and the gigahertz (the speed) of the computer. In other words, an algorithm needs to live up to very particular and measurable criteria. Speed is just one of these crite-

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<sup>21</sup> For this and the following list and its explanation, see J.A. Aslam and H. Fell, “Analysis of Algorithms: Running Time,” CSU200–Discrete Structures, accessed August 28, 2013. <http://www.ccs.neu.edu/course/csu200/05F/handouts/rt.pdf>.

ria, though its importance in trading cannot be overestimated; it's also the quality of algorithms that markedly accelerated trading in many markets, strengthened temporal thinking, and made it possible to develop a whole business model based on supra-human speed, High Frequency Trading (HFT). Other criteria include precision (the more accurate the solution is, the better), memory (the less required, the better), optimization (some instructions, when repeated, may lead to learning and greater success in meeting a particular condition), and so on. If this sounds different from how we “size up” humans, even when they compete over speed, when they run a race for instance, then that's because it is. Algorithms appear to have always been compared with how they “measure up” compared with human task performances in this area. Yet as noted before, algorithms are not expected to have the same properties as humans do. “An algorithm is a well-ordered collection of unambiguous and effectively computable operations that when executed produces a result and halts in a finite amount of time”<sup>22</sup> – I know of no account according to which a human being would fit this description. Although they started out more or less imitating human behavior in trading and are still advertised as being capable of doing exactly that<sup>23</sup>, algorithms do “think” differently from “us.”

But how do they think? The second pathway to recognition I distinguished involves algorithms' cognitive capacities. This is a vast topic, dealt with extensively in the history of AI; the very point of it has always been that artificial intelligence attempts to reproduce human intelligence by computer systems. I want to discuss this here only on the specific level of what it is that fuels the cognitive capacities algorithms have in the trading context, and how humans fare in comparison. Two answers are relevant here. The first is that the thinking tools trading algorithms apply when they are making trading decisions appear to be taken directly from financial economics (Jovanovic 2012) – and from the systematic analysis developed in trading practice, including that of chartists or technical analysts (Preda 2007). For example, an algorithm may start out with a model informed by a version of the efficient market theory and be programmed to detect inefficiencies

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<sup>22</sup> G. M. Schneider and J. Gersting, *An Invitation to Computer Science* (New York: West Group, 1995), 9.

<sup>23</sup> See Steven Perlberg, “Now You Can Do Algorithmic Trading From Your Couch,” *Business Insider*, June 18, 2013, accessed July 16, 2013. <http://www.businessinsider.com/now-you-can-do-algorithmic-trading-2013-6>. And see Scott Cendrowski, “Quant Trading Comes to Main Street,” *CNN Money*, June 18, 2013, accessed July 16, 2013. <http://finance.fortune.cnn.com/2013/06/18/quant-trading-comes-to-main-street>.

in the price of different but related trading instruments or of the same instrument when it is traded through different venues – and it may then use an arbitrage strategy to profit from the inefficiency. The financial theory behind a model may be complex and the model used may be simplified to optimize speed in addition to trading strategy. But compared with human traders, who say they learned from experience and appear to use implicit processing circuits and heuristic rules (Knorr Cetina 2014), it's nonetheless clear that the algorithm has been switched to a scientific mode of thinking, or more precisely, switched to drawing on scientific models and calculations rather than on experience as human traders do.

The second process involves machine learning, that is learning from processing vast amounts of data. This, too, is a scientific approach based on neural networks, fuzzy logic, and deep learning artificial intelligence technologies – but in a sense it comes closer to the inductive process of learning from experience through trading floor apprenticeship that human traders in the big global banks I researched had to undergo. The algorithms involved are machine learning algorithms. However, training on vast amounts of data takes time, and for this reason alone machine learning algorithms have not been used routinely in trading areas in which algorithms dominate trading and that compete on speed, such as HFT. Bias may also need to be considered since what the algorithm learns depends on what's in the data it is trained on. If the data come from human trading and include strategies of advantage taking with guile, and strategies legally classified as fraud, algorithms will learn these strategies. Deep learning algorithms and generative adversarial machine learning using two neural networks that contest each other are also inherently intransparent – a phenomenon scientists experiment with but don't quite understand, which may cause problems with the regulatory oversight over trading that uses deep nets. For all these reasons, the first kind of algorithms appear to dominate algorithmic trading.

In fact, in the high frequency trading area in which all trading is by algorithms, the latter are rule-based and relatively straightforward, yet they also have become more sophisticated in what they can accomplish. For example, when doing order execution, instead of splitting orders evenly and trading the child orders over equal periods of time, they learned to include more randomization – to elude market participants able to identify the linear actions of a tool that trades according to a fixed schedule. Then they became responsive – they learned to execute orders in response to live

market volume – instead of using historical volumes to determine when to execute a child order. And then, according to Johnson, they started to base their responses on particular types of analysis or conditions, evolving within categories of algorithms for a while, before a new generation of algorithms took hold.<sup>24</sup> The first generation of algorithms learned from humans – they evolved from using a linear fixed execution schedule to responding to market conditions in order to reduce market impact. The second generation learned from financial theories and models as it became more price and cost sensitive – it used transaction cost analysis to estimate and reduce transaction costs. That is when algorithms began to move beyond trying to imitate the behavior of experienced traders. The third generation became reflexive – on top of what they could do before, algorithms learned to examine and use data and venues that the market itself provided. For example, they learned to examine order books, which became more widely available as markets transitioned to electronic trading platforms, and to use more than one execution system, which also became available (e.g., electronic crossing networks and alternative trading systems). Algorithms cognitive capacities jumped levels with each generation, but what remained constant over time is that with every jump, they learned to make progressively more and more sophisticated trading decisions. In financial markets, this progressive acquisition of decision power appears to be associated with the acceptance and recognition of algorithms’ autonomy as traders. Artificial intelligence in the sense of cognitive knowledge that a synthetic object like a robot acquires may first have to be coupled with decision power, for example the ability to determine when and how to trade, if the object is to be seen as autonomous.

Algorithms autonomy warrants some exploration here because it is that capacity that made their takeover of trading possible and the ongoing reinvention of financial market structure complete. When the social sciences use the notion of autonomy, as they do frequently in politics and law and rarely in sociology, it refers to human agency as exercised by groups: autonomy is self governance by groups. Ansart (1999:45, cited in Lallement 2015: 229) defines autonomy as “the capacity of an individual or group to act in free self-determination, in accordance with its own desires and will.”<sup>25</sup> Philosophical treatments, on the other hand, focus directly on the

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<sup>24</sup> B. Johnson, *Algorithmic Trading & DMA: An Introduction to Direct Access Trading Strategies*, 14.

<sup>25</sup> The quote is from the English translation of Ansart’s definition in Lallement 2015: 229.

individual and the conditions of existence of his or her authority to act – the level relevant here. While algorithms may collaborate in groups that divide labor, they are not acting as political entities against other groups or against leaders in defense of self determination. Philosophers locate the authority to act internally to the person. A person that acts must initiate the action and thereby authorizes it, usually with respect to a reason, intention or motive behind which the person stands. That authority to commit to an action is not grounded in the person’s role or status, or in law and culture, but in the fact that only the person can initiate an action. This rather formal connection between being an agent and having authority may well be criticized from a broader social science perspective that defines authority in relation to status, achievement, belief systems, offices held and so on. But it has the advantage of being formal enough so as to also apply to synthetic actors, as we shall see.

Much of the philosophical discussion is about authority-undermining influences on self-governance – with inconclusive results, except for the most exemplary threats that prevent a person from being accountable for what they do such as brain washing and addiction. It is as plain to philosophers as it may be to researchers in other disciplines that many historical, biographical and contemporaneous circumstances influence what we do; in fact, they may well agree that every action is subject to such influences. Socialization theories in the social sciences sometimes depict humans as “cultural dopes” (Wrong 1961)<sup>26</sup>, near automatons that follow scripts of their culture implanted in them during their upbringing – and yet we nonetheless accept that these individuals are, on a practical and theoretical level, actors that make their own decisions, and we grant them the right and authority to do so. Philosophers also investigated to what degree coherence with higher order values and desires, responsiveness to reasons, or responsiveness to reasoning resulting in the rational evaluation of alternative choices of actions are relevant conditions for autonomous agency, with unsettled results – we don’t want to deny a from some perspective

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<sup>26</sup> Sociological discussions centered on notions like that of Bourdieu’s habitus or Granovetter’s embeddedness (1985) don’t refer to autonomous agency but have implications for it. Bourdieu’s notion of a class habitus, for example advocates a strong concept of socialization – that would seem to imply reduced but without denying agency to individuals. Swidler’s useful concept of culture as a toolbox return in a sense agency to the individual, while maintaining a strong role for culture. Granovetter (1985) used Wrong’s critique of oversocialized conceptions of human beings to argue for the more plausible notion of network embeddedness as a mechanism influencing individual action.

irrational or non-circumspect individual agency autonomy much as we do not put into questions the agency rights of a heavily socialized actor.

The opinion that external influences and social and cultural programming during socialization don't take away from the autonomy we grant individuals to self-govern their actions has a direct correlate in the engineering literature to which I want to get now. Algorithms surely are excellent candidates whom we could deny self control. They are after all programmed to run in a certain way, and, as we heard before, they tend to follow these programs. But again, this is no worry in this literature, in which autonomy appears to mean something closer to an agentic medium "when being left alone" can perform objectives and pursue tasks. In recent writings, the agent frequently is three-dimensional: a robot, an aircraft or unmanned aerial vehicle (UAV, see Hocraffer and Nam 2017 for swarms of those), or a medical instrument employed by a surgical team in a teleoperation (e.g. Froehner et al. 2020). The agent may also be something that comes closer to what we see in trading, and that consists of algorithms or is heavily algorithm-based. Examples are autonomous systems that respond to cyber attacks (Endsley 2017:5), diagnostic automations (Wickens and Dixon 2007), or airtraffic control systems (which also involve scoping; Metzger and Parasuraman 2001). In fact, algorithms are usually involved in all of the applications mentioned (they are what reads out sensors in cars and tells the engine to stop). This body of literature does not, to my knowledge, ask questions about the metaphysical conditions of possibility or legitimacy of autonomy but links autonomy to the conditions under which "hands off" autonomous technical systems operate successfully with or without human factor elements of management. The fact that an element is programmed to perform the objectives it is tasked with does not count against its autonomy to act – What does count, however, from the earliest work on autonomous agents onward (Maes 1991, Hofacker 1999), is the type of programming and the analogy on which it is built. The main contrast in these discussions is between autonomy and automation. As Moustiris et al. explain it, if a robot acts based on a number of preprogrammed movements it would be classified as an automation. If, however, perception of the environment and a corresponding adaptation of the robot's behavior to new situations is involved – if it presents "purposeful actuation in the environment", it would be seen to present agency – though the degree of agency would depend on the complexity of the mission (Moustiris et al 2011). Rather than to use conventional AI that focused on the abstraction and programming

of rules, new studies that switched to the idea of autonomy (collected first in Maes 1991) focused on bottom up pathways from sensorimotor interaction and on the notion that functionality was “emergent” – the idea that “complex and unpredictable behaviors” could emerge from the dynamics between agents and their environment (Tani 2009: 421). For these authors, both automation and autonomy are intimately connected to advances in technology (Krogmann 1999:2). In fact, turning traditional AI on its head, Krogmann (1999:2) avoided the term programming altogether and limited the notion artificial intelligence to autonomous agents that are in a sense unprogrammed. Thus systems have no artificial intelligence if a program “injects them” with what they have to do and how they have to react to prespecified situations. They have intelligence if their creator “has given them a structure – not only a program – allowing them to organize themselves, to learn and adapt to changing situations”. Krogmann (1999:5-6) goes on to specify fuzzy logic, neural networks and genetic and evolutionary algorithms as among the tools that can implement such structures. Autonomy for him is a much wider reaching form of independent action: it “is being designed to achieve functions independently, performing well under significant uncertainties for extended periods of time with limited or no communication and with the ability to compensate for system failures, all without external intervention”(Krogmann 1999).<sup>27</sup> It’s a definition that correlates strongly with how algorithms that trade in areas in which only algorithms trade are defined by the regulatory agency, the Commodity Futures Trading Commission (CFTC) – as decision making and trading without human direction (2012):

“High frequency trading is a form of automated trading that employs: (a) algorithms for decision making, order initiation, generation, routing, or execution, for each individual transaction *without human direction*”<sup>28</sup>

What we see today in HFT is that this sort of independence from human direction can be achieved with rule-based algorithms prevalent in this area

<sup>27</sup> Krogmann (1999) as summarized by Endsley 2017:5-6.

<sup>28</sup> Emphasis added, see CFTC Technical Advisory Committee Sub-Committee on Automated and High Frequency Trading –Working Group 1 <https://www.cftc.gov/sites/default/files/idc/groups/public/@newsroom/documents/file/wg1presentation062012.pdf> accessed May 20, 2019. The full definition reads “High frequency trading is a form of automated trading that employs: (a) algorithms for decision making, order initiation, generation, routing, or execution, for each individual transaction without human direction”; (b) low-latency technology that is designed to minimize response times, including proximity and co-location services; (c) high speed connections to markets for order entry; and(d) high message rates (orders, quotes or cancellations).

and does not need to rely on the kind of machine learning associated with getting a computer to act without programming it. What HFT algorithms do need to achieve functions independently is appropriate infrastructure and fast data access. HFT also uses a sort of experimental try-and-see approach reflected in high order- and quote-rates coupled with high cancellation rates that the CFTC also notes, a strategy that seemingly stands in for plan-based trading that needs more time to design and execute.

If human autonomy is threatened by a number of influences that can undermine self-governance, the autonomy of algorithms can also be undermined and is, in fact, under constant threat: by the bugs and deficiencies algorithms can have, by their “brittleness” in face of disruptive events and situational variations, as well as by their life cycle and shortlivedness in areas such as trading that requires the frequent re-engineering and development of their code<sup>29</sup>. The threats are of a different nature than those humans face, but they lead to similar consequences. Though algorithms are “left alone” when trading, humans remain “in the loop” – these are the quants that monitor algorithms’ results as well as market indicators that may require intervention, and that select algorithms for particular uses and situations, fix their code, and create and reengineer them. Thus in practice, the capability of algorithms to act “without human direction” turns out to mean levels of semi-autonomy rather than completely independent action. Semi-autonomy is not meant to suggest any half and half division of labor between humans and algorithms. It is an umbrella term for levels of autonomy granted to algorithms with the human actor in some type of presence and possibly in a monitoring position.

Semi-autonomy implies a relationship in which two different systems and classes operate in different ways and are clearly separated but are also coupled – and here we can see that semi- autonomy also involves the relational capacity of algorithms, the fourth pathway to recognition mentioned in the beginning. In the present case, semi-autonomy indicates a structuration principle that’s based on inter-species relations of recognition and authority rather than on the kind of intraspecies power relations we find in human systems. The relations between human and non-human agents in financial markets can’t easily be characterized in terms of the various inequality principles that inform our concept of social structure, nor can they be characterized as a hierarchical organizational structure. Algorithms are

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<sup>29</sup> For the detailed examples of these threats see Knorr Cetina (2021, ch. 9).

not workers or employees, and the human species masters are not owners or managers of capital, the upper class, or CEOs. It is also not simply a principal-agent arrangement, although there are echoes and resemblances. In such a relationship, the principal legally appoints an agent to act on their behalf, as when an investor appoints an advisor or broker. What counts most and is most often problematic in this relationship is the fiduciary commitment of the agent to act in the best interest of the principal. Human hired “agents” may develop their own interests, may not agree with the instructions of the principal and may compromise their duty of loyalty to the principal, as captured by the term principal-agent problem. Algorithms, however, are not contracted but created by quants, and quants will have mainly themselves to blame it would seem if there are performance problems; the flaws algorithms may have, and there are many, cannot usually be described in terms of algorithms’ self-interest- and moral problems. In other words, the principal – agent distinction is tailored to fit the characteristics of humans and their contractual relationships of delegation but not that of intense human-synthetic inter-intelligence collaborations.

To signal some of these differences to established notions of hierarchy, authorization and dominance, one can see the classes of actors involved as infra- and metaactors. As agentic media, algorithms are deeply dependent on an ecology of infrastructures to accomplish what they do, hence the notion infra-actors. The notion meta-actor I use here signals their meta-pragmatic task set: the quants on the floor don’t actually trade although they may call themselves traders. They are not expert human traders of the sort described in previous work (e.g. Knorr Cetina and Bruegger 2002a) and still trading in currency and other markets, they are expert quantitative scientists. It is important to note that both categories of agents are knowledge workers.<sup>30</sup> The authority of meta-actors derives from their Ph.D.s in a quantitative science; and the authority of an algorithm resides in its being an epistemic object structured to hold, within the right infrastructural environment, a variety of advantages over human actors. The system of semiautonomy that has developed in this area is grounded in the sciences system, although it is realized in the financial system.

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<sup>30</sup> For the concept of a knowledge society that’s of a different nature than the human groups (societies) we traditionally describe in terms of human social structure see Peter Drucker (1993) who associates a knowledge society with knowledge as a productive force. See also Daniel Bell (1974) who pointed to the value of theoretical knowledge.

Semi-Autonomy, then, is a relationship in its own right rather than simply an instance of hierarchical authority relations, class relations, or contractual interconnections. It signifies a form of dependency in both directions, of algorithms on humans and humans on algorithms – with dependency distributed in a way that can shift over time and is temporally ordered. For long periods of time, the human may actually be dependent on the synthetic actor – an object that acts without human direction and interference, as described by the CFTC for High Frequency Trading.

How humans can be dependent on synthetic actors can be illustrated by the accidents that do occur. Catastrophic events of various kinds are not infrequent in complex trading- and other environments, that involve multiple algorithms, control loops, sensors and human roles that interact over different time scales and changing conditions. At various times such events have been attributed to “erroneous codes,” and they usually lead to investigations by the regulator, for example by the Security and Exchange Commission. One example is the near break down of the firm Knight Capital. According to the SEC, an erroneous code “routed millions of orders into the market over a 45-minute period, and obtained over 4 million executions in 154 stocks for more than 397 million shares. By the time that Knight stopped sending the orders, Knight had assumed a net long position in 80 stocks of approximately \$3.5 billion and a net short position in 74 stocks of approximately \$3.15 billion.” The SEC charged Knight for, among other things, not having “technology governance controls and supervisory procedures sufficient to ensure the orderly deployment of new code or to prevent the activation of code no longer intended for use in Knight’s current operations but left on its servers that were accessing the market;” Knight also did not have “controls and supervisory procedures reasonably designed to guide employees’ responses” to such incidents.<sup>31</sup> The complaint makes it clear that supervisory governance would not only have been needed but was mandated by Securities and Exchange Act rules, and that Knight Capital may have relied too much on its autonomous trading systems. The SEC also said that “while Knight’s technology staff worked to identify and resolve the issue, Knight remained connected to the market and continued to send orders...accumulating an unintended multi-billion dollar portfolio of securities in approximately forty-five minutes

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<sup>31</sup> See Securities Exchange Act of 1934 Release No. 70694 / October 16, 2013, administrative proceeding File No. 3-15570. Introduction, point 1. And 9 B. <https://www.sec.gov/litigation/admin/2013/34-70694.pdf>

on August 1, and, ultimately, Knight lost more than \$ 460 million.” As a consequence of the incident, Knight also experienced net capital problems and violated several rules and regulations.

Flash crashes – by now routine – are another example of how the dependency on algorithms can play out. But beyond the autonomous behavior of algorithms they also exemplify the temporal acceleration that was also there in the case of Knight Capital. The first major crash in which algorithms were involved that caught the attention of professionals and lay traders, as well as of government regulators and agencies was the U.S. trillion-dollar stock market crash of May 6, 2010 during which the Dow Jones Industrial Average lost nearly 1000 points (998.5 to be precise). It involved not one firm but the whole market and is called a flash crash since it lasted only briefly. A variety of situations have been called a market crash or a financial crisis over history since the 1673 Tulip bubble burst, and the downturns they refer to occur within a broad variety of timelines encompassing days, weeks or even years. Recovery periods after previous well documented stock market crashes ran in years, not in minutes. For example, it took 6 years to recover to previous all-time highs of the S&P 500 after the financial crisis of 2007-8, and with smaller drops of the market between 1950 and 2000, it took at least one year.<sup>32</sup> Participants –firms and individual investors – incurred a wide range of economic losses in earlier crashes that did destroy livelihoods—and it took an abundance of financial resources and government aid over prolonged periods of time to pull through and recover from the crash. The time it took for the flash crash of 2010 to unfold was 13 minutes. Recovery was equally lightening fast: it took 23 minutes for prices to recover to normal levels.

The flash crash was quickly blamed on algorithms. According to the report by the Security and Exchange commission that quickly followed upon the

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<sup>32</sup> Calculations of the duration of recovery depend strongly on the measure applied, such as the official end of a recession, or the return to the previous value of a price or indicator. The present calculation is based on the historical yearly S&P 500 price from 1950-2018 (see <https://fourpillarfreedom.com/heres-how-long-the-stock-market-has-historically-taken-to-recover-from-drops/> accessed March 28, 2020). According to the U.S. National Bureau of Economic Research the recession that followed the housing crisis of 2007 extended over 18 months, but this did not include the weak economy that followed for which the the S&P 500 can be an indicator. See of example the speech of the then Chairman of the Federal Reserve, Ben Bernanke, of November 20, 2012: <https://www.federalreserve.gov/newsevents/speech/bernanke20121120a.htm> (accessed March 28, 2020).

In 2008, the S&P 500 bottomed at 683 on March 9, 2009, after declining 59%. Although the recession that followed the market crash was declared officially over in 2011

crash, a large fundamental seller (known now to have been Waddell&Reed Financial Inc.) initiated an algorithm “to sell a total of 75,000 E-Mini S&P contracts (valued at approximately \$4.1 billion) as a hedge to an existing equity position”. The position was unusually large, and the algorithm used targeted “an execution rate of 9% of the trading volume calculated over the previous minute, but without regard to price or time”. Such an algorithm would respond to increased trading volume by trying to sell more, and it would not consider a sharp price decrease as a deterrent to further selling. The report goes on to say that there were alternatives: for example, a human trader could have manually taking into account price, time and volume, as the firm had previously done when it took 5 hours to sell 75,000 contracts, or the firm could have used an algorithm that takes price, time or volume into consideration. The algorithm chosen on May 6, 2010 that targeted only volume took only 20 minutes to execute the trade (CFTC-SEC 2010:2).

In financial interactions algorithms offered speed, consistency, and learning from data, all lumped together and over time understood in terms of an efficient operational capacity that was higher than that of humans. The crash, surprisingly perhaps, embodied this efficiency of algorithms. It had been plain that algorithms speed up transaction beyond human capacity, but during a crash, they sped it up to excess – an excess human traders by themselves were not able to understand when it first occurred. Human observers and participants were also surprised by the nearly equally lightning-fast recoveries of the market. “Before anyone knew what was going on, it sprung back up on you,” one commentator said about the first Flash crash. With this speed of recovery, no economic fatalities occurred: The flash crash of 2010 did not have the economic function of a financial crisis, for example the function of a market correction after a bubble. In fact, according to financial analysts, it seems to have had very little impact on anything economic going on – and this appears also true for the similar crashes that happened since.

But if nothing economically interesting happens in such crashes, is there a function or effect? One answer lies, I suggest, with the symbolic and affective reevaluation of algorithms and ultimately their acceptance and endorsement as traders that are equivalent and, in some ways, better than humans. Consider that a flash crash has many features of a Durkheimian ritual but occurs unexpectedly, tests the whole transaction apparatus, and

signifies a transition to a new market structure. As those in the market see the market fall on screen, they quickly become captivated by the spectacle and begin to share a common focus of attention, a mutual awareness of what is happening, and a common mood of shock and fear – just as described by Randall Collins in his book on Interaction Ritual Chains (2004). But when the market recovers nearly equally fast, confidence returns, and emotional energy can be drawn from the restored symbol of the market and its apparent functioning in a new configuration. The crash disrupts but without casting a shadow.

Most notably, perhaps, it also did not cast a shadow on algorithms – they emerged from the disruption less contested than before. This path to greater acceptance involved two steps. First, algorithms were central to the rapid downfall of the market, but they were also central to its rapid recovery and the return of prices to previous levels. Algorithms' speed tested the market, including the infrastructure on which they are dependent and other technical aspects, but the infrastructure survived when given a quick break, and synthetic actors' speedy responsiveness after the crash restored the market quickly and avoided the human and institutional costs of long downfalls and long recoveries. One could see that the flash crash of 2010 was visibly terrifying for participants in the pictures and recordings taken at the time. But one could also see the joy and emotional energy that followed from the re-affirmation of the market when it returned.

Evidence for the second step lies in the investigative reports and scientific papers written after the crash, the narrative tail of the event mentioned before. To my knowledge, none of the official reports that appeared til 2017 and later, advised to eliminate or severely curb algorithmic traders. The widely cited British Foresight Report, for example, considered algorithmic traders as a positive development benefitting investors. It is exemplary in its wide angle lens, historical overview and assessment of future developments. However, like other reports it also alerted participants on all levels to the need to align inhuman algorithmic capacities with human monitoring, control and the larger market purpose.<sup>33</sup> In other words, the 2010 flash crash and the investigations that followed attuned us to how the autonomy

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<sup>33</sup> The title of the Government's Press Release of October 23, 2012 runs "Foresight report on computer trading shows benefits to financial markets but calls for joint action to manage risks." See Department for Business, Innovation & Skills and Government Office for Science, October 23, 2012, <https://www.gov.uk/government/news/foresight-report-on-computer-trading-shows-benefits-to-financial-markets-but-calls-for-joint-action-to-manage-risks> (accessed February 4, 2017).

of algorithms may play out as it runs up against the autonomy of other players under conditions in which a multitude of self organizing strategies are present simultaneously. The reactive mix that resulted generated the crash. But the mix that immediately followed the downturn and brought the market back to its pre-crash-state exonerated algorithms and allowed them to be cast as possible saviors of the market. The flash crash became a signifying event that produced both positive and negative meanings, but within the economic area, these meanings affirmed algorithms and quants within the continuity of a changing market; the change implied an increasing transition to algorithmic trading and an acceptance of new types of financial crashes. If algorithms produce “events” such as flash crashes, they can also be seen as producers of culture: of orders of recognition and interaction in trading.

#### **4. Takeover by Science: Some Conclusions**

In this article I trace in some historical detail the contemporary history of a takeover by science of an area that is commercial and part of the financial economy, a subsystem of modern society that operates on the basis of mechanisms quite different from those in science. It took three major transitions and disruptions of a previously established financial market system for the takeover to materialize. The trajectory is not linear, and it surely is not simple technological progress. A takeover involves the controlling interest of people, not machines – interests that can be quite oppositional as the history of our major stock exchanges shows whose members fought off a switch over of their work to scopic media for quite a while before they were forced to accept it (Pardo Guerra 2019). I did not in this paper pursue the history of the conflicts and alliances between such interests – I wanted to show the transformative pattern and its consequences rather than the details of the motivations and strategies of particular human actors. The pattern is not one of linear progress, and the trajectory could have veered off in a different direction at various points in time. In that sense it is historical and shaped by interactions with the respective environment rather than a path internally designed and followed. Edward Calahan, for example, who is credited with being the inventor of the ticker, worked as chief telegrapher in the Western Union telegraph company when he came up with the ticker tape idea, and Reuters was a News company that took

advantage of its transatlantic cables to make a deal with financial firms. Thus, both the affordances in an ecology and forces internal to markets proved important over time.

Some features of the overall pattern I sketched stand out and may be important to consider in further research:

1. For a takeover pattern to become plausible early technologies adopted in an area should be epistemic technologies.<sup>34</sup> I define an epistemic technology as one that provides with the output or effect it produces opportunities for further research. It may also give rise to classes of knowledge workers that form around these opportunities. Information technologies and digitization often imply epistemic affordances, but the ticker was not a digital technology; its affordance of research and analysis can be linked to the transformation of invisible, dispersed, hard to collect market actions into data streams that visualized the transactions and rendered them ready to hand for response transactions. Whether a technology has epistemic affordances (and whether these are taken up) needs to be investigated and cannot be determined in advance. What the ticker surely showed is that datafication by itself, especially if it provides an abundant record of actionable phenomena, combined with visualizations of sorts, can lead to these affordances.
2. One assumes that a continuity of orientation to knowledge and technology across disruptions and transitions (the continuity of the epistemic logic as I called it) also raised the chances for a takeover in the case considered. Such continuities may help bridge radical changes in structure and practices that occurred with the transition from the pre-ticker spatial market to a scoped temporal market held together by a central media structure, and from that to a semi-autonomous algorithm-traded market. And they presumably helped stave off a different option, the emergence of incommensurable paradigms of trading in different periods of time; for a comparison consider that such incommensurabilities – and an orientation to incommensurability – appear common today in some political systems. Similarly, the boost temporal considerations in earlier markets received from the ticker’s capacity of rendering the behavioral-interactive market as a sequence of prices and transac-

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<sup>34</sup> See for example Ratto (2012). By epistemic technology Ratto following earlier work means that computational technologies amplify the knowledge-making capacities of humans, supporting and facilitating the creation, legitimation, and critique of truth claims. See also Callen (2018).

tions proved decisive and helped bridge the transitions to Monitor and algorithms – it surely advanced the temporal logic described, and the temporalized market simply became reproduced and speed enhanced in ever new and richer form by later technologies.

3. Disruptive transitions such as the once sketched in this article can have radical outcomes: changes of the structure of a system, new practices, and new regimes – think of communication about markets within networks of participants turning into coercive regimes of attention and observation of data on tape or on screen. But the most radical outcome of all in the sequence of three transitions surely is the shift to algorithms – synthetic actors that rather swiftly and without widely noticeable resistance replaced human expert traders. Humans remained in the loop, but they are not, as a rule, former traders that retrained. Neither are they as one might perhaps expect, financial economists. It needs physicists, mathematicians, computer scientists, and similar fields to work with the new synthetic actors. I proposed the notion semi-autonomy to capture the human-algorithm relational governance that replaced the self-governance of human traders. Semi-autonomy relations are a social, cultural and also a legal form that does not fit neatly into our existing vocabulary of hierarchical, employment-, class- gender- race- or other group relations. They are likely to become much more prevalent than they are now, as the speedy transition to algorithms in financial markets implies. What is noteworthy here is that semi-autonomy is a notion that suggests the coupling of distinctive, differentiated domains such as science and commerce, or perhaps in the future science and law and science and medicine. In financial markets it has led to the emergence of an epistemic mercenary class that's both an insider in quantitative science and an insider in financial market. But semi-autonomy relations are also symmetric; they involve relationships of mutual dependence, and advantages and superior skills on both sides of the aisle, the human and the synthetic, for different purposes.

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# Laudatio M. Schmoeckel

## D. Heirbaut

Matthias Schmoeckel was born in Flensburg in 1963. He studied art history in Bonn and law in Bonn, Geneva and Munich. The year 1993 was marked by two important events: he passed the second state exam and he also defended a doctoral thesis on the doctrine of international law in Nazi Germany. This potentially opened the doors for a successful career at the bar, but Matthias Schmoeckel opted for a life in academia. A position as assistant in Munich enabled him, in 1999, to defend a habilitation thesis on the development of criminal procedure between 1200 and 1800, and a professorship in Bonn followed very soon thereafter.

His university rapidly recognised his administrative capacities so that he was appointed dean of the law school in 2003 and 2004. In addition, he found time for many other activities. He was a guest professor in Paris and organised the Deutsche Rechtshistorikertag, the main biannual event of legal history in Germany. Moreover, from 2002 he had also become the trusted representative of the Konrad Adenauer Foundation and thereafter was asked to contribute to initiatives as diverse as the excellence cluster gerontology, consumer protection in the German school in Warsaw and the organisation of the International School of Ius Commune in Erice, Italy. He became a corresponding member of the Istituto Lombardo, a prestigious academy in Milan, and he is also a member of Emory University's Center for the study of law and religion. He is on the board of two organisations of medieval canon law and also an administrator of the German Althusius Society and the Institute of Notarial Law, as well as the Legal Forum in Bonn.

In addition, he is very active as an editor or board member of several book series, amongst them *Forschungen zur neueren Privatrechtsgeschichte*, *Rheinische Schriften zur Rechtsgeschichte* and *Rechtshistorische Reihe*,

and also several reviews. Of the latter it is noteworthy that he is an editor of the *Revue historique de droit français et étranger*, France's leading review of legal history.

Matthias Schmoeckel is a very prolific author. He has authored nine monographs, edited or coedited more than thirty collective volumes, has written almost 150 articles and this does not count a list of smaller publications, such as his many contributions to great encyclopaedic works like the *Handwörterbuch zur Deutschen Rechtsgeschichte*. This quantity is strengthened by the quality of his publications, many of which have been ground-breaking. Thus, his 1993 doctoral thesis was the first study since World War II to look at the German doctrine of international law during the Third Reich. Several other publications of Matthias Schmoeckel deal with the law and the jurists of the Nazi era, in particular Carl Schmitt.

A second strand of his research is the history of criminal law, evidence and proof. Matthias Schmoeckel has published a book on the abolition of torture and the development of the learned criminal law in Europe since the Central Middle Ages. In his publications on the history of criminal law, Matthias Schmoeckel has shown a rare talent for going beyond the simple conclusion that it was very different from current practices, instead proving that the old law and its development need to be seen in the context in which its practitioners lived.

A third topic of Matthias Schmoeckel's research concerns canon law. In his thinking canon law does not just mean medieval canon law, but also the law of the reformation and contra-reformation and later eras. In his work, for example in the books he edited with Franck Roumy and Orazio Condorelli, Matthias Schmoeckel convincingly argues for taking into account the contribution of canon law to the development of European legal culture.

Another of Matthias Schmoeckel's research lines studies notaries and law, both in the past and the present. As an example of the former, Matthias Schmoeckel is the editor of a book on the history of notaries in Europe, but he has also produced a considerable body of literature on current German legal rules which are relevant for notaries. Thus, he has written a monograph on the law of succession. Closely linked to this are his publications on other aspects of current German law, like the General Part of the German Civil Code. He is also the co-editor with Joachim Rückert and Rein-

hard Zimmermann of the Historical Critical Commentary of the German Civil Code.

Matthias Schmoeckel is also a researcher of the local legal history of Bonn and the Rhineland. In fact, his legal history institute is an institute of German and Rhenish legal history. The latter does not only mean that he has studied many aspects of the Bonn law school, especially its history during the Nazi era and its aftermath, but also French law in Germany, in the post-Napoleonic era and until the 1900 general Civil Code for Germany, though as Schmoeckel's work illustrates with its own typical particularities.

Anyone thinking that nothing more is left in the publication list of Matthias Schmoeckel should be forgiven as there is yet another topic, which has taken his interest, the history of economic law. Whereas legal historians traditionally focused mostly on private law, criminal law and public law, Matthias Schmoeckel pleads for including also economic law. He pioneered the history of economic law in Germany in 2008 with the first handbook on this subject. Although he established the field almost single-handedly, Matthias Schmoeckel needed some 500 pages to describe it. Interestingly, his work rapidly bore fruit. Already in 2013 and 2014 he could coedit volumes on the history of economic law, a clear indication that many young scholars had heeded his call for more research on this fascinating topic. His own more recent research brings together his interests in economic and canon law by studying the relationship between law and religion and re-evaluating *inter alia* the old Max Weber thesis of a link between the rise of capitalism and Protestantism.

The numerous major topics of his research have not hindered a plethora of smaller publications on very diverse topics. It would be impossible to give even the most concise overview of all his many side projects. One example may demonstrate the riches of his smaller, but in no way lesser, research. In the 2011 volume of the review *Signa Iuris* the reader can even find an article on Peter Paul Rubens where Matthias Schmoeckel explains the views on public law behind the painting 'The Felicity of the Regency of Marie de Medici', which is now preserved in the Louvre.

In short, a future observer may easily be misled into thinking that in the early twenty first century there was not just one professor Matthias Schmoeckel in the Bonn law school, but at least six scholars with that name. Once

convinced that Matthias Schmoeckel is only one very hard working person, the future observer may then assume that Matthias Schmoeckel only wrote books, but that is also far from the truth. He has a very extensive network of friends and colleagues and is a key person of legal history in Germany. He regularly hosts scholars from Germany and abroad in Schloss Poppeldorf, the magnificent eighteenth century residence of the archbishops of Cologne, electors of the Emperor of the Holy Roman Empire. He also invites the colleagues from Western Germany at many occasions to his house in Bonn, also extending an invitation the legal historians from Belgium and the Netherlands. Visitors of his garden can only wonder where he finds the time to care for what may be the most beautiful private garden in the region of Bonn. However, in the following lecture he will not present his garden of plants and flowers, but the fruit from his even richer garden of legal history.

# From subsistence to profit as economic orientation. Major shifts in economic order

M. Schmoeckel

## 1. Introduction and questions

Max Weber (1864-1920<sup>1</sup>) published several papers examining the relationship between the modern economy and faith from a sociological perspective. It was not about a direct causality of Protestant theology and modern capitalism in particular, but about a mentality or way of life that correlates<sup>2</sup> with capitalism in the sense of an “elective affinity”. But, of course, Weber’s theses have long been regarded as refuted; one wonders why they are repeated so often. They appear as irrefutable misconstructions that appear to readers in the USA as valued narratives or more generally as “grand narratives”<sup>3</sup>. Its mistakes may be remembered in short:

1. Max Weber’s famous thesis of the economic upswing after the 16th century already disregards the much larger upswing that all of Europe has experienced since the 12<sup>th</sup> century, from Portugal to the Baltic states, from the mountains in Norway to Sicily. The 13<sup>th</sup> century in particular is a high point of European urban and economic development<sup>4</sup>. Not only in Northern Italy and Flanders, but in many other regions of Europe, new cities emerged and trade flourished. English economic history therefore uses the term “commercial revolution” to describe

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<sup>1</sup> Cf. MAX WEBER, *Die Protestantische Ethik und der Geist des Kapitalismus*, in: idem, *Die Protestantische Ethik und der Geist des Kapitalismus*, ed. D. Kaesler, 2nd ed. Munich 2006, 65-276.

<sup>2</sup> HANS-PETER MÜLLER, *Max Weber*, Cologne/ Weimar/ Vienna 2007, 86.

<sup>3</sup> Cf. HEINZ STEINERT, *Max Webers unwiderlegbare Fehlkonstruktionen. Die Protestantische Ethik und der Geist des Kapitalismus*, Frankfurt am Main/ New York 2010, 20, 23.

<sup>4</sup> HENRI PIRENNE, *Sozial- und Wirtschaftsgeschichte im Mittelalter*, Tübingen 1946, 43ff.

this upswing, which was particularly noticeable there in the 14<sup>th</sup> century and was due to long-distance trade between the Mediterranean and northern Europe, for example in English wool. At the same time, banks and insurance companies were created, which made the new business models possible<sup>5</sup>. This economic boom puts into perspective the importance of economic growth in Northern Europe from the 16<sup>th</sup> to the 18<sup>th</sup> century.

The great development of the economic zones of Europe took place before 1500. At this time the great boom of the cities and their federations can be found all over Europe. From the Norwegian mountains to Italy, from Spain to the Eastern colonization, it becomes clear what a fundamental role this urban boom had for European development. Ghent increased dramatically until the 13<sup>th</sup> century, acquired 64,000 inhabitants at that time and became one of the largest towns of this era. Cologne was able to double from 1140 with 20,000 inhabitants to 40,000 in 1430, while Paris rose from 25,000 in 1180 to 200,000 in 1347. From 1000 to 1340, the population growth of Central and Northern Europe exploded from 6 to 35,5 million, while it shrank again to 22,5 million by 1450<sup>6</sup>. The land to supply the new population became almost scarce<sup>7</sup>. This upswing was mainly due to the flourishing trade of that time. The specialist on medieval towns and their history, Eberhard Isenmann regards long-distance trade as constitutive for this urban boom<sup>8</sup>. A bit later new merchant towns like Nuremberg developed into important centres of long-distance trade in the 13<sup>th</sup> and 14<sup>th</sup> centuries, as numerous customs privileges prove. In 1397 Nuremberg had only 5000 inhabitants, but in 1485 it already had 36,000 inhabitants.

The growth of the cities of the 16<sup>th</sup> century was weaker in comparison. Nuremberg, for example, grew to only 40,250 inhabitants by 1622. The major changes were rather fluctuations between German cities. In 1600, Cologne still had 40,000 inhabitants, stagnating economically and una-

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<sup>5</sup> Economic historically still particularly revealing RAYMOND DE ROOVER, *Business, Banking, and Economic Thought in Late Medieval and Early Modern Europe*, ed. J. Kirshner, Chicago/London 1974.

<sup>6</sup> J.C. RUSSEL, *Die Bevölkerung Europas 500-1500*, in: C. Cipolla (Ed.), *Europäische Wirtschaftsgeschichte*, Vol. 1: *Mittelalter*, Stuttgart/ New York 1978, 21.

<sup>7</sup> FRIEDRICH-WILHELM HENNING, *Handbuch der Wirtschafts- und Sozialgeschichte Deutschlands*, Vol. 1: *Deutsche Wirtschafts- und Sozialgeschichte im Mittelalter und in der frühen Neuzeit*, Paderborn et al. 1991, 167.

<sup>8</sup> EBERHARD ISENMANN, *Die deutsche Stadt im Mittelalter 1150–1550. Stadtgestalt, Recht, Verfassung, Stadtrecht, Kirche, Gesellschaft, Wirtschaft*, Vienna/ Cologne/ Weimar 2012, 57.

ble to feed or attract any more inhabitants<sup>9</sup> despite the economic growth of the neighbouring Netherlands<sup>10</sup>. While the Rhineland gradually lost its leading economic position, other trading centres developed, apparently dependent on the large trading companies, none of which settled in the Rhineland<sup>11</sup>. Nuremberg, for example, outstripped Cologne in terms of inhabitants at the beginning of the 16<sup>th</sup> century<sup>12</sup>. Other regions of Germany, not least the trading cities of southern Germany, emerged as places where the economy developed particularly strongly.

2. For his studies, Weber was guided by the US model, in particular by Benjamin Franklin<sup>13</sup>. However, he used Martin Luther's business ethics for comparison. It is clear that one must differentiate between Luther's and Calvin's economics and their students. Because of the Anglican Church in England and the different currents in the USA, the identification of the decisive influence of Luther or Calvin is here at least problematic or probably the wrong approach from the outset.
3. Even more difficult is the reverse conclusion that the other, non-protestant states and regions did not proceed diligently and were economically clumsy, especially since this conclusion is presented without closer examination and apparently wrong in the Belgian case.
4. For the determination of economic contents Weber referred to the "spirit of capitalism". Here, too, one would have to determine more precisely what is to characterize this economic form from an economic or legal point of view.
5. A historical consideration also taught that the various developments in Germany were not only more diverse, but above all followed much more the political logic of the individual case than general theological teachings: While, for example, the Protestant cities of the Hanseatic League in the north experienced a general decline from the 16<sup>th</sup> century

<sup>9</sup> Although trade increased overall, the number of the total population decreased slightly and redistributed, see Rolf Sprandel, No. 14: Gewerbe und Handel 1350-1500, in: H. Aubin/ W. Zorn (Ed.), *Handbuch der deutschen Wirtschafts und Sozialgeschichte*, Vol. 1 Stuttgart 1971, 356.

<sup>10</sup> HENNING, *Handbuch der Wirtschafts- und Sozialgeschichte Deutschlands*, Vol. 1 (n.7), 602.

<sup>11</sup> HENNING, *Handbuch der Wirtschafts- und Sozialgeschichte Deutschlands*, Vol. 1 (n.7), 593f.

<sup>12</sup> On the change in the significance of Nuremberg and Cologne see HERMANN KELLENBENZ, *Deutsche Wirtschaftsgeschichte*, Volume 1, Munich 1977, 180-183.

<sup>13</sup> See PETER GHOSH, *A Historian Reads Max Weber. Essays on the Protestant Ethic*, (Cultural and Social Studies, 1), 5th ed., Wiesbaden 2008

onwards, southern German cities flourished such as Nuremberg – even before the Reformation – and Augsburg, which was mixed-confessional.

But how can we explain the great success story of the European economy instead? One of the reasons for the eternal return of Weber's thesis is that so far there is no real alternative. If we are to look for reasons for Europe's economic growth, we must look at developments since the late 12<sup>th</sup> century. We must not limit ourselves to cultural or religious factors, but must above all examine the framework conditions of the institutional order.

A special look should be taken at the attitude of lawyers towards profit. Rejection or approval clearly show skepticism or approval towards the economy. The admission of profit can also be seen not least as an expression of an economic understanding that in this way seeks to use human profit for the general supply of goods. However, only a few lawyers have dealt with this topic; unfortunately, there are not many significant sources here.

Here the religious and ethical ideas of the theologians and jurists play a considerable role. In spite of the importance of Roman law for the revival of trade, it was above all canon lawyers, inspired by theology, who devoted themselves to questions of trade<sup>14</sup>. The church played a central role here because it not only stood as a judge on the side, but as a participant in the market often enough changed it to its advantage. The Church was therefore interested, too, in the defence of property and the admissibility of wills as classical elements of Roman law.

But the church cannot be imagined as a unity. Often enough, representatives of the Church stood on both sides of the great disputes. The "Franciscan Poverty Dispute" after 1231 not only allowed the return to property with the various divisions of its aspects in possession, usufruct, simple use and the possibility of constructing subjective rights to property from it. Rather, the case also shows the Franciscans, who wanted to secure only individual legal aspects from the advantages of their monasteries, so as not to violate the vow of poverty, while the Pope – as an intended owner without the possibility of simple use – did not show any interest in only assuming

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<sup>14</sup> In addition already MATHIAS SCHMOECKEL, *Die Kanonistik und der Anstieg des Handels vom 13. zum 15. Jahrhundert*, VSWG 104 (2017), 237-254.

the responsibility of the properties of the Order without the advantages<sup>15</sup>. Overall, this dispute motivated the discovery of subjective law.

One can certainly rule out the possibility that church and law did not support economic growth until the beginning of the modern era, because by then the decisive forms of legal transactions such as bills of exchange, banks, insurance companies and stock exchanges had long since emerged<sup>16</sup>. However, the business-friendly authors such as Petrus Joannes Olivi OFM (1247/48-1296/8), Antoninus Archbishop of Florence (13389-1459) and Bernardinus of Siena (1380-1444)<sup>17</sup> are clearly less well known outside Italy than Martín de Azpilcueta, Leonardus Lessius or Conrad Peutinger. I would like to compile and accentuate various findings from recent years.

First of all, the leading role of the Roman Church and the canon lawyers should be recalled and characterized (see 2.). I do not deny the influences of law and moral theology. However, in my opinion, it is difficult to separate this from canonical studies. Albericus de Rosate quoted the moral theology of Thomas Aquinas comprehensively in his *Dictionarium* and showed that no limit was felt in this respect. Many important suggestions were taken from Roman law. The economic boom itself is undisputed. The German historian Jürgen Kocka recently pointed out that it can only be understood as part of a global phenomenon, namely as a result of economic growth in China and Arabia<sup>18</sup>.

This is followed by a reference to the economic theory of the Spanish school in the 16<sup>th</sup> century (see 3.), since this is better researched and is often described as the basis of modern economics. What is the basis for this growth; the extent to which this speaks for a new development or a new economic order in the 13th century must be examined. However, the Span-

<sup>15</sup> MAXIMILIAN KRIECHBAUM, *Actio, Ius und dominium in den Rechtslehren des 13. und 14. Jahrhunderts*. Ebelsbach 1996 (Münchener Universitätschriften. Abhandlungen zur rechtswissenschaftlichen Grundlagenforschung 77), S. 24–28, 40–54; ORESTE BAZZICHI, *At the Roots of Capitalism*. Middle Ages and Economic Science, Cantaloupe 2010, 45.

<sup>16</sup> Fundamentally WILHELM ENDEMANN, *Studien in der romanisch-kanonistischen Wirtschafts- und Rechtslehre*, Berlin 1874 re-impr. Aalen 1962; in particular on the development of the stock exchange at the beginning of the 15th century in Bruges, see last PETER STABEL, *De gewenste vreemdeling. Italiaanse kooplieden en stedelijke maatschappij in het laat-middeleeuwse Brugge*, *Jaarboek voor Middeleeuwse Geschiedenis* 4 (2001), 189–221, 213.

<sup>17</sup> ANDREA PADOVANI, *Giustizia e lavoro nelle summae di Antonino da Firenze, Angelo da Chivasso e Giovanni Battista Trovamala*, in: D. v. Mayenburg/ F. Roumy/ O. Condorelli/ M. Schmoeckel (Eds.), *Der Einfluss des kanonischen Rechts auf die europäische Rechtskultur*, vol.5: *Das Recht der Wirtschaft (Norm und Struktur, 37.5)*, Cologne/ Weimar/ Vienna 2016, 375–403.

<sup>18</sup> JÜRGEN KOCKA, *Geschichte des Kapitalismus*, 42nd ed, Munich 2013.

ish economic boom came to a standstill in the 17<sup>th</sup> century, when Spain went bankrupt several times.

The growth of Protestant territories in the 16<sup>th</sup> and 17<sup>th</sup> centuries must therefore be distinguished from this. To what extent the new denomination should be taken as the basis for modern economic growth according to Max Weber or other characteristics will be examined as the last point (see 4.). Hopefully, this will fulfil the desideratum of cross-denominational research, respecting also the medieval foundations of the development since the 16<sup>th</sup> century.

## 2. Trade and commercial law up to the 16<sup>th</sup> century

### 2.1. Classical Canon Law

The field of canonistic commercial law, in the third book of the collections of decretals on the “clerus”, is probably the most neglected field of canon law<sup>19</sup>. There is still too much adherence to the doctrine of fair prices, for example, as an approach to the doctrine of the Church which is oriented towards objective market requirements. It is difficult enough to combine history with law and theology; the additional dimension of economic history exaggerates the degree of difficulty. In 2016, some Italian, French, and German canon lawyers attempted a non-systematic but concerted exploration: The fifth volume on the “Influence of Canon Law”<sup>20</sup> provided a wealth of new insights and innovative approaches. I have tried to collect and condense the insights in the last year<sup>21</sup>. I rely here on canon law literature in the narrower sense, furthermore on confessional literature and moral theology.

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<sup>19</sup> For the fair price see CHRISTIAN HECKER, Lohn- und Preisgerechtigkeit. Historische Rückblicke und aktuelle Perspektiven unter besonderer Berücksichtigung der christlichen Soziallehren. (Ethik und Ökonomie 6) Marburg 2008; ELISABETH KOCH, Gerechter Preis, HRG, Volume 2, 2nd ed. Berlin 2009, 123-127; MARCELLO LANDI, Uno die contributi della Scolastica alla scienza economica contemporanea: La Questione del Giusto prezzo, o del valore delle merc, DT 113.2 (2010), 126-143.

<sup>20</sup> DAVID VON MAYENBURG/ FRANCK ROUMY/ ORAZIO CONDORELLI/ MATHIAS SCHMOECKEL (Eds.), Der Einfluss der europäischen Rechtskultur, Vol.5: Das Recht der Wirtschaft (Norm und Struktur, 37.5), Cologne/ Weimar/ Vienna 2016.

<sup>21</sup> MATHIAS SCHMOECKEL, Kanonisches Recht und der Anstieg des Handels (n. 14), 237-254.

The teachings of theologians such as Thomas Aquinas, Heinrich von Ghent (around 1217-1293) and Gottfried von Fontaines (Godefroid de Fontaines/Godefridus de Fontibus, † after 1305) have already been presented. They taught through the influence of Aristotle that money and the market were necessary and worthy elements of life<sup>22</sup>. The same has just been shown for Guillaume d'Auxerre and his *Summa aurea* (1215-1229)<sup>23</sup>.

It is noticeable that there was no language that would suit our understanding. There was neither a general contractual concept nor that of a merchant. *Consensus* was the term used to describe the concordant will that had been a prerequisite for marriage since Roman law. *Contractus* was used mainly for commercial transactions only in the 15th century, but argued with *pactus/pactum* about the possibility of being used as a generic term<sup>24</sup>. Still Felinus Sandaeus (1444-1503)<sup>25</sup> did not separate in his definition the traders from the craftsmen: “Mercatores et artifices”<sup>26</sup>. Bartolus (1313-1357) cautiously focused on market participation (*mercator*) and special business (*negotium*) at the same time in order to identify this business area, thus combining the objective with the subjective approach<sup>27</sup>:

“Mercator seu negociator non dicitur quis per unum actum”

After all, one already had the beginnings to define the merchant in objective and subjective terms. At the same time, this lacked the possibility to develop a doctrine of commercial business, rather, one had to switch to a consideration of the individual types of business, e.g. in particular the purchase contract.

On the other hand, the doctrine of the Church helped centrally to assert the autonomy of the will of the contracting parties as the basis of the contract. *Pactum sunt servanda* and the *clausula rebus sic stantibus* have therefore

<sup>22</sup> JOEL KAYE, *Economy and Nature in the Fourteenth Century: money, market exchange, and the emergence of scientific thought*, Cambridge 1998, 97ff on Aristotelianism with Thomas, 104 on the necessity of the merchant with Heinrich von Ghent.

<sup>23</sup> WIM DECOCK, *Le marché du mérite. Pense le droit et l'économie avec Léonard Lessius*, Turnhout 2019, 68.

<sup>24</sup> Closer MATTHIAS SCHMOECKEL, *Melanchthons Konzept der Verträge. Archäologie der Privatautonomie*, ZRG KA 104 (2018), 304-345.

<sup>25</sup> For him see now GIGLIOLA DI RENZO VILLATA, Felino Sandei, in: O. Condorelli et al. (Eds.), *Der Einfluss des kanonischen Rechts auf die europäische Rechtskultur, Volume 5: Das Recht der Wirtschaft, (Norm und Struktur 37.5)*, Cologne/ Weimar/ Vienna 2016, 145-171.

<sup>26</sup> FELINUS SANDEI, *Repertorium rerum, et verborum imemorabilium in locupletissimos Felini Sandei Commentarios ad quinque libros decretalium*, Venice 1574, 394.

<sup>27</sup> BARTOLUS DE SAXOFERRATO, *Commentaria to D. 32.65.2*, Venice 1526 re-impr. Rome 1996, fol.68ra/vb n.4.

formed an indissoluble connection since the beginning of the 13<sup>th</sup> century, not opposites, but two complementary means of securing the same interest<sup>28</sup>. Above all, however, canon lawyers at the same time created the way out to be able to regard contracts against the content of faith or offensive business as immoral and ineffective from the Church's point of view. This led to the doctrine of the nullity of immoral transactions and of contracts contrary to morality<sup>29</sup>. All contracts must be *bona fide*, must not violate the spirit of the contract, must not agree an unlawful price and must lead to the delivery of the goods. Overall, Nieder showed more flexibility to determine what kind of business and profit was basically lawful. But the boundaries based on the moral theology remained still rather narrow. The profit – in particular of the long-distance dealer – is the remuneration for his work. This of course did not rule out recognition of the *laesio enormis*, but gave trade a much broader prerogative of assessment.

Reference is made to the importance of consensus, which threatens the validity of the contract by errors about price, thing, contract type, sex or finally legal. Certain items are generally excluded from trade, e.g. future items, items of the church<sup>30</sup>. Profit and intemperance are another topic<sup>31</sup>. We therefore do not find any actual commercial law, but only contract law as a prerequisite of trade. Hostiensis suspected many possibilities for sins in the shops of merchants. Like the lawyers of his time, he acted generally and helped, for example, to introduce general categories. There was neither a special private right for merchants nor a special respect if they, like the *miserable personae* in general<sup>32</sup>, were subject to church jurisdiction. However, one saw the importance of trade for the cities, traders were useful and

<sup>28</sup> See ORAZIO CONDORELLI, Il principio “pacta sunt servanda” e i “foedera pacis” nelle fonti canonistiche dei secoli XII-XV, and FRANCK ROUMY, Les origines canoniques de la clausula rebus sic stantibus, both in: Der Einfluss der Kanonistik auf die europäische Rechtskultur, Volume 6: Völkerrecht, (Norm und Struktur, 37.6), Cologne/ Weimar/ Vienna 2020, 39-85, 1-38.

<sup>29</sup> SARAH MARIA PINTARIC, Vereinbarungen *contra bonos mores* in der Kanonistik (Rechtshistorische Reihe, 484). Frankfurt a. M. 2020.

<sup>30</sup> HOSTIENSIS (Henricus de Segusia), Commentaria to X 3.17, Venice 1589 Turin 1965, n.2 147vb/148ra.

<sup>31</sup> HOSTIENSIS, Commentaria (n.30) to X 3.17, n.3 148rb.

<sup>32</sup> GUILLELMUS DURANTIS, Speculum iudiciale, de competentis iudicis aditione, § 1 n.27, Basel 1574/ re-impr. Aalen 1975 397; FELINUS SANDEI, Repertorium (n.26), 394; for the term see THOMAS DUVE, Sonderrecht in der Frühen Neuzeit. The early modern *ius singulare*, investigated on the basis of the *privilegia miserabilium personarum, senum and indorum* in Alter und Neuer Welt, (Studies on European Legal History, 231), Frankfurt a. M. 2008, 66.

necessary for the city<sup>33</sup> and the community<sup>34</sup>. They should be able to detect their goods, make the right decisions about them and act accordingly<sup>35</sup>.

In addition, moral standards were developed for business activities. Commercial transactions should be conducted with as little sin as possible<sup>36</sup>. The *forum internum* taught when business (*negotia secularia*) would become “*inhonestum*” due to its nature or circumstances<sup>37</sup>. This was less true objectively by the nature of the business, i.e. in the case of usury or simony, but more by their circumstances. Business could become dishonest *ex causa* or *ex tempore* or *ex persona*:

- *A deal would be ex causa inhonestum* if made on the basis of a corrupt intention, e.g. because of greed.
- *Ex tempore* shops would be *inhonestum* outside business hours.
- *Ex persona* business was considered *inhonestum* if clergymen or other clergymen were involved.
- But even *ex loco* shops could become *inhonestum* if they were closed in brothels or similar indecent places<sup>38</sup>.

The legitimate trade in luxury goods or weapons and poisons that could be used for murder was much discussed. Raimund wanted to focus here on the intention of the person concerned alone<sup>39</sup>. Weapons could also serve in the just war, the knife to cut bread or golden ornamental borders to decorate the church. Analogously, poisons could be used by doctors as medicine.

The central question was whether traders were allowed to make profits<sup>40</sup>. As a result, a balance was sought. Moderate profit was allowed if work was done for it and advantages were achieved for society, such as procuring

<sup>33</sup> ALBERICUS DE ROSATE, *Dictionarium Iuris tam Ciuilis quàm Canonici*, Venice 1573, 417: “Mercatores sunt utiles et necessarij sunt in bonis ciuitatibus”.

<sup>34</sup> CARLETUS, *Summa angelica*, fol.311 ra, n.2.

<sup>35</sup> ALBERICUS DE ROSATE, *Dictionarium* (n.33), 505: “Negociari volens tria habere debet: scilicet vires inuenire: de inuentione iudicare: et secundum iudicata operari”, after Aegidius Romanus, *De Regimine principis*, c.vj.

<sup>36</sup> ALBERICUS DE ROSATE, *Dictionarium* (n.33), 506: “Negotia quaedam sunt, quae vix sine peccata fieri possunt.”

<sup>37</sup> RAYMUNDUS DE PENIAFORT, *Summa de poenitentia et matrimonio, cum Glossis Ioannis de Friburgo*, Rome 1603 re-impr. 1967 Meisenheim/ Glan, l.2 c. De negotijs secularibus, & utrum de illicite acquisitis posit fieri eleemosyna, 244f § 1.

<sup>38</sup> RAYMUNDUS DE PENIAFORT, *Summa* (n.37), 246 § 3.

<sup>39</sup> RAYMUNDUS DE PENIAFORT, *Summa* (n.37), § 6.

<sup>40</sup> ALBERICUS DE ROSATE, *Dictionarium* (n.33), 506.

the necessary food for the city<sup>41</sup>, as Thomas von C(h)obham (†1327) also taught<sup>42</sup>. On the other hand, what serves no purpose<sup>43</sup>, pursues profit in itself or is even harmful, may not be sold and the profit is inadmissible in these cases. In this way dice games are always a sin.

Thomas Aquinas (1224-1274) focused on general use; what is helpful for both sides or the general public is permitted. In that case, profits could also be made<sup>44</sup>. In doing so, he focused on the doctrine of the just price. For the trading business (*negotatio*), it would not be the individual motive that matters, but the general supply function<sup>45</sup>. Of course a merchant was allowed to profit from his profession or his work just like a craftsman<sup>46</sup>. Thomas also became more generous towards luxury products, e.g. jewels, because habits could also determine when this was generally considered necessary<sup>47</sup>. For the purpose of calculating the permissible profit, Thomas took into account the risk of the transaction, the possible loss or other loss of profit and the agreed contractual loss. Justified, not unreasonable profit was thus permissible<sup>48</sup>.

His contemporary Petrus Joannes Olivi OFM was incredibly modern, perhaps because he was a Franciscan<sup>49</sup>. His “Tractatus de contractibus” shows a remarkable openness towards all market requirements. According to him, the business activity is characterized by the free economy of the dealers<sup>50</sup>. The price was therefore ultimately determined only by the appreciation of

<sup>41</sup> ALBERICUS DE ROSATE, *Dictionarium* (n.33), 506.

<sup>42</sup> JACQUES LE GOFF, *Kaufleute und Bankiers im Mittelalter*, Frankfurt a. M. 1989, 79, who unfortunately reckons Chobham into the 13th century and thus overlooks the development culminating in Thomas von Aquinas (1224-1274); to Chobham s. ODD LANGHOLM, *Economics in the Medieval Schools. Wealth, Exchange, Value, Money and Usury according of the Paris Theological Tradition 1200-1350*, (Studies and texts on the intellectual history of the Middle Ages, 29), Leiden/ New York/ Cologne 1992, 52ff, 54 on his business-friendly attitude. JACQUES LE GOFF, *La bourse et la vie*, Paris 1986, further developed his problematic idea that the invention of the purgatory would bring about economic friendliness.

<sup>43</sup> ALBERICUS DE ROSATE, *Dictionarium* (n.33), 435: “lucrum turpe sequitur qui minus emit, vt plus vendet.”

<sup>44</sup> THOMAS AQUINAS, *Summa Theologica*, I-II q.77 art. 1 (via [CorpusThomisticum.org](http://CorpusThomisticum.org): [36858]).

<sup>45</sup> THOMAS AQUINAS, *Summa Theologiae* II-II, q. 77 art. 4 [42257]: “Vide negotiatio, secundum se considerata, quamdam turpitudinem habet, in quantum non importat de sui ratione finem honestum vel necessarium.”

<sup>46</sup> THOMAS AQUINAS, *Summa Theologica*, qu.78 art. 2 [42286].

<sup>47</sup> THOMAS AQUINAS, *Summa Theologica*, qu.169 art. 2 [45763 and qu.169 art.2 [45764].

<sup>48</sup> Cf. JOHN T. NOONAN JR., *The Scholastic Analysis of Usury*, Harvard 1957, besonders 194ff; LANGHOLM, *Economics in the Medieval Schools* (n.42), 236ff.

<sup>49</sup> Cf. Bazzichi, *Alle radici del capitalismo* (n.15), 64 and more often, which refers to the continuity of Franciscan influence.

<sup>50</sup> PIERRE DE JEAN OLIVI, *Traité des contrats*, ed. S. Piron, Paris 2012, I.6, 96ff.

the dealer and then fair when a buyer was found<sup>51</sup>. The profit of a business was a necessary consideration for traders. This went so far that if a favourable purchase transaction failed, the money lent instead could be reclaimed with the profit that would have accrued from the purchase transaction<sup>52</sup>. This was used to legitimize interest rates for money transactions. Olivi even went so far as to think about commodity futures. Even capital venture contracts for the future did not appear to him to be immoral at all, but depended rather on the assessment by the parties<sup>53</sup>.

## 2.2. Later development

Petrus de Ancharano (c. 1330-1416) was still progressive when he set the price at the different and varying appreciation of a matter by the parties. The loss of profit and the damage suffered were among the legitimate criteria for determining the right price. This is part of the risk of the purchase transaction, which must in no way lead to the annulment of the contract<sup>54</sup>. He also considered the precise regulation of the territory by the legislator to be admissible. Such restrictions on freedom of trade are usually legitimate<sup>55</sup>. The only thing that would help here would be to acquire a lot of advice in order to be up to the demands of the trade. In any case, Petrus de Ancharano shows that Olivi's teachings slowly began to assert themselves in canonry.

Even in the late 14<sup>th</sup> century, there were still a number of places with an increased interest in and understanding of market processes in trading centres. Thus the grandson of Johannes Andreae, Gaspar Calderinus (1346-1399)<sup>56</sup>, professor in Bologna like his father and grandfather, taught that things were traded on the European markets at very different prices. Calderinus attributed this to the different interests of the various regional markets, which were still quite undetermined. Calderinus thus at least began to admit that the appreciation could turn out differently and denied the doctrine of the just price. In doing so, he helped to further break up the idea

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<sup>51</sup> I. q.2, 108 n.22.

<sup>52</sup> *Dubia circa materiam Contractuum*, 7 pr, 233 n.63f.

<sup>53</sup> *Dubia*, 212 n.35ff.

<sup>54</sup> PETRUS DE ANCHARANO, *Consilia sive juris responsa*, Venetia 1585, cons.157, 77 n.5.

<sup>55</sup> PETRUS DE ANCHARANO, *Consilia* (n. 54), cons.157, 76 n.2.

<sup>56</sup> To Gaspar Calderinus s. HANS JÜRGEN BECKER, Art. Calderini, Gaspare, *Dizionario Biografico degli Italiani* 16 (1973) [quoted from [http://www.treccani.it/enciclopedia/gaspere-calderini\\_%28Dizionario-Biografico%29/](http://www.treccani.it/enciclopedia/gaspere-calderini_%28Dizionario-Biografico%29/), last 14.7.2016].

of a fair price. At the same time, the Church developed a legal doctrine of money debt in the first place<sup>57</sup>.

The authors of the 15<sup>th</sup> and early 16<sup>th</sup> centuries were sometimes even more business-friendly. The great canonist and archbishop of Palermo, “Panormitanus” (1386-1445), however, rather relied on Petrus de Ancharano. Everyone may legitimately seek profit and therefore must not give up exactly the sum in money that he has received<sup>58</sup>. Usury (*usura*) and legitimate profit (*interest*) should therefore not be confused. With this he apparently already reacted to the dominance of the *montes* and their financial transactions.

Sylvester Mazzolini OP from Prierio (1456/1457 - 1523/7), the house theologian of the Pope (Magister sacri palatii) at the time of the beginning Reformation, author of a confessional sum, stressed the necessity of trade. With regard to the individual and his goals, one must praise the trade because it concerns the maintenance of the family and society<sup>59</sup>. According to Cardinal Cajetan (Thomas de Vio, 1469-1534), the gain could even lead to overcoming the birth status<sup>60</sup>. A little later Konrad Summenhart (ca.1450-1502) taught how many aspects could be used to determine the price. This also included legitimate profit<sup>61</sup>, so that the notion of fair price was gradually neglected<sup>62</sup>. In general, Sylvester Mazzolini concluded that the price was a question of *aestimatio*, while in *res fructuosa* it depended on the yield (*reditus*).

From the 14<sup>th</sup> century onwards, more and more new treaties were signed in order to avoid the accusation of *usuriousness* (*usura*). First of all, one should think of special purchase transactions such as the purchase of annu-

<sup>57</sup> PETER LANDAU, Die Bedeutung des kanonischen Rechts in der Geschichte der Geldschuld, in: idem (Ed.), Europäische Rechtsgeschichte und kanonisches Recht im Mittelalter, Badenweiler 2013, 805-814 on the establishment of the theory of the stock market price (“Kurswerttheorie”).

<sup>58</sup> PANORMITANUS, Commentaria to X. 5.18.8, Opera omnia, Venice 1588 re-impr. Frankfurt a.M. 2008 (Ius Commune, Canonistic Literature, 1), Vol.7, 238 n.6.

<sup>59</sup> SILVESTRO MAZZOLINI, Summa summarum quae Silvestrina dicitur Bologna, q. 1, fol.173rb/va.

<sup>60</sup> RAYMOND DE ROOVER, The Scholastic Attitude toward Trading and Entrepreneurship, in: J. Kirshner (Ed.), Business, Banking and Economic Thought, Chicago 1974, 336-345, 341. For the Italian development cf. PAOLA VISMARA, Oltre l’usura. La Chiesa moderna e il prestito a interesse, Soveria Mannelli 2014.

<sup>61</sup> JOHN T. NOONAN, The scholastic analysis of usury, Cambridge Mass. 1957, 249ff, who lets this thought begin only with Summenhart.

<sup>62</sup> ALEJANDRO A. CHAFUEN, Faith and Liberty. The Economic Thought of the Late Scholastics, (Studies in Ethics and Economics), Lanham et al. 2003, 82, for de omnia contractibus, Vol. 1: Tratatatus, q.LVI.

ities, which Endemann already explained in more detail<sup>63</sup>. On the whole, the church was open-minded and mostly accepted what was presented as necessary. Even pure financial transactions have apparently been permitted since the 12<sup>th</sup> century. One knows these original banks at this time in Venice, but one must assume that it was similar in Genoa, Rome and Naples<sup>64</sup>. Its business activities were based on exchange trading with its fixed exhibition venues as well as business with the deposited securities. Even at this early stage, it is obviously possible to differentiate between public and private banks. But everywhere laws arose, which should offer a protection from too large enterprises, de Roover already called it a first *anti-trust law*<sup>65</sup>.

The large number of circumvention transactions was due on the one hand to the necessity of not being able to directly violate the old prohibitions of canon law, but on the other hand also to the tolerance of the following generations of canonists, who interpreted the old prohibition norms in a completely new way in order to allow more and more space for the needs of trade. In southern Germany in the 15th century<sup>66</sup>, treatises on commercial law such as Matthias von Krakow (c. 1335/40-1410) were written<sup>67</sup>. The work of the theologian and canonist Johannes Nieder OP (†1438)<sup>68</sup>, “De contractibus mercatorum”, was addressed to pastors and interested lay people. It deals with the following questions:

1. of a fair purchase,
2. of the fair price of the goods,
3. 24 rules for merchants to recognize when they are right or wrong,

<sup>63</sup> WILHELM ENDEMANN, Studien in der romanisch-kanonistischen Wirtschafts- und Rechtslehre (n.16), Vol. 2, 103ff.

<sup>64</sup> ENDEMANN, Studien in der romanisch-kanonistischen Wirtschafts- und Rechtslehre Law (n.16), Vol. 1, 424ff, 432ff.

<sup>65</sup> RAYMOND DE ROOVER, Monopoly Theory Prior to Adam Smith: A revision, The Quarterly Journal of Economics 65 (1951), 492-524, = idem, Business, Banking, and Economic Thought (n.5), 273-305, 284, for a further interpretation of the term monopoly already 280.

<sup>66</sup> MATTHIAS NUDING, Geschäft und Moral. Schriften “De contractibus” an mitteleuropäischen Universitäten im späten 14. und frühen 15. Jahrhundert, in: F.P. Knapp et al. (Eds.), Schriften im Umkreis mitteleuropäischer Universitäten um 1400, (Education and Society in the Middle Ages and Renaissance, 20), Leiden/ Boston 2004, 40-62.

<sup>67</sup> NUDING, Geschäft und Moral (n.66), 48, 53ff, 59f.

<sup>68</sup> To him and his work first of all WINFRIED TRUSEN, De contractibus mercatorum. Wirtschaftsethik und gelehrtes Recht im Traktat Johannes Niders (†1438), in: Ius et commercium. Festschrift für Franz Laufke zum 70. Geburtstag am 20.6.1971, Würzburg 1971, 51-71; previously already on this subject JOHANNES HÖFFNER, Wirtschaftsethik und Monopole im fünfzehnten und sechzehnten Jahrhundert, Diss. sc.pol. 1940, Jena 1941, 85ff.

4. an overview of fair and unfair forms of contract,
5. a doctrine of the origin of all property and possessions.

The validity of a transaction depended above all on the consensus of both parties. Obviously, the practice should be given a guideline for the assessment of the many contracts and provisos.

However, we are far from understanding or even recognizing the richness of these sources, which are often not even printed yet. The gradual discovery of confessional literature and of late authors such as Felinus Sandaeus (1444-1503) are a new approach<sup>69</sup>.

In the area of public finances, John XXII in particular systematized the sources of income of the Church, which was later used as a model by the states. In addition, there were rules on the protection of coins, public money flows and the handling of finances. Andreas Thier recently referred to the first use of the maxim “quod omnes tangit, ab omnibus approbari debet” by Petrus de Ancharano (c. 1330-1416)<sup>70</sup>. It was used as an argument that the Prince could only burden his people with costs if he had obtained the consent of his subjects<sup>71</sup>. At the end of the 15<sup>th</sup> century, Johannes Bertachinus (c. 1448? – around 1500)<sup>72</sup> almost completed the systematization and dogmatization of customs and tax issues.

The crime of falsification (*falsum*) and deception (*stellionatus*) also applied to the fraudulent trade in foodstuffs such as bread, beer<sup>73</sup> and wine<sup>74</sup>. So we recognize a consumer protection law *avant la lettre*<sup>75</sup>.

<sup>69</sup> See above Fn.25.

<sup>70</sup> Petrus de Ancharanus (around 1330-1416) s. ANDREAS THIER, Money in Medieval Canon Law, in: D. Fox/ W. Ernst (Ed.), Money in the Western Legal Tradition. Middle Ages to Bretton Woods, Oxford 2016, 136-166, 148 with Fn. 124.

<sup>71</sup> For this use by Petrus de Ancharanus (c. 1330-1416) see THIER, Money in Medieval Canon Law, in: D. Fox/ W. Ernst (Ed.), Money in the Western Legal Tradition (n.70) 136-166, 148 with Fn. 124.

<sup>72</sup> SCHMOECKEL, Johannes Bertachinus und die Entstehung des gelehrten Steuer(straf)rechts, in: B. Kretschmer/B. Zabel (Eds.), Studien zur Geschichte des Wirtschaftsstrafrechts. Methoden – Analysen – Kritik, Baden-Baden 2018, S. 433–449.

<sup>73</sup> HANS-GEORG HERMANN, Das Reinheitsgebot von 1516. Vorläufer, Konflikte, Bedeutung und Auswirkungen, in: Haus der Bayerischen Geschichte (Ed.), Bier in Bayern. Ausstellungskatalog zur Jahresausstellung 2016, 1-12.

<sup>74</sup> ALEXANDER MARINGER, Weinrecht und Verbraucherschutz: Vom Alten Reich bis zur Gegenwart unter besonderer Berücksichtigung des Anbaugebiets Mosel (Rechtsordnung und Wirtschaftsgeschichte, Volume 9), Tübingen 2014.

<sup>75</sup> DAVID VON MAYENBURG, Reinheitsgebot: der Beitrag des canonischen Rechts zum Verbraucherschutz, in: idem et al. (Ed.), Der Einfluss der Kanonistik auf die europäische Rechtskultur, Volume 5: Das Recht der Wirtschaft, (Norm und Struktur, 37.5), Cologne/ Weimar/ Vienna 2016, 297-331.

The constitutio “Saepe contingit” (Clem. 5.11.2, issued before 21.3.1314<sup>76</sup>), which was included in Decretales Clementinae in 1314, which regulated the summary procedure, should be mentioned only briefly. A faster procedure has been introduced for specific procedures, including economic sectors such as bills of exchange. Due to special interest in legal certainty and speed of jurisdiction, many local courts were even allowed their own commercial courts, such as the *Tuchhallergericht* (“court in the hall of the cloths”) in Cologne in 1371<sup>77</sup>.

The attempt to demonstrate the approaches of economic and commercial law in all possible areas produced a wealth of results. Perhaps these various findings can be summarized under the aspect of profit, which, although accepted in principle by canon law as a possibility, was always made subject to the proviso that other objectives of society would also be achieved. Profit was never an end in itself, interest was always only one aspect, while the decision was taken more according to considerations of society as a whole. In the absence of a clearer concept, I would characterize this form of economy as a subsistence economy.

### 2.3. The Further Development of Canon Law in Spain

Against this background, one can hardly confirm the often-heard thesis that the modern economy began with the Spanish era or the school of Salamanca. Those who postulate this often refer to Thomas Aquinas and others<sup>78</sup>:

- The division of property into different uses was already found in the middle of the 13<sup>th</sup> century as a result of the Franciscan poverty dispute.
- The protection of coins and approaches to a doctrine on how money was created and how it could be used can also be found in canonical doctrines from the 13<sup>th</sup> century onwards.
- The idea of a fair price was increasingly abandoned and left to the interest of the trade.

<sup>76</sup> Vgl. KENNETH PENNINGTON, *The Prince and the law. Sovereignty and Rights in the Western Legal Tradition*, Berkeley 1993, 171 n.31.

<sup>77</sup> DIETER STRAUCH, *Kölnisches Gerichtswesen*, <https://kups.uni-koeln.de/7587/1/KoelnGerichtswesen.pdf>, last 27.11.2018, 7 sub no.6.

<sup>78</sup> CHAFUEN, *Faith and Liberty* (n.62); MARJORIE GRICE-HUTCHINSON, *Early Economic Thought in Spain 1177-1740*, London/ Boston/ Sydney 1978, 81.

- From the 14<sup>th</sup> century onwards, respect for profit and special rules for commerce were increasingly found, not least in the writings “de contractibus”. The banks and their financial transactions are little theorized, but can still be found in practice.
- Lessons on the public use of money were no more an innovation of the Spanish authors.

On the other hand, it is easy to point out the new problems. The establishment of the administration and a Christian society required the transport of food, especially wine, to America. The development of a new state administration and its own infrastructure was a new task, especially in this dimension. As the trade and prices of the all-round sought-after goods rose, consumers complained about the price increases for which they blamed exports. With the new goods – precious metals and slaves – new moral and legal problems arose. Money detached itself more strongly from the precious metal and the relationship between price, quantity and demand was observed. The Spanish authors were confronted with this opportunity to develop innovative solutions. One therefore finds a wealth of new insights in the writings of the Spanish school<sup>79</sup>. Josef Schumpeter called the school of Salamanca ready as “founder of economy as a science”<sup>80</sup>. Many see it as the founder of “mercantilism”<sup>81</sup>.

For example, Martín de Azpilcueta (1492-1586), the 16<sup>th</sup> century canonist celebrated as Doctor Navarus, recognized the fall in the price of gold and silver coins<sup>82</sup>. He was not only a celebrated professor in Salamanca and Coimbra<sup>83</sup>, but managed a large fortune himself and was associated at both universities with issues of the economy of the Crown. He was thus familiar with economic issues both in theory and in practice.

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<sup>79</sup> In recent years, an American series has attempted to republish these findings. Passages from large works are isolated in small volumes. What used to be panopticos of law or moral theology becomes a short *tract* or *thesis*: Sources in Early Modern Economics, Ethics, and Law, Grand Rapids 2014ff: from the larger circle of the school of Salamanca one can find, among others, Martín de Azpilcueta, *On Exchange*, 2014; Luis de Moína, *A Treatise on Money*, 2015; Leonardus Lessius, *On Sale, Securities, and Insurance*, 2016; Juan de Mariana, *A Treatise on the Alteration of Money*. E.g. JOSEF SCHUMPETER, *History of Economical Analysis*. *Geschichte der ökonomischen Analyse*, Vol. 1, Göttingen 1965, 146ff.

<sup>80</sup> JOSEF SCHUMPETER, *History of Economical Analysis*. *Geschichte der ökonomischen Analyse*, Vol. 1, Göttingen 1965, 146ff.

<sup>81</sup> GRICE-HUTCHINSON, *Early Economic Thought* (n.78), 81.

<sup>82</sup> MATHIAS SCHMOECKEL, *Das kanonische Zinsverbot und die Konfessionalisierung*, in: W. Decock/ J. J. Ballor/ M. Germann/ L. Waelkens (Eds.), *Law and Religion. The Legal Teachings of the Protestant and Catholic Reformation*, (Refo 500, Academic Studies, 20), Göttingen 2014, 186-212.

<sup>83</sup> Classic JOSEF HÖFFNER, *Christentum und Menschenwürde. Das Anliegen der Spanischen Kolonialethik im goldenen Zeitalter*, Trier 1947, 283ff.

The evaluation of coins does not only depend on the difference of the metal, the quality, the minting and the weight or doubt of its value (*reproución*). Even the different place of trading plays a role<sup>84</sup>. The Spanish imports of gold and silver from South America and Mexico meant that the value of these metals in Spain had fallen significantly, while it was still more expensive in France, albeit still cheaper than in Germany. Thus, Martín de Azpilcueta experienced significant inflation in its time<sup>85</sup>. Azpilcueta was thus on the verge of describing the principle of supply and demand, but it was Adam Smith who actually did so<sup>86</sup>. As a result, Azpilcueta showed much understanding for banks and insurance companies by giving them considerable leeway to determine the interest rate, which is still to be regarded as legitimate. As a result, little more than a general abuse check should remain.

His reinterpretation of canon law is admirable. He commented on the old basis of the usury ban. The profit depends on the value of the use of the thing<sup>87</sup>. People would decide that differently. Likewise, they could start with one thing quite differently. Only the loan business, which was concluded exclusively with the intention of making a profit, remained unlawful. Azpilcueta thus proved that even under canon law it was possible to focus further on profit and interest. Azpilcueta adopted the classical substance, liberalized it for simple trade and thus instrumentalized canonical law for Spanish world trade<sup>88</sup>. For the contract teachings of the Spanish school, Thomas Duve referred to a similar dependence of the Spanish authors on the canonists as a result<sup>89</sup>.

The great representatives of the school of Salamanca, such as Francisco de Vitoria, considered trade useful for the community<sup>90</sup>. Even though they experienced this much more strongly through the upheavals of their time, they inherited this fundamental attitude from the medieval authors.

<sup>84</sup> MARTIN DE AZPILCUETA, *Comentario resolutorio de usuras*. Salamanca 1556, 81 n.44.

<sup>85</sup> RODRIGO MUÑOZ DE JUANA, *Moral y economía en la obra de Martín de Azpilcueta*, Pamplona 1998, 343.

<sup>86</sup> See Marjorie Grice-Hutchinson: 1998, 49-72, 67; Noonan: 1957, 323f.

<sup>87</sup> MARTIN DE AZPILCUETA, *Comentario* (n.84), 12 n.16: “[...] for the value of the use is taken in it”.

<sup>88</sup> SCHMOECKEL, *Das kanonische Zinsverbot* (n.82), 186-212.

<sup>89</sup> THOMAS DUVE, *Kanonisches Recht und die Ausbildung allgemeiner Vertragslehren in der spanischen Spätscholastik*, in: O. Condorelli et al. (Eds.), *Der Einfluss der Kanonistik auf die europäische Rechtskultur*, Volume 1: *Zivil- und Zivilprozessrecht* (Norm und Struktur, 37.1), Cologne/ Weimar/ Vienna 2009, 389-408.

<sup>90</sup> DANIEL DECKERS, *Gerechtigkeit und Recht. Eine historisch-kritische Untersuchung der Gerechtigkeitslehre des Francisco de Vitoria (1483–1546)*, Freiburg i. B./Vienna 1991, 260; JOSEF HÖFFNER, *Wirtschaftsethik und Monopole im 15. und 16. Jahrhundert*, 2<sup>nd</sup> ed. Darmstadt 1969, 261.

At most, they expressed their agreement more freely. Jaime de Corella OFM (†1699) already underlined the fact that the merchant is in the service of the republic and therefore rightly deserves his profit<sup>91</sup>. The late commentator on canon law, Emanuel Gonzales Tellez (†1649), said that the travelling merchants were “*omne commiseratione digni*”<sup>92</sup> and therefore deserved reasonable prices for their services. He openly admitted that the canons of ecclesiastical law were sometimes problematic for the solution of these questions<sup>93</sup>.

Thus there are areas in which canon law was not only continued, but in which the authors of the School of Salamanca also clearly detached themselves from canon law. The obvious, hardly explainable jump in prices of the goods on the market could hardly be associated with the idea of a uniform fair price. De Vitoria was therefore already focusing solely on the market price. This price is fair as long as there is no error or compulsion in the business<sup>94</sup>. Cheaper shopping and more expensive selling are therefore part of the profession of the merchant, restrictions on profit for the purpose of the common good are not made. However, the state should have the task of banning harmful transactions. These included in particular monopolies and price agreements, which were generally considered inadmissible. De Vitoria also considered State price assessments to be compulsory in principle. This shows clear limits to his liberal attitude towards the economy. As new as the problems and often innovative as the solutions found by the representatives of the School of Salamanca in questions of commercial law were, they remained faithful to the ecclesiastical tradition of not absolutizing the aspect of profit. It remained with the consideration also of social and moral questions.

The importance of the Spanish authors spread their teachings to the continent. Wim Decock just recently analyzed the Economic influence of the great Leonard Lessius SJ (1554-1623), a student of Suárez and Bellarmin

<sup>91</sup> JACOBUS DE CORELLA, *Praxis Confessionalis II Partes*, Augsburg 1757, II c.7 n.36, 281.

<sup>92</sup> EMANUEL GONZALEZ TELLEZ, *Commentaria perpetua in singulos testus quinque librorum Decretalium Gregorii IXi*, III Lyon 1693, for X 3.17.1 n.10, 278 For him see the contributions in “Estudios sobre el Doctor Navarro en el IV centenario de la muerte de Martin de Aszpilcueta, Pamplona 1988”; SCHMOECKEL, *Das kanonische Zinsverbot und die Konfessionalisierung*, in: W. Decock/ J.J. Ballor/ M. Germann/ L. Waelkens, *Law and Religion. The Legal Teachings of the Protestant and Catholic Reformation*, (Refo500, Academic Studies, 20), Göttingen 2014, 186-212, 199ff., 204f., m.w.N.

<sup>93</sup> GONZALEZ TELLEZ, *Commentaria perpetua* (n.92), 3.17.2, n.6, 279.

<sup>94</sup> GERHARD OTTE, *Das Privatrecht bei Francisco de Vitoria*, (Forschungen zur Neuern Privatrechtsgeschichte, 7), Cologne/ Graz 1964, 82, 84.

and later professor at Leuven university. He became recognized for his interest and understanding of the new Flemish economy. It was reported that he even visited the stock market of Anvers in order to learn more about the changing economy of his time<sup>95</sup>. He generally considered profit to be permitted. In the loan agreement, he saw the principle of *amicitia*<sup>96</sup> (friendship) realized, which here shaped the exchange relationship and his consideration. Josse de Damhouder (1507-1581) from Anvers equally accepted profit as a necessary part of the new economic order. He appeared to him as part of what was acquired through work or works<sup>97</sup>. As far as no one would be harmed by it, the profit appears as honourable in its nature, which all are allowed to strive for lawfully. After all, profit is the goal of every commercial effort. But these passages did not come from the Protestant Netherlands, but from Antwerp. But why shouldn't one have developed an understanding for profit and its significance for economic progress in this large and old trading city? Also German Jesuits, who in this respect were accused of particularly conservative, anti-economic positions, prove to be much more open-minded towards the new demands of the economy in closer regard<sup>98</sup>.

## 2.4. Resume

As new as the problems and often innovative as the solutions found by the representatives of the Salamanca School in questions of commercial law were, they remained faithful to the ecclesiastical tradition of not absolutizing the aspect of profit. It remained with the consideration of the will of the participants or the consensus<sup>99</sup>. This proves that the new problems of the economy could also be solved with the help of classical canon law; the Spanish lawyers were open and flexible enough for innovative, practicable new solutions.

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<sup>95</sup> WIM DECOCK, *Le marché du mérite* (n.23), 59f.

<sup>96</sup> LEONARDUS LESSIUS SJ, *De iustitia et iure caeterisque Virtutibus Cardinalibus libri quatuor*, Antwerp 1609, lib.2 cap.20, Dub.V n.35ff, 249f.

<sup>97</sup> JOSSE DE DAMHOUDER, *Sententiae selectae pertinentes ad materiam praxios rerum criminalium et aliarum partium iuris scientiarumque*, Antwerp 1601 re-impr. Aalen 1978, 105: "Lucrum est acquisitia ex labore vel opera."

<sup>98</sup> KLAUS HAUSEN, *Petrus Canisius's Stand on Usury: An Example of Jesuit Tactics in the German Counter Reformation*, *Archiv für Reformationsgeschichte* 55 n.2 (1964), 192-204.

<sup>99</sup> WIM DECOCK, *Theologians and Contract Law. The Moral Transformation of the Ius Commune* (ca. 1500-1650), Leiden/ Boston 2013, 608.

As theologians they continued to heed the social and moral questions of their society. Like the theologians before them, they sought balance without hindering the economy. In this respect, they are more a continuation of the earlier tradition than a new beginning in the economic order. It can be assumed that this was precisely the strength of commercial law, which did not stand in the way of innovations, but reliably created a balance in society.

How absurd Weber's thesis is can be seen once again in Flemish writings. Their general acceptance of profit and their encouragement of a fruitful life even in economic terms<sup>100</sup> show that Catholicism alone did not hinder people or territories to strive for wealth.

### 3. The Reformation

#### 3.1. Martin Luther and the Lutheran Tradition

Martin Luther had indeed abandoned the study of canon law and sold his copy of the *Corpus iuris canonici* when he entered the Order<sup>101</sup>. But during his theological studies he came again and again into contact with canonical law<sup>102</sup>. Despite his famous burning of the *Corpus iuris canonici* as well as his canonical writings, he proves to be a faithful pupil of canon law in most cases, who – intentionally or unintentionally – continued to use and adhere to its standards. This does not apply to church and matrimonial law<sup>103</sup>, i.e. the cases of clear dissent, for which, however, he also needed a clear idea of conventional law. But in the other matters he remained particularly traditional, for example in wills<sup>104</sup>, in the law of indulgences<sup>105</sup> and also in commercial law<sup>106</sup>. In three phases he dealt with the question

<sup>100</sup> Cf. DECOCK, *Le marché du mérite* (n.23), 208f.

<sup>101</sup> HEINRICH FAUSEL, *D. Martin Luther. Leben und Werk 1483 bis 1521*, Munich/ Hamburg 1966, 31.

<sup>102</sup> THOMAS KAUFMANN, *Geschichte der Reformation*, Frankfurt a. M. 2009, 136, on his relation with Summenhart; MARTIN BRECHT, *Martin Luther: Sein Weg zur Reformation 1483-1521*, Stuttgart 1981, 67f on Angelus de Clavasio.

<sup>103</sup> HKK/ MATHIAS SCHMOECKEL, before § 1313-1320, Tübingen 2018, note 39.

<sup>104</sup> MATHIAS SCHMOECKEL, *Luther's Last Will and the Triumph of Testamentary Freedom*, in: O.-A. Rønning/ H. Vogt/ H. M. Sigh (Ed.), *Donations, Inheritance and property in the Nordic and Western World from Late Antiquity until Today*, London/ New York 2017, 179-212.

<sup>105</sup> MATHIAS SCHMOECKEL, *Vom Recht der Guten Werke: Ging Luthers Kritik der Ablässe fehl? M. Laureys* (Ed.), has not yet appeared.

<sup>106</sup> SCHMOECKEL, *Das kanonische Zinsverbot* (n.82), 186-212.

of usury<sup>107</sup>. In 1519 and 1520 he condemned usury, while between 1523 and 1525 he was more open-minded and wanted to leave the regulation to the princes. During a famine in 1539 he preached again sharply against usury and wanted to prohibit the interest. In general, therefore, Luther took action against interests that mostly seemed forbidden to him under divine and natural law<sup>108</sup>.

One cannot, according to Luther, free oneself from this duty, neither by referring to the opposite habit, even that of the Church, or to the then lacking interest in giving something, because the commandment of God is unmistakable and irrevocable here. With regard to moral obligation, however, Luther distinguishes three degrees<sup>109</sup>. Compared to the prohibition to answer violence with force and the general obligation to give alms, the prohibition of interest is of least binding force. Here, conflicting concerns may therefore exceptionally lead to the admissibility of the interest<sup>110</sup>.

In 1524 he openly admitted the necessity of buying and trading as long as these were essential goods and not pure luxury products<sup>111</sup>. A limited profit is part of the trade. The princes would have to determine the permitted profit and interest<sup>112</sup>. For the interest rate of up to 5%, Luther referred to a dissertation by Johannes Eck (1485-1543) in Bologna<sup>113</sup>. After 1539 Luther complained about interest, but he did not fall behind the position of Thomas Aquinas. And much worse than the little “Wucherling” (little usurer) are the “big world-eaters”, who actually cannot be punished hard enough<sup>114</sup>.

<sup>107</sup> BENJAMIN NELSON, *The idea of usury from Tribal Brotherhood to UniversalOtherhood*, 2 Volumes, Chicago/London 1949, 34f, 45; MARTIN HONECKER, *Art. Geld II, Historisch und ethisch*, TRE 12, Berlin/New York 1984, 278-298, 286.

<sup>108</sup> MARTIN LUTHER, (Kleiner) Sermon von dem Wucher [1519], WA 6. volume, *Schriften 1519/20*, 5. The relevant works of Luther can be found in extracts also with English translation in Eric Kerridge (2002, 97f, 115f, 131-133, 145-148, 149-151, 153f, 155f).

<sup>109</sup> DAZU auch OLIVER O'DONOVAN/JOAN LOCKWOOD O'DONOVAN, *Bonds of Imperfection: Christian Politics, Past and Present*, Grand Rapids MI, 2004, 117.

<sup>110</sup> LUTHER, (Little) Sermon of Usury [1519] (n.108), 3rd ed.

<sup>111</sup> LUTHER, *Von Kaufhandlung* [1524], WA *Schriften 15<sup>th</sup> Volume*, 293-313, 293.

<sup>112</sup> LUTHER, *Von Kaufhandlung* [1524] (n.111), 302.

<sup>113</sup> To Johannes Eck's “Contractus trinus” s. WILLIBALD M. PLÖCHL, *Geschichte des Kirchenrechts*, vol. 3, Vienna/Munich 1969, 249f; CLEMENS BAUER, *Conrad Peutingers Gutachten zur Monopolfrage. Eine Untersuchung zur Wandlung der Wirtschaftsanschauungen im Zeitalter der Reformation*, *Archiv für Reformationsgeschichte* 45 (1954), 1-44, 145-196, 177ff; AUGUST M. KNOLL, *Der Zins in der Scholastik*, Innsbruck/ Vienna 1933, 144ff.

<sup>114</sup> MARTIN LUTHER, *An die Pfarrhern, wider den Wucher zu predigen. Vermahnung* [1540], WA *Schriften 51<sup>st</sup> vol.*, sermons 1545/46, 369.

As a result, Luther was morally willing to accept financial transactions<sup>115</sup>, but he did not go as far as Petrus Olivi. He relied on the older literature of canon law up to Eck's dissertation, did not develop a position of his own and remained rather general. It can hardly be a decisive reference for new economic concepts<sup>116</sup>. Rather, this observation proves how the Lutheran movement built on the doctrine of canon law and continued the common European tradition.

His students also sought a balance between permissible profit and the protection of society. This attempt at balance is still evident in Johann Gerhard's work<sup>117</sup>. He can rely on numerous authors of the Lutheran tradition, but also of other denominations.

### 3.2. Jean Calvin and the Calvinist tradition

The same applies to Jean Calvin's teaching on commercial law. Like Luther, Calvin was the son of a merchant. In 1545 he addressed a short text "De l'usure"<sup>118</sup> to a friend. According to Calvin there was no clear prohibition of interest in the Bible, but only a reminder of moderation. The Jewish prohibition of interest only belonged to Israel's political law and therefore could not be transferred to other countries and above all to the present. Money must very well be classified as fruitful, especially in connection with human work<sup>119</sup>. As a result, he formulated seven rules for a moderate use of interest: interest should not be taken from the poor. You should not harm others in the process. The natural equity (*equite naturelle*) must be maintained. It was not only the private benefit of the contracting parties that was important, but also the general benefit. Here Calvin thus represented a quite classical position of canon law.

<sup>115</sup> More restrictive the perception of HANS-JÜRGEN PRIEN, *Luthers Wirtschaftsethik*, Göttingen 1992, 214f.

<sup>116</sup> ANDREAS PAWLAS, *Die lutherische Berufs- und Wirtschaftsethik*, Neukirchen-Vluyn 2000, 207ff, 209.

<sup>117</sup> JOHANN GERHARD, *Loci Theologici*, ed. Preuss, Berlin 1868, Vol.6, locus 24, n.232ff, 388ff; MATHIAS SCHMOECKEL, Introduction to Johann Gerhard, *On Interest and Usury*, transl. Richard J. Dinda, Grand Rapids MI. 2020.

<sup>118</sup> JEAN CALVIN, *De l'usure* [1545], *Ioannis Calvinii opera selecta*, ed. P. Barth/ G. Niesel, Vol. 2, Munich 1952, 391-396; on the influences of Luther and especially Bucer cf. JOSEF BOHATEC, *Calvin's doctrine of state and church with special consideration of the organism idea*, Breslau 1937; reimpr. Aalen 1961, 716-719.

<sup>119</sup> So KALLE ELONHEIMO, *Das Universale Recht bei Johannes Calvin*, Mit besonderes Berücksichtigung seines Naturrechtsverständnisses, Abo 2006, 158.

If one looks at his “*Institutio religionis Christianae*”, on the other hand, another picture emerges. The result, however, is interpretation that can result from reading this work, not directly Calvin’s teaching. Since God was the sole sovereign and society was founded by a social contract, God was not only the highest sovereign, but the chief of all princes. In a treaty with mutual rights and duties, the rule of God would be recognized, in return for which people would be granted certain rights. Princes and their magistrates are there to enforce the commandments of God<sup>120</sup>. The Christian must decide above all individually by the strength of his faith. The order provided by law and authority thus serves the purpose of self-education<sup>121</sup>. The conscience of men must be free, so that man can decide for the right side out of a free heart, that is, out of his faith. So while citizens would have to exercise their rights themselves, the state would serve to protect citizens’ freedom<sup>122</sup>.

For man, this freedom therefore has a central place in life<sup>123</sup>; it is one of God’s greatest gifts<sup>124</sup>. The more stable the order is, the greater these freedoms could be<sup>125</sup>. Calvin already described this civil freedom as a right (*ius*)<sup>126</sup> in so far as it exists in the state and is to be preserved by the authorities, even as their supreme task<sup>127</sup>. Calvin was probably referring to life<sup>128</sup>, to the freedom of conscience and thus of confession<sup>129</sup>. On closer inspec-

<sup>120</sup> MATHIAS SCHMOECKEL, *Die Gewährleistung der Freiheit des Einzelnen als Staatszweck nach Calvin*, in: H. de Wall (Ed.), *Reformierte Staatslehre in der frühen Neuzeit (Beiträge zur politischen Wissenschaft, 102)*, Berlin 2013, 21-50.

<sup>121</sup> JEAN CALVIN, *Institutio* [1536] (Basel), c.6.196f, 224f; VOLKER REINHARDT, *Die Tyrannei der Tugend. Calvin und die Reformation in Genf*, Munich 2009, 213.

<sup>122</sup> JEAN CALVIN, *Institutio* [1559] (Basel), IV.20 n.8, 1098: “*Quinetiam huc summa diligentia intenti magistratus esse debent, nequ in parte libertatem, cuius praesides sunt constituti, minui, nedum violari patiantur.*”

<sup>123</sup> In addition already JOSEF BOHATEC, *Calvin’s teaching* (n.118), 97 with further proofs.

<sup>124</sup> JEAN CALVIN, *Homilia 29 to Sam 1.8*, CR 57, 556: “*libertatis beneficium a solo Deo Opt. Max. profectum*”.

<sup>125</sup> JOHN WITTE JR., *The Reformation of Rights: Law, Religion and Human Rights in Early Modern Calvinism*, Cambridge 2007, 65.

<sup>126</sup> JEAN CALVIN, *Commentarii Romanos et Corinthios et Sermons Corinthios Cap 10 et 11: Commentarius in epistolam Pauli ad Romanos*, c.10.23 = CR 77, 468: “*ius libertatis christianae*”.

<sup>127</sup> JEAN CALVIN, *Institutio* [1536] (n.121) c.6.230, 260: “*ut suum cuique salvum sit et incolume*”.

<sup>128</sup> So also JOSEF BOHATEC, *Calvin’s teaching* (n. 118), 114.

<sup>129</sup> JEAN CALVIN, *Institutio* [1559] (n.122), III.19 n.14, 293: “*Iam vero quum hac libertatis praerogativa [...] donatae fideles conscientiae id Christi beneficio consequutae sint, ne ullis observationum laqueis in iis rebus implicentur in quibus eas esse liberas Dominus voluit*”; JOSEF BOHATEC, *Calvin’s teaching* (fn. 118), 114; MARIO TURCHETTI, *Der Beitrag Calvins zur Entstehung der modernen Demokratie*, in: M. E. HIRZEL (Ed.), *1509 - Johannes Calvin - 2009: sein Wirken in Kirche und Gesellschaft; Essays zum 500. Geburtstag*, Zurich 2009, 237–266, 251f on the liberty of conscience; JOACHIM STAEDTKE, *Calvins Calvin’s teaching*, in: W. P. FUCHS (Ed.), *Staat und Kirche im Wandel der Jahrhunderte*, Stuttgart 1966, 100-114, 101, however, sees freedom of conscience addressed for the first time in 1663 by Roger Williams.

tion one can find here almost the classical basic speech. Although all humans are of the same nature, they are not the same<sup>130</sup>. Men are brothers, but also lords and servants<sup>131</sup>. Justification does not depend on possession, but only on how one deals with it. How each individual deals with his gifts and goods shows its abilities and virtues and decides whether someone can find justification. Only the beggar and the poor have neither power nor wealth, with which they can deal wrongly. Those who have more power and property risk much more not to deal with it in a sufficiently Christian way. In order not to relieve the individual of this test, the state must not take away the individual's assets or his decision on social security contributions.

Accordingly, the responsible handling of goods was important to him, reason (*ratio*) must guide action. It is reasonable to trade, he said. The prosperity of a merchant could show that he had dealt with the good in a meaningful way, in the final analysis also an indication of his God-fearing life. Of course, there would only be a few who would succeed. Some were therefore destined for salvation, others for damnation. God knows this decision before all time. This double predestination should not spare the individual decision; rather, the omniscient God already knew the effect of the individual inclinations.

So anyone who runs his business responsibly and becomes rich can regard this as an indication – but not as certainty – of his calling to salvation. The restriction of the state and the emphasis on individual freedom led to the insight that the individual had to provide for his own salvation by taking into account the considerations of society as a whole. If he paid only attention to his profit, then no one can stop him, but he himself endangered his justification. Of course, for Calvin's theology wealth was not an end in itself and by no means the only goal of a life or a society. But the success in the economy could dangerously narrow the perspective because of its indicative effect. This speaks for Weber's thesis, obviously there was at least one way to motivate the pursuit of profit theologically<sup>132</sup>. But with Calvin there was still the strong state, which must provide for the well-being of

<sup>130</sup> JOHN CALVIN, Comm. on Deut 5.5.17, CR 54, 321: "We are of the same nature: all this means that men are the same"; cf. JOSEF BOHATEC, *Calvins Lehre mit besonderer Berücksichtigung des Organismusgedankens*, Breslau 1937, 147; JOSEF BOHATEC., *Calvin und das Recht*, Feudingen 1934, 67.

<sup>131</sup> JOHN CALVIN, *Sermo 46 on Tim 6.1-2*, CR 82, 554: "We are brothers, and this will not prevent one from being a master and the other a servant,[...]".

<sup>132</sup> Against HEINZ STEINERT, *Max Webers unwiderlegbare Fehlkonstruktionen* (n.3), on the 19<sup>th</sup> century.

its subjects and sharply prevent excesses of the economy. Later, however, especially among the English Calvinists, the individual responsibility was emphasized, which was not the task of the state<sup>133</sup>.

Calvin's theology was thus open to numerous different interpretations – as were the other denominations. It is therefore not surprising that not all Calvinist territories automatically became rich, such as Romania. The later wealth still began directly with Calvin's work; this is true, for example, in the cases of Geneva, the Netherlands or England<sup>134</sup>. The Calvinist Emden could no longer keep up with the Netherlands after 1600. The decline of the Protestant Hanseatic League, especially in the conflict with the growing Nordic nation states<sup>135</sup>, proves that the Reformation alone was no guarantee for economic growth and that the successes were due to a multitude of individual factors.

### 3.3. Economic changes

One cannot look for the economic changes in modern times only in theology or the legal order. Much more important can be the upheavals in the economic flows of that time. The famous “crisis of the 17th century” described by Eric Hobsbawm in 1954 must be known and the starting point. The civil and religious wars in many parts of Europe led to an enormous demographic decline and thus to economic crises. At the same time, Mediterranean trade almost came to a standstill, not least because no one was able to efficiently counter the pirates there. The great southern economic powers also lost their importance: Spain experienced several state bankruptcies because the import of gold and silver had corrupted the standards<sup>136</sup>. The growing complexity of the economy has not been adequately addressed. The northern Italian city states such as Genoa and Venice lived only on past grandeur. The increase of pirates in the Mediterranean made sailing and living on the coast almost too dangerous<sup>137</sup>.

<sup>133</sup> CHARLES H. GEORGE, English Calvinists on Usury, 1600-1640, *Journal of the History of Ideas* vol.18 n.4 (1957), 455-474.

<sup>134</sup> So auch bereits HECTOR M. ROBERTSON, *Aspects of the Rise of Economic Individualism. A Criticism of Max Weber and his School*, Cambridge 1933, 210.

<sup>135</sup> MANFRED GROTEN, *Die deutsche Stadt im Mittelalter*, Stuttgart 2013, 271.

<sup>136</sup> MARK GREENGRASS, *The Lost Paradise. Europe 1517-1648*, Darmstadt 2018, 577.

<sup>137</sup> MARK GREENGRASS, *The Lost Paradise* (n.136), 556.

On the other hand, trade and the population of the cities along the Atlantic coast from La Rochelle to Denmark grew. The Levant trade was replaced by transatlantic trade, which still affected trade in the Baltic Sea. The cities from La Rochelle to Copenhagen benefited from these new economic flows. The transport of precious metals and slaves was replaced by trade in agrarian products such as tobacco, tea, coffee and cotton<sup>138</sup>. This benefited all regions participating in the new trade, regardless of their denomination.

This development has therefore been driven by a profound change in European trade. Again, it is only obvious at first glance to regard confessional facts as relevant here. By no means did the Protestant nations such as England and the General States have to profit particularly from this; rather the advantage for the old trading cities of Ghent and Antwerp would have been expected. The Protestant countries of the German coast, on the other hand, did not experience this special upswing. The Atlantic trade alone therefore did not automatically promote Protestant states. It is questionable whether we do not find in the different legal systems the reason why some states were able to exploit the new economic development of the Atlantic trade particularly well, i.e. to let the new engine of economic development take effect for them.

### 3.4. Resume

There is much to be said about the importance of the Protestants for the development of trade and the economy. With Calvin, as seen – as with the Franciscans – one finds an appreciation of subjective property and trade. Many ideas that lead to the first ideas of the rule of law, fundamental rights, the Constitution and free trade have been developed on the basis of his ideas by the first Calvinist jurists. The development of the market with its legal foundations in the sense of Polanyi can therefore be traced back to Calvin and the Reformation. The influences of Calvin can also be found in the work of the Scottish Calvinist Adam Smith<sup>139</sup>. Finally, Melancthon brought about a view of a society of almost cognitively incapable individuals who could only offer each other the basis for life through exchange

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<sup>138</sup> JAN DE VRIES, The Economic Crisis of the Seventeenth Century after Fifty Years, *Journal of Interdisciplinary History* XL.2 (2009), 151-194, 190.

<sup>139</sup> See the comparison in MATHIAS SCHMOECKEL/ MATTHIAS MAETSCHKE, *Rechtsgeschichte der Wirtschaft*, 2<sup>nd</sup> ed. Tübingen 2016, 44ff.

and contracts, a new basis of contract law<sup>140</sup>. Last but not least, the greater importance of individualism and one's own responsibility for faith and society also indirectly promoted the economy.

Max Weber was not wrong in attributing Protestantism some economic importance. But in the end a business-friendly tradition was continued or intensified, while some territories due to their political situation preferred to maintain the old order and forego large profits in return. But the willingness of Spanish authors to allow profits shows that one should not generalize here in a confessional respect.

Moreover, one must not ignore the influence of theology and other factors. What applies to Calvin's theology must not be equated with all Reformed territories. Neither all the Reformed states became rich, one thinks of Romania, nor did the later wealth begin directly with Calvin's work, this applies in the cases of Geneva, the Netherlands or England<sup>141</sup>. Even the Calvinist Emden could no longer keep up with the Netherlands after 1600. The decline of the Protestant Hanseatic League proves that the Reformation alone was no guarantee of economic growth and that the successes were due to a wealth of individual factors. We must therefore pay attention to further political and economic developments.

## **4. Shifts in economic power in the 16<sup>th</sup> century: new economic pioneers**

### **4.1. Political tension in the Rhineland**

#### **4.1.1. The old cities**

In view of the often dominant path dependencies, one would have expected a significant economic success for the Rhineland at the beginning of the 16<sup>th</sup> century. The ancient Roman towns along the river, which remained the world's economically dominant waterway until the 20<sup>th</sup> century, had all the prerequisites for success in terms of the country's infrastructure, education and sufficient wealth. The same would have been assumed outside

<sup>140</sup> SCHMOECKEL, Melanchthons Konzept der Verträge (n.24), 304-345.

<sup>141</sup> Already in this sense HECTOR M. ROBERTSON, *Aspects of the Rise of Economic Individualism. A Criticism of Max Weber and his School*, Cambridge 1933, 210.

the Empire for the cities of Northern Italy or the old trading cities between Brussels and Antwerp.

Clearly, it came differently. The large trading cities of northern Italy, but also the Hanseatic League in northern Germany, experienced a clear decline. Cologne, on the other hand, stagnated in the early modern period. While the other cities up to Paris became more and more important, Cologne lost relative importance, but without ever becoming meaningless. Although Cologne thus remained an important trading centre, it was not until the 19<sup>th</sup> century that it again developed a new economic thrust. On the other hand, it was the southern German cities such as Augsburg and Nuremberg that were able to achieve a new significance in Germany thanks to their economic success.

This led Max Weber to his famous, long disproved but repeatedly revived thesis of the economic innovative power of the Protestants<sup>142</sup>. He was less interested in a direct causality of Protestant theology and modern capitalism in particular, but rather in the similarity of a mentality or way of life that correlates with capitalism in the sense of an “elective affinity”<sup>143</sup>. For the determination of economic contents Weber referred to the “spirit of capitalism”. Neither this spirit nor Protestantism can be so unified. For his studies Weber was guided by the US-American pattern, in particular Benjamin Franklin<sup>144</sup>. However, he then examined Martin Luther’s business ethics. It is clear that one has to differentiate between Luther’s theology on the one hand and the reformed theology in its different manifestations. To what extent Luther influenced the USA or did not dominate completely different currents here would have to be clarified first. Weber’s “great narrative” has been falsified time and again, but returns time and again, apparently because it meets narrative needs<sup>145</sup>.

Instead of a discussion with Weber, we will assume that Gero Fuchs’ dissertation in Bonn has just been completed. At first it illustrates almost diametrically opposed convictions in the economic thinking of the time<sup>146</sup>. It was about the legality of the profit. After presenting this case, I will try to

<sup>142</sup> Cf. MAX WEBER, *Die Protestantische Ethik und der Geist des Kapitalismus*, in: idem, *Die Protestantische Ethik* (n.1) 2006, 65-276.

<sup>143</sup> HANS-PETER MÜLLER, *Max Weber, Cologne/ Weimar/ Vienna 2007*, 86.

<sup>144</sup> See GHOSH, *A Historian Reads Max Weber* (n.13).

<sup>145</sup> STEINERT, *Max Webers unwiderlegbare Fehlkonstruktionen* (n.3).

<sup>146</sup> GERO FUCHS, *Gewinn als Umbruch der Ordnung? Der Fall des Siegburger Töpfers Peter Knütgen im 16. Jahrhundert*, Diss.jur. Bonn 2018, Tübingen 2019.

make it fruitful for the German and international development of the legal and economic order. I will also include other legal-historical works that have been written in Bonn in recent years. This closes various circles of my research. Their combination should show to what extent their results are consistent. The references to my and other Bonn researches shall prove their coherence.

#### 4.1.2. The case of Siegburg

The starting point is an exceptional case that takes place in the small town of Siegburg on the Rhine<sup>147</sup>. In the middle of the 16th century there were potters there who exported their simple goods with some success to the Netherlands and the Hanseatic cities. Potter Peter Knütgen (†1572), on the other hand, invented an almost white shard, which he decorated with extraordinary finesse. His products were in great demand and were probably sold as far as Saint Petersburg. In order to increase his profit, Knütgen did not adhere to the guild rules and sold his goods independently. His extraordinary profit led to anger in Siegburg and around 1560 even to an indictment before the court of lay assessors. The landlord of the town, the abbot of the Siegburg monastery Sankt Michael, presided over this. First, the court of lay assessor reached an agreement without a verdict because Knütgen promised within a settlement to adhere to the guild rules in the future. In doing so, he dispensed above all with his independent trading. When he violated his promise, he was sentenced by the court of lay assessors on the basis of the settlement. The main argument was that Knütgen violated the chance of his rivals to earn what they needed for their life; this was called their “Nahrung” (nourishment). Knütgen died a little later without any notable riches.

It was about an extraordinary profit which, from the Siegburg point of view, would lead to a change in public order. In the background there was also a mixture of different lordships between the abbot as landlord and lord of the town, the duke of Jülich-Kleve-Berg as lord of Berg and the archbishop of Cologne. Knütgen also used the Reformation to add Protestant motifs to his goods and to better sell them. At the same time he also attacked the legitimacy of the monastery and the position of the abbot as lord of the city. The potter might have been inspired by modern ideas up to his faith. But his attack on the church made the abbot and the archbishop his

<sup>147</sup> Closer FUCHS, Gewinn als Umbruch der Ordnung (n.146).

enemy. His thoughts were compatible with those of the Duchy of Berg, but Berg was not able to assert himself in Siegburg. The Knütgen case and the defence of the status quo up to the political situation damaged the potter.

The dispute was carried out – to the success of the old order – over the question of excessive profit. Through his new trade and wealth, the art potter was given a social position which, according to the old order, he was not entitled to. The Siegburg pottery was distributed via Cologne and became known worldwide as “Kölner Ware”. Siegburg itself could have won by independence from Cologne, but in the fight against the “high flyer” the forces of the status quo prevailed.

In order to maintain the political and guild order, Knütgen had to abandon his special business. The city also renounced to benefit from his particular profits. As a result, the Knütgen factory was closed down and Europe – apart from a few other attempts by the Knütgen family – had to wait until porcelain was invented before it was possible to produce the fine tableware that was expected by contemporary tastes. The city therefore renounced the possible enormous profits for several periods in order to adhere to the old status quo, especially in political terms.

As far as this case can be absolutized, it provides the basis for an understanding of why the traditionally successful and significant Rhineland economy from the 16<sup>th</sup> century onwards fell behind other territories in comparison, i.e. why Nuremberg, for example, was able to overtake Cologne in terms of population figures. The profit of the South German trading houses was not considered immoral or an attack on the established order and forbidden. Rather, the flourishing of these companies led to the growth of the cities.

## 4.2. Intern problems of the Empire

In the Siegburg and other German sources, there was contemporary talk of the “nourishment” to be protected. Werner Sombart (1896-1941)<sup>148</sup> later generalized this term as an interpretation scheme. “Nourishment” was about providing for all citizens as well as the regulatory idea of caring for all members of society. Unlike on the market, not everyone should earn as much as possible for themselves, but an economic situation should be

<sup>148</sup> Cf. the contributions in R. BRANDT/ TH. BUCHNER (ed.), *Nahrung, Markt oder Gemeinnutz. Werner Sombart und das vorindustrielle Handwerk*, Bielefeld 2004.

achieved that enabled everyone to make the necessary living. The “nourishment” was thus aimed at meeting the needs of all, so that public order was stabilized. This is consistent with the Church’s reflections on the determination of permissible profit.

The habilitation thesis of David von Mayenburg can also be interpreted in this light<sup>149</sup>. The conflict between the peasants and noblemen in the Peasants’ War of 1525 can also be understood from this perspective. Were the nobles allowed to demand any profit or did it have to be restricted in order to promote the common good? Was everyone allowed to claim what corresponded solely to their interests, or did an economic solution have to be found that offered an adequate solution for all parties in the sense of the established order? The peasants demanded that the nobles should not make maximum profit for themselves, but that they should pay attention in all questions to achieving an appropriate solution for the other side as well.

Where the old forces prevailed, including the guilds, the principle of nourishment was primarily to maintain the established order, but also to provide for all. Where this order was lacking, early capitalist developments could take place in small oases. The success of the Protestant Aachen cloth merchant Arnold Schmitz after his emigration from Aachen to the guild-free Monschau in the wake of the Aachen religious unrest in the 16<sup>th</sup> century is proof of this<sup>150</sup>. Success at the new location could only last as long as guild structures were not formed here again. Such guild-free cities therefore had to remain the exception.

But individual states were able to copy this policy. A territory as small as Neuwied, with its pronounced religious tolerance in the 18<sup>th</sup> century, was able to attract important craftsmen such as the family of the great carpenter Abraham Roentgen and thus create the structures of important factories<sup>151</sup>. But this model only worked as long as these innovative craftsmen were driven from their homeland, as the policy of tolerance remained a rare exception.

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<sup>149</sup> DAVID VON MAYENBURG, *Gemeiner Mann und gemeines Recht. Die Zwölf Artikel und das Recht des ländlichen Raums in der Zeit der Bauernkriege* (Studien zur Europäischen Rechtsgeschichte, 311), Frankfurt a. M. 2018.

<sup>150</sup> ERNST BARKHAUSEN, *Die Tuch-Industrie in Montjoie. Ihr Aufstieg und Fall*, Aachen 1925, 80ff.

<sup>151</sup> E.g. Wolfgang Thillmann/ Bernd Willscheid (Eds.), *Möbeldesign - Roentgen, Thonet und die Moderne*, Neuwied 2011; ROLAND SCHLÜTER, *Calvinismus am Mittelrhein. Reformierte Kirchenzucht in der Grafschaft Wied-Neuwied 1648 - 1806*, (Rechtsgeschichtliche Schriften, 26), Cologne/ Weimar/ Vienna 2010.

So it was often only a few measures that were decisive for economic success: The abolition of the special production of Knütgen in Siegburg, whereby one consciously renounced the profit, or the decision about religious tolerance and free profit in Neuwied. Precisely because there were often few actions that had a deviating effect, they depended on the political circumstances of their time and environment, whereby the question of religion was only one factor among many.

However, these decisions also reflect a general attitude towards profit. In the Rhineland, with its diverse and overlapping power claims of several, the preservation of the traditional order was obviously more important. In other regions with clearer power relations, on the other hand, it was easier to try out innovations. Economic progress, therefore, required a clear distribution of power.

### 4.3. The economic crisis of the 17<sup>th</sup> century

The civil and religious wars led to economic crises in many parts of Europe. Mediterranean trade almost came to a standstill, not least because no one could efficiently counter the pirates. The great southern economic powers lost their importance: Spain experienced several state bankruptcies because the import of gold and silver had corrupted the standards<sup>152</sup>. The growing complexity of the economy has not been adequately addressed. The northern Italian city states such as Genoa and Venice lived only on past grandeur. The increase of pirates in the Mediterranean made sailing and living on the coast almost too dangerous<sup>153</sup>. Eric Hobsbawm described this development in 1954 as the “crisis of the 17<sup>th</sup> century”<sup>154</sup>.

On the other hand, trade and the population of the cities along the Atlantic coast from La Rochelle to Denmark grew. The Levant trade was replaced by transatlantic trade, and from there by Baltic trade. It was an enormous structural change that favoured the northern states of Europe. The transport of precious metals and slaves was replaced by trade in agricultural

<sup>152</sup> GREENGRASS, *The Lost Paradise* (n.136), 577.

<sup>153</sup> GREENGRASS, *The Lost Paradise* (n.136), 556.

<sup>154</sup> ERIC J. HOBBSAWM, *The General Crisis of the European Economy in the 17<sup>th</sup> Century*, *Past & present* 5 (1954), 33–53; 6 (1954), 44–65. To some extent already SCHUMPETER, *Konjunkturzyklen I* (n.80), 260ff.

products such as tobacco, tea, coffee and cotton<sup>155</sup>. In this situation, this consolidated the states that traded.

This development has therefore been driven by a profound change in European trade. Again, it is only obvious at first glance to regard confessional facts as relevant here. By no means did the Protestant nations such as England and the General States have to profit particularly from this; rather the advantage for the old trading cities of Ghent and Antwerp would have been expected. The Protestant countries of the German coast, on the other hand, did not experience this special upswing. The Atlantic trade alone therefore did not automatically promote Protestant states. It is questionable whether we do not find in the different legal systems the reason why some states were able to exploit the new economic development of the Atlantic trade particularly well, i.e. to let the new engine of economic development take effect for them<sup>156</sup>.

#### 4.4. England and the Netherlands and the rejection of Canon law

There were hardly any major legal changes in Europe during this period. Despite or perhaps because of the rich discussions, all denominations recognized the need for modern forms of business, but saw a high need for control on the part of the secular authorities. This justified the necessity of the magistrates, whether they were the city council of Zurich, the officials of the Elector of Saxony or the representatives of the Spanish monarchy<sup>157</sup>.

Apart from England, Europe was dominated by the law of the *Ius Commune*, which in England also applied to admiralty and royal justice. In it the values of the church of the last 1000 years had inscribed themselves. However, this did not rule out infinite peculiarities of the *ius particulare in detail*, not least in trade-related areas of law. Economic open-mindedness alone was not decisive for the special success at this time. Of course, the General States and England were also experienced in trade, but so were all the other old trading cities of northern Europe. But the great upswing only affected a few regions that consciously, creatively and with a lot of risk took advantage of the opportunity of the moment.

<sup>155</sup> JAN DE VRIES, *The Economic Crisis of the Seventeenth Century* (n.138), 190.

<sup>156</sup> JAN DE VRIES, *The Economic Crisis of the Seventeenth Century* (n.138), 151-194.

<sup>157</sup> On the admissibility of the money loan and moderate interest rates see SCHMOECKEL, *Introduction: Johann Gerhard*, (n.117).

Prototypes of this were formed in England and the Netherlands primarily because of their new corporate forms such as the new colonial companies, the stock exchange, the new banks, insurance companies and, finally, stock corporations. The mass consumption of standardized products and the participation of a broad section of the population fuelled and facilitated this growth. The East Indian societies of England and the Netherlands brought enormous profits, which also benefited the middle classes. They facilitated the new market and ensured the success of both nations, while in France the beginning of a trading company brought the loss of the title of nobility. Of course, because of the dominant Protestantism, England and the Netherlands in particular attached importance to not being dependent on canonical law, but to offering independent solutions even where the medieval heritage was unmistakable.

#### 4.5. For clarification: The increasing role of the *iustitia commutativa*

There are few criteria by which one can clearly illustrate the different concepts of “nourishment” and profit optimization. Aristotle’s doctrine of justice helps here to keep an overview. In the *Nicomachian Ethics*<sup>158</sup>, Aristotle taught the differences of *distributive* justice (*iustitia distributiva*), at which something was assigned to everyone, as well as justice in voluntary exchange relations: ἐν τοῖς συναλλάγμασι διορθωτικόν/ εν τοῖς synallágmasi diorthōtikón/ in the exchange relations. The translation or interpretation of διορθωτικόν has always been controversial<sup>159</sup>. Thomas Aquinas saw it as transaction business. Thus the assumption of the category of *iustitia correctiva* or *commutativa* in the exchange relationships was consolidated, while the distributive justice was to apply only to general goods.

The reception by canon law was one-sided. Already Heinrich von Ghent (before 1240 -Tournai) was a very important theologian and philosopher. He looked only at the *iustitia commutativa* or *directiva* to<sup>160</sup> determine the relationship between the citizens. Like two judges, both parties should decide on the one price of the goods. Godefroid de Fontaines, on the other hand, wanted to define justice as a social process. What is generally ac-

<sup>158</sup> Book 5, 1130b, 30ff.

<sup>159</sup> Vgl. JEFFREY HAUSE, Aquinas on Aristotelian justice: defender, destroyer, subverter, or surveyor, in: T. HOFFMANN et al. (Eds.), *Aquinas and the Nicomachean Ethic*, Cambridge 2013, 146-164, 156f; STEFAN ARNOLD, *Vertrag und Verteilung*, (*Jus Privatum*, 182), Tübingen 2014, 32f. 41f.

<sup>160</sup> KAYE, *Economy and Nature in the Fourteenth Century* (n.22), 105.

cepted as a price is the fair price. The *aestimatio* by the company should therefore determine the price<sup>161</sup>. Also the business practiced by the general public should not be rejected for moral theological reasons, but should be recognized as legally effective. For the fair price it is sufficient that there are several buyers at the low price. The comparison between potential buyers adds or subtracts something from the starting price. For Molina, this *iustitia commutativa* concerned only the relationship between state and citizen<sup>162</sup>.

Melanchthon did not differ much when he referred in a few words to Aristotle's exchange relations. Although this was intended as a corrective to the omnipotence of the contracting parties, it was not in the sense of a firmly established fair price<sup>163</sup>. Rather, it was the will of the parties that determined the fair price, as in the case of Vitoria. In contrast to Vitoria, further barriers were removed. For Melanchthon the autonomy of the treaties was the means of fallen Adam, despite all his limitations, to shape his life in such a way that he could secure the necessities of life. Melanchthon was probably a little more modern in economic matters than Luther, but his conception did not yet include modern private autonomy and economic liberalism, although in the end he did not allow any more regulating forces here.

The big difference lies in the elimination of the limitation of profit. The "arithmetic method" for determining the fairness of exchange was corrected in Aristotle by the *iustitia distributiva* with its "geometric method", according to which every citizen should see what he could achieve for his polis. Similarly, canon law always contrasted the pursuit of profit with other equal motives. It was never only about the merchant, but always about the well-being of society. With Melanchthon, the only thing that matters is the balance between the parties; his successors still believe to this day that they can derive from the synallagma alone the principles that determine civil and commercial law. But the interests of the two parties do not necessarily – perhaps not even typically – coincide with the general interests: I can be happy to be able to buy myself beautiful living space; the price increase in it can lead to the fact that most can no longer afford it.

<sup>161</sup> KAYE, *Economy and Nature in the Fourteenth Century* (n.22), 111.

<sup>162</sup> ALEJANDRO A. CHAFUEN, *Faith and Liberty. The Economic Thought of the Late Scholastics*, (Studies in Ethics and Economics), Lanham et al. 2003, 102.

<sup>163</sup> SCHMOECKEL, *Melanchthons Konzept der Verträge* (n.24), 304-345.

The decoupling of the *aestimatio* for price determination from other targets can lead to hardships.

- Prisoners work cheaper, but even cheaper are slaves. These would then be the excesses which one accuses capitalism of<sup>164</sup>. This is illustrated not only by the transatlantic slave trade, but even more by the considerations on punitive labour and the use of criminals for the hardest use in construction and mining<sup>165</sup>.

Commodity futures seem possible, one seems to be alone on the consensus of the parties. So they were already justified by Peter Olivi. For Senator Buddenbrock, however, this type of business still appeared not only dangerous, but also usurious, inasmuch as he saw it as an unlawful exploitation of the farmer's situation<sup>166</sup>.

Karl Polanyi pointed economic history to the great break with economic liberalism, which was postponed by the states and their mercantilism after the Reformation<sup>167</sup>. In fact, one sees considerations to this effect much earlier, at least with Petrus Joannis Olivi in theory and – to use a legal-historical example – the rise of the Snewlin family in Freiburg i.B.<sup>168</sup>.

The far-reaching economic changes in the 16<sup>th</sup> and 17<sup>th</sup> centuries thus exploited only some territories, while others – often because of internal weaknesses – insisted more on the existence of order. Denominational, legal and economic motives overlapped, but sometimes also allied themselves in camps of tradition and progress. Ultimately, it turns out that the legal etc. Changes could only become effective if the company was willing to do so.

The acceptance of progress by the free market and the profitability of profitable investments was not yet clear at that time. The question is whether the ratings today are so different. However absurd the example of Siegburg may seem at first glance, anyone who wants to defend the existing social and economic structures against the market will hardly behave differently.

<sup>164</sup> JÜRGEN KOCKA, *Geschichte des Kapitalismus* (n.18), 99.

<sup>165</sup> Cf. MATTHIAS MAETSCHKE, *Verdammung der Missethäter zur Bergarbeit: das Scheitern der Bergwerksstrafe im frühneuzeitlichen Europa*, (*Rechtsordnung und Wirtschaftsgeschichte*, 16), Tübingen 2016.

<sup>166</sup> Already pointed out by LAWREN ARMSTRONG, *The Idea of a Moral Economy. Gerard of Siena on Usury, Restitution, and Prescription*, Toronto/ Buffalo/ London 2016, 27f.

<sup>167</sup> KARL POLANYI, *The Great Transformation* [1944], Frankfurt a.M. 1999, 187.

<sup>168</sup> HERMANN NEHLSSEN, *Die Freiburger Familie Snewlin. Rechts- und sozialgeschichtliche Studien zur Entwicklung des mittelalterlichen Bürgertums*, Freiburg i.B. 1967.

## 5. Resume

The results are to be recorded here in a few general theses:

- 1<sup>st</sup> thesis: The European economic upswing of the 12<sup>th</sup>/13<sup>th</sup> century was dependent on a stable framework for society as a whole, for which the law can be helpful. The upswing from the 12<sup>th</sup> century onwards was not a phenomenon against which the church opposed itself. On the contrary, one can regard the moral theological guidelines on the one hand as a basis which mediated both a certain general security and a social acceptance. The theory explained and appeased, while in reality the Church was always flexible to the needs of trade. The business of circumventing usury shows how much the clergy were willing to adapt to the demands of the business world.

As much as this legal order followed economic developments, it helped to build social consensus and overview as trade developed and complexity increased. The legal system thus helped trade and legitimized it. The economy even benefited from the legal system:

- (a) The law created new rules that explained in a generally understandable way what was permitted and prohibited. Such new law provided for transparency and predictability, ultimately even a certain legal and planning certainty, on the basis of which trade could develop.
- (b) Ethics also provided a balance in society. It was not the winner who was unilaterally promoted, but rather forced to give something to society. Unethicality in its various forms and the fear of too great an economic power (monopolies) led early on to a critical reflection of society, which rebelled against excesses and imbalances.
- (c) Flexibility combined with principle consistency allowed companies to seek appropriate circumvention strategies. The *utilitas* argument generally weighed heavily, not least in trade<sup>169</sup>. The benefits and drawbacks of profit and the effects on the various strata of soci-

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<sup>169</sup> Vgl. MURRAY ROTHBARD, *Economic Thought before Adam Smith. An Austrian Perspective on the History of economic Thought*, Vol.1, Cheltenham UK/ Northampton Mass. 1995, 59ff esp. on Petrus Joannes Olivi OFM.

ety were repeatedly weighed against each other by the clergy<sup>170</sup>. Although some bans were rigid, they did not exclude innovations and developments in the circumvention strategy. This ensured that the economy searched for new forms and means and that innovation could pay off. Certainly, the possibility of adapting the economic order to the social order also offered opportunities for abuse. However, the great forces alongside the economy repeatedly led to corrections in dysfunctional developments. More and more people learned to use the possibilities of the economic order and to find their economic advantage in it. The increasing education with constant security of the legal interests led to the development of the market, as Karl Polanyi described it.

- (d) Economically, one could assume that low taxes and few formalities by the church kept transaction costs low. The secular authorities only had to ensure that the traders were protected from criminal acts.
- 2<sup>nd</sup> thesis: The new economic legal order did not come into being suddenly, but developed over centuries. In Peter Olivi, therefore, one finds clear precursors even in the theological and canonical tradition of the High Medieval Church. Until the 20<sup>th</sup> century, however, conservative views held the view that the new forms of the economy and their clear profit orientation were morally reprehensible.
  - 3<sup>rd</sup> thesis: Even a clever reinterpretation of canon law, as Martín de Azpilcueta already did, would have been able to support the modern economy. The general approval of profit also in Catholic regions and the associated respect for trade and business enterprises shows that everything was done that was regarded as a necessary compromise.
  - 4<sup>th</sup> thesis: With the 16<sup>th</sup> century and the Reformation, the economic flourishing of the Protestant states did not begin immediately, but rather Portugal, Spain and France initially profited from the Atlantic trade. From the 17<sup>th</sup> century onwards, it was not the lack of a suitable law or religion, but the profound changes in economic flows that led to the disadvantage of the southern European territories, most of which were Catholic.

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<sup>170</sup> For Innocent IV and Antoninus of Florenz cf. AMILETO SPICCIANI, *Capital and interest between trade and poverty in the theologians and canonists of the XIII-XV centuries*, Rome 1990, 49ff, 143ff.

- 5<sup>th</sup> Thesis: The development of the modern economy in the Netherlands and Great Britain owes itself neither to the absence of canon law nor directly to the denomination of these states. The primary reason for this is the enormous increase in North American trade, which was expected to reshape Europe. Due to the legal-historical tradition, however, both countries consciously did not make use of the canonical tradition even where this would have been possible, but emphasized the task of a reorganization of the legal order.
- 6<sup>th</sup> thesis: Especially the Calvinist denomination, especially in the version of the 17th century, which emphasized the importance of the individual, facilitated the development of giving the market more freedom. The individuals should and wanted to prove themselves in the economy, they should find the right way without guidance from the strength of their conscience and faith. The freedom of the markets and ensuring the security of individual goods became the conditions of the new economy. In addition, there was greater freedom in the structuring of transactions and the determination of profits. Concerns about the public interest hardly played a role in determining the inadmissibility of a transaction or price.
- 7<sup>th</sup> thesis: European economic history can no longer be described as a change from the anti-business era dominated by the Church to economic liberalism and its successes. This black-and-white painting of intentions and successes does not describe the history of Europe.

But not Calvinism itself, but rather much earlier and more fundamental beliefs and tendencies of Christianity shaped the European economic order and formed the basis for its long-term success. This is all the more true if we regard not only the one-sided optimization of profits, but also the criticism of it in favour of a solution that satisfies society as a whole, as a common European tradition. This is especially true when we consider not only the profit but also the criticism of the economic order to be legitimate. The pursuit of profit is then individual right and duty as well as the realization of solidarity and mercy. The advantage of the multiple search for possibilities of innovation is not only the goal of profit, but also the goal of a humane order for all. In the continuation of a liberal tradition, it then takes “our eyes, our hands and our voice” to achieve the broader goal, strengthened in this way.



# Laudatio W. Oosterlinck

**E. Van Laecke**

It is an incredible honour and pleasure for me to write this laudation.

I doubt if anyone in the world of urology doesn't know the figure of Wim Oosterlinck. But maybe they don't know all the professional and human aspects of this man. I will therefore try, in my short text to give a sketch of the incredible impression this unique man has made on me, and certainly on many of my colleagues.

He remained unique, because when I asked him for his CV in the preparation of this laudation, he replied to me: "I have deleted everything, never thought that this would interest anyone else".

Willem Oosterlinck was born on 10.09.1944

In 1968 he graduated as a physician at the University of Ghent.

In 1973 he was recognized as a urologist, after which he developed a long career in the department of urology of the University Hospital of Ghent from resident to professor

In May 1992 he obtained his PhD thesis with a research on the chemolysis of urolithiasis

In 1993 he became head of urology at the University Hospital Ghent and remained so until 2008.

During this period he built a department with international renown. His absolute strength was the fact that he always thought in function of the department. He was the man who introduced the subspecialties in this service. Within each subspecialty, he gave his coworkers the freedom and support to develop a strong entity on their own. At that moment, he was far

ahead of his time. This strategy was very successful, not only for himself but especially for the whole department of urology. All of these sub-specialties have succeeded in developing into nationally and internationally recognized sub-units with an excellent reputation.

The success was strongly influenced by his extreme enthusiasm and his strong drive. He could be tough, but was mainly characterized by honesty and sincerity. You could always count on him, not only for professional matters but certainly also on a deep human level.

At the end of 2009 he became an emeritus professor, but Wim would not be Wim if he had stopped urology at that time. Until 2015 he continued to work at our department, mainly in helping the young residents. Coaching, training, helping with studies and publications, in short a real mentor with the enthusiasm of a young foal. You saw how he enjoyed this period when he could do those things in which he is so good, but without the stress and pressure that you are subjected to as head of service.

When you see Wim, the enthusiasm comes to you. Mentally and physically, he is characterized by a touch of eternal youthfulness.

Together with Griet Mortier, he married in 1969, he has three sons and is the proud grandfather of 8 grandchildren. I don't know many people for whom family is so important. I myself had the pleasure of experiencing Wim and Griet with their impressive group of children and grandchildren during an evening on a skiing holiday in Austria. Well, I can assure you, as a grandchild you can't wish for a better pair of grandparents, and as an outsider you hope to be such a great grandfather later on.

Let's be clear, though it may sound cliché, Griet is indeed the strong woman behind the man.

Also physically Wim is still top. Cycling, hiking and especially gymnastics keep him in top condition. As far as cycling is concerned, there is a small comment. Ever so often Wim would meet the soil, when e once again, with his characteristic schwung he misses a turn. At his retirement celebration, we gave him a bicycle helmet, partly for our own sake as we wanted to be assured of his intellectual abilities for a few more years.

Gymnastics has always been a special hobby for Wim. Since 40 years he is together with Griet member of the gymnastics club Olympia Merelbeke. Years ago, even before there was any organized team building, we organ-

ized a sports evening in the department. Wim wanted to introduce us to his passion, the fitness gymnastics. He had asked his gymnastics teacher to give a training session to the co-workers of the service. I suspect he wanted to teach most of us a lesson. After an hour of gymnastics, there were still a few fervent athletes who could still go along with the still fresh-looking Professor Oosterlinck, while the vast majority were panting, puffing and moaning to the finish line. Mission accomplished, Wim.

Besides being an excellent clinician, one of whom you think at first as a young resident, how does that person know all this, and after which you soon realize, listen carefully to what he says and watch what he does and remember as much as possible of that, Prof Oosterlinck was also an excellent scientist.

He has published 171 papers and is an internationally acclaimed expert. His spearheads were urethra surgery and treatment of bladder tumors. He was a member of the European Association of Urology's Uro-oncology guidelines group from 1998 to 2011

Above all, don't think that these intellectual activities have stopped after retirement. From 2017 until today Prof Oosterlinck contributed to 6 papers. How lucky we were to give him that helmet.

Besides seriousness and wisdom, humor characterizes this man. Professor Oosterlinck was known and notorious for his April 1 jokes.

I hope it is clear to all of you what an inspiring figure in urology Professor Oosterlinck has been and still is. I think it is right to say that everyone he has trained, everyone who has been allowed to work with him, has the deepest respect for this unique person.



# The big jump forward in the surgical treatment of renal stones around 1980.

**Willem Oosterlinck**

Until 1980 most renal stones were removed through a wide incision in the flank at the level of the lowest rib, the so called lumbotomy. The incision went through all the abdominal muscles and was as such very destructive and often painful during a long period. By the incision, not the kidney itself, but the renal pyelum was incised to grasp the stones. Indeed a kidney receives about 1/10<sup>th</sup> of the heart debit and an incision in it can be very bloody and was therefore avoided. About 4800 such operations were performed per year in Belgium the number remaining constant over the years. For ureteral stones the incision in the abdomen often could be kept smaller but nevertheless it remained an aggressive approach to remove a stone, mostly not larger than one cm.

A difficult problem were the large staghorn stones, filling the whole pyelum and renal calices (fig.1)



**Figure 1: A staghorn stone.**

Removal through an incision of the pyelum alone ended mostly in incomplete removal and rapid regrowth of the stones. There was a strong need for improvement in this field.

Around 1980 a revolution took place in this treatment and, as a young urologist, I was standing in the front row to observe and collaborate with the revolution. That being the reason I choose this period for my Sarton lecture.

## **The Intra Renal Surgery club (IRSC)**

At the end of the seventies a group of West-European urologists with special interest in improving renal surgery decided to exchange ideas and experiences yearly. It was not a structured organisation with rules and statutes, but rather a group of friends. One of us organised the yearly meeting on a voluntary basis. In 1984 the meeting occurred in Ghent, with Walter De Sy as president. Along urologists several radiologists were involved as they were the first to puncture the kidney and to place catheters in it. The use of ultrasonography was in their hands at that time. Improving the pre- and peroperative imaging also was an item of importance (1, 2).

Research was directed principally to the improvement of staghorn stone surgery. A first method to avoid bleeding at incision of the renal parenchyma was clamping of the renal artery(3). However it only can be done during a maximum of 20 minutes. A Longer ischemia period provokes irreversible renal damage. To solve the problem research was directed to prolong the period.

Several medications were identified with that purpose: intravenous mannitol shortly before clamping the renal artery, inosine(4), captopril(5) and allopurinol. A second method to obtain a long period of ischaemia without damage was cooling the kidney. It was simply done by applying a frozen physiologic solution or by coils with cooling fluid around the kidney. John Wickham developed a machine therefore(6). Others punctured the renal artery with a strongly curved needle and perfused the kidney with cooled solution. Preoperative catheterisation of the renal artery through the groin was another option to perform the cooling. Anyhow cooling took a considerable time and often it was difficult to foresee the time needed to remove all stone fragments, sometimes achieved within the 20min limit

but it could take also more than an hour. Peroperative radioscapy and –graphy(7), and later ultrasonography, were developed to improve the stone localisation(8, 9).

Although clamping of the renal pedicle provided a bloodless incision of the renal parenchyma and good visibility in the operating field, bleeding started immediately at the removal of the pedicle clamp. The venous bleeding is of low pressure and stops with slight pressure on the renal parenchyma by large mattress stiches. But arterial bleeding was much more difficult to stop. Therefore methods were developed to make renal incisions at the places where no arteries would be incised. It being possible as the kidney has a terminal type of arterial vascularisation, just like the branches of a tree. Between the these branches there is no connection and so it is possible to make incisions without traumatizing any important branch of the renal artery(10, 11). Dissection at the renal pedicle of branches of the artery allowed partial clamping of the renal artery and defining avascular planes between the areas of the different branches of the renal artery(12). Slight differences in temperature at the surface of the kidney between clamped areas and still vascularised kidney could be detected by liquid cholesterol thermometer(13, 14). Techniques to avoid vascular damage after ischaemia were developed(7, 15).

At the demand of J.Wickham the endoscope industry developed a special 90° angled endoscope, called nephroscope, to allow peroperative endoscopic exploration of the renal calices (Fig2). The “waterpick”, an instrument made for cleaning his tooth at home, was used also to provoke pulsed rinsing into the renal cavities. Another way to remove small stone fragments was “coagulum extraction”. Hereby the renal cavities were filled with a fibrin cloth in which small stone fragments got stickled and removed when the coagulum was removed (16).

All these techniques improved the staghorn calculous surgery considerably. But this type of surgery became obsolete in less than 10 years later for 2 reasons. The first one was the progressive diminishing of staghorn stones by a better control of pyelonephritis and earlier detection of stones. The second one was the development of endoscopic removal of stones and the extracorporeal shockwave destruction of stones.

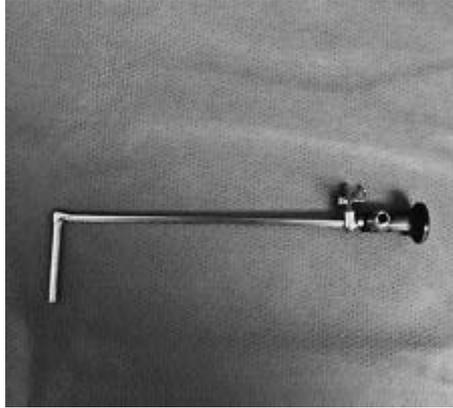


Figure 2: the nephroscope

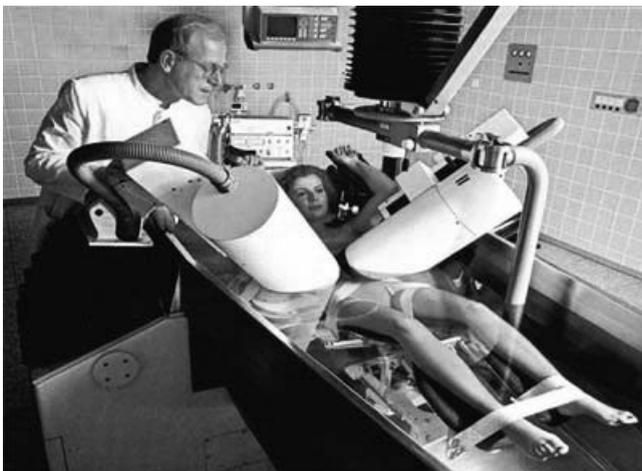
## The extracorporeal shockwave lithotripters (ESWL)

ESWL was announced in a very unconventional way at a session on renal stone surgery at the European congress of Urology in Athens in 1979. The session was presided by Walter De Sy. At the end of the session an older colleague came forward and asked to make a very important presentation on something that will make everything that had been presented that morning completely useless. Who are you? Asked De Sy. He answered Prof. Schmiedt from Munchen. De Sy hesitated to allow the talk but of course everybody was curious to hear the message being presented in such a provocative way. Schmiedt showed the in vitro and animal experiences with the lithotripter made by Dornier. Five years later the machine became commercially available and revolutionised the stone treatment. Christian Chaussy and Ferdinand Eisenberger, the young urologists who were involved in the development of the extracorporeal lithotripter(17), became members of the IRSC.

Dornier is German enterprise which made weapons for the German during world war II. Among other things they developed the first antitank weapon. As such their engineers were familiar with shock waves and how to focus them. In the lithotripter the shockwave was provoked by an electric spark and focused by a metallic parabolic mirror. The shockwaves are well guided in water and gel, not in air. They escape from the parabola in the form of a cone. At the level the skin of the patient the impact surface is rather large but it is small at the level of the stone. The patient feels the

beats of shockwaves in his back and therefore anaesthesia was used in the beginning of its use. Making the the cone of shockwaves larger at its base improved tolerability to the beats and ESWL.

In figure 3 the prototype machine is illustrated. The patient is brought with a lift in a water bath with the parabola below its back. Two X-ray tubes in  $90^\circ$  position localize the stone. It was clear from the beginning that this machine was much to complicated and simplifications were obvious from the beginning. One X-ray tube which could switch over  $90^\circ$  could localise the stone as well. Instead of a large waterbath the shockwave generator could be applied to the back of the patient with a closed parabola and gel contact. Patient could be positioned on a movable table with a saving for application of the shockwave generator.



**Figure 3: The Dornier prototype of the extracorporeal lithotripter.**

Dornier rapidly changed the concept of their machine in this sense resulting in the current appearance of these machines (fig 4) They were strongly incited by competitive industry which made other types of shockwave generators. The Wolf company developed a shockwave generator based on piezo-electric pulses( fig 5)(18). The piezo crystals were ranged on the inner surface of part of a sphere, resulting is a smaller focus of the beats on the stone and a larger surface at back of the patient. The procedure of ESWL could therefore be performed without need for analgesia. The Siemens company developed an electromagnetic shockwave generator, focussing the waves with a lens. All these new developments occurred in the eighties of the twentieth century. Localisation of the stone with ultrasonography

was applied diminishing the X-ray load to patients. The current available machines only facilitate its use but apply the original principles.



Figure 4

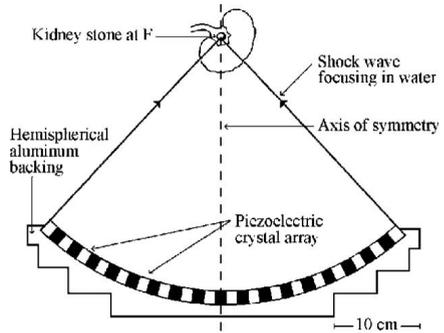


Figure 5

It is important to state that about 30% of the stones are not sufficiently destroyed by ESWL or are no indication for the technique. Therefore other techniques remained necessary. These techniques were developed nearly simultaneously with ESWL and are described below.

## Percutaneous litholapaxy (PNL)

Simultaneously with the ESWL PNL developed. The pioneers all were member of IRSC: John Wickham from London (19, 20), Peter Alken from Homburg- Saar(21) and Michael Marberger from Mainz(22). The idea it being feasible to puncture the kidney from the back of the patient, dilate the puncture track positioning a tube in the kidney was new at that moment. In the beginning radiologists, helped by the developments ultrasonography and X-ray equipment, who performed the earliest kidney punctures. The idea one could position not only a tube but also an adapted endoscope in the kidney came of course from urologist. When you are in kidney why not do something in it? PNL was born.

M.Kellett en R.Miller(London) associated with J.Wickham punctured the kidney. In Mainz it was radiologist R.Gunther(23) who performed the kidney punctures first. The tract was dilatated and a tube of the size of an endoscope was positioned. The PNL itself was done the next day. Very rapidly it evaluated to a one stage procedure done by the urologist.

The endoscope makers followed rapidly and made the instrument needed by the urologists. Besides the necessary endoscopes they made instruments able to break the stones to pieces. It was achieved by ultrason, jack hammer on compressed air, electric sprays at the end of a catheter and later by laser(24).

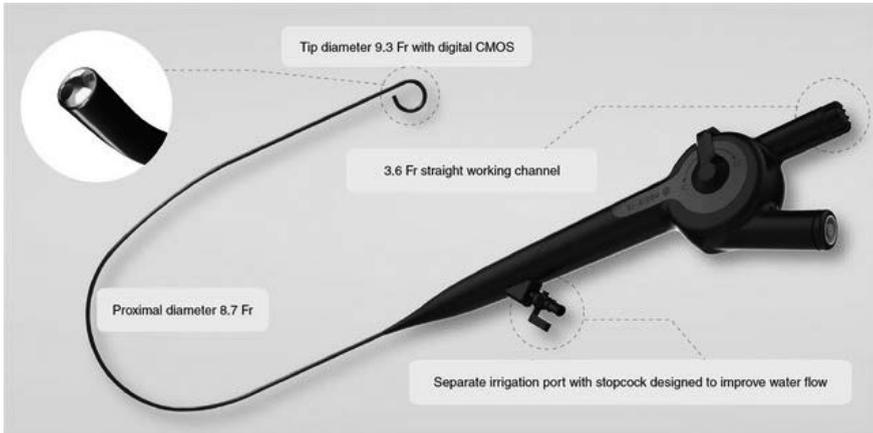
The preliminary results were presented on congresses since 1982. I still remember the way Peter Alken, German who fluently spoke French, was attacked at the French congress in Paris in 1982. Some big bosses of French urology declared him a liar: “Ce que vous venez de raconter est impossible...”. Alken answered that PNL would become standard procedure within a few years in all good urologic practices. This was indeed the case. Open surgery belonged rapidly to the history of urology.

In Belgium Geert Tailly in Louvain and I in Ghent(25) were pioneers of the PNL technique. I even made a special nephrostomy set to perform puncture, dilatation and tubing in one movement(26). Later the Cook company took over the idea and commercialised a similar set.

## **The ureteroscope**

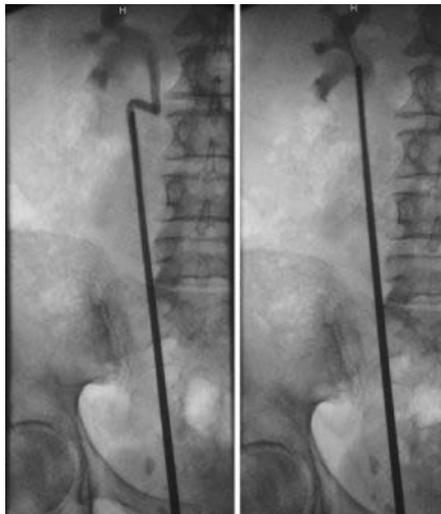
In 1973 the optical fibre technique was sufficiently advanced to make a flexible instrument to look in the ureter through the way of urethra-bladder. A Japanese demonstration turns into a terrible fiasco: in none of the 3 patients prepared for a life demonstration the ureter could be visualised!

The flexible ureteroscope disappeared for 20 years from the stage. The Olympus company was at that time the number one in flexible endoscopes and made the first flexible ureteroscope. It was introduced to the European urological community at the congress of the Société Internationale d’Urologie in Amsterdam. About 30 of the most important heads of departments of urology in Europe were lodged in the five star Japanese hotel Okura in Amsterdam. Two Japanese urologist were flying in make the demonstration.



**Figure 6**

An urologist from Madrid (27) came up with the idea of a semi rigid ureteroscope (Fig. 6) He expected to be able to explore the lower part of the ureter and to remove or destruct stones in that part of the ureter. Obviously the ureter is sufficiently flexible to move up this scope even until the kidney in a considerable number of patients(fig. 7). The technique is easy to learn for those familiar with endoscopy and therefore this instrument became rapidly and widely used. It became the standard instrument for stone destruction and removal in the ureter. The industry made a wide range of adapted instruments for this scope.



**Figure 7**

## End remarks

It is amazing that all innovations in this medical domain came from Western Europe. The US followed much later. One can say that the cradle of urology is, or at least was, Europe.

Innovations in the second half of the twentieth century are no longer the work of a single human but are the result of teamwork in which engineers of the industry play an anonymous role. Advances in stone treatment were the consequence of advances in technique used by the physician, seeing the opportunities.

The true revolution on stone treatment occurred in less than 10 years! After that period the instruments became more sophisticated. For example with the use of camera on the tip instead of glass fibre transmission, the main principles however are still the same.

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# Laudatio A. Ervynck

**P. Corneillie**

It is always tricky to nominate an archaeologist as laureate for the Sarton medal. After all, is the Sarton legacy not all about honouring meritorious investigators who contributed markedly in the unravelling of the history of a specific scientific domain, rather than promoting the study of history an sich?

Do not understand me wrong, the Faculty of Veterinary Medicine stands firmly behind its recommendation of dr. Anton Ervynck as its medallist, and it is both my professional and personal honour to act here today as proximus. However, Anton seems to have the odds against him. The fact that he graduated as a biologist from this university with the greatest distinction in 1983 does not exonerate him from the doubts casted. In fact, already during his PhD-studies, he turned his attention to archaeology, but without turning his back to biology, as he firmly upheld the interdisciplinary approach of his investigations, which resulted in the successful defence of his PhD-thesis on the archaeozoological research on the black and brown rat, at the University of Amsterdam in 1989. As archaeozoologist, ever since, he remained affiliated to different governmental scientific agencies, first to the National Service for Excavations, and later, as a result of federalisation of the institutions, to the Flanders Heritage Agency (the current Agentschap Onroerend Erfgoed), and is responsible for the study of animal remains and traces from archaeological excavations.

But before you make your judgement, let me share a personal story with you. It starts with a little sentence put on display in one of the “Veterinary History” museum cabinets next to our clinical lecture halls, meticulously curated by Luc Devriese, former Sarton medallist and – as I may say so – spiritual companion of Anton Ervynck. The sentence reads: “Over the

entire Great War, 484.000 horses were lost in the battlefields, one horse for every two men...”

I always wonder how many of our students, rushing past these cabinets in their sometimes futile attempt to timely arrive at their morning classes, do take some time to appreciate the content, let alone to have those casualty numbers sink in, and realize the huge impact these and other animals had on warfare, now more than a century ago.

Well, at least I did, but for those who know me, that may not come as a surprise. In fact, I grew up in Ypres, born from a family firmly entangled with the history of the city. It was my great-grandfather, head of a family of 10, who was finishing the preparations of his study on the history of the city when our hometown became the epicentre of warfare. My grandfather was then only a young teenager, but the struggle of his father, who had constantly to figure out how to safeguard not only his family, but also his magnum opus, and the ordeals of the city being bombed into obliteration, left a big impression. He wrote his experiences and memories down in different published works, and I still had the fortune to listen to his stories – narrated from first-hand account. Also my great-grandfather’s notes miraculously survived the war, unlike the city archives which had served as primary source, and became after publication one of the few key sources on the city’s past.

So, spoon-fed with this particular aspect of history, and now as veterinarian, I’m almost morally obliged to do my fare share and dig a little deeper into the role and fate of animals during the war.

When researching this specific topic, it’s not that difficult to retrieve tons of information: animal casualty numbers that surpass the figures mentioned by Luc (as he only accounted for the losses of the British Imperial Forces), endless lists of specific wartime uses of all kind of species, the heroic stories of legendary animals saving entire units from a certain death, the central role of the army veterinary corps who unprecedentedly managed to return 80% of the treated animals back to service,...

But none of these sources depict the animals the way my grandfather described them; how people looked at them and interacted with them, and what they meant to each other.

Until I stumbled on the work of Anton Eryvynck...

However, let me rectify this immediately for you: one doesn't just stumble on the work of Anton. Frankly said, it is harder avoiding his work rather than to be confronted with it... If one would change the famous Flemish expression "Wherever one goes along Flanders' roads..." into "wherever one digs along Flanders' roads...", Anton Eryvynck would definitely feature in the second part of the sentence. And his omnipresence is not just confined to the excavation sites. The last time I counted, and that is already a while ago, Anton was author or co-author of no less than 497 scientific papers or book chapters. And with the apparent same ease he is writing his next high impact scientific paper, he also finds the time to answer the umpteenth online question of a ten-year-old who is wondering what kind of animal bone he found in the garden...

So evidently, I'm not referring to my first encounter with the work of Anton, but only to a piece of work I was most charmed with: a chapter on horses and mules at the battlefield, written together with his wife An Lentacker, republished in the book by Birger Stichelbaut on the Traces of War: Archaeology of the first World War. They describe herein different animal burial sites and the information they disclose, for instance horses that were humanely put down and buried with honour behind the lines, as witnessed by my grandfather, who could link this act with a preventive measure against the spread of some sort of infectious disease. What my grandfather saw with his own eyes, Anton reads it from the skeletal remains he recovers. But he does much more than this with it, and that's the charming part: Anton always digs further – figuratively speaking – and uses all efforts to reconstruct the social interaction of man and animal, not only for the situation that lead to the death and burial of the animal, but also towards the broader context of society, animal husbandry and civilization of that time. And that's the hallmark of his archaeozoological work; from Mesolithic traces over the Roman empire and medieval towns to the more recent battlefield archaeology, from oysters and fish over rats, pigs and sheep to mules and horses, from far away to closer to home in his beloved Ghent,... all in an interdisciplinary setting and founded on sound scientific methodologies. Anton makes the animals narrate their history and their ever-evolving relationship and interaction with humankind. As such, he is also holding a mirror up to ourselves and from these historical data, he broadens our view and confronts us with our effects on ecosystems and the environment.

But what about the study of the history of archaeozoology and the interdisciplinary investigations on human-animal interaction? Well, with a very sobering remark in the aforementioned work, Anton provides us the answer: The study of animal remains has never really been a priority for a very long time...

However, repeating this statement today would be a true act of disregard towards the work and efforts of Anton Ervynck. The interest for and research into this history has always occupied Anton. And whilst never the essence of his work, he always strives to include adequate reference to the history of his science, to provide his readers a correct and richer context, and to allow them better understand and appreciate the science of zooarchaeology today. Recognizing that ideas of today not necessarily match up with the interpretations of tomorrow, let alone that these still relate to the facts of yesterday, Anton closely keeps track of the developments of his own scientific branch and the ones related to it, sometimes, if he has to, by going against the tide for not getting stuck in the present.

History is written by the victors, Winston Churchill once said. The story of the losers or the victims is seldomly recounted authentically; in fact, neither are. How biased must the historical accounts on human interaction with the environment including animals not be, as they are only written by ourselves...??? For Anton, animal remains do not lie, they do not conceal nor embellish the truth as they tell us a story no one was intended to tell. By illuminating the role of the voices animals, through their remains, cast in the historical debate, he tirelessly continues to underline the essence of zooarchaeology in the multiperspectivistic approach.

Therefore, Anton is not only studying history in all its aspects, as a pioneer and great advocate of this integrative and interdisciplinary zooarchaeology, he is also making history, or at least contributing to it, as he has been an inspiration to a lot of people joining him in this field of science. With his endless efforts towards a better understanding of the human-animal relationship throughout history, Anton is certainly a most worthy Sarton medallist for the Faculty of Veterinary Medicine.

# The study of archaeological animal remains: origins, specialisation and integration

Anton Ervynck

## 1. Introduction

One can only fully admire the immense work done by Georges Sarton (1884-1956), compiling his *Introduction to the History of Science*<sup>1</sup> in days before internet and the worldwide web, when one attempts to describe, aided by all sorts of modern communication, the history of the development of only a single scientific discipline, even that one is familiar with. This insight came about while writing a short introduction into the history of the analysis of archaeological animal remains, and its conceptual evolution through time. Good introductions to this theme have been published in literature<sup>2</sup> but their scope varies and they are inevitably influenced by the geographic origin of the authors, their scientific background, the *Zeitgeist* in which they were writing and their personal opinions or beliefs. Moreover, each overview seems to present a near impossible task, because of the enormous diversity of studies undertaken, a characteristic of the field (see further). Incompleteness and a slight bias are thus inevitable. This humble contribution will not differ in that respect.

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<sup>1</sup> Reprinted as: Sarton 1975, originally published in 1927, 1931 and 1947-1948.

<sup>2</sup> E.g., Reitz & Wing 1999; Albarella 2017; Gifford-Gonzalez 2018.

## 2. The history of a science

Although human fascination for the remains of animals from the past can be traced back to antiquity<sup>3</sup>, the science of palaeontology took off as a structured discipline at the beginning of the 19th century, with the work of Georges Cuvier (1769-1832)<sup>4</sup>. At first, the study objects were mainly fossilised remains from extinct species, originally belonging to geological strata and excavated from them, or exposed by natural erosive processes. Additionally, animal bones were found in caves and at least part of them also belonged to extinct species. As a milestone in the early study of this group of finds, Johann Christian Rosenmüller (1771-1820) introduced the species name *Ursus spelaeus* for the extinct cave bear<sup>5</sup>. Most importantly, at the same time, awareness grew that the human-made artefacts found in cave sites had an association with the bones of the now extinct animals, and that the cave deposits could thus be considered to be part of the realm of archaeology (see further)<sup>6</sup>.

During the 19th century, scientists also gradually started to study animal remains from sites with a clear archaeological nature, located outside caves and often of younger date than the cave deposits. The initial research questions were still clearly palaeontological and aimed, e.g., to reveal how prehistoric animals differed from recent ones (sometimes involving the definition of new, ancestral species). One of the pioneers of this approach was Ludwig Rüttimeyer (1825-1895) (fig. 1) who in 1861 published a study on the mammal remains derived from the excavations of the Neolithic lakeside dwellings in Switzerland<sup>7</sup>. Other examples of his work are *Lebende und fossile Schweine* (1857), *Beiträge zur Kenntniss der fossilen Pferde* (1863 and 1878), *Die Rinder der Tertiärepoche* (1878) and *Beiträge zur Naturgeschichte der Hirschfamilie* (1882)<sup>8</sup>. During the same period, Johannes Japetus Steenstrup (1813-1897) studied the animal remains from Danish Mesolithic shell middens, the so-called *køkkenmøddinger*<sup>9</sup>.

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<sup>3</sup> Mayor 2001.

<sup>4</sup> Cuvier 1812; Faria 2013.

<sup>5</sup> Rosenmüller 1794; Rosendahl *et al.* 2005.

<sup>6</sup> Frere 1800, as an early example, cited by Davis 1987.

<sup>7</sup> Rüttimeyer 1861.

<sup>8</sup> [https://de.wikipedia.org/wiki/Ludwig\\_R%C3%BCttimeyer](https://de.wikipedia.org/wiki/Ludwig_R%C3%BCttimeyer)

<sup>9</sup> Steenstrup 1870.



**Figure 1: Karl Ludwig Rütimeyer (1825-1895), founding father of the analysis of archaeological animal remains (Wikimedia Commons).**

After the pioneering work in the 19th century, the study of archaeological animal remains was taken up in more and more countries, initiatives that no longer necessarily developed from the field of palaeontology. In the Netherlands, Albert Egges van Giffen (1884-1973) studied zoology, and biology in general, at the University of Groningen and in 1913 finished a PhD thesis on the animal remains from the *terpen* (artificial dwelling mounds) from the northern part of the country<sup>10</sup>. In Germany, in the period following the second world war, zoological research gave rise to the foundation of institutes, linked with museums, universities or archaeological institutions, in which archaeological animal remains were studied<sup>11</sup>. Remarkably, a number of leading scholars had a training in veterinary medicine, showing the input from another scientific field next to biology and palaeontology<sup>12</sup>. This was most explicit at the *Ludwig-Maximilians-Universität München*, where the study of excavated animal remains started within the *Tiermedizinische Fakultät*<sup>13</sup>. From the beginning, much attention was paid to the study of what was called ‘palaeo-anatomy’, producing essential guidelines for the identification of animal remains<sup>14</sup>. At the same time, the background in veterinary medicine explained the focus on pathological phenomena observed on the archaeological specimens studied<sup>15</sup>. Soon, the German institutes manifested themselves by publishing voluminous studies of large bone assemblages from their country<sup>16</sup>.

<sup>10</sup> van Giffen 1913; Waterbolk 1973; Bierma 1973.

<sup>11</sup> See Becker & Benecke 2001 for an overview.

<sup>12</sup> See again Becker & Benecke 2001.

<sup>13</sup> Boessneck 1964.

<sup>14</sup> Starting with Boessneck *et al.* 1964.

<sup>15</sup> Boessneck & Meyer-Lempennau 1966.

<sup>16</sup> E.g., Boessneck *et al.* 1971, and the work at Haithabu / Hedeby (review by Schmölcke & Heinrich 2006).

In the period after the second world war, the analysis of archaeological animal remains also took off in many other countries, including France<sup>17</sup> and the United Kingdom<sup>18</sup> (often following sporadic, much older pioneering work). In more southern areas (Spain, Greece, Turkey), research was initially stimulated by excavations run by scholars from the north, eventually leading to the establishment of foreign archaeological institutes in those parts of the world<sup>19</sup>. Gradually, the exploration of archaeological collections of animal remains then developed locally, attracting students from the country itself.

In Russia, the development of the study of archaeological animal remains followed a similar pathway as in Western Europe, with early publications in the 19th century and the development of leading scientific schools in the second half of the 20th century<sup>20</sup>. Although, in post-WW II times, communication between the sides divided by the ‘Iron Curtain’ for long remained difficult, this did certainly not imply that in the world under Soviet influence the scientific study of archaeological animal remains was not thriving. That the first international meeting of a group that later became formalised as the ‘International Council for Archaeozoology’ (ICAZ) was held in an East-European country (Budapest, 1971), is meaningful<sup>21</sup>.

In contrast to the evolutions described for the Old World, the study of animal remains had a markedly different history in North America, mainly because in that part of the world archaeology is seen as a part of cultural anthropology (for the UK this is partly also the case). That implies that although the methodology of observing and recording the finds is mainly the same as in the European tradition, the research questions differ. Where the European line of research initially focused upon the animals themselves, the American tradition is more centred around human behaviour<sup>22</sup> (see further). In terms of chronology, the American studies were, just like in Europe, characterised by pioneering work in the late 19th century and the formation of organised research schools after the second world war<sup>23</sup>.

<sup>17</sup> E.g., the work of Henri Martin in the beginning of the 20th century, cited by Vigne 2005. See Conseil d’Administration de la Société Préhistorique Française 1936.

<sup>18</sup> Cornwall 1956; Chaplin 1971.

<sup>19</sup> See Becker & Benecke 2001, for the German projects.

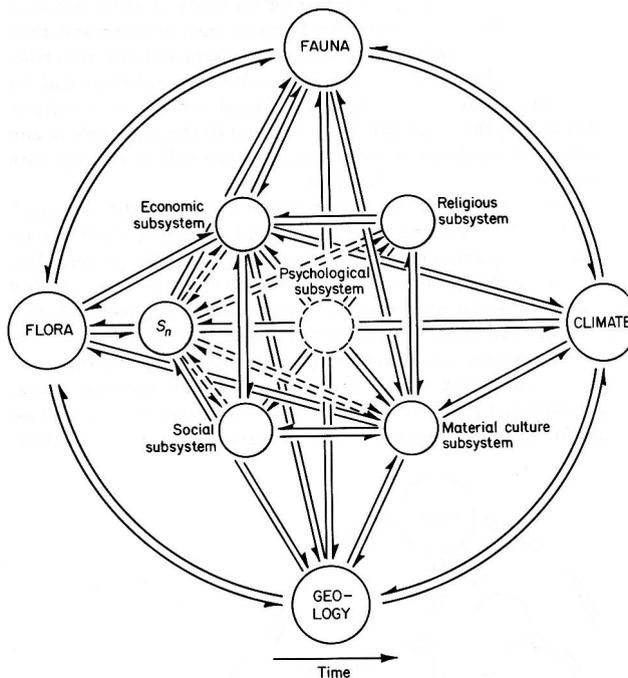
<sup>20</sup> Smirnov 2013.

<sup>21</sup> Proceedings of that meeting: Matolesi (ed.) 1973.

<sup>22</sup> Robison 1987, see Binford 1981 for the theoretical viewpoint behind this.

<sup>23</sup> Robison 1987; Landon 2005, see also Gifford-Gonzalez 2018.

Eventually, both research traditions met in the field, e.g., in the Near East, where scholars were studying animal remains in order to reconstruct the processes of early domestication<sup>24</sup>. This tradition of foreign students being active in Southwestern Asia continued for decades until wars and instability took their toll. Also in Africa most research was done by foreign institutes, while projects by local scholars remained rare. An exception is South-Africa<sup>25</sup> and, for the Near East, Israel<sup>26</sup>. Strong centres of development have also manifested themselves in South America<sup>27</sup>, India<sup>28</sup>, China<sup>29</sup> and Japan<sup>30</sup>, while in Oceania, the input from Australia and New Zealand was vital<sup>31</sup>.



**Figure 2: Schematic model of the interactions between the subsystems of a socio-cultural system and the components of an ecosystem. The interactions with another socio-cultural system ( $S_n$ ) are also indicated (Clarke 1968).**

<sup>24</sup> E.g., Reed 1961; Legge 1977.

<sup>25</sup> Antonites *et al.* 2016.

<sup>26</sup> Horwitz 2002.

<sup>27</sup> Emery 2004; Mengoni Goñalons 2007; Mengoni Goñalons *et al.* 2010.

<sup>28</sup> Chattopadhyaya 2002.

<sup>29</sup> Jing 2002; Jianlin & Blench 2008; Lin 2014; Liu & Ma 2017.

<sup>30</sup> Ikawa-Smith 1980.

<sup>31</sup> Horton 1986; Cosgrove 2002; Nagaoka & Allen 2009; Manne *et al.* 2016.

In fact, the history of development should be discussed per country (or even regions within them), and historical overviews are indeed available for some parts of the world (e.g., for the Netherlands<sup>32</sup>, Poland<sup>33</sup>, Hungary<sup>34</sup>, Serbia<sup>35</sup>, Romania<sup>36</sup>, Spain<sup>37</sup>, Italy<sup>38</sup>, Greece<sup>39</sup>, Eastern North America<sup>40</sup>, Canada<sup>41</sup>, Mexico<sup>42</sup>, the Caribbean area<sup>43</sup>, Brazil<sup>44</sup>, Oceania<sup>45</sup>, next to the references already mentioned). However, attempting this would exceed the scope (and possibilities) of this paper. Nevertheless, it can already be envisaged on empirical grounds that the picture that would emerge will be one showing a wide diversity, in terms of both research strategies and conceptual frameworks. This diversity should then be diachronically evaluated against the practical, social and political conditions in each of the study areas considered.

Umberto Albarella<sup>46</sup> rightly pointed out that the inequalities in the development of the analysis of animal remains to a certain extent reflect the uneven distribution of wealth and communication possibilities over the globe. To this, one may add the ‘colonial attitude’ in the early phase of the discipline, during which scholars explored the archaeology of foreign countries but, at the same time, sometimes forgot to promote the local development of scientific projects, to be run by local scholars.

Another, practical aspect of the discipline, hampering communication and thus scientific development, is the fact that much information is published in many different languages. In most high-standard journals English has become the *lingua franca* but still a lot of information from publications in equally important languages (in terms of population numbers: Spanish, Chinese, Japanese,...) is missed by the English speaking community. Moreover, it must be underlined that archaeological results, for many

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<sup>32</sup> Lauwerier 2004.

<sup>33</sup> Błaszcyk 1979.

<sup>34</sup> Bartosiewicz & Choyke 2002.

<sup>35</sup> Stojanović & Bulatović 2013.

<sup>36</sup> Bălăşescu & Popovici 2003.

<sup>37</sup> Morales 2002.

<sup>38</sup> Salvadori 2015.

<sup>39</sup> Payne 1985; Reese 1994; Trantalidou 2001.

<sup>40</sup> Bogan & Robinson 1987; Carlson 2000.

<sup>41</sup> Stewart 1998; 2002.

<sup>42</sup> Corona-M 2008.

<sup>43</sup> Grouard 2010; deFrance 2013.

<sup>44</sup> Nogueira de Queiroz 1999.

<sup>45</sup> Crabtree 2016.

<sup>46</sup> Albarella 2017.

rightful reasons, must often first be published in the native language of the location of the sites explored, making these reports inaccessible for scholars outside of that language group. This aspect represents a sharp contrast with other sciences, e.g., mathematics or quantum physics, but without doubt the development of automated digital translation devices will soon partly provide a remedy.

Finally, it should not be forgotten that the analysis of animal remains, as a global discipline, copes with material from many different regions, characterised by different faunas, influenced by extremely varying cultural developments, all described within their own chronological frameworks. This makes it not easy to deduce global results and interpretations from this wide scatter of regional and diachronic studies. Achieving this will be one of the mayor challenges for the future (see further).

### 3. What's in a name?

One could say that the study of animal remains<sup>47</sup> from archaeological excavations is widely known under the name of 'archaeozoology'. However, this is an ethnocentric, continental European statement, as in the Anglo-Saxon world most often the term 'zooarchaeology' is used. The difference seems semantic but reveals the significant divide in the development of the discipline, described earlier. Archaeozoology implies studying animals through their remains excavated by archaeologists. Zooarchaeology is the study of former human behaviour, in relation to the environment, on the basis of zoological material. The first approach is thus more paleontological, the second more anthropological.

When an International Council was founded, zooarchaeologists and archaeozoologists had to decide on a common name. Eventually, the term 'archaeozoology' was chosen, not because of conceptual reasons but as a practical option following the oldest tradition within the development of the discipline. In a recent newsletter of the Council, Richard Meadow (American and one of the leading figures in the field) was cited on how ICAZ's name came about: "ICAZ is ICAZ because it was born to a large extent on the European continent, and in those days of long ago most colleagues came to the study of faunal remains from archaeological sites out

<sup>47</sup> Including traces of animal activity: Gautier 1993.

of veterinary medicine or palaeontology. Even Barbara Lawrence (USA) and Juliet Clutton-Brock (UK), both of whom attended the famous Budapest conference of 1971, took that route. And depending on the academic structures in each of the European countries, many still do come from the zoology side, in contrast to the UK and America where few do, at least for the later periods of prehistory. The zooarchaeology orientation began largely with my generation during the 1960s and 1970s in Britain and the USA where we came to the field through Archaeology or Anthropology programs. The real strength of the field today is in its diversity, with students and scholars now coming from a wide variety of backgrounds and with greatly varying interests.<sup>48</sup> Still, the matter of choice remains a sensitive one and recently ICAZ has decided to add to the name of its newsletter the statement: ‘A Newsletter for the Archaeozoology and Zooarchaeology Communities’. In what follows, for simplicity’s sake, only the term ‘archaeozoology’ will be used.

As archaeozoology grew out of palaeontology (at least in continental Europe), the question must be posed where to draw the line between both disciplines. The answer is not straightforward. Clearly, archaeozoological material is found in anthropogenic features, while palaeontological material derives from natural deposits. Note that there is no strict chronological borderline between the two phenomena: natural deposits can be of a very young date and certainly be of equal age as archaeological features. In fact, the finds from such natural deposits can be very informative for the study of the contemporaneous archaeozoological remains (which implies that archaeozoologists also have to study palaeontological finds). A problem, however, lies in the definition of ‘anthropogenic’. It would be strange to restrict this term to *Homo sapiens*, and to exclude, e.g., *Homo neanderthalensis*. And what about the other and earlier hominids? Archaeozoology can certainly reveal aspects of the foraging strategies of those ‘people’<sup>49</sup>. Another interesting case to illustrate the difficult distinction between palaeontology and archaeozoology is the study of the Late Pleistocene megafauna<sup>50</sup>, wherein it is often difficult to ascertain whether contexts excavated are of anthropogenic nature or not. A Eurasian woolly mammoth (*Mammuthus primigenius*) that was hunted by humans, but escaped and later died of natural causes, would be the subject of palaeontology, while

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<sup>48</sup> Fairnell 2019.

<sup>49</sup> Andrews 1983.

<sup>50</sup> Clark & Speth 2013.

the same animal, hit by a spear, and then used as a human food source, would be the study object of archaeozoology.

#### 4. The ramification of a scientific discipline

The foregoing overview of the historical development of archaeozoology of course tells little about the conceptual evolution of the discipline, about the knowledge collected and the insights gained. Again, a thorough review of this evolution would represent an immense task, but some general patterns can be observed. In the beginning, most research was focused on bones, primarily from mammals and (to a lesser extent) birds. Until the end of the last millennium, the titles of influential textbooks such as ‘Animal bone archaeology’<sup>51</sup> or ‘The archaeology of animal bones’<sup>52</sup> illustrate this pattern.

In the early period of the development of the study of archaeological animal bones, significant progress was made in terms of methodology. Identification of the remains was supported by the publication of bone atlases, of which the *Knochenatlas* of Elisabeth Schmid is one of the most frequently used examples, at least in Europe<sup>53</sup>. The study of the evolution of animals, in an anthropogenic context, was further underbuilt by the introduction of osteometric observations. The most influential publication, in that perspective, was the manual published by Angela von den Driesch<sup>54</sup>, promoting a uniform way of taking measurements and thus allowing comparison of data between research groups around the globe. Measurements and morphological observations helped to extract more essential information from the excavated bones (about age, sex, domestication status, etc.), a methodological development that is still ongoing<sup>55</sup>. Progress was further made through analysing the often neglected issue of quantification<sup>56</sup>. Of equal importance for the interpretation of the excavated remains was the insight that their taphonomy was of vital importance for their evaluation. Taphonomy was originally defined by palaeontologist I.A. Efremov<sup>57</sup> in 1940 as

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<sup>51</sup> Hesse & Wapnish 1985.

<sup>52</sup> O'Connor 2000.

<sup>53</sup> Schmid 1972.

<sup>54</sup> von den Driesch 1976.

<sup>55</sup> Ruscillo 2006.

<sup>56</sup> Lyman 2008.

<sup>57</sup> Efremov 1940.

“the study of the transition (in all its details) of animal remains from the biosphere into the lithosphere” and is now often subdivided into two major aspects, i.e. the analysis of how animal remains became deposited at an archaeological site, in an archaeological feature<sup>58</sup>, and, secondly, how the deposited remains survived until they are excavated during archaeological fieldwork. These approaches clearly derive from one of the founding disciplines of archaeozoology: palaeontology.

One of the peculiar characteristics of the study of archaeological animal remains is that the gathering of the primary data, the collection of remains recovered from an excavation, is most often not under the control of the archaeozoologist who will eventually study them. Although a number of notorious exceptions could be cited, traditional archaeological excavations often only produced a selective, biased collection of larger animal remains, explaining why all attention went to the bones of animals (mostly mammals) of considerable size. Inevitably, this inadequate method of recovery had to be criticised<sup>59</sup>, eventually leading to a more sophisticated way of dealing with animal remains on archaeological sites. The major step forward was the introduction of the practice of sieving considerable soil volumes from archaeological features, or washing them in flotation tanks, not only searching for macrobotanical remains or small cultural artefacts, but also for smaller animal finds<sup>60</sup>. This change of excavation strategy (when applied) opened up the way for the analysis of a wide variety of animal remains that were hardly taken into account before. Smaller mollusc shells and fish bones came into the picture, but more, for archaeozoological analysis hereto unexplored groups of finds claimed attention. Examples are the study of the remains of insects<sup>61</sup> or mites (Acari)<sup>62</sup>.

Another recent trend in archaeozoology is the use of new techniques for observation and analysis, allowing interpretations that were beyond reach before. An example is the microwear analysis of teeth, yielding insight into an animal’s former diet<sup>63</sup>. Dietary reconstructions can also be made upon the basis of stable isotope analysis, which also provides information about an animal’s provenance and life history<sup>64</sup>. The study of ancient DNA

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<sup>58</sup> Gautier 1987.

<sup>59</sup> Payne 1972; Clason & Prummel 1977.

<sup>60</sup> Thomas 1996.

<sup>61</sup> Kenward 1982.

<sup>62</sup> Schelvis 1987.

<sup>63</sup> Mainland 1998.

<sup>64</sup> Pilaar Birch & Kirsanow 2013.

sheds light upon the evolution of domestic (and wild) animals<sup>65</sup>, while the presence of genetic material of pathogens (bacteria, viruses and parasites) demonstrates the former occurrence of diseases<sup>66</sup>. Evolutionary relationships between different animal populations of the same species can now also be studied through the application of ‘geometric morphometrics’, a comparative approach based upon the mathematical description of biological forms according to geometric definitions of their size and shape<sup>67</sup>. Equally promising is the development of ZooMS (zooarchaeology by mass spectrometry), allowing the species identification of animal bones on the basis of the molecular composition of their collagen<sup>68</sup>.

The growing variety of animal groups studied and the application of new observational and analytical techniques has inevitably resulted into specialisation. No archaeozoologist is able anymore to oversee the whole field in detail and to cope with the extremely varied and ever growing mass of literature. Moreover, the background from which people arrive into archaeozoology now differs widely, with chemists, geneticists and taxonomic specialists joining the field formerly occupied by veterinary scientists, palaeontologists and anthropologists. At the same time, due to the expansion of the group of scholars and the growing volume of literature, archaeozoologists who study all animal groups from all periods and all parts of the world have become rare. Indeed, specialisation has also occurred in the choice of study area and chronological period. The list of Working Groups actually active within ICAZ provides an illustration of these trends<sup>69</sup>:

- Animal Paleopathology Working Group (APWG)<sup>70</sup>
- Archaeomalacology Working Group (AMWG)<sup>71</sup>
- Archaeozoology, Genetics and Morphometrics Working Group (AGM)
- Archaeozoology of the Baltic Region and Adjacent Areas (ABRA) Working Group
- Archaeozoology of Southwest Asia Working Group (ASWA)<sup>72</sup>

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<sup>65</sup> Zeder *et al.* 2006.

<sup>66</sup> Hübler *et al.* 2019.

<sup>67</sup> Cardillo 2010.

<sup>68</sup> Buckley 2018.

<sup>69</sup> <https://www.alexandriaarchive.org/icaaz/working>

<sup>70</sup> Bartosiewicz & Gál 2018.

<sup>71</sup> Bar-Yosef Mayer 2005.

<sup>72</sup> Çakırlar *et al.* 2018.

- Bird Working Group (BWG)<sup>73</sup>
- Fish Remains Working Group (FRWG)<sup>74</sup>
- Grupo Zooarqueología de Camélidos (GZC)<sup>75</sup>
- Marine Mammal Working Group (MVWG)
- Microvertebrate Working Group (MVWG)
- Neotropical Zooarchaeology Working Group (NZWG)<sup>76</sup>
- North Atlantic Bioarchaeological Organization Zooarchaeology Working Group (NABO ZWG)<sup>77</sup>
- Stable Isotopes in Zooarchaeology Working Group (SIZWG)<sup>78</sup>
- Taphonomy Working Group (TWG)<sup>79</sup>
- Worked Bone Research Group (WBRG)<sup>80</sup>
- Zooarchaeology of the Modern Era Working Group (ZMEWG)
- Zooarchaeology of the Roman Period Working Group (RPWG)<sup>81</sup>

## 5. Research questions

The diversification and specialisation within the field of archaeozoology could present the danger that communication between researchers becomes more difficult and that broader research questions receive less attention, or are more and more tackled through very detailed and specific projects, of which the specialist results are difficult to communicate to a wider scientific public. A way to deal with this, is restoring the focus on general themes that can unify the research interests of a very diverse group of scholars. A handy approach to achieve this, is the use of a theoretical scheme in which the processes that constitute the former human behaviour that archaeologists want to reconstruct and understand, are clearly defined and put into context against one another.

A famous example of such a scheme is a diagram published in 1968 by David L. Clarke<sup>82</sup> (fig. 2), in which the interactions between subsystems

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<sup>73</sup> Bejenaru & Serjeantson 2014.

<sup>74</sup> Béarez & Clavel 2008.

<sup>75</sup> Mengoni Goñalons *et al.* 2001.

<sup>76</sup> Mondini *et al.* 2017.

<sup>77</sup> Cooper & Sheets 2012.

<sup>78</sup> Pilaar Birch & Kirsanow 2013.

<sup>79</sup> Denys & Brugal. 2018a; 2018b.

<sup>80</sup> Bejenaru 2018.

<sup>81</sup> Skeates 2017.

<sup>82</sup> Clarke 1968.

within a so-called socio-cultural system are mapped, to which the interactions of all these subsystems with the components of the ecosystem are added. Needless to say, also the components of the ecosystem interact amongst each other. Together, this is not an island situation, as socio-cultural systems (within their ecosystem) are interacting with others (with their own ecosystem). And, of course, the whole system (or set of systems) evolves through time, influenced by socio-cultural evolutions or changes in the ecosystem (e.g., climate!). The strength of the diagram is its simplicity, reducing the socio-cultural system to five subsystems and the ecosystem to four components, thus promoting a theoretical, visual understanding of an immensely complicated set of phenomena. Actually, more than fifty years after its publication, David L. Clarke's work is still considered to be one of the most important within the field of archaeology<sup>83</sup>.

Considering the position of the fauna within the scheme, it is clear that a relationship exists with all aspects of human behaviour<sup>84</sup>. Animals served as more than only food supply, often thought to be the main or even only research theme within archaeozoology. Furthermore, it is essential to note that animals - directly or indirectly - had an impact upon all aspects of former human cultural behaviour (and not only the other way round). The arrows indicating the relationships between cultural subsystems and components of the ecosystem indeed go both ways. The interaction between humans and animals involved more than the first making use of the latter. Humans not only imposed processes upon animals such as exploitation, domestication, eradication, introduction, pollution and disturbance, but animals also responded, by colonisation, adaptation or extinction. This viewpoint, clearly inspired by ecology, makes the proposition of Clarke a real symbol for the introduction of the processual approach into archaeology (the so-called New Archaeology)<sup>85</sup>, as an alternative for the classic cultural-historical approach, in which most emphasis was laid upon the position of humans, 'dominating' the world around them. Instead of this, the New Archaeology stimulated the elaboration of research questions going beyond the reconstruction of the economic use of animals, the history of their domestication, or the study of animal pathology (often resulting from human actions). The presence, absence and behaviour of animals influenced, even enabled human economic, material, social, religious (ideological) and

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<sup>83</sup> Lycett & Shennan 2018.

<sup>84</sup> Steele 2015.

<sup>85</sup> See Trigger 2006 for an introduction into archaeological theory.

psychological behaviour. This leads to the insight that humans and animals should be treated as equals within their relationship, making that, in a psychological way, the animals are also seen as ‘persons’<sup>86</sup>.

The relationships between cultural subsystems and components of the ecosystem can be analysed on many levels: that of a site, a region, a continent or even that of the globe. It only depends on how the socio-cultural system under study is defined. When this is done broadly, in terms of geography, cultural sphere, or chronological range, the study of the animal remains can lead to more general, universal insights than more restricted case studies can provide<sup>87</sup>. Starting from the cultural subsystems, research questions can be put forward, after which a selection can be made of the specialist analyses (techniques, find groups) needed to find answers. Around such research questions, teams of specialists can be assembled that will interact closely, regardless of their background or specialisation. Recently, more and more archaeozoological publications are appearing that promote that approach<sup>88</sup>.

Not separating research approaches per finds group or methodology applied also has the extra advantage that a close interaction is initiated between the viewpoints of the natural sciences and the humanities<sup>89</sup>. Doing this, archaeo(zoo)logy reaches the potential of gaining insights that go deeper than that of both research subdivisions separately. Essential is, however, that ‘translators’ are found, who have the ability to understand the jargons of both natural sciences and humanities, and can transform the results of one group into the language of the other. Another discipline that presents that same dynamic is geography (with the artificial division between physical and social geography), but then: has archaeology not been called ‘the geography of the past’?

## 6. Integrating archaeozoology

Before a sound interpretation can be made of the characteristics of the animal world represented by the material remains found at a site, the results of each part of the research executed separately must be integrated. This

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<sup>86</sup> Hill 2013.

<sup>87</sup> Amorosi *et al.* 1996.

<sup>88</sup> E.g., deFrance 2009; Russell 2012; Rowley-Conwy *et al.* 2017.

<sup>89</sup> Živaljević 2013.

not only implies that a diverse group of archaeozoologists need to learn to communicate with each other (which can be done by laying the emphasis on more global research themes, as explained above), but also that a single coordinator can no longer oversee the whole process. This becomes even more stringent when the integration of the archaeozoological results with those from physical anthropology, archaeobotany, soil science or geology is taken into consideration, and even more when all of this is also confronted with the studies of cultural artefacts, features and structures. Traditionally, the director of the excavations was expected to perform this gigantic task of integration (which sometimes only ended up in collecting the data but not evaluating them against each other), but nowadays it is realised that only a group dialogue directed by research questions and intermediate interpretation and theory building (leading to renewed or new research questions) can yield fruitful results (fig. 3)<sup>90</sup>.

An essential aspect of this process of integration is, and will remain, a critical, 'inside' analysis of what archaeozoology is producing in terms of valuable output. Are the data reliable, biased through controllable or uncontrollable factors, are they well thought through? Without self-criticism<sup>91</sup>, no integration with other disciplines will ever be possible.

When all approaches within archaeozoology, and archaeology as a whole, would be fully integrated, the task of interpretation would not yet be over. The scheme proposed by Clarke can also be used as the basis of a description of historical research into former human behaviour. As history analyses the same processes, this implies that, e.g., social or economic archaeozoology should be matched with social and economic history. This match must be realised diachronically, as archaeology can investigate periods for which historical sources are not available. However, this does not mean that when people started to write, archaeology stops and history takes over. Indeed, archaeozoological results must be confronted with historical data about animals when studying periods for which both sources of information are available. This is not a straightforward enterprise as the nature of the basic data, and the bias through which they are distorted, differs profoundly between both disciplines. Again, translators are needed, who speak the languages of both the archaeological and historical communities, and who are able to take into account the differences in time frames and

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<sup>90</sup> Hesse & Wapnish 1985.

<sup>91</sup> See O'Connor 1996.

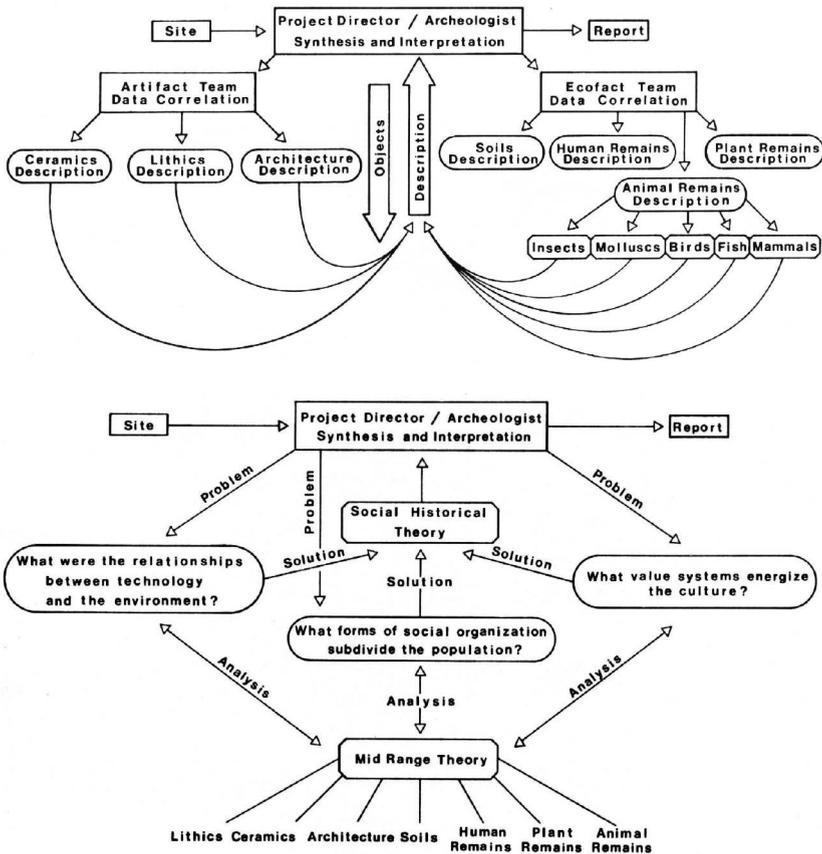


Figure 3: Traditional archaeological research model in which the analysis is subdivided per finds category (above), versus an integrated research model in which the analysis is subdivided in function of the research questions posed (below) (Hesse & Wapnish 1985)

conceptual backgrounds of both disciplines. Fortunately, important progress has already been made in that respect<sup>92</sup> and the future for cooperation seems bright<sup>93</sup>. On a theoretical level, the connection between archaeology and the structural history promoted by the French *Annales* school (with its emphasis on the *longue durée*) has proved to be a major step forward<sup>94</sup>.

<sup>92</sup> E.g., Thomas 2006.

<sup>93</sup> Landon 2005.

<sup>94</sup> Bintliff 1991.

It should also not be forgotten that in the New World and the UK archaeozoology (in that case zooarchaeology) was founded as part of cultural anthropology. Hence, the integration of archaeozoology with the wider field of anthropology is also a priority. In general, the relationship between anthropology and archaeology has evolved through time, both in North America and the UK<sup>95</sup>, but recently, anthropological approaches are again being published more and more frequently as part of the study of archaeological animal remains<sup>96</sup>. For the archaeozoologist belonging to the continental European tradition within the field it is certainly refreshing to see interpretations about animal remains being expressed in terms of civilisation, values, blood and kinship, identity, authority and reason<sup>97</sup>.

Finally, the input of ethnography, a science closely related to both history and anthropology, should not be forgotten. Making analogies between present, often traditional, and past systems of interaction between humans and animals can present dangers but recent studies demonstrate the merit of this kind of approach<sup>98</sup>.

## 7. The way archaeology works

The foregoing plea for integration is of course easily stated theoretically but is often difficult to realise in practice. One of the main reasons is that the study of archaeological animal remains is organised in many practical ways, ranging from universities and research institutes running large international projects, to small analyses done by commercial firms, as part of preventive archaeology (a trend that already exists for a long time<sup>99</sup> but that became almost dominating during the last decades). Evidently, this distinction is artificial as there is small research at universities and projects within preventive archaeology can be very large. Point is, however, that time budgets and financial means certainly differ between research groups, allowing some to make steps towards integration while this is nearly impossible for others. This does not imply that the data from ‘smaller’

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<sup>95</sup> Gosden 1999.

<sup>96</sup> E.g., Campana *et al.* 2010.

<sup>97</sup> See Engelke 2017, for an introduction.

<sup>98</sup> Albarella & Trentacosta 2011; Broderick 2016.

<sup>99</sup> Coy 1979.

research are not of value, but eventually they will have to be synthesised into a bigger story.

A problem for the cooperation between archaeozoological projects executed in the academic world or as part of the legislation around preventive archaeology is the inadequate stream of information, hampered by the fact that many reports from the latter group are poorly distributed, and published in local languages (see earlier). Nevertheless, this so-called grey literature is essential when sites are compared within a certain region and period, as an attempt to answer more general research questions. Even more problematic is the inaccessibility of the basic data, or their incompatibility. In some parts of the world, governmental regulations try to find a remedy for this obstructive situation<sup>100</sup> but, ironically, often the academic world ‘escapes’ from these initiatives.

For decades to come, much time and effort will have to be spent in order to reach the level of analysis and integration that provides deeper insights, valuable for society. Because archaeozoology hardly yields economic profits (in terms of production and consumption of goods), the discipline will have to justify its actions through underlining what higher values it achieves. The scientific enquiry into the former behaviour of humans, and their interaction with ecosystems, is a good argument *in se*, as any understanding of the past is relevant for coping with the future. Moreover, the insights from archaeozoology can be practically applied for managing aspects of present-day life. Examples are the relevance for wildlife management<sup>101</sup>, for maintaining sustainability in the (over)exploitation of animal resources (such as hunting, overfishing or intensive animal husbandry techniques)<sup>102</sup> or for understanding the social impact of animals on society and the psyche of humans<sup>103</sup>. In fact, when one regards the list of research questions published some years ago as the ‘Grand Challenges for Archaeology’ (fig. 4)<sup>104</sup>, for all of them an input from the study of animal remains can be envisaged.

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<sup>100</sup> As for the Netherlands: Lauwerier & de Vries 2004.

<sup>101</sup> Lyman 1996; Murray 2008; Wolverson *et al.* 2016.

<sup>102</sup> Siracusano 2006.

<sup>103</sup> Sykes 2014.

<sup>104</sup> Kintigh *et al.* 2014.

### Box 1. Grand challenges for archaeology

#### A. Emergence, communities, and complexity

1. How do leaders emerge, maintain themselves, and transform society?
2. Why and how do social inequalities emerge, grow, persist, and diminish, and with what consequences?
3. Why do market systems emerge, persist, evolve and, on occasion, fail?
4. How does the organization of human communities at varying scales emerge from and constrain the actions of their members?
5. How and why do small-scale human communities grow into spatially and demographically larger and politically more complex entities?
6. How can systematic investigations of prehistoric and historic urban landscapes shed new light on the social and demographic processes that drive urbanism and its consequences?
7. What is the role of conflict—both internal factional violence and external warfare—in the evolution of complex cultural formations?

#### B. Resilience, persistence, transformation, and collapse

1. What factors have allowed for differential persistence of societies?
2. What are the roles of social and environmental diversity and complexity in creating resilience and how do their impacts vary by social scale?
3. Can we characterize social collapse or decline in a way that is applicable across cultures, and are there any warning signals that collapse or severe decline is near?
4. How does ideology structure economic, political, and ritual systems?

#### C. Movement, mobility, and migration

1. What processes led to, and resulted from, the global dispersal of modern humans?
2. What are the relationships among environment, population dynamics, settlement structure, and human mobility?
3. How do humans occupy extreme environments, and what cultural and biological adaptations emerged as a result?
4. Why does migration occur and why do migrant groups maintain identities in some circumstances and adopt new ones in others?

#### D. Cognition, behavior, and identity

1. What are the biophysical, sociocultural, and environmental interactions out of which modern human behavior emerged?
2. How do people form identities, and what are the aggregate long-term and large-scale effects of these processes?
3. How do spatial and material reconfigurations of landscapes and experiential fields affect societal development?

#### E. Human–environment interactions

1. How have human activities shaped Earth's biological and physical systems, and when did humans become dominant drivers of these systems?
2. What factors drive or constrain population growth in prehistory and history?
3. What factors drive health and well-being in prehistory and history?
4. Why do foragers engage in plant and animal management, and under what circumstances does management of a plant or animal lead to its domestication?
5. Why do agricultural economies emerge, spread, and intensify, and what are the relationships among productive capacity, population, and innovation?
6. How do humans respond to abrupt environmental change?
7. How do humans perceive and react to changes in climate and the natural environment over short- and long-terms?

Figure 4: The grand challenges (research questions) for archaeology, compiled by Kintigh *et al.* in 2014.

## 8. Conclusion

Clearly, the field of archaeozoology / zooarchaeology has undergone a dramatic evolution, having moved far away from the sheer morphological approach of palaeontology. This should not imply, however, that the field forgets or disregards its roots. Its strength will lay in its ever growing diversity and its capability to communicate with other sciences. Teresa E. Steele recently rightly stated that “Humans and animals share a universal and intimate relationship that stretches from the earliest appearance of our lineage, through our prehistory, and into history and the modern era. Consequently, zooarchaeology - the analysis of animal remains from archaeological sites - transcends all cultural, temporal, and geographic boundaries, and therefore can be used to address questions spanning the breadth of archaeology”<sup>105</sup>. In fact, one could change the latter phrase into ‘spanning the breadth of natural sciences and humanities’.

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# Laudatio L. Sass

**J. Feyaerts**

It is with great pleasure that I am able to introduce to you Prof. Louis Sass from Rutgers University, New Jersey, USA, laureate of the Sarton medal 2019-2020. Through this medal, the faculty of Psychology and Educational Science and the Sarton Comite of Ghent University want to express their special appreciation for Prof. Sass's work within the history and theory of psychology.

In Prof. Sass's own case, that history began as a student in English literature at Harvard University (B.A. 1970), followed by a PhD in Psychology at the University of California at Berkeley in 1979.

Since 1983, Prof. Sass has been affiliated with the Graduate School of Applied and Professional Psychology at Rutgers University, Department of Clinical Psychology. In 2012, he became a Distinguished Professor at the same department. He has been a visiting professor at numerous international universities, such as the *Universidad Nacional* in Colombia, the *École Normale Supérieure* in Paris, the Center for Subjectivity Research in Copenhagen, and the University of Chicago.

Prof. Sass has received fellowship awards in the USA from the National Endowment for the Humanities, the Institute for Advanced Study in Princeton New Jersey, and the Fulbright Foundation. His scholarly and scientific work focuses on the field of phenomenological psychopathology, with an emphasis on the schizophrenia spectrum, as well as on various philosophical issues concerning psychology and psychiatry.

Prof. Sass is the author of two influential monographs – *Madness and Modernism: Insanity in the Light of Modern Art, Literature, and Thought*, and *The Paradoxes of Delusion* – both testifying to an extensive historical

and theoretical knowledge of our field and its fruitful application to contemporary research questions. *Madness and Modernism* is perhaps the key work responsible for the current renaissance of phenomenological thought in psychiatric and clinical research.

Prof. Sass is also the first author of nearly 80 journal articles in such diverse journals as *Schizophrenia Bulletin*, *Schizophrenia Research*, *World Psychiatry*, *Philosophy*, *Psychiatry and Psychology*, and *Continental Philosophy Review*, and of over 30 book chapters in philosophical, psychoanalytic and psychiatric-clinical collections – along with many co-authored publications. Indeed, one single mind has somehow managed both to publish high-level scientific contributions that have significantly advanced our current understanding of schizophrenia, but at the same time to offer (among other theoretical studies) a philosophically acute and unusually lucid assessment of the psychoanalytic work of Jacques Lacan in a recent paper ‘Lacan, the mind of the modernist’. A truly remarkable achievement.

I also want to mention that in the past Prof. Sass has been the President of two divisions of the American Psychological Association: Division 24 for Theoretical and Philosophical Psychology and Division 10 for Psychology and the Arts; that he has been the recipient of the Joseph B. Gittler award from the American Psychological Foundation for scholarly work that has made a transformative contribution to the philosophical foundations of psychology; and that he has been appointed Honorary Professor at the Department of Philosophy at Durham University in the UK. A revised edition of *Madness and Modernism* was awarded the BMA: British Medical Association First Prize as best book in the field of psychiatry for 2018.

However, when we look beyond all these numbers and titles, what immediately stands out as a consistent feature of Prof. Sass academic contributions is the remarkable quality, lucidity, and intellectual modesty that transpire throughout his work. These are all borne out by a refined historical consciousness about the recurring nature of philosophical and psychological problematics, knowledge of which significantly enhances Prof. Sass’s original viewpoint on contemporary issues in a wide array of disciplines.

It is because of the exceptional quality of his work that the Dept of Psychoanalysis & Clinical Consulting has nominated Prof. Sass as a candidate for the Sarton medal. The board of the Faculty of Psychology and Educational

Sciences and educational sciences as well the Sarton Comite of Ghent University have both unanimously confirmed that nomination.

So after this glowing yet entirely deserved praise, I am happy to give the floor to Prof. Sass himself for the lecture he will provide on this occasion.



# On subjectivity, self-interpretation, and the project of psychology

Louis Sass

## 1. Prologue

When you ask a more senior member of a field to speak, and when, even worse, you *encourage* him by giving him an award, you put yourself at risk of hearing somewhat more, but also somewhat less than you bargained for. You risk hearing something more idiosyncratic and opinionated than you might have wished, and perhaps less judicious and well-defended than you might have expected. But, with that warning (and with what is, I admit, only a semi-sincere apology), let me proceed to offer my own, perhaps overly personal and dyspeptic view of what is right and wrong with the field in which many of us are working: namely, clinical psychology and related fields associated with the psy professions.

I must alert you that my talk may sound, at times, something like a lament. Also, I will necessarily be painting with a broad brush, not only because of time limitations but also because of the wide and interdisciplinary scope and the (admittedly) highly value-laden nature of what I will try to say.

If I had to state, in advance, just what is the key message of this talk, it would be the following:

As psychologists or psy professionals, we should be concerned not only with the *accuracy* of our understanding of human experience but also with its *impact* on our very nature as psychological beings: namely, with the ways in which the interpretations we apply to ourselves – from psychology and elsewhere – actually play a key role in *making* us who we are.

What is therefore needed in the psy disciplines and professions, I shall argue, is a far deeper appreciation of the central role of human subjectivity as well as of the profound difficulties inherent in grasping both its nature and its significance. This, in turn, calls for two, potentially complementary developments: one involving greater attention to literature and the arts, the other involving recourse to the tradition and perspectives of phenomenology, in philosophy as well as in psychology and psychopathology.<sup>1</sup>

What is called for, in my view, is a more vigorous reciprocity between psychology and the arts, broadly defined. In this reciprocity, art and literature would be treated not merely as the *objects* of psychological analysis, but would (along with literary studies and art criticism) lend their richer resources to the psy disciplines and the psy professions, helping these latter to offer deeper and more revelatory analyses of human experience and expression, and also to be subjected to subtler forms of criticism. In my view, it is the phenomenological approach, in its hermeneutic and existential variants, that has most in common with these perspectives from the arts and humanities, and that is best suited (often in conjunction with psychoanalysis) to offering a rich analysis of human subjectivity and human existence.

My own intellectual journey has, in fact, been devoted largely to the tradition of phenomenology, in particular phenomenological psychopathology and especially with regard to psychotic conditions. I have been interested in the ways in which an understanding of literature and the arts can both sharpen and deepen our understanding of abnormal conditions or states of mind. For several decades, I have focused largely on the schizophrenia spectrum of disorders; and there have tried to demonstrate the relevance of certain parallels in the forms of experience and expression that are found in modernism and in madness: namely, how the hyperreflexivity and alienation characteristic of modernist (and so-called postmodernist) avant-garde art and culture can reveal aspects of schizoid, schizotypal, and schizophrenic experiences that have been neglected, yet may hold the key to understanding these latter conditions.<sup>2</sup> In my brief lecture today, I will not have anything directly to say about this earlier work on modernism and madness; what I will offer here, however, is a general, and in many ways personal, perspective on the rationale for adopting this sort of approach.

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<sup>1</sup> Re phenomenology in psychology and psychiatry, see Broome et al, 2012, and Stanghellini et al, 2019.

<sup>2</sup> See Sass 2017 (orig. 1992); for another example: Sass, 1997.

In a moment, I will proceed; but first let me extend a warm thanks to the Sarton Committee, to the Department of Psychoanalysis and Clinical Consulting, and to the Faculty of Psychology and Educational Sciences for their kind recognition of my work – and also to Jasper Feyaerts in particular, for his friendship and his generous *Laudatio*.

## 2. Understanding subjectivity: introductory remarks

How are we to understand and to represent subjectivity, the very nature of consciousness or our experiential lives? This, obviously, is a key issue in philosophy and psychology, and even, perhaps, in our culture at large – and it is one that can be approached in a dizzying variety of ways. Here we might distinguish two broad areas of interest.

One area of concern pertains to the *adequacy* of our understanding. To what extent can our conceptual resources do justice to subjectivity, as opposed to denying or distorting its true nature, especially through misleading forms of objectification, mythologies of various kinds, or uncritical reliance on everyday concepts regarding mental life?

But there is also a second area of importance, and this concerns not the adequacy but the *impact* of our forms of understanding: that is, the ways in which our conceptualizations *of* ourselves (including, within that, our appreciation of the role of consciousness itself – our own and that of other people) may not simply reflect but actually *alter* our nature – might in part simply *make* us what we are. Human beings have been described as “self-interpreting animals.”<sup>3</sup> The phrase is apt, suggesting that self-awareness is not merely self-referential but actually *self-constituting*.

In this lecture, I wish to explore some of the historical origins of the confrontation with subjectivity in the modern West, and then to consider some contemporary psychological perspectives in light of this exploration. My talk could be thought of as a kind of diptych, with two facing panels.

First, I will offer an historical sketch of what might be termed the birth of subjectivity in modern Western culture – a development, involving both discovery and invention, that, for many scholars, begins with the European

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<sup>3</sup> Taylor, 1985.

Renaissance and emerges especially in the literary and artistic works of that period and its aftermath.

Then I wish to consider, in light of these facts, the status of several contemporary ways of conceptualizing the human being that play (or could play) a dominant role in psychology and the psy professions more generally. To appreciate the importance of this latter issue, we need to recognize the central role that psychology and cognate disciplines now play, as perhaps the key source of an explicit, overall vision of the human being and human existence in what is, in large measure, our post-religious society. As psychologists, and especially as *clinical* psychologists, we are often preoccupied with practical questions – whose importance is indisputable. Psychologists should, however, *also* be asking whether our field does justice to the the very nature of human experience – and in particular to those forms of subjectivity and selfhood that began to come into focus or being in the Renaissance.

### 3. Subjectivity's advent: discovery and invention

One of the most interesting ways in which self-interpreting animals can differ from one another, concerns the quality and degree of self-consciousness itself – and, at another meta-level, regarding our self-awareness thereof.

Although the latter issue may sound overly abstract or merely fanciful, it is both real and consequential – and has long been recognized by our major historians of Western culture and thought. The self-conscious focus on subjectivity and self-awareness seems, in fact, to have come increasingly to the fore in the course of the last five or more centuries of European thought and experience. This is reinforced by recent scholars who read the Renaissance as the origin, not only of new types of “*self-fashioning*,” but also of new forms of skepticism about “*other minds*,” forms generated by a complementary and disquieting awareness of the primacy of individual awareness and of the consequent unknowability of the other (e.g., Lionel Trilling, Stanley Cavell, and Stephen Greenblatt).<sup>4</sup>

<sup>4</sup> Trilling 1972; Greenblatt 1980; Cavell 2003.

A full history of the “discovery” of subjectivity (which might be thought of as a pre-history of the phenomenological movement) would, of course, have to treat many topics not considered here, including from the ancient world.

Such complex forms of self-awareness emerged with particular clarity in the works of William Shakespeare, especially in the self-reflection of figures like Hamlet and Falstaff,

The literary scholar Harold Bloom goes so far, in fact, as to speak of Shakespeare's "*invention* of the human," which might better be understood as the invention of the *modern* human being or, more specifically, of modern inwardness via the "subjectivity effect."<sup>5</sup> There were of course *characters* before Shakespeare. There was however little sense of true character *development*, nor (a related point) of the essential *motor* of such development, namely, of the forms of intense inner conflict accompanied by private deliberation or subtle, half-recognized dramas of self-deception, self-doubt, and ironic distance that are epitomized by the character of Hamlet – aptly described as "the premier Western performance of consciousness"<sup>6</sup> and, in many respects, the representative modern person. The consciousness Hamlet performs is inescapably *self-conscious*, showing intense introspection regarding his own motives and moral worth as well as acute awareness of the relativity of point of view.

Shakespeare's portrayals are imbued not only with a novel appreciation of subjectivity, in all its variety and ambiguity, but also with an acknowledgment of subjectivity's limits, indeed, with a particularly profound recognition of the human potential for self-delusion – a recognition nicely captured when Regan remarks to Goneril that their father, King Lear, "hath ever but slenderly known himself" (Act I, scene i). But it is obvious, as well, that Shakespeare knew that higher degrees of consciousness do not always and only yield truer insight but can also obscure understanding and undermine clarity of purpose. This, if anything, is at the heart of Shakespeare's most important creation, the endlessly self-questioning Hamlet – Shakespeare's doppelgänger and the precursor of many a later figure of Western literature; and one who (like Dostoevsky's Underground Man) not only *illustrates* but also *recognizes* that consciousness and especially self-consciousness can indeed be "a thorough-going illness." The melancholy Dane is, indeed, wary of how (as he himself puts it) "the native hue of resolution" can be "sicklied o'er with the pale cast of thought." (III, i)

<sup>5</sup> Bloom, 1998; "subjectivity effect" is from Joel Fineman, quoted in Bloom 1998, p. 714.

<sup>6</sup> Garber, 2004, p. 4. For a more general discussion of characters in Shakespeare, see the classic study by Bradley, 1904.

Harold Bloom's statement that Shakespeare "invented" the human (or even the *modern* human being) may well seem exaggerated. Shakespeare's impact was certainly profound,<sup>7</sup> but the transformation represents a broader shift apparent not only in literature (where Montaigne and others play an important role) but in various domains of culture and creative production. (A fuller account would need to consider many other topics, including the rediscovery of antiquity, especially Greek tragedy.) A particularly clear illustration of this development is the advent of portrait painting in the Renaissance, where an acute sense of subjectivity and individuality seems to emerge from a background of medieval anonymity.

Portraits of individuals were, in fact, rare before the Renaissance. When individuals were depicted by such late-medieval or early Renaissance painters as Cimabue (1240?-1302) or even Giotto (1267-1337), they generally appeared as participants in larger religious scenes or devotional contexts. There is often something impenetrable about these early faces, which typically have the feel of a generic motif or the look of a medallion, shiny and impenetrable – more reflective of an artist's or a tradition's favored schemas than of any strong interest in penetrating an individual soul.

Increasingly, however, in the course of the *Quattrocento*, we find portraits like Antonella da Messina's "Portrait of a Man," painted in 1475 (a century before Shakespeare), which hangs now in the Louvre.<sup>8</sup> Here the background fades to black, and the amazement of an individual subjective presence virtually explodes into view – luminous with a light that seems to come as much from within as from without, capturing a responsiveness to the world that is, at the same time, and inseparably, a manifestation of the sitter's own being. Da Messina's young man is there as a lived *presence*: a center who gathers space around him – and who does so, in part, precisely by conveying an implicit awareness of his own presence *as* an awareness and a point of view.

But the culmination – unsurpassed and perhaps unsurpassable – of the evocation of inwardness and presence, may well be the portraits of Shakespeare's near-contemporary, Rembrandt, and especially his self-portraits

<sup>7</sup> We have all been "Shakespeareized," as Ralph Waldo Emerson put it: Garber, 2004, p. 3.

<sup>8</sup> See [https://www.art.com/products/p28105224488-sa-i8574907/antonello-da-messina-portrait-of-a-man-known-as-the-commander-1475.htm?RFID=217825&ProductTarget=823742075921&utm\\_medium=cpc&utm\\_source=google&utm\\_campaign=PLA&gclid=CjwKCAiApOvwBRBUeIwAcZGdGIt30hcpVHmnNIA6YVRExV1pKWRuxRLTKi5dtZN2KX-2U4szLvqT8LxoCTOIQAvd\\_BwE&gclid=aw.ds](https://www.art.com/products/p28105224488-sa-i8574907/antonello-da-messina-portrait-of-a-man-known-as-the-commander-1475.htm?RFID=217825&ProductTarget=823742075921&utm_medium=cpc&utm_source=google&utm_campaign=PLA&gclid=CjwKCAiApOvwBRBUeIwAcZGdGIt30hcpVHmnNIA6YVRExV1pKWRuxRLTKi5dtZN2KX-2U4szLvqT8LxoCTOIQAvd_BwE&gclid=aw.ds)

(Shakespeare 1564-1616, Rembrandt 1606-1669). Here, one may feel, is the true proof of Wittgenstein's dictum that the human body – in this case, of course, the human *face* – is, in point of fact, “the best picture of the human soul.”<sup>9</sup> Indeed, there is something almost freakish about Rembrandt's evocations of uniqueness and unfathomable depths. In gazing upon Rembrandt's eyes, those eyes of a painter painted by the painter himself, it is easy to forget they are composed out of inert flecks of paint – they seem, in the fullest sense, windows of a soul, messages of knowing and yearning, bodying forth that which is bodiless, inner, and self-present, though perhaps not fully transparent to itself.<sup>10</sup>

Interestingly, this treatment of the face goes together with new ways (distinct from linear perspective) of depicting space and perspective in the *external* world. Indeed, Rembrandt is one of the ultimate masters of *chiaroscuro* and *tenebrism* as well as *sfumato* – those lovely art-historical terms referring to the play of light and dark, of shadows, and the use of smoke-like painting techniques whereby sharp edges dissolve into soft transitions and darkensses; together these techniques evoke a sense of consciousness as containing ambiguous recesses and obscurities.

We may ask whether these developments (epitomized in Shakespeare and Rembrandt) merely reflect the adoption of richer and more accurate techniques of representation, or whether there is some real difference in the underlying reality, the actual psychological life, that is being depicted. Might the artist actually be confronting a distinct, more self-conscious form of subjectivity or humanity in the sitter before him? If we are, in fact, “self-interpreting animals,” it would follow that the *representations* that we see or read of ourselves do not merely reflect but also mold the very *kind* of beings or subjectivities that we are and are able to discern.

These key features of the modern self, manifest in literary and artistic expression, may be deeply rooted in major cultural transformations. It would be wrong, however, to assume they are constants that could never recede. In *Decline of the West*, published in the aftermath of World War I, Oswald Spengler expresses a fear of just this kind, a fear that cultural transformations then in the offing (largely involving the rationalization and homogenization Spengler associated with decline from a true “culture” to

<sup>9</sup> Wittgenstein, 1953, p. 178e, section iv.

<sup>10</sup> See Schama, 2015, p. 19 and *passim*.

the washed-out materialism of a mere “civilization”) might render us incapable of resonating to works such as these:

“One day the last portrait of Rembrandt and the last bar of Mozart will have ceased to be – though possibly a colored canvas and a sheet of notes will remain – because the last eye and the last ear accessible to their message will have gone.”<sup>11</sup>

Harold Bloom raises a similar issue in light of what he (along with some others) sees as a general cultural decline in recent decades and indeed, even a deterioration in the quality of personality or character itself: Given the “culture of virtual reality” and consumerism now coming to dominance, he asks: “[W]ill Falstaff and Hamlet still seem paradigms of the human?”<sup>12</sup>

All this may bear some relevance for us as psychologists. Should we not ask what sort of self we might wish to have – and indeed, what sort of selves, and what appreciation of subjectivity, we might wish our psychologies to foster and to inspire?

There seem, in fact, to be at least four lessons for psychology and the psy professions to be extracted from this condensed meditation on the development of literary and artistic representations of subjectivity.

First, and most obviously, we are reminded of the sheer existence and interest of the subjective domain, of both oneself and the other person as not merely highly complicated *objects*, but as the very centering of worlds – of “lived-worlds.”

A second lesson concerns the element of unknowability lodged at the heart of subjectivity. As Nietzsche pointed out, “we knowers are unknown to ourselves.” This means that any overcoming of our unknowing – of our *auto*-unknowing – will require some active looking beyond the obvious: for, as Nietzsche also insisted, “how can we ever hope to find what we have never looked for?”<sup>13</sup>

The third lesson is that, just as consciousness necessarily involves *self*-consciousness, of one kind or another, so a recognition of this fact suggests the diversity of the possible forms of subjectivity and selfhood across cultural and personal contexts. The fourth and final lesson is that psycholo-

<sup>11</sup> Spengler, 1932 (orig 1918-23). P. 168.

<sup>12</sup> Bloom, 1998, p. 716.

<sup>13</sup> Nietzsche, 1956 (orig. 1887), p. 149.

gy, which is not only an academic or professional field but also a major cultural force, might have something in common with portraiture, whether literary or visual: in the sense that its portrayals, too, are likely not merely to reflect, but also to transform the nature of personhood and subjectivity.

#### 4. Academic psychology: social learning theory

Given the developments I have just described, a person steeped in literature, art, or the humanities might well hope to find some counterpart in the various psy disciplines – whose purpose, after all, would seem to include understanding human nature in its depths and the full range of its variations.

We must remember, as well, that psychology and the psy professions are perhaps the major source of human self-interpretation in the modern Western world, having largely replaced the religious conceptions that dominated most lives up until the beginning of the twentieth century.<sup>14</sup> Given this fact, one might hope that psychology would reveal something like the progression to be discerned in Shakespeare and in *Quattrocento* portraiture and its aftermath – a progression in which the complexity, variety, and mystery of human consciousness come increasingly to the fore, and in which we would learn, increasingly, to take the measure of our own subjectivity and that of our fellow human beings. Can we say this hope has been fulfilled?

Psychology is an immensely diverse field, containing many different subfields and serving many distinct purposes; and this makes it difficult to generalize (a point to which I shall return). But if we focus for a moment on *academic* psychology alone, and, in particular, on those mainstream variants that purport to have relevance for clinicians or psychotherapists, the answer seems to me rather clearly to be no. In most of academic psychology, the seductions of objectivism, operationalism, and empiricism – often in unholy alliance with uncritical adoption of everyday concepts – have largely held sway, thereby overshadowing any serious concern with the depth and distinctive qualities of subjectivity as such. This, in my view, is not unrelated to the fact that much of mainstream psychology has less to offer by way of surprising illumination or novel insight than is often claimed on its behalf. The commitment to objectivism has generated

<sup>14</sup> Gauchet, 2003, espec chap.s X, XI, XII.

important practical applications that no responsible person would wish to dismiss (an important point that I cannot elaborate here).<sup>15</sup> If, however, we are looking for the kind of insight that might be revelatory or enriching: deepen our sense of existence, expand our empathetic imagination, or reveal hitherto unrecognized dimensions of psychological life, these seem few and far between.

It is, as I said, always hazardous to generalize. For this reason, it is crucial that the concepts or theories – and figures – whom we choose for consideration be inarguably at the center of mainstream academic psychology. We will therefore focus on what are, indisputably, among the central planks of the dominant, social-learning-theory tradition, which itself supplies the theoretical basis for the CBT or cognitive-behavioral approach that is currently dominant in the field of psychotherapy and indeed of clinical psychology (at least within the Anglophone world) more generally.

The first position to consider – termed “interactionism” – argues that the course of human behavior apparently results *neither* from personality traits *nor* from environmental stimuli or context alone, but, *rather*, from the *intersection* of these factors. Albert Bandura, who could justly be described as the single most influential theoretician of current social learning and cognitive-behavioral theory, incorporates this argument in his theory of “Reciprocal Determinism,” adding the obvious point that behavior itself is also a factor since it can affect both environment and the person:<sup>16</sup> “Personality,” he writes in one summary statement, “emerges from the mutual interactions of individuals, their actions, and their environments” (“triple reciprocal causation” – no less!). A second position is “self-efficacy” theory, also developed by Bandura.<sup>17</sup> Self-efficacy theory informs us that an important factor in motivating action is the belief that one is capable of the action in question and that the action in question will indeed have a desired effect. (Bandura speaks of the “centrality of the self-efficacy mechanism (SEM) in human agency”)

These are limited examples, admittedly, but they are hardly marginal or unrepresentative. A 2002 survey ranked Bandura as the fourth most-

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<sup>15</sup> See note below re social learning theory.

<sup>16</sup> Bandura, 1978.

<sup>17</sup> Bandura, 1982, p. 122.

frequently cited psychologist of all time (behind only Sigmund Freud, Jean Piaget, and B.F. Skinner) and as the most cited living one.<sup>18</sup>

There are some potentially useful reminders in these theories of interactionism or reciprocal determinism and of self-efficacy that can be helpful in designing various kinds of therapeutic interventions (a point that deserves elaboration, but that I have time only to mention in this talk).<sup>19</sup> Still, the critical reader coming from outside the cognitive behavioral or social learning tradition, cannot help but be struck with what seems the self-evidence of these claims:

*People behave in accord both with who they are and with the circumstances they find themselves in – and their own behaviors have an effect on their circumstances and identity.*

*People tend to engage in actions of which they think they are capable, and when they think those actions are likely to have the effects they seek to bring about.*

Most everything contained in the theories of interactionism, reciprocal determinism, and self-efficacy theory seems to be expressed in these two sentences, almost without remainder. Such statements are obviously not *false* – and it is true, as well, that, as clinicians, we may sometimes benefit from being reminded of the points they convey. But if revelation or counter-intuitive discovery is at all correlated with scientific value (a matter of some controversy, I realize), then, surely, we would have to give these systems low marks. Nietzsche’s statement, “we knowers are unknown to ourselves,”<sup>20</sup> is in no way honored here, nor is his admonition to look beyond the obvious.

But just how typical of academic psychology *are* such theories and episodes, at least in the study of clinically relevant areas like personality,

<sup>18</sup> Haggblom, 2002. For more on Bandura’s influence, see <https://www.apa.org/science/about/psa/2016/01/albert-bandura>

<sup>19</sup> The insights of social learning theory may, e.g., be far from revelatory. But this is not to say that such re-statements of what we already know cannot, nevertheless, be of considerable value – providing a schematic mapping of the multiple factors that may well be relevant and might otherwise be neglected in psychotherapy practice and research. What contemporary clinical psychology would most benefit from, in my view, is achieving a compromise between the simplifications of academic psychology and CBT, on the one hand, and the complexities of psychoanalysis and phenomenology, on the other. The relationship between these approaches may often involve mere tolerance along with mutual indifference – and that can sometimes be perfectly fine; but at other times a more complex encounter may be needed.

<sup>20</sup> Nietzsche, 1956 (orig. 1887), p. 149.

psychopathology, cognition, and social interaction? The Norwegian psychologist Jan Smedslund goes so far as to argue that *most* of the hypotheses and supposed laws “discovered” by mainstream psychological research are really *pseudo-empirical* in nature, amounting to little more than disguised statements of commonsense truths or even, in many cases, disguised tautologies.<sup>21</sup> One may not wish to go all the way with Smedslund’s critique. Still, it is difficult to disagree with one contemporary philosopher, Stanley Cavell’s, deflationary comment: “one sometimes feels that academic psychology tells us less than we already know.”<sup>22</sup> Anyone who wishes to dismiss these opinions as too harsh, or perhaps as ill-informed, should consult the views of Paul Meehl, the revered methodologist and conscience of clinical psychology.<sup>23</sup>

But how *shall* we account for this widespread drift toward banality in some major parts of our field of psychology?

Smedslund links the pseudo-empirical or tautological nature of psychology to psychology’s failure fully to take the measure of the ever-changing, ambiguous, and socially interactive (hence reflexive and recursive) nature of psychological processes. This is more or less how the matter has long been viewed by previous critics of academic psychology and its ilk who are grounded in the hermeneutic, phenomenological, and Wittgensteinian traditions, beginning with Dilthey and including such late 20<sup>th</sup> century figures as Charles Taylor, Hubert Dreyfus, and Clifford Geertz.<sup>24</sup> And this, I think, is the best way of accounting for the truth in Ludwig Wittgenstein’s famous remark in the very last line of his *Philosophical Investigations*: that in psychology, “problems and methods pass one another by.”<sup>25</sup>

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<sup>21</sup> Smedslund, 2016.

<sup>22</sup> Cavell, 1999, p. 93.

<sup>23</sup> See, e.g., Meehl, 1978, p. 806: “...most so-called ‘theories’ in the soft areas of psychology (clinical, counseling, social, personality, community, and school psychology) are scientifically unimpressive and technologically useless.” Elsewhere Meehl writes: “I think we ought to acknowledge the possibility that there is never going to be a really impressive theory in personality or social psychology” (Meehl in Peterson, 2005, pp. 79, 137).

<sup>24</sup> See also A. R. Louch, *Explanation and Human Action*, a Wittgenstein-inspired critique (in the spirit also of Dilthey and Winch) of the tendency of the social and behavioral sciences to ignore motive, purpose, and consciousness; published in 1966.

<sup>25</sup> Wittgenstein, 1953, p. 232, section xiv.

## 5. Psychoanalysis and existential-phenomenology

The contribution of psychoanalysis to a deepening of our awareness of human personality and experience and to the complexifying of the self-interpreting animals we are, has of course long been recognized by various scholars of both culture and psychology, and I will not dwell on it here. Wittgenstein was wary of Freud, for reasons a phenomenologist can certainly appreciate; but he also spoke of Freud as one of the few authors – and, presumably, one of the very few psychologists – who is truly worth reading: “Here at last is a psychologist who has something to say.”<sup>26</sup>

Freud is not, however, the only exception to psychology’s generally non-revelatory nature. Another is the broad tradition of phenomenology – understood as encompassing existential phenomenology and phenomenological psychopathology. Both these psychologies – psychoanalysis and existential-phenomenology – register the way in which the inwardness of human subjectivity becomes, to repeat a line from Harold Bloom, “the heart of light *and* of darkness.” We are like little gods, each living in a bubble of our own creation, yet we know ourselves but slenderly.

It seems to me, in fact, that these two traditions are virtually the only serious attempts, within modern psychology or psychiatry, to offer a vision of human existence that is both sophisticated and encompassing – and that, in this sense, respects the legacy of Shakespeare or Rembrandt. It should not be surprising, then, that forging a synthesis of these two perspectives has been a recurring ambition in the psy professions over the last three quarters of a century, in the work of thinkers as different as Ludwig Binswanger, Jean-Paul Sartre, and Jacques Lacan, among many others.<sup>27</sup> There is much to be said *about* this ambition, and also in *favor* of it; but I cannot take up

<sup>26</sup> Drury 1984, p. 136; see also Wittgenstein, 2007; Sass 2001.

<sup>27</sup> For recent discussions, see Phillips, 2019; Stolorow and Atwood, 2019. Also: Sass, 1998, re hermeneutics and psychoanalysis.

that topic here.<sup>28</sup> I would like, instead, to conclude by considering one key difference in the approach to subjectivity offered by these two essential psychologies of our time. This concerns how each of them conceives the unknowability of the subjectivity that both of them recognize.

## 6. Subjectivity's darkness – in psychoanalysis and existential phenomenology

Psychoanalysis speaks of an unconscious mind; and in its classical and most distinctive phase (which is when it was *least* akin to phenomenology), tended to conceptualize this realm as a kind of shadow-world or sub-basement in which unconscious fantasies or memories played themselves out as if on a stage – almost like a parallel universe, more decisive than the manifest one, but in which everything happens in the dark.

Heidegger, Merleau-Ponty, and their followers have tended to be unhappy with the essentially myth-like nature of these Freudian postulates. The existential phenomenologists have been committed to the idea that one would do more justice to the reality of the one subjective life we actually live if the manifest and the hidden could be understood as more intimately related: not as parallel yet interacting realms, but as interfusing within the same sphere of lived experience – though requiring somewhat different forms of description and analysis.

This is precisely what Heidegger is saying in the following, crucial passage from *Being and Time*, which attempts to describe just what it is that phenomenology is intended to reveal, given that its object (subjectivity itself) is by definition something of which we are already aware.

Manifestly it [the object of phenomenology] is something that does *not* show itself initially, something that is *concealed*. But at the same time it

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<sup>28</sup> The influence of phenomenology – at least of the hermeneutic sort – on psychoanalysis is obvious and profound. The major post-Freudian figure, Jacques Lacan, was a brilliant intellectual magpie, who scavenged across the intellectual landscape, but the influence of Heidegger – together with Merleau-Ponty and Sartre – is incontestable. I would argue, in fact, that the main advance of the Lacanian approach is to reintroduce the ontological horizontal dimension, a quintessentially Heideggerian theme to which Freud himself was insensitive; see Sass, 2015. At the same time, many innovative Anglophone psychoanalysts have embraced hermeneutics, or have argued for an enriched focus on the complexities of conscious, subjective life. This is particularly apparent, and sometimes explicitly avowed, by analysts in the now-dominant interpersonal or intersubjective and constructionist schools; see Sass, 1998.

is something that essentially belongs to what initially and for the most part shows itself, indeed in such a way that it constitutes its meaning and ground. Essentially, nothing stands “behind” the phenomena of phenomenology. Nevertheless, what is to become a phenomenon can be concealed. And precisely because phenomena are initially and for the most part *not* given phenomenology is needed. (*Being and Time*, Stambaugh translation, p. 31; 36 in original German; *ellipses omitted here*).<sup>29</sup>

Heidegger refers to the dimension at issue – that which is “concealed” yet part of the manifest – as the “ontological.” By this he refers not to any particular entities, objects, or actions of which one might be aware (this would be the realm of the “ontic”), but, rather, to the overall *horizon* or *form* of awareness itself, such as the quality of one’s experience of time, space, or causality, or the very way in which reality is organized and perceived. This may differ from person to person, but also from culture to culture or epoch to epoch. (Consider the differences in the experience of time in mania versus melancholia versus depression, e.g., or the different ways in which overall reality was experienced when the medieval Christian world gave way to the “infinite universe” of Enlightenment science.)

This, in fact, is the key point in all of Heidegger’s work. It is inseparable from what might be termed both his existentialist and his hermeneutic deviations from Husserl (and indeed, from those of the many phenomenologists who were crucially inspired by Heidegger’s vision). The most decisive dimensions of our experiential world (namely, our experience of time, space, causality – even of consciousness or subjectivity itself), along with our deepest and most decisive concerns (about freedom, death, and anguish): all these permeate the manifest in a manner that is ubiquitous while also being elusive and somehow concealed. They are, we might say, everywhere and nowhere – hiding in the light: indeed, identical to the lighting process that is coextensive with manifestation itself. Given their very nature, such dimensions and concerns do not simply show up in a clear fashion before an unprejudiced phenomenological or introspective gaze, no matter how refined (I refer here to the phenomenological methodology advocated by Husserl). They require, rather, the more subtle, and ever uncertain, methods of hermeneutic understanding.

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<sup>29</sup> Heidegger, 1996, orig. 1927.

Such an account, implicit in the hermeneutic orientation typical of existential phenomenology, would seem closely to approach – in its attitude and its evocations – the painterly implications of *chiaroscuro*, *tenebrism*, and *sfumato*. Such an account promises to foster empathy of a particular sort: one that (using the concepts of phenomenology and existentialism) has the resources to explore the potentially different perspective of the other, yet that (in its hermeneutic restraint) refrains from turning into a totalizing, clinical gaze.

## 7. Concluding remarks

To adopt the phenomenological approach (in its hermeneutic and existential variants) has the potential to transform quite radically one's overall sense of the nature and the difficulty of psychology, which must now seem a field that is afflicted (though perhaps also blessed) with a particular kind of paradoxicality: Its essential object (subjectivity itself) is at the same time obvious, familiar, self-evident, already known, yet also elusive, ambiguous, and obscure – and the latter for reasons that are not at all contingent (as is the case with overcoming the repression that blocks our knowing of an otherwise knowable unconscious) but rather *necessary*, since they are intrinsic to the nature of conscious manifestation itself. And this, in turn, necessarily entails a change in one's general epistemological stance, one that may take us beyond what is typically assumed in psychoanalysis (or, at least, in those older forms of psychoanalysis least influenced by phenomenology and hermeneutics).

In closing let me mention three qualities that are less common in the psy professions than one might have wished, yet may be fostered by an appreciation of literature and the arts and by adopting the perspective of hermeneutic phenomenology:

First, hesitation and critical self-consciousness in one's approach to one's object (as opposed to a confident scientism – or any approach too enamored of the value of its method).

Second, serious commitment to “saving the phenomena,” not just in the general, epistemological sense of this famous phrase, but in the post-Shakespearean, post-Rembrandtian sense of doing the fullest possible justice to the irreducible phenomena of subjectivity and self-presence.

And third, openness to methods and ways of thinking that may be indirect, especially the literary and the metaphorical.

All this, in turn, would foster forms of interpretation – of self-interpretation, and of interpretation of other human beings – that might have an impact on the very nature of subjectivity and selfhood in our age.

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# Laudatio C. Hein

**P. Uyttenhove**

Our university, our department, is pleased to honor Carola Hein today. Carola Hein is Full Professor and holds the Chair of History of Architecture and Urban Planning at Delft University of Technology.

She was previously Professor at the Growth and Structure of Cities Department at Bryn Mawr College (1999-2016) in the US. In 1998-99 Carola Hein has been lecturing at Tokyo Science University, Tsukuba University and the Tomin College of Toritsu University, and at Kogakuin University and Tokyo Science University. She has published numerous articles in peer-reviewed journals, books, and magazines. She is currently directing several doctoral theses at TU Delft and is involved in multiple research and editorial networks. Since many years, she has been building up a stable fundament of academic work combined with a vision on what that academic work should comprehend. There is at present no scholar in the history of urbanism and planning better placed to be awarded the precious Sarton Medal than Carola Hein. This choice is based on her excellent international academic reputation and long, meritorious list of books and articles, conference papers, awards, civil service and managerial responsibilities. To give an overview of her career would be almost impossible in the scope of this laudatory speech.

The choice for Carola Hein has another meaning than dictated by the norms of purely quantitative assessments of academic careers as is now often the case. It wants to acknowledge three main aspects of Carola's work: her international, or better, transnational dimension, her vision on research, and her – what could be called – trans-historical action. For Carola Hein, historical questions don't stop at the regional or national border, neither do the scholar's mind, thought and work. The historian has to reach out to other

cultural and social circumstances, experience different conditions, study specific situations. This has nothing to do with superficial internationalism or academic globetrotting. For Carola Hein, the historian, simultaneously, looks deep into the roots of historical questions and sees wide over all their ramifications. This needs spending time in local research in libraries, archives and interviews, but doing also comparative studies on other cases, on external interactions and on the theoretical aspects of the problem. It characterizes excellent scholars like Carola to have a universal attitude and, at the same time, an open-minded attention for differences and alternative situations. In the development of what is now called “the transnational turn in urban history”, Carola Hein occupies an important place.

Look at Carola’s own academic itinerary. Born and educated as an architect in Hamburg, she did research on the city’s reconstruction after it was terribly bombed at the end of the Second World War. She went then living and working in other cities like Berlin, Tokyo and Brussels. Postwar reconstruction became one of her recurrent topics. In Japan, Hiroshima’s reconstruction and its memorial by Kenzo Tange became one of her particular points of interest. With Diefendorf and Ishida, she edited also *Rebuilding Urban Japan after 1945* (2003), one of the first books about the reconstruction of Japan’s bombed cities after World War II and established in this research a link between German prewar urban planning concepts in Japan and its reconstruction. In the wake of this important work, she and Philippe Pelletier edited a book on *Cities, Autonomy and Decentralisation in Japan* (2006).

With the subject of capital cities, Carola was one of the first to open a field of in-depth and comparative historical analysis of the planning of capitals (national and supra-national). She was the main editor and author of the book *Hauptstadt Berlin 1957-58* (1991) on the well-known international urban design competition of 1957-1958. Besides many articles, she wrote two books about Brussels, capital of the European Union – *The Capital of Europe. Architecture and Urban Planning for the European Union* (2004), and *European Brussels. Whose capital? Whose city?* (2006) – and was also the editor of *Brussels: Perspectives on a European Capital* (2007) with Pierre Laconte. The urban planning history of European Brussels is seen against a background of almost illimited demolition of city fabric and loss of urban qualities.

What is more than worth noticing about the work of Carola Hein is not only how she continues to build on longstanding research. She has also the managerial capacity of team building, and, more than that, of constituting and directing large networks of scholars and researchers. As member, current vice-president and future president, she plays an important role in the International Planning History Society, founded in 1993 by Gordon Cherry and Anthony Sutcliffe in the continuation of the Planning History Group. She runs the Chair of Architectural and Urban Planning History at TU Delft.

Moreover, she edited, 2017, the fabulous *Routledge handbook of planning history*, internationally considered as a milestone for the discipline. Not only a huge undertaking, the book also means a new boost for the discipline by bringing its many different approaches and ideological differences closer to each other. I quote Carola in the introduction to this book:

“Research in planning history, including research by some of the authors of this book, has started to address the challenges of planning history writing, including the need to overcome national stories, and to go beyond empirical and narrative-driven research to develop theories. While such an approach cannot be comprehensive, this handbook at least models new global planning histories, giving insights into different approaches, geographical patterns, languages, and principles. It aims to further open up the parallel worlds of academic planning history in different disciplines, and to facilitate the emergence of collective languages, terminologies, methodologies, and theories.”

Carola Hein’s native city, Hamburg, continues in one way or another, to give her inspiration. In 2011, she publishes her book on *Port cities: dynamic landscapes and global networks*. Also, as a professor at Bryn Mawr College (Pennsylvania), she started to do research on the traces of raw materials, and in particular oil. Since then, she has developed this topic into a research on the global industrial impact of oil. From worldwide oil streams and economical flows of power and finances, to petrol stations in villages and office buildings of oil companies, from pipelines to car parkings and highways, Oil is a global actor with an overall, architectural and infrastructural impact on the design and visual culture of our cities and landscapes.

At the head of a wide international network of scholars, Carola is building up a research that looks both ways, to past and future, of the evolution of

one of the main foundations of our modern society: the petroleumscape of our civilisation. This is the third and maybe most essential reason for awarding the Sarton Medal: Carola's emphasis on the link between what already happened, and what will happen. It is her conviction that planning history has the capacity to analyze critical situations, as well as to analyze the work done by planners and architects to anticipate what will come. She thinks that this analytical tool, I quote, "should be applied more widely when thinking about contemporary and future resilience. We do not need ideological answers or engineers who engage only with future challenges; we need planners with a sense of history and historians with a sense of planning."

Dear Carola, I know you since many years as a young researcher in Hamburg. From a distance, I was able to follow your work and admiring your career. I hope, with the colleagues of our department, that the Sarton Medal will find a little place on your shelf next to your awards and fellowships of the Volkswagen Foundation, the Van Eesteren-Fluck & van Lohuizen Foundation, the Alexander von Humboldt Foundation, the Guggenheim Foundation, the Japan Society for the Promotion of Science and others.

# Oil and Water: Port city regions as nodes in the global petroleumscape

Carola Hein

## Preface

I am very honored to receive the Sarton medal. I would like to thank you for nominating me. Before I launch into the topic let me pay tribute to George Sarton to whom I feel strongly related. Sarton was a chemist and a historian. Like him, I have been trying to link science and history for the betterment of the future. He was Belgian born and left Europe. Like him, I emigrated to the United States, but unlike him, I have returned to Europe. Sarton was convinced that “The progress of each branch of science is a function of the progress of the other branches”.<sup>1</sup> Like him, I am convinced that we need transdisciplinary approaches. Sarton’s writings on New Humanism merit more attention. His ideas are as relevant today as they were a hundred years ago.

Attempts to address the current climate crisis have focused on technological solutions; they tend to ignore the power of humanist approaches and the need for systemic changes. The COVID-19 pandemic has demonstrated the potential impact of lifestyle changes. While some people are working harder than ever – think of the medical professions – others have lost their jobs and their livelihood or even died. In the absence of a medical (or technological) solution, the response by world leaders has been to impose quarantine. Within a matter of weeks, we have experienced a change in lifestyle that seemed impossible a few months ago as a response to clima-

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<sup>1</sup> George Sarton, “The New Humanism,” *Isis* 6, no. 1 (1924).

te change. Although there is yearning to go back to the way things were before the pandemic, there is also widespread acknowledgment that we have entered a new phase and should be sketching plans for a new normal.<sup>2</sup> The COVID-19 challenge can serve as a moment for authorities to rethink their attitude towards surrounding territories, their collaboration with cities and regions and their relationship with space, society and culture and to address the climate crisis. Strips of tape on floors are being used to keep people apart, but we need to create new plans and policies so that the post-pandemic society doesn't involve increased social, spatial or environmental disparities.

## Do Oil and Water Mix?

As a chemist, Sarton knew – like us – that water and oil do not mix. However, I would like to argue that in the spaces of port city regions water and oil not only mix, but that ports, cities, and regions actually thrive on that mixture. We need to acknowledge this particular historic relationship in order to go beyond oil and to design more sustainable (port) city regions. Such a development is needed in light of global urgencies – including climate change, sea level rise, migration, and the energy transition – as well as local urgencies, such as education and job creation. Politicians and planners need to carefully consider both oil and water in future scenarios. As Hurricane Harvey reminded us in 2017, land and water are not limited by clear and strong lines. When walls surrounding oil refineries and storage are breached, dirty water spills into neighborhoods. Ships carry much of the petroleum consumed globally around the world and port cities have traditionally been hubs of petroleum refining. Focusing on port cities, I explore the multitude of oil spaces--industrial, retail, administrative, infrastructural or philanthropic--and the representation of these spaces in diverse media to explain the ways in which the mix of oil and water has advanced the development of port city regions. My aim is to develop new approaches and tools to better understand the petroleum addiction that has been written into our cities and landscapes, to separate oil and water (to stay with the metaphor), and ultimately to help develop designs for a more sustainable and just future.

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<sup>2</sup> Andrew Littlejohn, "Should we return to 'Normal'?", Leiden Anthropology Blog, <https://leidenanthropologyblog.nl/articles/should-we-return-to-normal> (accessed 30 May 2020) <sup>Ramos</sup>

## So, what does a landscape of oil and water look like?

Let's start with a historic example. In the 1860s, the Atlantic Petroleum Company built petroleum installations on the Schuylkill River (Fig. 1).<sup>3</sup> These early oil storage and refining sites were located on the blue waters of the Schuylkill River amongst apple orchards, as the advertisement suggests. Four years later, the partners agreed to combine their properties and operations with Standard Oil of Ohio, while keeping the Atlantic name.<sup>4</sup> Consolidating oil transport and refining and developing its own fleet of ships, Standard Oil helped the city emerge as a key oil export centre.<sup>5</sup> In 1891, 50% of the world's illuminating fuel and 35% of all US petroleum exports came from the 360-acre Atlantic refinery.<sup>6</sup> An industrialized port city with global networks, Philadelphia offered the new industry the rail and shipping infrastructure it needed. The Schuylkill refinery continued to function until June 2019, when explosions and a larger fire brought the activity to a halt (Fig. 2).<sup>7</sup> In February 2020, the 335,000 barrel-per-day major East Coast refinery officially closed.<sup>8</sup> After 150 years, the mixing of oil and water that established the United States as one of the forerunners of the global petroleum business had come to an end in Philadelphia, but not in the rest of the country or the world.

<sup>3</sup> Gilbert Holland Montague, *The Rise and Progress of the Standard Oil Company*, New York: Harper & brothers, 1902.

<sup>4</sup> "Our Oil Trade. Petroleum the Rival of King Cotton," *Philadelphia Inquirer* (16 October 1867); John A. Jakle, *City Lights. Illuminating the American Night*, Baltimore: Johns Hopkins University Press, 2001.

<sup>5</sup> Neil McElwee, "Atlantic Refining Co.," *Oil 150*. [http://oil150.com/essays/article?article\\_id=159](http://oil150.com/essays/article?article_id=159) (accessed 30 May 2020); "Struck Oil. A Great Fire at Point Breeze," *North American* (14 June 1879), 2.

<sup>6</sup> William Mátoš, "Atlantic Refining Company," in *Philadelphia, Its Founding and Development, 1683-1908*, Philadelphia: Executive Committee in charge of the Founders' Week Celebration, 1908.

<sup>7</sup> "Philadelphia refinery fire: What we know (and what we don't)" 21 June 2019 (accessed 30 May 2020) State Impact Philadelphia; <https://stateimpact.npr.org/pennsylvania/2019/06/21/southphilly-refinery-fire-what-we-know-and-what-we-dont/>; "Old, corroded pipe led to Philadelphia refinery fire: Chemical Safety Board", *Business News*, 16 <https://www.reuters.com/article/us-pes-bankruptcy-investigation-idUSKBN1WV1TW>

<sup>8</sup> Stone, A. "After Explosion, Philadelphia Refinery to Be Permanently Shut Down." *Forbes*, 2020. <https://www.forbes.com/sites/andystone/2020/02/17/with-ample-drama-largest-east-coast-refinery-meets-its-end/#6876bc277ef7>



**THE ATLANTIC PETROLEUM STORAGE COMPANY OF PHILADELPHIA.**

The several large and commodious Warehouses and Docks on following, for the storage and enjoyment of Petroleum and its products.

It has separate and distinct Departments for Crude and Refined Oil, divided by a Electric Fence of about 300 feet in width.

Each Department has its own Warehouse and Docks. The Refined Oil Department, known as the Atlantic Petroleum Store, has four Warehouses, with a floor of 150,000 square feet, and capacity for over 50,000 barrels; also tanks of various sizes to hold oil and gas for distribution.

The Department known as the Empire Store, has seven colossal the storage capacity of the Refinery, also has Tanks with two between and work, for the storage of Crude Oil, which are perfectly fireproof.

The Docks of this Department can accommodate eight vessels.

The Company offers its piers and wharves to store Crude Oil in bulk, barrels, keels, allowing them to come Yards for the storage of said Crude Oil.

The Property of the Company consists of seventy acres of ground situated on the Schuylkill River, (near its mouth), and is directly connected with the Delaware and the Old English of the West, by the Pennsylvania Canal, and Philadelphia and New Brunswick, and Oil can and to be removed from the River and it is subject to loading from railroad depots in Warehouse, and also to heavy tankers, the capacity of four or five days in the sea, lying at the wharves, loading wharves situated in Warehouse.

The various Property of the Company allows them to separate their Warehouses, Tanks and Docks so that in case of fire to any one part, the balance would be unharmed.

The large experience of these having charge of the business of the Company, warrants its proposition to those who favor it with their patronage, the greatest care and attention to their interests.

The Office of the Company is located at No. 115 Walnut Street, and is connected by Telegraph with the houses, which are situated at West Chester, on the Schuylkill River.

Warehouse: Point Breeze | PHILADELPHIA.  
Office: 115 Walnut Street

**BOARD OF DIRECTORS, 1866.**

JAMES A. WRIGHT,  
WM. G. WARDEN,  
ELIAS D. KENNEDY,  
JAMES A. HUTCHINSON,  
JAMES W. FEE,  
EDWARD H. BENKER.

**OFFICERS, 1866.**

JAMES A. WRIGHT, *President.*  
THORNTON PYLE, *Treasurer.*  
ELIUS ROBERTS, *Secretary.*  
JOHN H. DEHL, *Collector Second District.*  
CHARLES F. DAVIS, *Governor Second District.*  
WM. G. WARDEN, *Superintendent.*

Figure 1: The Atlantic Refinery on the Schuylkill River depicted as an idyllic location next to apple yards, *Atlantic Petroleum Storage Company Advertisement, 1866. Library Company of Philadelphia.*



Figure 2: Philadelphia's oil refineries in photograph by Carol M. Highsmith taken from the Passyunk Street Bridge between 1980 and 2000. Library of Congress. <https://lcnc.loc.gov/2011630489>

## Why does petroleum refining need water?

Oil and ships have long been intimately connected, in the early years by way of river transportation and later by ocean. Refining technology has evolved, but the principles of refining remain the same. Crude petroleum is heated to be transformed into benzine, gasoline and other products. Because water is essential for the process, refineries have often been located near rivers. Access to water is also needed to facilitate the transport of petroleum and its products, especially between continents. In the 1860s, at the beginning of petroleum extraction in Western Pennsylvania, barges carried oil down Oil Creek and the Allegheny River to Pittsburgh refineries and consumers.<sup>9</sup> While these early barges were quickly replaced by rail transportation, water transport still remained less expensive on the Great Lakes. Seafaring ships carried petroleum in barrels along the coasts and across the oceans. Standard Oil, selling kerosene for lamps in China as early as the 1890s, owned its own fleet of ships. This fleet also carried oil from Philadelphia to Shanghai and other treaty ports in Asia.<sup>10</sup> Refineries needed rivers for industrial processes, for cooling and washing, for dumping unwanted products, and as a supply of drinking water for its employees.<sup>11</sup> Proximity to the port, as the transition point between water- and land-based infrastructure, contributed to the location of oil refineries.<sup>12</sup> Water infrastructure therefore became a key component of the early petroleum infrastructure, if not the defining framework.

In 1868 the Belmont Petroleum Refinery, owned by Newhouse Nusbaum & Company, one of the first documented refineries in Philadelphia, produced some 2 million gallons of refined products. The map of the Belmont refinery illustrates how the industry functioned (Fig. 3). Crude oil was stored in large tanks (14) at the back of the lot near the “Factories Railway” – indicating the presence of an industrial cluster along the Philadelphia and Reading Railroad. It was then brought to the Still House, a stone house

<sup>9</sup> “Barge, rail and truck, Petroleum Panorama,” *Oil & Gas Journal* 57, no.5 (1959): 652.

<sup>10</sup> Frank Hamilton Taylor and Wilfred Harvey Schoff, *The Port and City of Philadelphia* (Philadelphia: International Congress of Navigation, 1912) and Sherman Cochran, *Encountering Chinese Networks: Western, Japanese, and Chinese Corporations in China, 1880-1937* (Berkeley: University of California Press, 2000), 12-43.

<sup>11</sup> Christopher Sellers, “Petropolis and Environmental Protest in Cross-National Perspective: Beaumont–Port Arthur, Texas, versus Minatitlan–Coatzacoalcos, Veracruz,” *Journal of American History* 99 (2012): 111-123.

<sup>12</sup> Carola Hein, “Between Oil and Water: The Logistical Petroleumscape,” in *The Petropolis of Tomorrow*, ed. Neeraj Bhatia and Mary Casper (New York: Actar / Architecture at Rice, 2013).

with iron doors and shutters containing a steam boiler (1). Here, the crude petroleum was heated. Next to the Still House were the cooling tubs (2) and the receiving tanks (4) as well as the receiving house for the petroleum products (3). The receiving house was connected to the river by a water pipe and to the engine and treating houses (5/6) through an underground steam pipe. The cooper shop (7), where workers made barrels, was in the middle of the lot. Storehouses for residuum (13), a tar-like material, benzene (12) later used as a component in gasoline, and a bonded warehouse – a secure space in which goods were cleared for export (or stored) until custom duties were paid – (11) stood alongside the railway. Along the river was an office with a garden, housing for operatives, and a stable (8/9). The problematic intersection between oil and water was critically visible in the story of the Belmont refinery. Because it was located upstream from the city water works, city officials feared for the quality of the drinking water. Together with other mills and industrial enterprises, the refinery eventually closed, and the city bought the land for what would become Fairmount Park, the largest municipal park in Philadelphia.

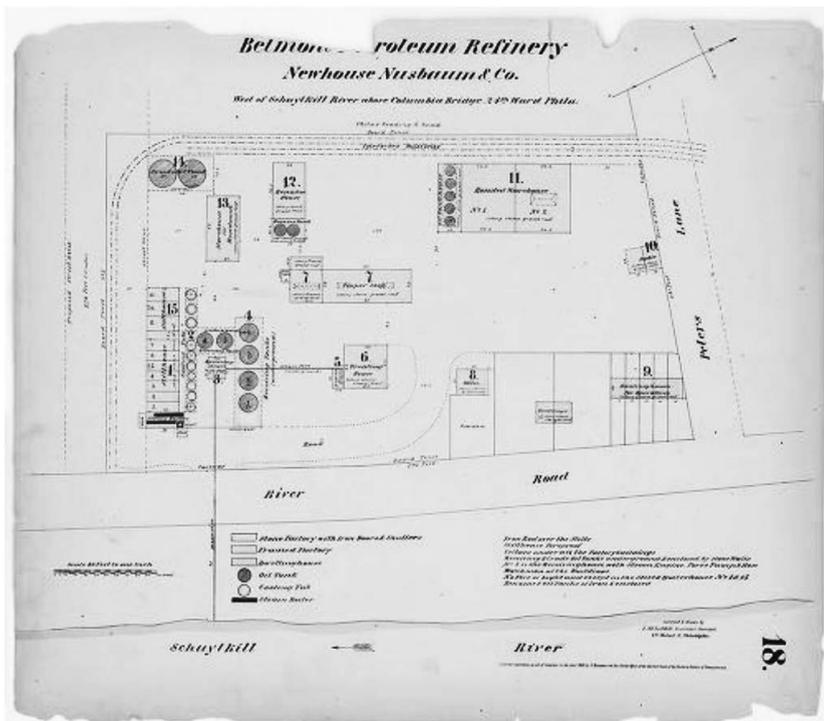


Figure 3: Plan of the Belmont Petroleum Refinery in 1866,

The closure of the Belmont refinery is typical of the early period of oil, when the interplay of oil ownership, transportation opportunities, refining capacity, and the promise of great profits made the oil trade a complex, quickly changing, and very competitive business. Producers, refiners, shippers and merchants tried to figure out the new products' characteristics and municipalities issued new fire and land regulations. Petroleum extraction sites have historically been located far from sites of consumption. Major oil companies have sited refineries in line with their shipping fleet and the availability of rail, road or pipeline networks and in agreement or collaboration with the national or local authorities that control infrastructural development, environmental regulation, spatial planning, and utilities on and around the site. Financially and spatially, refineries are the most important hubs in the global network of petroleum. They are huge, long-term investments that guide global flows.

Refinery locations (and often installations) have weathered considerable change. There have been periods when war destroyed refineries or nationalization changed their ownership, when oil companies reinvented themselves, with the emergence of the car for example, or when people figured out how to produce a multitude of other products from oil. Some countries that hosted early production sites have nationalized refineries built by foreigners. Though ownership changed and refineries became inaccessible to European or American players, the installations themselves have continued to function and to serve clients worldwide via shipping. Over time these refineries would even redirect global shipping. Once, refineries had found the most appropriate locations in proximity to a source of water for industrial use and shipping water, they were there to stay: As the international professional services company Ernst and Young stated: "Old Refineries Rarely Die."<sup>13</sup> Their closure is thus not just a local decision, but one that depends on global flows and that has repercussions in the region and beyond.

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<sup>13</sup> "“Old Refineries Rarely Die”: Port City Refineries as Key Nodes in the Global Petroleumscape,” *Canadian Journal of History/Annales canadiennes d’histoire (CJH/ACH)* 55, no. 3 (2018).

## How do port city regions and their mixture of oil and water exemplify planetary urbanization?

Conceptualizing the ways petroleum has shaped various architectural and urban spaces and in fact entire landscapes helps us understand the role of port city regions as places at the edge of sea and land and the relationship between oil and water.<sup>14</sup> The transformation of cities and landscapes in the wake of the petroleum revolution is also a unique expression of planetary urbanization as conceptualized by the American urban theorist Neil Brenner and the Swiss sociologist Christian Schmid.<sup>15</sup> Petroleum flows encompass the entire world. Constellations of oil actors – including corporations and nations – shape seemingly disconnected and geographically distant physical spaces over time. Together, they function as a *global palimpsestic petroleumscape*, a term I coined to capture how the petroleum industry’s physical structures and imaginaries are interconnected and how they have impacted the built environment (Fig. 4).<sup>16</sup> The spaces of petroleum have spread through cities and landscapes globally; as hubs of petroleum shipping and refining, port city regions are a key node in the petroleumscape and core actors in planetary urbanization. The reliance on shipping as well as the extraction of petroleum from the sea bottom shows that the petroleumscape exists on a sea-land continuum. In fact, it is intimately linked to the sea, a connection that is only starting to be fully appreciated.<sup>17</sup>

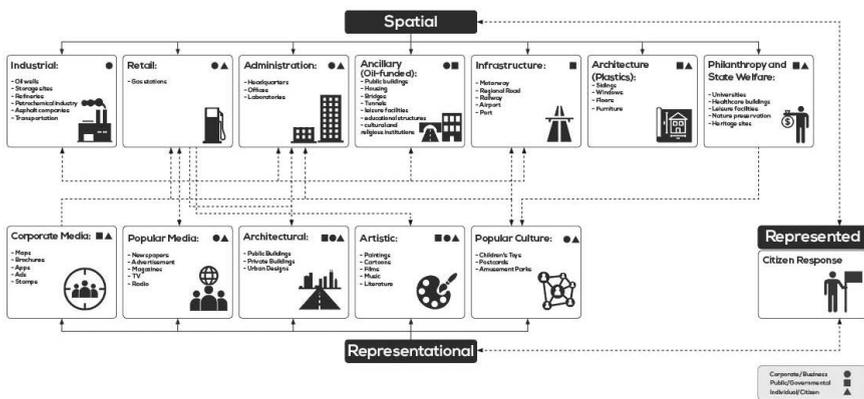
<sup>14</sup> Carola Hein, “Analyzing the Palimpsestic Petroleumscape of Rotterdam,” *Global Urban History Blog* (2016), <https://globalurbanhistory.com/2016/09/28/analyzing-the-palimpsestic-petroleumscape-of-rotterdam/> (accessed 30 May 2020); “Port Cities: Nodes in the Global Petroleumscape between Sea and Land,” *Technosphere Magazine* (2017); <https://technosphere-magazine.hkw.de/p/Port-Cities-Nodes-in-the-Global-Petroleumscape-between-Sea-and-Land-mpc8kjkvtvGaTxxDq3tfvF7> (accessed 30 May 2020); “Between Oil and Water. The Logistical Petroleumscape,” in *The Petropolis of Tomorrow*, eds. Neeraj Bhatia and Mary Casper (New York: Actar/Architecture at Rice, 2013): 436-447; “Global Landscapes of Oil,” *New Geographies* 2 (2009): 33-42; Carola Hein and Mohamad Sedighi, “Iran’s Global Petroleumscape: The Role of Oil in Shaping Khuzestan and Tehran,” *Architecture Theory Review* 21.3 (2017): 349-374; Carola Hein, “Oil Spaces: The Global Petroleumscape in the Rotterdam/the Hague Area,” *Journal of Urban History* 44.5 (2018): 887–929.

<sup>15</sup> “Neil Brenner and Christian Schmid (2015) Towards a New Epistemology of the Urban? City 19/2-3, 151-82.”; Neil Brenner and Christian Schmid. “Planetary Urbanization.” In *Urban Constellations*, edited by Matthew Gandy. Berlin: Jovis, 2011.

<sup>16</sup> Carola Hein, “Oil Spaces: The Global Petroleumscape in the Rotterdam/the Hague Area,” *Journal of Urban History!*, no. 43 (2018): 887–929.

<sup>17</sup> Nancy Couling, “The Urbanization of the Ocean: Extractive Geometries in the Barents Sea,” in *Infrastructure Space*, ed. Ilke Ruby and Andreas Ruby (Berlin: Ruby Press, 2017); Nancy Couling and Carola Hein, “Blankness: The Architectural Void of North Sea Energy Logistics,” *Footprint*, no. 23 (2018): 87-104

The global petroleumscape has many functional layers with different spatial qualities. The petroleum industry divides the layers into upstream, midstream and downstream, with refineries in the last category. The *upstream* sector includes oil prospecting and extraction. Its sites are often in rural areas or places that are difficult to access. The *midstream* sector includes the road, rail, and pipeline infrastructure that transports petroleum and its products to and from refineries, often on a global scale. The *downstream* sector includes oil refining and processing as well as marketing and some midstream activities, all of which are important in distributing oil products to consumers. Each of these sectors has similar functions and typologies (style, location, or architectural form) and they interconnect to form a single landscape. The concept of the petroleumscape starts with the recognition that the diverse spatial emanations of oil – including refineries and storage sites, office buildings and gas stations – are connected through their relation to this single commodity and its group of industrial players. Connecting the actual built structures of oil with representations of these spaces and the practices related to petroleum products reveals how oil shapes behaviors and secures continuous production and expansion of its spaces, thus creating a feedback loop.



**Figure 4: The hybrid, multiple, shifting, and uneven ways in which many actors collaborate to create the global petroleumscape. Source: Carola Hein**

The expansive growth of the petroleum industry and its multitude of products – from lighting oil to fuel and plastics – has relied heavily on buy-in from the general public, who have come to rely on the benefits of cheap energy for travel and heating, or of easy-to-use building materials for citizens of different classes, races, cultures, genders, and ages around the

world. The petroleum industry has carefully promoted the benefits of petroleum products and has developed new uses. Evolving imaginaries have helped reinforce widespread citizen buy-in, creating an energy culture that supports the spatial presence of the industry and has further increased consumption in everyday life. People around the world have embraced the multitude of new petroleum spaces that are served by the refineries, but that are rarely considered as a network.

## What are the spaces that are served by the industrial petroleumscape?

The refineries are the backbone of the petroleumscape. They serve other structures that are more accessible to the consumer. In everyday life, gas stations are the most visible structure that is clearly part of the petroleumscape. In the early years, they were friendly, small places, often with diverse services that allowed people with money and time to travel freely. These structures have taken on very different forms through time and space. They can be vernacular or designed, free-standing or part of a supermarket. But, in all these guises they are the places where the handshake with the consumer occurs. Since their emergence in parallel with the spread of the car as a key mode of transport, they have become more recognizable, highly branded. They are part of the everyday, as nearly everyone has been to gas stations, has memories of gas stations of the past, and associates them with various kinds of encounters and transactions. They serve both land and sea, and gas stations are even located on floating structures that cater to boats (Fig. 5, 6)

Perhaps less recognizable than gas stations, but often even more prominent within a particular locale are *petroleum headquarters*. They are often designed by prominent local architects, in line with the predominant taste in corporate or public architecture. These iconic buildings, such as the former Exxon/Esso headquarters in The Hague (now Spaces) (Fig. 7), are often located next to government ministries, designed in a style typical of its time and similar to that of key administrative buildings nearby.

From these places entire commodity chains are run. Decisions taken in New York, London, or The Hague can change the form of hinterlands, coastlines and cities or change global (maritime) geographies. The SS Murex, for



Figure 5: Gas station in Tokyo 2016 (Carola Hein).

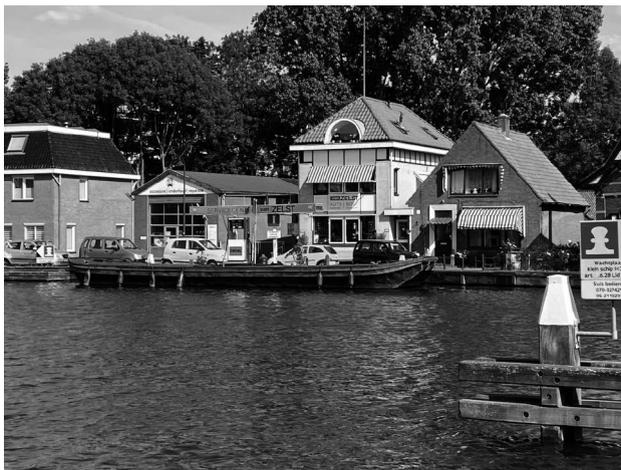


Figure 6: Gas station for ships installed on a boat near Leidschendam 2020 (Carola Hein)

example, was the first oil tanker to cross the Suez Canal (completed in 1869) in 1892. By using the Suez Canal, Shell was able to compete with the Rothschilds, who were transporting petroleum by train from Russia, and with Standard Oil, who sent their petroleum in barrels around the world.<sup>18</sup> The tanker was built by the Samuel brothers, whose Shell Transport and Trading Company joined the Royal Dutch Petroleum Company to create Royal Dutch Shell, one of the leading petroleum companies today.

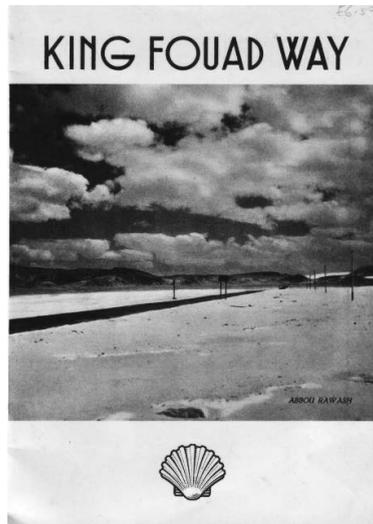
The petroleumscape serves the needs of the oil companies, who decide what type of spaces they should build to advance their business. This can involve networks of pipelines and streets or entire cities. The history of Shell in Egypt stands as an example. Shell's interest advanced the construction of the port city of Suez and the creation of what was once the biggest refinery in the world. A report from 1920 underscores the Shell company's importance for the region. It mentions a number of companies involved in the functioning of the refinery complex, which then covered some 25 hectares and provided storage of 40.000 tons of crude and refined



**Figure 7: The former Exxon headquarter in The Hague nicknamed the Red Elephant, Source: Roel Wijnants**

<sup>18</sup> Carola Hein, "Suez et la route du pétrole (Also in Arabic)," in *Suez*, ed. Claudine Piatone (Cairo: Institut Francais d'Archeologie orientale (IFAo), 2011).

products. The production and refining of oil was also closely related to water, as the Compagnie du Canal delivered water and received fuel to make its installations work. Shell's strategy involved sales of asphalt and the refining of heavy petroleum – including for construction purposes. During the Second World War, the company built airfields in Egypt as well as streets such as the King Fouad Way (Cairo-Alexandria Desert Road) that links Cairo to Alexandria. These streets are built with bitumen from Egypt, allowing the company to make use of a petroleum product with little market value.<sup>19</sup>

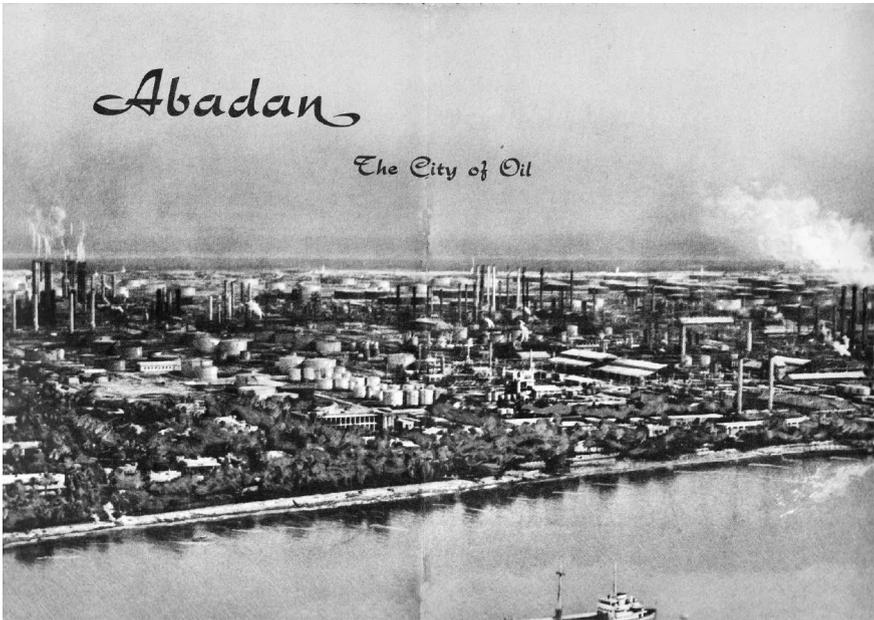


**Figure 8: King Fouad Way (Cairo-Alexandria Desert Road) An advertisement pamphlet, dating probably from 1940, underlines the safety of this new route, built according to the Shell methods**

If and when necessary for the functioning of the petroleum industry, the major companies built entire cities. The city of Abadan in Southern Iran is one example. When oil was found in Southern Iran, a complete infrastructure of streets and pipelines had to be established. The initial housing for workers was not sufficient for the long term. Consequently, the Anglo-Persian Oil Company (later BP) designed Abadan, a company town between 1910 and 1951. Along with the necessary technologies for exploiting petroleum, oil companies brought into their countries of operation architectural and urban concepts such as the garden city, intended to address

<sup>19</sup> Company, S. O. P., *King Fouad Way: Cairo-Alexandria Desert Road*. Egypt / Cairo: Al Hilal, n.d.1940s, p. 18.

social and ethnic anxieties by setting up housing districts that separated expatriates from local workers. Colonial social structures were inscribed into urban form by combining spacious compounds for British expatriate workers with barrack-like huts for locally recruited workers, as well as a locally administered town for nationals. Extracting oil from the Iranian desert as well as building a refinery and a new city required extensive infrastructure construction and drove the development of this city at the border of land and sea.



**Figure 9: Postcard of Abadan showing the refinery in the middle of housing estates**

The petroleumscape has constantly evolved. The industry depended on chemical innovation to find new uses for petroleum and to expand its global network. Beginning with the invention of synthetic polymer-based plastics at the beginning of the 20<sup>th</sup> century, designers and architects were intrigued by their possibilities for building. Initially, the uses they envisioned ranged from the small scale – light switches and furniture – to whole elements – windows and walls. But after the Second World War, architects, in alliance with chemical companies, searched for new functions and consumers. Chemical companies envisioned a profitable use for their products. Experimentation in all-plastic houses peaked in the late 1950s and early 1960s. Probably the most famous of these was the “House of the Future”

designed by the MIT architects Marvin Goody and Richard Hamilton and sponsored by the chemical company Monsanto. Its location in Disneyland California guaranteed that it was seen by millions of visitors. Opened in 1957, the powerful collaboration of research, construction and design, MIT architects, the Monsanto Chemical Company, and Disneyland inaugurated a visionary plastic house of the future with novel forms and technologies in Anaheim that was marketed to millions of visitors as part of a modern lifestyle: clean, functional, and fun. The rapidly growing plastics industry fueled petroleum extraction, shipping and refining.

## **How did the growth of the petroleum infrastructure affect the imaginary, particularly in port cities?**

Petroleum storage and refining changed the ports and cities where it took place, inspiring artists to create new depictions. Importing and then refining crude oil locally was cheaper and more efficient than bringing in refined products. In the late 19<sup>th</sup> and early 20<sup>th</sup> century, several oil-related sites opened in Dunkirk. Companies represented these changes as great achievements, important enough to be documented in monumental paintings. Pride in oil storage and handling seems to have inspired a large painting of Dunkirk that documents the emerging material petroleumscape (Fig. 10). Viewing the city from the sea, this anonymous work dated between 1923 and 1930 puts port activity at center stage. Former fortifications have been made into large green zones separating the old city from its rural surroundings. This green belt appears ready to be populated with (industrial) activities: multiple oil storage tanks visible on both sides of the river give a first impression of a new industrial future after World War I. The painter shows the tanks lit by the sun, and the new structures are gleaming white in the front-right portion of the image. That vision of Dunkirk's future would almost immediately transpire with the development of large refineries and storage sites.



**Figure 10: Painting of Dunkirk with petroleum storage tanks, Source: Studio Mallevaey - Collection Musée portuaire - Dunkerque**

Apart from some celebratory images of the ways in which oil has transformed the environment, oil and water are not usually apparent in architectural, artistic or corporate discourse. Several famous architects made design visions that promoted the oil industry. The famous project for the Cité Voisin by Le Corbusier was sponsored by a car manufacturer. Cars were also a key feature in Frank Lloyd Wright's Broadacre city. The most striking connection between oil, cars and city planning was the City of the Future project for the 1939 World's Fair in New York. It resulted from a collaboration between General Motors, designer Norman Bel Geddes, and Shell Oil, who used the imagery for advertisement purposes. It featured a modern city of highways and skyscrapers. The exhibit went on to inspire planners in shaping real cities and encouraged citizens to imagine how to live in the second part of the 20<sup>th</sup> century. At the same time, the petroleum industry, along with other private and public players, was lobbying for oil-friendly public policies like subsidies for highways and against public transit. Together with the heavily promoted desire for the single-family home--and in US federal mortgage deals for veterans in the postwar period--these were a recipe for increased driving and suburban sprawl.

The impact of *popular media* merits further investigation, forming part of the representational layer of the petroleumscape. Think of children's toys produced without direct collaboration of the oil companies: a puzzle featuring an oil refinery, a toy car with the Esso logo, a Lego car handed out at the Shell gas station, or plastic Barbie houses that might eventually inspire their owners to choose plastic window frames, furniture, or floor

coverings. Such objects promote the recognition of oil buildings, logos, and colors from an early age, preparing children for an oil world, albeit without displaying the oil and shipping flows that drive it.

Philanthropy similarly lacks a visual connection to the industrial landscape of oil, but investments in heritage, education, or culture effectively helped the global flows of oil. In parallel with their commercial ventures but consciously and carefully separated from the Standard Oil/Exxon name, the Rockefeller family, for example, made architectural gifts to educational, health and cultural institutions and supported natural and historical sites in key locations, establishing their philanthropic footprint in their headquarters city New York, but also throughout the United States and effectively the world. Their gifts promoted societal transformation and constructed a cultural modernity through physical spaces and carefully build mindscapes in tune with the oil-based transformation of cities and landscapes around the world.

One example of these investments is Colonial Williamsburg. Beginning in 1926, the preservation and restoration of Colonial Williamsburg as a major piece of American identity, funded by John D. Rockefeller Jr., fit nicely in that development (Fig. 11). The Rockefellers did not turn to historic American places such as Pithole or Titusville, which were originally created by the oil industry and lost their income after oil and money had been drained, or to the refinery hubs such as Philadelphia – itself a former colonial city. That part of the celebration and cleanup of the oil industry was left to the public sector or to local initiatives. Instead Rockefeller claimed a national heritage site on which to build the family story. The presentation of Williamsburg played up the destruction of the landscape that had already occurred. A statement entitled “Saving Williamsburg for Posterity” argued “In our headless haste towards the future we have only left a few buildings standing, and we have waited for this our swiftest-moving stage of progress the age of the airplane and the radio, to wake up to a lively sense of the importance of keeping what we still have and of making the remnant count to the utmost, so to compensate for what our neglect has allowed to be destroyed.”<sup>20</sup> There was no acknowledgement that the destruction of Williamsburg was effectively a result of the petroleum-fueled transformation.

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<sup>20</sup> Office of the Messrs. Rockefeller Records, Cultural Interests, Series E (FA 314), Rockefeller Family, III 2E, 159, 138a, Williamsburg 2, Rockefeller Archives.



**Figure 11: The governor's palace in Williamsburg in 1944, reconstructed and restored to its original state by John D. Rockefeller, Jr. during the 1930s. Source: Farm Security Administration - Office of War Information photograph collection (Library of Congress), <https://www.loc.gov/pictures/item/2017852033/>**

While petroleum-fueled cars took over cities and landscapes in the United States and elsewhere, there are no cars in the Williamsburg picture, instead the town celebrated the horse cart. There, it appeared important to preserve the traditional character of the town and to invest in the construction of the Colonial Parkway that passes underneath the historic city and connects it to the larger region. The transformation of the region through the Colonial Parkway was carefully orchestrated by national agencies (e.g., the Department of the Interior) in collaboration with John D., who was personally engaged in the project of connecting Williamsburg to its surroundings. Perry, Shaw & Hepburn architects designed the tunnel entries,<sup>21</sup> and Rockefeller personally stayed involved in the design and construction discussion of the tunnel. In 1941 Williamsburg was advertised as “a real contribution to the people of the country in this troubled time” and an antidote to Un-Ameri-

<sup>21</sup> Extract from Meeting of Special Committee on Proposed Lodge and Cottages at Williamsburg (sic), September 29, 1937, Colonial Williamsburg, Colonial National Monument, Parkway, 1937-1939, Rockefeller Archives.

canism.<sup>22</sup> The family that had developed one of the largest oil companies in the world, shipping over all seas, celebrated itself as the saviour of real America.

A similar attitude is evident in more recent attempts to inscribe former oil buildings in our future heritage. As some oil sources dry up and others are abandoned, many of the early structures of oil exploitation have become obsolete and are given new roles. Converted into museums, tourist attractions, or public parks, former drilling sites stand as memorials to the industry, its artifacts, and its technologies. The Oil Museum of East Texas, financed by the Placid Oil Company, recreates the region's 1930s heyday and celebrates its icons. Opened in 1999, the Stavanger Oil Museum by Lunde & Løfvset reflects images of drilling platforms to petroleum storage tanks facing the sea. It houses an exhibit on the history of oil exploitation in Norway, and functions as an educational site about current drilling in the North Sea. More recently, the redevelopment of former petroleum sites, including ones in the sea, has emerged as a theme for planners and politicians. The city of Ekofisk, on the Norwegian continental shelf, has received heritage status.<sup>23</sup> Gigantic rigs in the Gulf of Mexico and in the North Sea are being envisioned as hotels, windmills, and artificial reefs. The sea as part of the petroleumscape is being celebrated through heritage structures.

## **How does the development of the Dutch Randstad reflect the interaction of water and oil?**

A specific example of the historic expansion of the petroleumscape at the intersection of sea and land is the growth of the port and city of Rotterdam and its hinterland. Rotterdam is the biggest port in Europe with latest technologies and other specificities that are not quite the same in other regions. Nonetheless, the story of the Dutch Randstad exemplifies the ways in which oil has transformed port city regions. Here and in other cities around the world, regional development has effectively been floating on oil.

A series of analytical maps highlights how water and oil have shaped the Rotterdam port city region. They show the various phases in which

<sup>22</sup> Office of the Messrs. Rockefeller Records, Cultural Interests, Series E (FA 314), Rockefeller Family, Colonial Williamsburg, Publicity 1954-56, Rockefeller Archives.

<sup>23</sup> Industrial Heritage Ekofisk, <https://ekofisk.industriminne.no/en/home/> (accessed 30.5.2020)

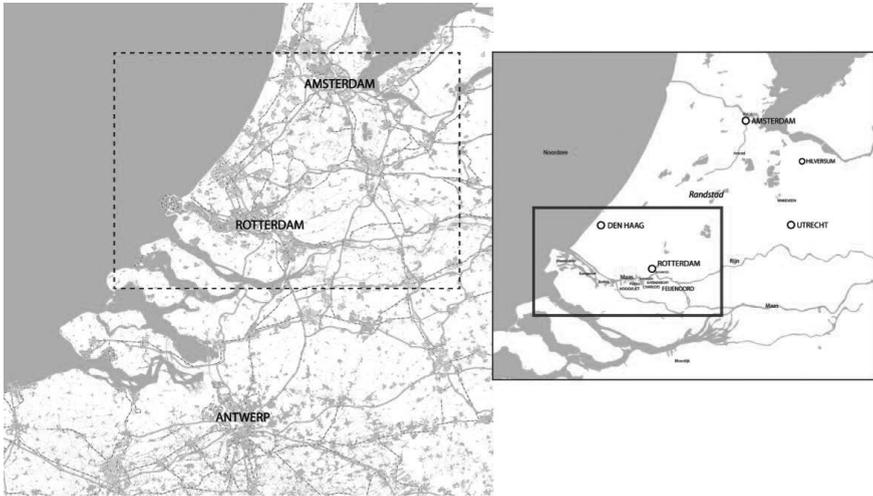
the industrial, infrastructural, administrative, retail, and ancillary spaces (which comprise the spatial layer of the petroleumscape) have grown in the era of the car, specifically comparing 1910, 1940, 1970 and 2000. (Fig. 12-16) Progressing in steps of 30 years - examining the end of the lighting oil period, the early years of car development up to World War II, the postwar period, and recent decades in which criticism of oil has started to gain ground. As the series of maps shows, from the earliest locations in the city to the tip of the Maasvlakte extension of the 1970s, petroleum refining, storage, and transportation have occupied enormous spaces in the port. The growth of the port did not occur in a vacuum. It was closely linked to petroleum-fueled developments in other parts of the region, notably the construction of administrative and research buildings, retail, and infrastructure.

The analytical map of the city of Rotterdam from 1862-1910 illustrates how petroleum storage shifted from its initial location in the city towards the south side of the river and then westward, right as the city constructed new ports and otherwise expanded. The new ports were carefully situated in the plans for a new shipping lane, with improved access to the North Sea and new railway connections to the German hinterland. Finding a place for petroleum storage was one goal; making sure that it could be transported to and from the port was another, and one that required collaboration among various partners. The construction of water, rail, and road infrastructure at the national scale and the extension of the city borders became key factors in the development of the Rotterdam port, and in turn they facilitated the petroleum trade.<sup>24</sup> The opening of the shipping canal, the Nieuwe Waterweg, connected Rotterdam directly to the North Sea in 1872. It improved the competitive position of the city as it facilitated access for the growing number of steamships that transported petroleum. The construction of railway lines to the border – lines that would also come to serve the oil industry – was a second step.

The quick growth of the petroleum trade and the need for dedicated facilities flowed from a close collaboration between elite merchants and the municipality and solidified relationships between them. The Willemsbrug over the Maas opened in 1878, providing a better link between city and

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<sup>24</sup> Carola Hein and Paul van der Laar. "The Separation of Ports from Cities: The Case of Rotterdam, Springer." In *European Port Cities in Transition*, edited by Angela Carpenter and Rodrigo Lorenzo, 265-86: Springer, 2020.



**Figure 12-16: The ARA area and the growth of the petroleumscapes in four periods, 1910, 1940, 1970, and 2000; (Carola Hein, Arnaud de Waijer, Otto Diesfeldt, Iskandar Pané)**





port and also to Belgium and Antwerp. The construction of new infrastructure and growth of the city created the foundation for Rotterdam's development as an oil node just as new global players in oil entered the European market. At the end of the 19<sup>th</sup> century, these players were interested in Rotterdam port as a transit point for oil headed for rapidly industrializing areas in Western Germany. The American companies' advances in shipping, transportation, and refinement, as well as the advent of major companies that gained control of the entire production and distribution chain, had by that time extensively reshaped the port and the oil business. Their interests connected various parts of the world through their commodity flows, putting their imprint also on the Randstad.

If demand for lighting oil established Rotterdam as a major oil port, the rapidly growing new demand for benzene as a car fuel triggered its explosive growth. Petroleum companies selected sites as needed for their own purposes; promoting business and influencing decision-makers necessitated a location and buildings different from the ones dedicated to the industry, and retail needed yet other spaces. The choice of The Hague for its headquarters, rather than one of the port cities, initiated the growth of a spatial cluster in which industrial and administrative interests collaborated.

The multinational setup of companies such as Royal Dutch Shell required close contact between the different headquarters in the Netherlands and the United Kingdom and also had an impact on travel connections. In parallel with the infrastructure created for oil itself, newly emerging aerial connections facilitated the travel of decision-makers among different sites and facilities. In 1920, the Waalhaven Airport opened in the Rotterdam port next to the oil facilities and allowed companies to bring in executives from abroad as the oil trade expanded. The first and second dedicated oil ports were inaugurated in Pernis in 1933 and 1942, carrying petroleum to the Shell refinery there.<sup>25</sup> Connection between Rotterdam and the harbor on the south side of the river Maas remained a problem until the construction of the Maastunnel between 1938 and 1942. Among other benefits, the tunnel provided better access for the additional workforce required for activities related to the oil industry.

Pre-war development of oil infrastructures in the port and the capital city had a major impact on the post-war rebuilding of bombed-out Rotterdam. The port city's leading role in petroleum storage and refining made it a target in the Second World War. The German military bombed the storage tanks, and the Allies destroyed the remaining tanks to keep the German enemy from getting their hands on the oil.<sup>26</sup> Despite extensive destruction, taking advantage of its existing networks, the port rapidly returned to its leading position after the war.

As production centres shifted in the postwar era, existing industrial oil structures in the port of Rotterdam helped maintain the continuity of oil transportation and transformation. In the early 1960s, with decolonization taking place in Asia and Africa, most of the oil started coming from the Middle East; the US lost its status as primary oil supplier, and oil companies (and their home countries) lost access to oil resources.<sup>27</sup> Growing petroleum demand in the post-war period brought new opportunities to Rotterdam, which positioned itself as a major import centre, initiating new oil port construction in Botlek (1954-60), Europoort (1958-64) and Maasvlakte I (1965-74).

<sup>25</sup> Ferry de Goey, *Comparative Port History of Rotterdam and Antwerp (1880-2000): Competition, Cargo and Costs*, (Amsterdam 2004); Reginald Loyen, Erik Buyst, and Greta Devos. *Struggling for Leadership: Antwerp-Rotterdam Port Competition between 1870-2000*. Berlin: Springer Science, 2002.

<sup>26</sup> "125 Jaar Pakhuismeesteren 1818-1943," (1943). H. Gabriëls, *Koninklijke Olie: De Eerste Honderd Jaar 1890-1990* (Den Haag: Shell, 1990.)

<sup>27</sup> C. Boer and M. de Bauer, *Energie*, Shell Nederland (1981).

The postwar growth of the port coincided with the expansion of cities of the Randstad, the development of the Dutch highway network in conjunction with the construction of new gas stations alongside them. The oil crises of the 1970s, when major industrial countries faced oil shortages, could have challenged the prominent role of petroleum actors in shaping the built environment. Car-free Sundays in the Netherlands allowed citizens to reclaim highways. But the memory of the public was short, and few long-lasting changes occurred. By that time, Rotterdam was firmly established as a leading oil port, particularly important for serving consumers in the German hinterland. Refineries continued to grow, but that growth is visible only through dedicated mapping. The pipeline network that links Rotterdam with Antwerp (where the big ships can no longer gain access) and where the petrochemical industry needs petroleum) and with Germany is largely out of sight. The oil companies share other parts of the infrastructure, such as important rail and highway networks, with general users, who do not easily recognize them as part of oil networks. Today, with refinery closures looming in North Western Europe, scholars of the Clingendael Institute expect that the refineries of the Rotterdam and Antwerp port will be among the last ones standing.<sup>28</sup> This means that both ports and their cities have to find a new strategy.

The example of Rotterdam underscores how port cities have been key nodes at the intersection of water and land during transitions past and present. The development of Rotterdam shows a certain path dependence in the way in which port and city leadership engage with each other over time, demonstrating that the port has long led the development of the region, while the city has tried to facilitate it. Other cities will display different spatial and institutional patterns. In the case of London, the port city development path has been led by private investment. London's world-class port has moved to the outskirts of the city and it is administrated separately from the city center, while local and national institutions only intervene to balance spatial or social short-comings of the private actors. Rapid growth of trade, the emergence of petroleum as a fuel, new technologies and urbanization have required port and city expansion. Extensive landside route and rail infrastructures connected the port to the hinterland. Specific patterns varied, but in every case, port spaces expanded dramatically and

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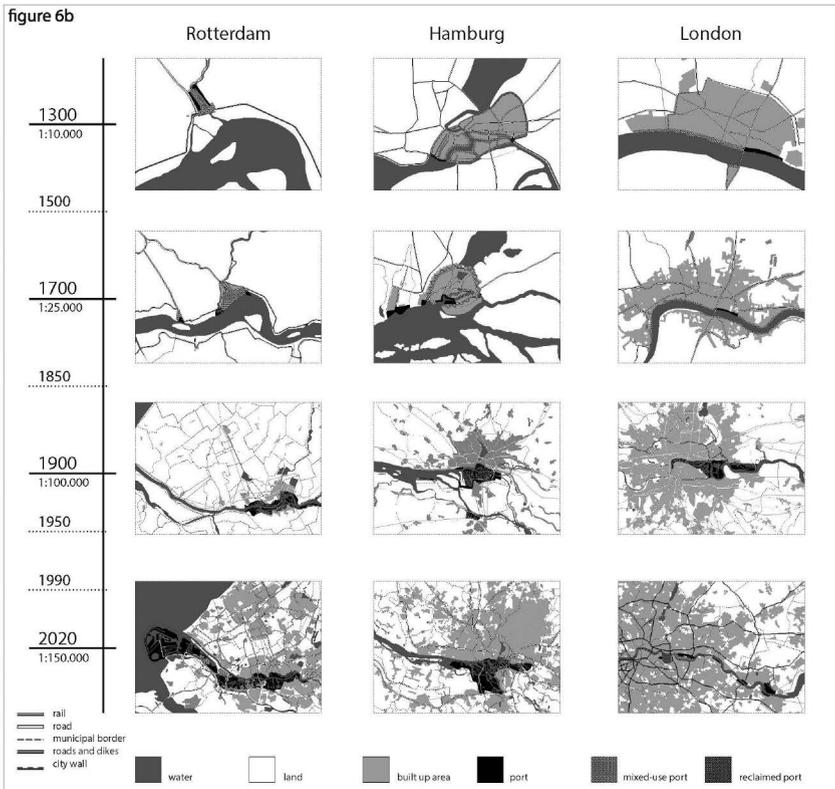
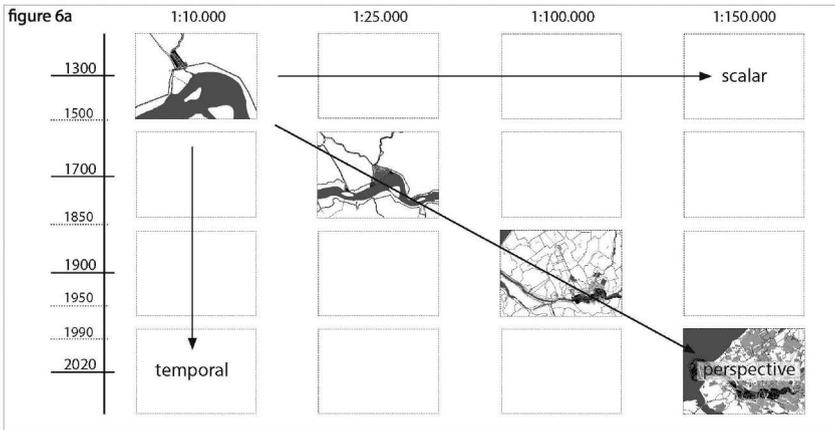
<sup>28</sup> Robert van den Bergh, Michiel Nivard, and Maurits Kreijkes, "Long-Term Prospects for North-west European Refining. Asymmetric Change: A Looming Government Dilemma?". Den Haag: CIEP, 2016.

started to occupy land in the estuaries. Petroleum trade and refining was among the businesses that found a place outside the city. In fact, the new port at Tilbury is located on the former site of a Shell refinery. The case of the city-state Hamburg illustrates the development of shared port-city paths under long-term public leadership that has provided direction for the expanding port as well as for the growing city.<sup>29</sup> Over the last decades, Hamburg port bulk cargo has largely disappeared from the marketing even if the oil industry remains one of the most profitable pillars of the local economy. As the German historian Christoph Strupp has pointed out: “In Hamburg, port and trade have always been more closely linked than port and industry, in urban economic policy as well as in the media and in public perception.”<sup>30</sup> (Fig. 17) For more than a century and a half, the paradigms of faster, bigger and further away have led societal development fueled by what seemed to be an unending stream of energy flowing through the ports. Port development, perhaps the most iconic built intervention in water planning and management, has thrived on petroleum paradigms. A post-oil future may depend on the usage of petroleum for select purposes and on taking much of the oil out of the water and the port city regions.

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<sup>29</sup> Carola Hein and Dirk Schubert, “Resilience and Path Dependence - a Comparative Study of the Port Cities of London, Hamburg and Philadelphia,” *Journal of Urban History* (2020); “Resilience, Disaster and Rebuilding in Modern Port Cities,” *Journal of Urban History* (2020). Carola Hein and Yvonne van Mil. “Mapping as Gap-Finder: Geddes, Tyrwhitt, and the Comparative Spatial Analysis of Port City Regions.” *Urban Planning* 5, no. 2 (2020): 1-15. Carola Hein and Yvonne van Mil. “Towards a Comparative Spatial Analysis for Port City Regions Based on Historical Geo-Spatial Mapping.” *PortusPLUS* 8 (2019): 1-18.

<sup>30</sup> Arnold Kludas, Dieter Maass, and Susanne Sabisch, *Hafen Hamburg: Die Geschichte des Hamburger Freihafens von den Anfängen bis zur Gegenwart* (Hamburg: Kabel, 1988); Wolfgang Michalski, *Hamburg: Erfolge und Erfahrungen in der globalisierten Welt* (Hamburg: Murmann, 2010). Christoph Strupp, *The Rise of Oil as a Commodity in the Port of Hamburg*, (Forthcoming)



**Figure 17: First draft for comparative geo-spatial mapping methodology, with case study of London, Hamburg and Rotterdam in 1300, 1700, 1900, 2019. Carola Hein, Yvonne van Mil, Blanka Borbely and Batuhan Özaltun.**

## What if we take the oil out of the water and the ports? OR What can we learn from the history of the petroleum revolution in port city region history for their post-oil future?

Design as a means to plan the future can also be a tool to provoke debate. A good example of the role of paper visions in shaping people's opinions is the so-called plan 2000+, made in 1969 for the Rotterdam region. It featured a gigantic new port and entire new city for some 500.000 people – Grevelingenstad to be built on the island of Goeree-Overflakkee replacing existing villages – on the south side of the River Maas (Fig. 18). The plan 2000+ exemplified the trust its makers placed in technology and its capacity to reshape the borders between sea and land. As people became aware of the plan, it provoked opposition. Ultimately, the plan was not realized. Capturing scenarios in plans and drawings makes them more visible. Testing the reaction to these kinds of visions may help us identify the values that are meaningful for the future of ports, cities and their regions.

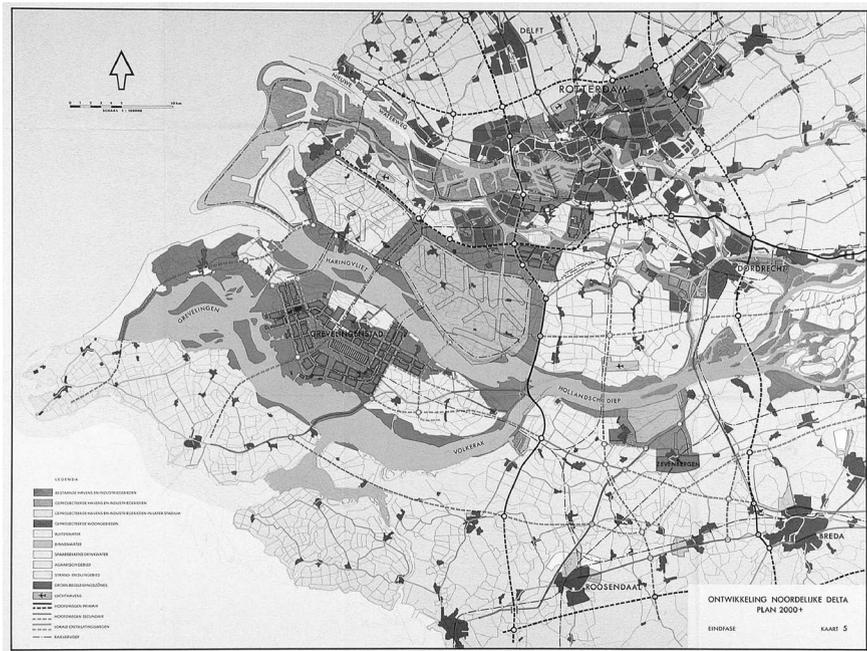


Figure 18: Plan 2000+ for the Rotterdam port city region from 1969

For a post-oil future, we need to undo the mix of oil and water and generate new energy landscapes and new perspectives for ports as sustainable motors for the larger hinterland. We need to acknowledge that the line between sea and land can and will change as climate change leads to sea-level rise. We need to make sure that the post-petroleum port doesn't increase socio-spatial differences. A critical part of the transition away from oil is education about its actual history: raising awareness of the extent to which it shapes our everyday lives, the costs and effects of its ubiquity, and the power of the propaganda pursued by oil companies. Augmented reality or virtual reality tools can help. We need to design the transition, and make the spaces of post-oil just as pervasive, heroic, and appealing as the spaces of oil. In place of petroleum and its narratives, we need to close circles of consumption and production to create circular economies, lessen the use of fossil fuel, reduce petroleum-based plastic waste to overcome an energy-intensive lifestyle, guarantee water safety, reducing hunger aligning with the UN Sustainable Development Goals (SDG).

We can design a transition that promotes circularity and sustainability in a socially just way and develop new narratives about eco-friendly materials to promote new creative practices. Port city regions as key nodes in the petroleumscape are key players in the much-needed transition to more sustainable practices and circular economies. The Port of Rotterdam states that they are committed to countering climate change to contribute to Dutch prosperity and employment and that they want to collaborate in creating economic and social value and realizing sustainable growth.<sup>31</sup> Taking this statement as a point of departure, a group of MSc 2 students from Delft University of Technology in the course Building Green, developed a board and card game where players both compete and collaborate (Fig.). Players have to accomplish individual goals in line with four different roles as Green Sector, Oil Company, Real Estate and Port Authority, knowing that all players only survive the game with a cooperative state of mind. The game promotes insight into the workings of a port-city, encourages support for sustainability, explains the multilayered complexity of the transition to sustainability, and demonstrates the tension between individual interest and the common interest.

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<sup>31</sup> Port of Rotterdam, Sustainability, <https://www.portofrotterdam.com/en/our-port/our-themes/a-sustainable-port/sustainability> (last accessed April 18 2020)



**Figure 19: Conceptualization of *Harbor Hustle*, a serious board and card game developed as part of the final class assignment by MSc 2 students Coen de Vries, Teun van Kneegsel van Kneegsel, Michaël Vrijhof and Sali Asefa at Delft University of Technology in the course “Building Green”, taught by Carola Hein and Tino Mager in 2019**

Students from the Beyond Oil studio at TU Delft have started to visualize the impact of petroleum and the transition on physical spaces in Rotterdam, Dunkirk and Naples, and they have explored energy narratives and “design fiction”, that is creating speculative and even provocative scenarios and displaying them visually.<sup>32</sup> They have examined the political and economic drivers of the transition, developing alternative infrastructure and food systems, proposing new construction materials and systems, and examining ways to turn polluted industrial sites into educational tools and creative spaces for people and nature. Their projects invite the visitors to rethink their own engagements with petroleum.

Changes in the refining business will affect ports, cities, and transportation infrastructure, and those entities must formulate planning strategies in response. Places where oil is still physically present will require more extensive clean-up and transformation investment than the headquarters and research buildings or the ancillary buildings, such as housing, schools or leisure structures. As refineries and storage areas around the world disappear, they will require extensive and specialized cleanup. Designers might start to think of new strategies to combine cleanup of these sites with new

<sup>32</sup> Estelle Harry, “Insights: Scott Smith,” Medium, Design Friction, 2016, <https://medium.com/design-friction/insights-scott-smith-354d1b6cffd6#.jvxa0vu8c> (accessed 30.May 2020)



**Figure 20: Proposal for the Rotterdam port city region Beyond Oil, Authors: Adam Hill, Anne de Jong, Benjamin Evans, Sophie van Riel, Samuel Hartman, MSc2 Studio Beyond Oil 2019**

strategies for preservation, recuperation, and redefinition. Even cleaned up, refineries will be difficult to integrate into their neighboring cities: they will remain valuable to the oil industry due to the extensive specialized networks that they are integrated in and that continue being used, and they are often located in specialized areas of the port that are difficult for ordinary people to access. As part of working ports, their street infrastructure cannot accommodate a large increase of non-port related traffic. All of this poses problems for meaningful redevelopment. Moreover, any transformation in the oil sector will generate changes in land use, real estate, and social structure in Rotterdam and the Amsterdam-Rotterdam-Antwerp region, also requiring advance planning to mitigate negative impact.

We need new tools and approaches to go beyond the mix of oil and water. To do this, we need a thorough understanding of the petroleum revolution and the way in which it relied on water for production and for shipping. We need to get away from purely technical responses to think within multiple disciplines. We need to identify the ways in which petroleum actors have used space and culture to promote petroleum. This raises the question: how can we use our understanding of the past to better engage with contemporary challenges? With Sarton, I would like to propose that while the past

is beautiful it is the future that matters. In the New Humanism, he writes :  
“Le passé si beau qu’il soit est moins beau que l’avenir. Il ne peut nous  
attarder longtemps. C’est l’avenir qui importe. Le Nouvel Humanisme est  
tendu vers lui”.