The Professionalization of Science: Competence, Autonomy, and Service

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Abstract

One of the most important responses to cases of fraudulent and questionable conduct by scientists has been to introduce codes of conduct for scientists, ethics boards for research integrity, and to educate scientists on integrous conduct. This is often viewed as the 'professionalization' of science, yet there is little systematic discussion about this actually means. In this paper I draw on the sociology of the professions and on data comparing codes of conduct in science to those in the professions, in order to examine what precisely professionalization implies for science. I suggest how existing scientific codes of conduct could be amend their positions on competence, autonomy, and service, to better fit the ideal model of professionalization.

Keywords: Research Integrity – Professionalization – Self-Regulation – Autonomy – Ideals

1. Introduction

One important type of response to cases of fraudulent and questionable conduct by scientists has been through the introduction of codes of conduct. Codes of conduct are statements on what the most important ethical principles are underlying scientific research[1], what the best research practices are, and what behaviors count as infractions of the code (i.e., as misconduct). Currently there is a proliferation of scientific codes of conduct, with different national funding agencies and university institutions with own codes; but there are also supranational frameworks such as the Singapore Statement (WCRI, 2010) or the European Code of Conduct (ESF-ALLEA, 2017). Universities are widely implementing training programs to familiarize researchers with the code, and integrity boards are being set up to review alleged infractions of the code.

In this respect, the scientific community is adopting a structurally similar approach as present in the professions, such as medicine or law. In fact, there is a long tradition in the

[1] In this paper I will understand 'scientific research' to exclude industrial research (which has a very different social structure) but to include all forms of academic research, including humanities research. This parallels the usage of the term in scientific codes of conduct, which cover principles also applicable to humanities (e.g., avoiding plagiarism, respect for colleagues, etc.). This usage of the term 'science' is closest to the German/Dutch *wissenschaft/wetenschap*.

sociology of the professions (Abbott, 1988; Freidson, 2001; Larson, 1977; Wilensky, 1964) that understands the phenomenon of the introduction of codes of conduct as a crucial step in the 'professionalization' of an occupation. Thus, the widespread introduction of codes of ethics can be seen as an important step in the professionalization of scientific research.

Yet this connection between codes of conduct and professionalization remains underproblematized. The professionalization of science has been relatively often remarked upon (Braxton & Baird, 2001; Shamoo & Resnik, 2015; Taylor, 2009), but so far the discussion remains limited to the statement of normative directives (e.g., researchers must take more responsibility for their activities) and does not yet delve into the underlying question about what professionalization actually means and to what extent it is applicable to scientific research.

In this paper I set out to explicitly problematize the concept of the 'professionalization of science', and by developing an account I will also aim at drawing out normative implications. Some questions I consider are: What does professionalization mean? And what does specifically the professionalization of science mean? Can the scientific community ever be organized in the way, for instance, communities of physicians are? How should codes of conduct be written if professionalization is an ideal?

These questions concern the larger problem concerning to what extent *self-regulation* is appropriate for science. The self-regulation of an activity means that the practitioners themselves – and not consumers, clients, managers, politicians, or judges – make the decisions on what constitutes best practice, who can become a practitioner, or various specializations and hence collaborations between practitioners are to be organized. Self-regulation is a defining hallmark of the professions, such as law or medicine, and the primary function of any code of conduct is to enhance self-regulation. How this occurs will be explained in more depth later on in this paper, but at this point can briefly summarized as follows: codes of conduct aid self-regulation of a professional community by directing the discretionary activity of the members of a profession towards a certain service ideal (e.g., care or justice).

Professional self-regulation as such is an *ideal model*, and in reality is mixed in with two other ideal models: the free market, and bureaucratic managerialism. This distinction between three modes or 'logics' for organizing labor received a forceful articulation by the prominent sociologist Eliot Freidson (esp. in Freidson 2001). The framework developed there is highly relevant to help identify one of the chief challenges for the scientific community going forward, namely, to decide what mix of these three models is optimally appropriate for organizing the activity of scientific research.

This paper thus can be motivated as contributing towards this larger challenge. However, the scope is limited to the following question: *if* we assume that the model of unadulterated professional self-regulation is the appropriate one for science, what then are the implications for how the codes of conduct should be written? Bear in mind that codes of conduct can be viewed as position statements on how the autonomy of scientific researchers as well as the service ideal of scientific research is implicitly understood by the scientific community (or parts of the community). In particular, I will argue that, if professional self-regulation is an ideal, then the codes of conduct should be amended in (at least) two ways: (1) it should be possible to hold individual scientists responsible for incompetent research, even if it was unintentional, and (2) the principles of research integrity should include 'the disinterested search for truth'. I will argue that these two conclusions follow from a revision of the understanding of (1) the autonomy of researchers, and (2) the service ideal of scientific research.

By drawing on the sociology of the professions, the paper also explores a novel way of investigating research integrity, to be contrasted with two broad literatures on how to reform scientific research. First, the current applied-ethical literature on research integrity is predominantly focused on cataloguing empirical states of affairs, such as frequency of misconduct (Fanelli, 2009; Vries, Anderson, & Martinson, 2006), how the definitions of misconduct vary across institutions (Resnik, Neal, Raymond, & Kissling, 2015), or how policy varies across countries (Godecharle, Nemery, & Dierickx, 2013). While drawing heavily on this empirical research, this paper takes a theoretical turn by situating the phenomena of research integrity and misconduct within a larger social dynamic, namely the dynamics of professionalization. The implicit goal of this is to achieve a deeper understanding both of how codes of conduct originate in the first place, what their purpose is, and of how codes of conduct can be potentially amended in the future in a way that is grounded on principled reasoning.

Second, the current paper is also to be distinguished from a growing literature on 'meta-science' (e.g. Ioannidis et al., 2014; Munafò et al., 2017; Smaldino & McElreath, 2016). Strictly speaking, meta-science refers the application of scientific methods in order to understand science itself – and is hence very broad – however, in practice the meta-science literature largely focuses on building statistical models of how certain common procedures or common incentives have led to undesirable research outcomes. To give some examples: some models show that overreliance on P-values or small sample sizes leads to unreliable research (Ioannidis, 2005; Ioannidis et al., 2014; Munafò et al., 2017); other models point to how career incentives to publish and journal incentives to publish positive also lead to unreliable research (Smaldino & McElreath, 2016); yet other models show how overreliance on bibliometrical indicators for

career advancement can suppress innovative research (Wang, Veugelers, & Stephan, 2017). In this way, the research on meta-science, while considerably heterogeneous, in general focuses on discovering what incentives and procedures can lead to more desirable research outcomes. Recent philosophy of science literature also parallels this focus on incentive structure (Heesen, 2018; Kitcher, 1990; Strevens, 2006). By contrast, the current paper concerns a different dimension of the organization of the scientific community that is distinct from incentives and procedures: how we should understand the autonomy of individual researchers and their sense of deontology, and how this autonomy and deontology is to be shaped within the wider structure of incentives and procedures.

The paper is structured as follows: after giving a background in the sociology of the professions (section 2), we show how, by introducing codes of conduct, science is attempting to professionalize (section 3). However, by itself, a code of conduct can also be interpreted as a first step towards a new layer of bureaucracy. So in the following two sections, we examine how current codes of conduct hold up with regards to two dimensions of professionalism: the service ideal (section 4), and responsibility for incompetence (section 5). In the final section we discuss what it would mean for science to professionalize further.

2. Defining the Professions

In the broad sense of the term, a 'professional' refers to someone who can earn living from an activity (as opposed to an amateur or hobbyist). However, this paper is concerned with a narrower sense of the term, where professions typically refer to certain types of knowledge-based occupations, with law and medicine the paradigmatic examples. It is often thought that professions are prestigious, client-focused, and highly paid; however, from a sociological perspective, these three properties are incidental rather than defining characteristics of a profession.

For purposes of this paper, a good place to start is with the following definition given by the Freidson:

> 1. A body of knowledge and skill which is officially recognized as one based on abstract concepts and theories and requiring the exercise of considerable *discretion*;
> 2. An occupationally controlled *division of labor* [into different specializations];
> 3. An occupationally controlled *labor market* requiring credentials for entry and career mobility;

> 4. An occupationally controlled *training program* which produces those credentials, schooling that is associated with 'higher learning', segregated from the ordinary labor market and provides opportunities for the development of new knowledge;
> 5. An *ideology* serving some transcendent value and asserting greater devotion to doing good work than to economic reward (my emphasis, Freidson, 2001: 180).

In this understanding, a profession is defined by five elements, that can be further grouped into three areas: individual autonomy (criterion 1), collective autonomy (criterion 2-4), and the service ideal (criterion 5). This way of grouping the elements together into autonomy and the service ideal is present in other prominent analyses of the professions (Abbott, 1988; Macdonald, 1995; Wilensky, 1964), and I will call the 'traditional model' of the professions.[2]

In the traditional model, both autonomy and the service ideal can be argued as following from the nature of the knowledge underlying the professional activity.[3] The professional activity is deemed sufficiently complex, involving the application of abstract theoretical knowledge to particular situations, that it cannot be turned into a "commodified expertise" (Abbott, 1988). The latter refers to the standardization of the activity, where it can be specified ahead of time under what circumstances a specific task should be carried out. In such cases it is not necessary that individual practitioners exercise their discretion – or even desirable, since following standardized rules would minimize the risk of error. In medicine, there may be guidelines and rules for diagnosis, but the course of action chosen by the individual physician is ultimately the result of individual discretion (in contrast, say, to an employee at an assembly line). This is partially due to the myriad factors involved in a correct diagnosis, but can also be due to the changing state of the art knowledge.

Collective autonomy follows for closely related reasons, where the community of practitioners (perhaps via representation in a governing body) decide what tasks and specialized activities the members of the community will focus on, who can receive licenses to exercise the professional activity, and how they will be trained. Such decisions can only be made given in-depth knowledge of the state of the art – and hence only by the practitioners themselves. In this way, the quality of knowledge of professionals, and ultimately quality of service, is ensured (Freidson, 2001).

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[2] Instead in terms of knowledge and ideals, the professions have also been analyzed in terms of power. Thus the service ideals of the professions have long been accused of being ideals in name only, and actually means towards increasing the wealth and power of the professional communities (Larson, 1977).
[3] In fact, some have argued that the abstract character of the knowledge is the most defining feature of the professions (cf. Abbott, 1988, p. 8, or Brante, 2011).

Since the danger always exists of such autonomy being used for mere self-serving purposes, in the traditional model of the professions (cf. Wilensky, 1964), autonomy is counterbalanced by a strong professional deontology: being a professional means performing a service according to certain standards of competence, regardless of whether the client is be able to distinguish between a competent and an incompetent service (Davis, 1991). Consequently, these professions have strictly regulated training procedures for aspiring professionals, a deontology enshrined in a code of conduct, where one of the key concerns is professional competence, and a board of ethics to examine alleged infractions of the code.

This is why a formal *code of conduct* is seen as a crucial part in the process of 'professionalization', where an occupation adopts the characteristics of a profession. The purposes of a code of conduct include "to eliminate the unqualified and unscrupulous, (…) to reduce internal competition, and (…) to protect clients and emphasize the service ideal" (Wilensky, 1964, p. 145) In could be argued that, only by enhancing the service ideal, a code of conduct can do all that: adhering to the service ideal means not providing incompetent service, keeping abreast of developments in their field to maintain competence, not prioritizing monetary gain (and thus not setting out to compete over clients with other professionals, since this can lead to a compromising of the quality of service).

3. The Three Logics

There is little point in interpreting definitions of the professions as descriptions of all occupations going by the name 'profession'. There are many occupations such as engineering, teaching, or nursing which claim professional status but which do not readily exhibit the collective autonomy of the traditional model of professions. There are occupations which exhibit characteristics of professions: labor unions have codes of conduct, as do even criminal associations (cf. Brante, 2011). Moreover, established professions such as law and medicine has changed significantly in recent decades in many major OECD countries, with increasing levels of external control through reforms such as New Public Management (cf. Carvalho & Correia, 2018).

A fruitful way of understanding the definitions of the professions, proposed by Freidson (2001), is in a more normative sense as a certain "logic" by which an occupation can be organized. In this interpretation, professionalism is one logic alongside two others: the free market (going back to Adam Smith: Smith, 1776/2008) and a centralized bureaucracy (going back to Weber's rational-legal bureaucracy: Weber, 1922/1978; and Marx's command

economy: Marx & Engels, 1848/2018). Each logic corresponds to an ideal model according to which labor can be organized. Any actual occupation will thus exhibit various mixes of the two models. For instance, commodity trading occurs in markets that are regulated by centralized agencies, and insurance underwriting occurs within rigid corporate bureaucracy but where the corporation may compete against other corporations in a free market.

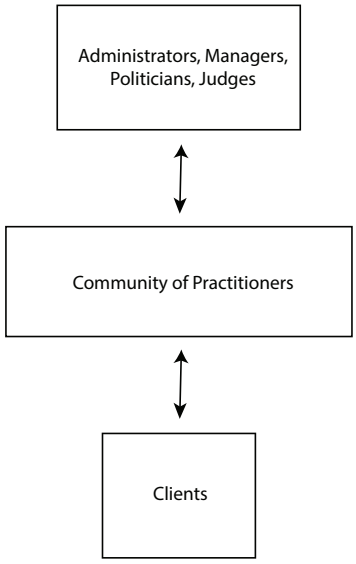

Figure 1: Where autonomy is placed determines the organizational logic.

A key differentiating factor between each logic lies in who controls what work the laborers or practitioners carry out, or in other words, which party is deemed the autonomous one. In a market, consumers or clients ultimately decide what work is carried out: the practitioners conform to the wishes of consumers or clients. In a bureaucracy, managers decide. In the third model, "professionalism", the community of practitioners is organized such that the practioners themselves decide what work is carried out – not consumers, or managers. This is also known as self-regulation[4]. The rationale or 'logic' underlying the self-regulation of professionalism is that consumers and managers lack the specialized knowledge to be able to evaluate the tasks carried out. This means that professionalism can only be justified when the knowledge necessary for a certain kind of task is only obtainable with much effort, and so goes far beyond common or daily knowledge possessed by all adults in society.

In this way, where autonomy is placed depends strongly on the nature of the knowledge required for doing the work. Freidson (2001, pp. 17ff) distinguishes between everyday knowledge (the type possessed by all functioning adults), practical knowledge (the conscious

[4] "Professionalism is a set of institutions which permit the members of an occupation to make a living while controlling their own work." (Freidson, 2001, p. 17)

or tacit 'know-how' gained on the job), and formal knowledge (the knowledge that is organizable into theories and abstract concepts). Activities based on the first lend themselves to a market organization; activities based on the second lend themselves to a bureaucratic organization; activities based on the third lend themselves to professional organization (cf. Freidson 2001, p. 60). Thus, depending on the type of knowledge involved, a different organizational logic is appropriate.

Distinguishing between the three logics helps make sense how the professional character of occupations can change over time. Whereas Wilensky in 1964 was able to write "bureaucracy may enfeeble the service ideal… a client orientation undermines colleague control and professional norms", many professions have precisely gone through fundamental changes, with an increasing bureaucratization (i.e., managerial control) of professional activities, and an increased role being given to market regulation (as opposed to autonomous self-regulation). Concrete changes include removing barriers to competition between professionals[5], more accountability towards clients, performance evaluations, and client demand leading to reorganization of professional subspecialisations and training programs. These changes started in the 1970s and have been especially strong in Anglo-Saxon countries (Boyce, 2008; Carvalho & Correia, 2018), and have been termed 'deprofessionalization' (Clark, 2005).

4. Science, Academia, and the Professions

Applying the previous discussion to scientific research is not straightforward, and requires disentangling scientific research from academia, and charting the ways in which research, academia, and professionalization interact.

Academia, understood in the strict sense as university teaching, is one of the oldest established professions, going back to the founding of the universities in the Middle Ages. Toghether with law, the clergy, and medicine is included among the original 'status professions' (Elliott, 2013). Yet for most of its history, the main service offered by university professors was teaching (Shapin, 2008). Scientific research was not their main activity, and was just as likely to be carried out by clergy, physicians, surgeons, and by the independently wealthy. This pattern

[5] Professionals may, for instance, be required to carry a license to carry out certain activities, the license thus serves not just to ensure a certain standard of quality, but also to limit the competition. An code of ethics, in maintaining a focus on a service ideal, also serves to weaken consumer-focused competition between professionals. See (Abbott, 1988; Wilensky, 1964).

continued into the 19th and 20th centuries: Charles Darwin was an independent researcher; Gregor Mendel, one of the founders of genetics, was a monk; Georges Lemaître, who first hypothesized the Big Bang, was a priest. Therefore, a first distinction should be made between scientific research and university teaching: whereas the latter has been a profession for a long time, and meets the criteria of the traditional model (e.g., it is based on an established body of knowledge), the former has until relatively recently been an amateur activity.

A current example of professional self-regulation in the academic community is how certain specializations are maintained even though there is little to no actual market demand for them: most of the humanities, and many fundamental sciences as well. Self-regulation does not just buffer the goals of the market model to increase competition and reduce cost. It can also buffer managerial goals of efficiency and productivity, where certain disciplines are maintained even though they would not meet targets of efficiency or productivity (e.g., publications, number of doctorates, external funding). Even though it is clear that different countries have shifted organizational models to different degrees (CITE), the organizational logic in academia remains predominantly one of professionalism.

As a profession, university teaching has had, since its inception, a rather unique and complicated relationship with the other professions. On the one hand, university professors have functioned the 'custodians of knowledge' and led many of the training programs for professions (law, medicine, ministry). This is still the case, and most modern professionals receive their basic training at the university (dentistry, civil engineering, etc.). For this reason some have dubbed the academics the "producers of producers" (Larson, 1977), or the "meta-profession" (Carvalho, 2017).

On the other hand, university teaching has also been an area where conflicts between professions are fought out. Professions have changed significantly over time: new professions can appear and either claim jurisdiction over a new activity, or 'invade' the jurisdiction of an old profession. One of the key ways to gain supremacy over some activity is by gaining an upper hand in what is taught to students – and this is where scientific research enters the picture. For instance, in the late 19th century, psychiatrists battled with spiritualism over jurisdiction over mental problems (Abott 1988, p. 29), and psychiatrists' claim to scientific knowledge was crucial in this respect. For this reason, Abbott argues that one of the most important functions of scientific knowledge in a profession is to *legitimize* the profession's jurisdiction in the public's eyes:

> "Academic knowledge legitimizes professional work by clarifying its foundations and tracing them to major cultural values. In most modern professions, these have been the values of rationality, logic, and science." (Abbott 1988, p. 54)

Battles can also play out between two academicized professions. Abbott gives the example of how psychiatrists in the 1920s argued how they knew more about the nature of personal responsibility than lawyers (Abbott, 1988, p. 55). This led to an academic debate about responsibility which can be seen as a proxy for a conflict about jurisdiction (the psychiatrists lost that battle).

However, codifying professional know-how and making it more scientific does not only concern direct competitions for prestige. It is also what ensures the long-term success of a profession. Making professional know-how amenable for scientific investigation entails a high degree of abstraction, and this abstraction has two advantages. First, it allows for more efficient instruction, where the professionals can learn basic principles which are applicable in a wide range of circumstances. Second, it allows a professional field greater flexibility in dealing with novel problems that might arise:

> For abstraction is the quality that sets interprofessional competition apart from competition among occupations in general. Any occupation can obtain licensure (e.g., beauticians) or develop an ethics code (e.g., real estate). But only a knowledge system governed by abstractions can redefine its problems and tasks, defend them from interlopers, and seize new problems—as medicine has recently seized alcoholism, mental illness, hyperactivity in children, obesity, and numerous other things. Abstraction enables survival in the competitive system of professions (Abbott, 1988, p. 8).

The abstract scientific character of professional knowledge allows for new connections and discoveries to be made (and hence greater innovation). In sum, university teaching, scientific research, and professional activity have in many cases been closely intertwined. Physician-researchers and lawyer-researchers, who retain both academic affiliation as well as a professional practice, are a case in point.

Nonetheless, while the interaction between professional activity scientific research can be intense, a vast amount of scientific research – in the humanities, or fundamental science – is not geared towards improving a professional activity. We thus must consider separately the question: what does the professionalization of scientific research entail?

5. The Professionalization of Science: Core Implications

Recall that the core consideration in determining whether the logic of professionalization is appropriate for an activity concerns the nature of the knowledge underlying that activity, which needs a certain level abstractness and complexity in application. Hence the first sub-question that would need to be tackled to make progress on the larger question above concerns the nature of scientific knowledge: what is the relation between the knowledge underlying scientific research, and the application of that knowledge in scientific research?

This sub-question opens up onto questions that cannot be possibly be discussed here in any depth. Philosophers of science have distinguished various ways on how scientific research can build upon established scientific knowledge. One is through induction and confirmation, where the scientist inductively generalizes from observations, and then seeks to confirm that generalization through further observation. Another is through falsification, where the scientist seeks observations that negate established knowledge (Popper, 2005). However, both confirmation and falsification are ideal scientific methodologies that do not correspond to the way scientific progress actually occurs. For instance, the Ptolemaic system had a very significant degree of confirmation and was yet abandoned for the Copernican system in virtue of the latter's simplicity, even though both systems were equally predictive of observations. Moreover, in reality falsification is not logic-proof methodology it is often taken to be: an observation that might seem to falsify a generalization can always be explained away by other means (philosophers of science call this the 'Duhem-Quine thesis). This means that it is never clear whether a wayward observation is a genuine falsification or a merely apparent; and it is often good science to explain away wayward observations as merely apparent falsifications. Darwin's theory of natural selection was initially falsified[6], as

Scientific research thus progresses by both building on existing scientific knowledge, but also occasionally breaking it down. The Kuhnian view of science (Kuhn, 1970) tries to bring together these two aspects in the concepts of 'normal' and 'revolutionary' science. Normal science is incremental research, applying established concepts and methodologies to well-defined problems, and proposing solutions. Revolutionary science concerns the rethinking of fundamental concepts and methodology, and often involves redefining the problems that need to be solved. The activity of normal science can be argued to have a similar relation to established knowledge as a professional activity: the activity of normal science perhaps adds to existing scientific knowledge, but it does not significantly alter what knowledge is already

[6] By the swamping argument, due to Jenkin.

established. By contrast, revolutionary science is not additive or incremental, and undermines the very knowledge on which the activity is based.

While this discussion of scientific knowledge, progress, and methodology only sketches the very broadest outlines in the philosophy of science, for our purposes here it is nonetheless sufficient in order to understand better what is entailed by a professionalization of science.

Implications for scientific autonomy. Because the activity scientific research, per definition, is the contribution of novel scientific knowledge, the activity cannot be commoditized (i.e., turned into a rule-based activity), nor can 'clients', in general, dictate what discoveries will be made. Factors outside the scientist's control (e.g. serendipity) play an outsized role in the success of scientific research compared to a professional activity. The latter is based on established knowledge: cause-effect relations are well known and described, and a professional can carry out an intervention with high degree of certainty. By contrast, the scientific activity may build on previous knowledge, but the success of a study is – per the definition of 'innovation' – not guaranteed by established knowledge.

Moreover, a consequence of the fact that (good) scientific research is based on the most advanced knowledge available at any given time, means that the quality of research or the competence of a scientists can only be judged by fellow scientists with similar training. As Wilensky noted already in 1964:`

> A science, in contrast to a profession, has no clients except, in an ultimate sense, society; and bosses, if any, are often indeterminate. The main public for the scientist is fellow-scientists, who are in a position to judge competence; the main public for the professional is clients or employer-clients, who usually cannot judge competence. (Wilensky, 1964, p. 141)

Implications for the scientific service ideal. Sociologists have traditionally defined the service ideal of science in terms of epistemic values. Wilensky wrote in 1964 that "the scientist's disinterested search for truth is the functional equivalent of the professional's technical service ideal" (Wilensky, 1964, p. 141). Merton (Merton, 1942) defined the scientific 'ethos' by means of four values: universalism, communism, disinterestedness, and organized scepticism. The 'disinterestedness' value refers to how scientists should not be influenced by considerations of personal gain, nor by societal pressure, but only to pursue objective truth in a disinterested way. Also philosophers of science have traditionally understood truth to be the goal of science as a whole, because, if one were to deny any role to some sense of 'objective truth' to science, then

scientific progress as such becomes impossible (and very few, if any would deny that science has progressed in some absolute way the past 500 years).

However, philosophers of science have long been skeptical about overly naïve conceptions about how individual scientists operate. Purely disinterestedness among scientists is likely impossible (Longino, 1990). Scientists do not perfectly work together by sharing preliminary data and ideas, but rather compete against each other for scientific credit (Kitcher, 1990; Strevens, 2006). This is moreover likely beneficial for overall scientific progress, because individual scientists are not always the best judges of scientific relevance. And, finally, individual scientists are heavily influenced by the community in which they operate. Thus, according to Kuhn, scientists' observations are heavily influenced by the theoretical paradigm with which their community operates ('theory-ladenness of observation'), and aim at only solving 'puzzles that are defined within well-established paradigms rather than at obtaining 'truth' in some more absolute sense (Kuhn, 1970).

Nonetheless, these skeptical considerations undermine only naïve conceptions of the traditional service ideal, rather than undermining it entirely. From a sociological perspective, if most scientists were motivated by personal gain rather than the truth, scientific research would need to be organized very differently. In the professionalism model, scientists are bound to certain ideals of service, and are granted significant autonomy to pursue those ideals according to their own autonomous judgment. Only scientists can supervise or correct the work of other scientists. Competition between scientists is minimized to avoid 'races to the bottom' where the service ideal is compromised – for instance, by limiting the number of people who can enter the profession. In exchange for these privileges, scientists adhere to a strict code of ethics ensuring that scientists prioritize the service ideal over personal gain.

By contrast, if scientists were to systematically abuse the privilege that goes together with autonomy, the rest of society would likely impose a different model of regulation. The marketisation model refers to a situation where scientists compete against each other to offer their services for a pool of clients. Nothing is regulated, and scientists will innovate to attract the interest of clients, and 'clients' (i.e., journals, funding agencies, universities) will compete against each other to 'buy' the services at the lowest possible price. The bureaucratic model entails a purely centralized organization, where the variety of scientific specializations are planned in advance, the necessary qualifications to practice those specializations, and a standardized production of the 'service' (i.e., scientific research) to assure consumers of reliability.

Of course, the marketisation and bureaucratization of scientific research within academia is already a reality. Nonetheless, if compared to other occupations, (academic) scientists still enjoy a significant degree of autonomy. This is one of the reasons why scientific misconduct is (and should be) taken seriously: if left unchecked by self-regulation, it will lead to increased marketisation and bureaucratization of academia.

In many ways, scientific research was until relatively recently still an amateur and part-time activity. Starting in the 19th century, and especially after 1945, as states increasingly recognized the commercial and military importance of science, growing numbers of researchers were given salaries to dedicate themselves full-time to scientific research. This was a gradual historical process, and started earlier in countries such as France and Germany, where the government was more centralized than in Britain or the United States (Bowler & Morus, 2010, p. 329).

However, doing an activity full-time is a necessary but not sufficient condition for that activity to be professionalized, and as Shapin notes, this transition from amateur to professional was never completed for scientific research (Shapin, 2008, p. 14). The current focus on research misconduct and research integrity is a crucial part of this professionalization. Yet, if one examines current scientific codes of conduct, there is still significant ambiguity on what professionalization should mean.

In the following sections I will examine scientific codes of conduct through the lens of Freidson's the three logics of organization of work, and especially through the lens of the logic of professionalism.

6. Two Logics Inherent in a Code of Conduct

Codes of conduct are typically associated with the logic of professionalism: they aim at strengthening the *autonomy* of workers, by emphasizing the service ideal. The labor activity is not primarily meant for some personal gain (whether in the form of monetary rewards, or social status, or prestige), but rather for the service ideal. However, a code of ethics need not be aimed at strengthening autonomy of individual workers or practitioners. It can also function as a first step towards creating set of rules within a bureaucratic-managerial model of regulation. In this model, the code of ethics will be used by boards or commissions within the professional body to create additional procedures to which the professional must submit before carrying out the professional activity.

In the context of research, this is arguably what the codes of ethics regarding research involving human and animal subjects has developed into. Developed after the atrocities

committed during the Second World War in name of science, these codes of ethics have a certain service ideal in mind – namely scientific research that conforms to basic moral principles concerning human rights. However, these codes of ethics have not been used to further the professionalization of science, in the sense of strengthening the autonomy of individual scientists; rather, they have also been used for adding a layer of bureaucracy to research. A scientist embarking on a clinical trial is not merely to use her or his own judgment with regards to the ethical dimension of the trial: she or he is also to submit a research protocol to a research ethics committee in order to gain ethical approval. An evolution from the professional logic to the bureaucratic-managerial logic can be seen in the history of the codes. Thus, for instance, the Nuremberg Code (1947) and the original Helsinki Declaration (1964) do not make any reference to ethics committees, but only to the informed consent of patients, the competence of the physician-researcher, and a careful deliberation – in the words of the 1964 Helsinki Declaration "careful assessment of inherent risks in comparison to foreseeable benefits to the subject or to others" (principle 4). By contrast, in the first revision of the Declaration of Helsinki (1975), review by an independent committee was included as a basic principle (principle 2), and principle has since been expanded into a separate section (WMA, 2013)

While there is considerable criticism of the bureaucracy that ethical review creates (see for instance (Robson & Maier, 2018), it should not automatically be assumed that the logic of professionalization is the optimal one in all situations. As mentioned above, the appropriate logic depends on the nature of the activity and the related to the knowledge upon which the activity is based. In the case of determining whether a research on human test subjects is consistent with human rights, it is probably not quite appropriate that the researchers themselves make these decisions, but that the decisions are outsourced to external experts.

To what extent issues regarding research integrity will follow the same path of bureaucratization is still very much an open question. Most codes of conduct explicitly aim at enhancing some service ideal, and appeal to the discretion of individual scientists. However, some codes of conduct allude to a direction of bureaucratization. For instance, in 'Safeguarding Good Scientific Practice' (DFG, 2013) it is stated that "Only science itself can guarantee good scientific practice, primarily with organizational and procedural regulations." While couched in self-regulatory terms ("science itself"), on a longer time-scale this could mean the creation of special administration positions dedicated to the organizational and procedural regulations on research integrity, and enforcing that individual researchers follow these regulations. In such a scenario, a code of conduct would then have constituted a first step towards a further bureaucratization of scientific research.

There are good reasons to doubt that an extreme bureaucratization or marketisation of scientific research would ever be possible. Given the high levels of training and originality required for good scientific work, it is quite plausible it has the best chance of flourishing when individual scientists or groups of scientists have considerable discretion and hence autonomy on how to best conduct their research (and thus independence from administrators/managers or clients). What the *optimal* mix of logics is for scientific research is a separate question that goes beyond the scope of this paper[7]. What does the logic of professionalism imply about current codes of conduct?

7. Scientific Codes of Conduct on the Service Ideal

Until now the discussion has been general, showing how codes of conduct should be read in relation to more fundamental concepts of professionalism, scientific autonomy, and the service ideal. For the remainder of the paper I want to use this framework to better understand scientific codes of conduct, both in their current form, as well as how they could be amended to correspond more closely to the ideal of professionalism. I will subdivide this task into two interlinked discussions: First, what is the service ideal of scientific research, and how should this be represented in codes of conduct? And second, given that the vast majority of individual researchers are part of an institution, and given that a significant fraction of researchers collaborate, how should we understand the autonomy of individual researchers, both with regard to their discretionary judgment about the quality of research, as well as their responsibility for completed research?

The traditional service ideal does not figure in any of the major codes of conduct for scientists. For instance, the four principles put forward by the European Code of Conduct are:

(1) Reliability in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources.
(2) Honesty in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.
(3) Respect for colleagues, research participants, society, ecosystems, cultural heritage and the environment.
(4) Accountability for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts. (ESF-ALLEA, 2017, p. 4)

[7] For one, the optimal mix of models is likely to depend on the scientific discipline. Research in pure mathematics most likely requires more individual autonomy than, e.g., research in cancer studies, where large labs are involved. Moreover, the latter involves a methodology where testing on human subjects is inevitable, so will require more bureaucratic regulation, than, e.g., research on number-theoretic theorems would.

Of these four principles, 'reliability' comes closest to the traditional service ideal, since one can reasonably assume that by being reliable in producing high quality research, that this is the most important way to search for truth.

Yet there is a significant difference between these four principles and the service ideals of professions such as medicine or law. The AMA code of ethics states that is has been developed "primarily for the benefit of the patient", and states that the physician "shall be dedicated to providing competent medical *care, with compassion and respect for human dignity and rights*" (my emphasis). The emphasis is on caring for the patient, and this is to be held as the ideal, over and above personal gain for the physician, and it is even to be distinguished from the preferences of the patient him- or herself (which may not be aligned with the ideal of care). The very first principle of the same code can be read as reformulating this service ideal in terms of competence, compassion, and respect:

> "A physician shall be dedicated to providing competent medical care, with compassion and respect for human dignity and rights."

Of course, in reality, physicians may fail to live up to this ideal in varying degrees. Nonetheless, the prominence of the ideal in the code of ethics indicates the weight placed on the ideal by the professional community of physicians.

In the Model Rules of Professional Conduct (American Bar Association), the first responsibility of the lawyer is described as:

> A lawyer, as a member of the legal profession, is a representative of clients, an officer of the legal system and a public citizen having special responsibility for the *quality of justice*[8] (my emphasis).

Thus, in the legal and medical professions, the service ideal is defined in terms of quasi-Platonic ideals of care and justice. In contrast to the current professional codes of conduct, it becomes quite clear how current scientific codes of conduct do not conform to the traditional service ideal of the disinterested search for truth.

One way to understand the difference between ideals like care, justice, or truth, and ideals such as 'reliability' or 'honesty', is that the former corresponds more closely to the naïve personal motivations or intentions to do scientific or professional activity. Whereas an aspiring physician may be genuinely motivated by the prospect of helping patients, or an aspiring teacher of educating the next generation, it is unlikely an aspiring researcher is motivated by a desire to be reliable, honest, respectful, or accountable[9]. Arguably, codes of conduct serve to preserve

[8]https://www.americanbar.org/groups/professional_responsibility/publications/model_rules_of_professional_conduct/model_rules_of_professional_conduct_preamble_scope/

[9] It would be good to find some social science research on motivations of scientists to support this assertion.

these naïve motivations, even when grizzled professionals may be confronted with obstacles (either in form of incentives or procedures) towards further those ideals on a daily basis.

In this respect, the question could be asked whether the scientific codes of conduct, as they currently stand, are actually a first step towards a bureaucratization of scientific research. The ideals of 'reliability' or 'honesty' refer to ideal situations where problematic behaviour is absent rather than to ideals that would motivate young science students to become full-time researchers. Instead, these ideals could easily be interpreted as first steps towards introducing new forms of management of scientists: procedures for increasing reliability, transparency, and accountability of researchers. In the bureaucratic model researchers experience a code of ethics as an external constraint on their research activities, rather than as enhancing their scientific autonomy by directing their activities towards the service ideal.

Table 1 represents a review of the service ideals in current scientific codes of conduct. Among non-traditional service ideals, a further distinction has been made between methodological and social ideals. Methodological ideals concern how scientists structure their research activities, and are signalled by 'rigor', 'diligence', 'reliability', 'verifiability', 'impartiality', 'critical questioning'. Social ideals concern ideal interpersonal relations between scientists, and are signalled by words such as 'respect', 'honesty', 'transparency', 'accountability', 'fairness'. Some of these ideals are closely related to Mertonian norms: communism is closely related to honesty and transparency, universalism to impartiality and rigor, and organized scepticism is related to verifiability and critical questioning. The only Mertonian norm that is neither social nor strictly methodological is disinterestedness, since this concerns the personal motivations and institutional motivations to do science.[10]

This service ideal can be supported by a number of norms governing client relations and colleague relations. Those governing client relations include the norm of avoiding emotional involvement with the client, or that of giving equal service, regardless of who the client is. The norms regulating how colleagues interact include the norm of deferring to other specializations or other more competent colleagues.

[10] Merton himself emphasizes the institutional element: It is rather a distinctive pattern of institutional control of a wide range of motives which characterizes the behavior of scientists. For once the institution enjoins disinterested activity, it is to the interest of scientists to conform on pain of sanctions and, insofar as the norm has been internalized, or psychological conflict. (Merton, 1942, p. 142)

Scientists' Code of Conduct \ Service Ideal	Traditional	Methodo-logical	Social
Federal Research Misconduct Policy (USA)	N	N	N
NRC Research Integrity Policy (CA)	N	N	Y
Australian Code for the Responsible Conduct of Research (AU)	N	Y	Y
The Concordat to Support Research Integrity (UK)	N	Y	Y
The European Code of Conduct for Research Integrity (Europe)	N	Y	Y
Code of Ethics for Scientific Research in Belgium (BE)	N	Y	Y
French national Charter for Research Integrity (FR)	N	Y	Y
Safeguarding Good Scientific Practice (DE)	N	Y	Y
Guidelines for Research Integrity (IT)	N	Y	Y

Table 1: The different service ideals present in various scientists' codes of conduct

8. Scientific Codes of Conduct on Researchers' Autonomy

Autonomy is the second core aspect of professionalism, and is closely related to the service ideal. In this section I outline what professional autonomy means, and detail what current scientific codes of conduct imply about scientists' autonomy.

Discretion, Responsibility, and Intent. Discretion refers to the capacity of individuals to choose an appropriate response to a challenge in their working environment. A doctor's discretion means that the doctor him- or herself can deliberate on the most appropriate treatment for a patient, can make a choice for a course of action without seeking approval from an external committee. A lawyer's discretion entails that the lawyer makes his or her own judgement on what the best legal advice is given the particularities of the client's problem. Moreover, this choice need not coincide with the preferences of the patient.[11] In this way, discretion cannot be understood separately from professional knowledge and the service ideal: a professional is given discretion because clients trust that the professional will take all steps necessary towards the service ideal, and is in a superior position to do so because of mastery of a certain body of knowledge. Ideally, the professional will not even be swayed by political forces that may not always be aligned with the service ideal.[12]

Discretion also implies that the professional has the responsibility for the service, because the professional – and not the consumer, or a manager – decided to carry out the

[11] An extreme form of discretion, where the physician by default does not take the preferences of the patient into consideration, is better known as paternalism, and has come in for much criticism. (CITE).

[12] Even though, of course, history shows that when the political forces are powerful enough (as happened in the Nazi era: cf. Brante, 2011, p. 7) the service ideal can be compromised

professional activity in one way rather than the other. Hence the professional can be held responsible for a deficient service, especially when based on the state of the art of professional knowledge, a deficient service should not have been expected. In this way, discretion and responsibility are two sides of the same coin of autonomy: one cannot have discretion without also having at least a considerable degree of responsibility over the outcome.

The core question is: where should the line be drawn between responsibility and absolution when the service is deficient? The common answer often lies in distinguishing between different levels of intent. This is done slightly differently in different jurisdictions, but for the purposes of this paper we can consider the distinctions drawn in the Model Penal Code (Dubber, 2015), which distinguishes between four levels of intent (adapted from Dubber, 2015).

Purpose: An act A is committed 'purposely' by a person if the act or the cause of the act was the conscious object of the person.

Knowledge: An act A is committed 'knowingly' if the person knows and is aware that A is a likely consequence of his or her actions – but the act is not necessarily a conscious object in the mind of A.

Recklessness: An act A is committed 'recklessly' if the perpetrator knew that A could occur, but disregarded the risk. Thus, there was knowledge, but no awareness that A would likely occur.

Negligence: Finally, an act A is committed negligently when the perpetrator was ignorant that A could occur, but that he or she should have known.

In this subdivision, negligence is the only level of intent where there is no conscious intention present of the possible consequences of the action, and of the four categories it is typically judged to be the least serious offense. A typical example of negligence would be a construction company that is unaware of safety regulations: this lack of knowledge does not exculpate the company should a work place accident occur. Medical malpractice is another an example of a negligent action, and is handled by tort law, which regulates damages. (cf. Hall, 2014, p. 19).

In this way, it is important to note that negligence concerns the state of the knowledge of the professional. It does not concern the conscious intention[13], which may have still been directed at the service ideal; rather, it concerns whether the professional was in possession of the relevant or state-of-the-art professional knowledge before carrying out the activity.

[13] Intent can refer to the actual state of mind (subjective intent), or to what should have been the state of mind at the time the act occurred (objective intent): see Hall, 2014, p. 74.

Responsibility of Individuals. In one of the most important documents on self-regulation by the scientific community in the USA, the Federal Policy on Research Misconduct, it is stipulated that misconduct must be committed "intentionally, knowingly, or recklessly", thereby excluding the lowest level of intent identified in the Model Penal Code (Dubber, 2015) – negligence – from the category of misconduct. Since many instances of incompetence are committed without conscious intention (not even a conscious disregard of the norm) and thus qualify as negligence, incompetence is therefore implicitly excluded from the category of misconduct by the Office of Science and Technology Policy (see supplementary materials for all references to policy documents).

A similar situation pertains in Europe: the 2016 version of the European Code of Conduct for Research Integrity, or ECC,[14] defines misconduct by means of a list of offenses that are committed intentionally or knowingly. These offenses include fabrication, falsification, and plagiarism, but also manipulating authorship, self-plagiarism, selective citation, misrepresenting or exaggerating the importance of research findings, and supporting predatory journals. The very formulation of these offenses ('manipulation', 'misrepresentation', 'support') implies some type of conscious intent, and in this way the ECC also implicitly excludes incompetence as such as an infraction of its code.

By contrast, in the American Code of Medical Ethics, the very first principle concerns competence: "A physician shall be dedicated to providing *competent* medical care, with compassion and respect for human dignity and rights" (my emphasis). The second principle even stipulates that incompetence in other physicians should be reported: "A physician (…) shall strive to report physicians deficient in character or competence (…) to appropriate entities." (AMA, 2001). In the practice of law, a similar approach to incompetence can be discerned. In the code of conduct of the International Bar Association (IBA 2011), competence is explicitly included as a code of conduct: "A lawyer's work shall be carried out in a competent and timely manner." (IBA 2011, 7). The inclusion of this provision of the code is justified by reference to the trust of the client:

[14] The previous version of the Europe-wide code of conduct (ESF-ALLEA, 2011) followed USA Federal Policy on Research Misconduct with regard to levels of intent. in the most recent version of the European Code of Conduct, levels of intent are avoided as much as possible, partially because different European countries have divergent legal situations, and partially because the authors of the document wanted to move away from legalistic towards ethical language (Maura Hiney, personal communication).

> "the client is entitled to assume that the lawyer has the ability and capacity to deal adequately with all legal matters to be undertaken on the client's behalf or to procure that somebody else either in or outside the law firm will do it." (IBA 2011, 30)

Thus a client can presume that the lawyer is competent, and that the lawyer is aware of the limits of his or her competence, and seeks outside advice where necessary.

Table 2 gives a more general overview of how codes of conduct for the scientific community contrast with those in the medical and legal professions in major OECD countries.Here are some principles that a code of conduct may contain that indicate an emphasis on the importance of competence:

- Maintaining competence: "Undergo continuous training and maintaining up-to-date knowledge"
- Recognizing competence: "Only act within one's area of established competence; otherwise refer the client to a peer or ask for a peer's help"

If these or similar locutions are present in a code of conduct, then it is implied that incompetence is an infraction of the code: either by acting outside of the area of established competence, or if one is ignorant of current standards of competence (by not undergoing the necessary training).

The upshot is that professional codes of conduct, without exception, are acutely concerned with the issue of negligent incompetence. By contrast, the scientific codes of conduct by and large ignore this issue. The exceptions are Netherlands Code of Conduct for Research (KNAW, 2018) and the Australian Code for the Responsible Conduct of Research (ARC & UA, 2018), where negligent infractions of the code are included as research misconduct.

It should be noted that this reflects only the situation in the codes of conduct: it does not say anything about actual behaviour of scientists, or professionals. For instance, there have been studies on how incompetence among physicians seems to be underreported (DesRoches et al., 2010); nonetheless, insofar codes of conduct reflect the consensus of a community about what the norms governing conduct should be, this is a very significant difference, and one that invites further analysis.

Code of Conduct / Country	Scientific	Medical	Legal
USA	N	Y	Y
Canada	N	Y	Y
Australia	Y	Y	Y
UK	N	Y	Y
Europe	N	/	Y

Belgium	N	Y	Y
France	N	Y	Y
Germany	N	Y	Y
Italy	N	Y	Y
Netherlands	Y	Y	Y

Table 2: Is incompetence listed as an infringement of the code of ethics? Scientific versus medical and legal codes of conduct. Y = yes; N = no; / = code not available.

One may note that there are significant differences between disciplines, and that some disciplines (e.g. psychology) have a significant clinical or therapeutic aspect, and thus deal with clients on a regular basis. Therefore, perhaps unsurprisingly, when we look at the discipline-specific codes of conduct across a range of disciplines, we see a large variety in stances on incompetence. As Wilensky noted:

> where a scientific discipline has a substantial segment of its adherents fully engaged in applied work, the requisites of a profession are generally met. (Wilensky, 1964, p. 141)

Table 3 shows how, for codes of conduct in psychology, incompetence is listed as a serious infraction of the code, just as it is for physicians. Sociologists also offer their services to external parties in a non-academic setting, but only in Anglo-Saxon countries is incompetence listed as an infraction. Finally, in more theoretical disciplines with little if any contact with clients, such as physics and philosophy, incompetence is mentioned even less frequently if at all.

Code of Conduct / Country	Sociology	Psychology	Physics	Philosophy
USA	Y	Y	N	N
Canada	Y	Y	Y	N
Australia	Y	Y	N	N
UK	Y	Y	Y	N
Europe	N	Y	/	/
Belgium	/	Y	/	/
France	/	Y	/	/
Germany	N	Y	/	/
Italy	N	Y	/	/

Table 3: Differences between discipline-specific codes of conduct within science

These differences between science and the professions, as well as between scientific disciplines raise a number of questions. Why is it most, but not all, code of conduct do not list negligent incompetence as an infraction? Is it that the science community is still finding its way along the professionalization curve – and are the recent codes of conduct in the Netherlands and Australia indication of a trend? Or are there good reasons in not listing negligent incompetence as an infraction?

Progress on these questions can be made by understanding why negligent incompetence matters in the first instance: because it compromises the service ideal. When negligence occurs, the problem is not the lack of autonomous expertise: if the professional has undergone the requisite training, one can assume that requisite expertise is present, either for carrying out the service competently, or for recognizing one's incompetence, and undergoing additional training or referring the client to a competent professional. This is the difference with 'honest error', where the professional has taken every precaution to live up to the service ideal, but where a factor outside the area of control of the professional has intervened and prevented a successful intervention.

Hence, in the case of science, what negligence means is very dependent on how one understands the service ideal. In the traditional model of the service ideal, any scientific research where the researcher has not taken every precaution to ensure that the research constitutes a disinterested search for truth runs the risk of negligent incompetence. The ideal of disinterested search is very broad and ill-defined – this is both its strength, but also its weakness, and hence needs to be supplemented by more well-defined ideals such as honesty or reliability. However, it is entirely possible to adhere to the principles of honesty, reliability, respect, and accountability, and still not have made a genuine effort for a search for truth. One can conduct particular researches for reasons of furthering one's career rather than the truth, for instance, by publishing a variation of old research or by publishing on a fashionable topic.

5. Discussion and Conclusion: Towards a Further Professionalization of Science?

Many science policy suggestions implicitly adopt either the market or the bureaucracy model. In the first model, the focus lies on reforming the incentives of scientists, for instance, by increasing the incentive to do replication research (CITE), or increasing incentives to prioritize the quality rather than quantity of publications (CITE). In the second model, the focus lies on creating new procedures. An example of this is the proposed Registered Reports initiative (cf. Munafò et al., 2017), where journals make a decision to publish a study based on

a detailed proposed protocol, but before results are known, in order to avoid questionable practices such as HARKing (Hypothesizing After the Results are Known).

The current paper suggests a different, and likely complementary direction along which science outcomes can be improved, namely by strengthening professional autonomy of researchers, which is strengthened by the strengthening of a service ideal. This has been one of the core motivations of introducing scientific codes of conduct in the first place. However, in this paper I pointed to an ambiguity in any code of conduct: it can be the basis for professionalism, but it can also be the first step towards an increased bureaucratization. If scientific codes of conduct are to be the basis for the former, then they need to take a stronger stand on the autonomy of individual researchers, the self-regulation of the community, and the service ideal of scientific research. Given a logic of professionalism, social and methodological ideals (such as 'respect' or 'reliability') are necessary but not sufficient for a full service ideal, and the traditional service ideal of the disinterested search for truth should be included in any scientific code of conduct. It is due to adherence to these service ideals that professionals and professional communities are given significant autonomy in the first place. Furthermore, given a logic of professionalism, then individual researchers who conduct their research according to their own discretionary judgment – not that of administrators in institutions, nor consumers in the wider society – should also be held responsible when their research research falls short of the service ideal.

[9861 words]

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