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KNOWING WITH EXPERTS: CONTEXTUAL KNOWLEDGE IN AND AROUND SCIENCE

Abstract: *The original concept of epistemic dependence suggests uncritical deference to expert opinions for non-experts. In the light of recent work in science studies, however, the actual situation of epistemic dependence is seen to involve the necessary and ubiquitous need for lay evaluations of scientific experts. As expert knowledge means restricted cognitive access to some epistemic domain, lay evaluations of expert knowledge are rational and informed only when the criteria used by non-experts when judging experts are different from the criteria used by experts when making their claims. The distinction between "substantial knowledge" and "contextual knowledge" allows for the laypeople to know with experts without having to know precisely what experts know. Such meta-expert evaluations are not specific to the public sphere outside science, nor are they limited internally to science, but they are present in a wide range of contexts in and around science. The paper legitimizes the concept of contextual knowledge by relating it to the relevant literature, and expounds the idea by identifying some elements of such a knowledge.*

Keywords: *epistemic dependence; expertise; public understanding of science; social epistemology; testimony*

Poznávat spolu s experty: kontextuální vědění ve vědě a kolem ní

Abstrakt: *Původní koncept epistémické závislosti podněcoval u ne-expertů nekritickou podřízenost expertním názorům. Ve světle nedávného vývoje ve zkoumání vědy se však skutečná situace epistémické závislosti jeví tak, že zahrnuje nezbytnou a všudypřítomnou potřebu pro laické hodnocení vědeckých expertů. Jelikož expertní vědění znamená omezení poznávacího přístupu k některým epistémickým doménám, laická hodnocení expertního vědění jsou racionální a informovaná pouze tehdy, když se kritéria užívaná ne-experty při posuzování expertů liší od kritérií užívaných experty pro jejich tvrzení. Rozlišení mezi „substanciálním věděním" a „kontextuálním věděním" umožňuje laikům poznávat spolu s experty bez toho, že by museli vědět přesně totéž, co oni. Taková meta-expertní hodnocení nejsou specifická pro veřejnou sféru mimo vědu ani nejsou na vědu vnitřně omezená, ale vyskytují se v široké míře kontextů ve vědě a kolem ní. Tento článek legitimizuje koncept kontextuálního vědění jeho vztažením k relevantní literatuře a objasňuje tuto myšlenku pomocí identifikace některých prvků takového vědění.*

Klíčová slova: *epistémická závislost; expertíza; veřejné chápání vědy; sociální epistemologie; svědectví*

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1. Epistemic dependence

A central problem in recent epistemology is the problem of indirect or testimonial knowledge. Much of what we take to be known is indirect for us in the sense that it is based on our trust in other people's direct knowledge, in contrast with the idea of direct knowledge related to first-person empirical evidence and its rational assessment. In the past decades, the problem has been intensely investigated in the field of social epistemology, emerging from a thematic issue of the journal *Synthese* (October 1987) in which groundbreaking positions were outlined, e.g., by Steve Fuller[1] and Alvin Goldman.[2] Similar problems have been discussed in socialized versions of the philosophy of science,[3] or reflecting specifically to the problem of testimony,[4] especially in the history of science.[5]

A perhaps decisive inspiration to this emerging tradition was the eloquent characterization of the fundamental epistemological problem given by John Hardwig, who coined the term *epistemic dependence*.[6] He sets off by claiming, as an explication of a basic and common experience, that the source of a good deal (or even vast majority) of what we know is deference to epistemic authorities, and the greater the cultural complexity is, the more it is so. In the dominantly empiricist epistemological tradition, however, these elements of belief are not considered rational inasmuch as their acceptance

The work was supported by the Bolyai Research Scholarship. I am grateful to Natalie Ross for her useful corrections, and to two anonymous reviewers for their suggestions.

[1] Steve FULLER, "On Regulating What Is Known: A Way to Social Epistemology." *Synthese*, vol. 73, no. 1, 1987, p. 145–183. Fuller is the founder of the journal *Social Epistemology* in 1987, and also author of the book *Social Epistemology* (Bloomington: Indiana University Press 1988).

[2] Alvin GOLDMAN, "Foundations of Social Epistemics." *Synthese*, vol. 73, no. 1, 1987, p. 109–144. He was later founder of the journal *Episteme: a journal of social epistemology* in 2004, and author of *Knowledge in a Social World* (Oxford: Oxford University Press 1999) and *Pathways to Knowledge: Private and Public* (Oxford: Oxford University Press 2002).

[3] E.g. Philip KITCHER, *The Advancement of Science*. Oxford: Oxford University Press 1993; or Miriam SOLOMON, *Social Empiricism*. Cambridge: MIT Press 2001; and also feminist epistemologies such as Helen LONGINO, *Science as Social Knowledge*. Princeton: Princeton University Press 1990.

[4] E.g. C. A. J. COADY, *Testimony*. Oxford University Press 1992; Martin KUSCH, *Knowledge by Agreement*. Oxford: Oxford University Press 2002; Jennifer LACKEY – Ernest SOSA (eds.), *The Epistemology of Testimony*. Oxford: Oxford University Press 2006.

[5] E.g. Steven SHAPIN, *A Social History of Truth*. Chicago: University of Chicago Press 1994; or see the June 2002 issue of the journal *Studies in the History and Philosophy of Science*.

[6] John HARDWIG, "Epistemic dependence." *The Journal of Philosophy*, vol. 82, 1985, p. 335–349.

is not based on rational evidence (since the testimony of others does not seem to be a rational evidence). So if we want to avoid the seemingly absurd conclusion that the majority of our knowledge is irrational, proportionally to social complexity, then we are faced with a dilemma: 1. Either we have to say that "someone can know 'vicariously' – i.e., without possessing the evidence for the truth of what he knows, perhaps without even fully understanding what he knows".[7] 2. Or we have to accept that "the *community* of inquirers is the primary knower and that individual knowledge is derivative",[8] and then we give up the fancy idea of intellectual autonomy (Hardwig opts for this second solution).

Note that already the term "dependence" suggests a strongly asymmetrical relation between experts (people with direct knowledge) and laypeople (those with indirect knowledge only). Hardwig takes a pessimistic position regarding the possibility of laypeople's assessment of expert opinions: since laypeople are, by definition, those who fall back on the testimony of experts, they have hardly any means of rationally evaluating expert claims. Of course, laypeople can ponder on the reliability of certain experts, or rank the relative reliability of several experts, but it can only be rationally done by asking further experts and relying on their assessments – in which case we only lengthened our chain of epistemic dependence, instead of getting rid of it.[9] So, according to Hardwig, we have to fully accept our epistemic inferiority to experts, and either rely uncritically on expert claims or, even when criticizing these claims, we have to rely uncritically on experts' replies to our critical remarks.[10]

In this paper I argue that laypeople's epistemic inferiority to experts is not as straightforward as portrayed by Hardwig, and that laypeople have important means of assessing expert opinions. First I turn to the relevant literature in order to identify contexts where such assessment seems not only possible but necessary, and summarize some of the solutions offered. Then I try to show that both the concepts of "expert" and "layperson" need to be reconsidered in the light of those essential transformations that has recently taken place, on the one hand, in the public perception of science and its social role and, on the other hand, in the philosophical, historical and sociological studies of science. Finally I offer a vague description of what

[7] *Ibid.,* p. 348.
[8] *Ibid.,* p. 349.
[9] *Ibid.,* p. 341.
[10] *Ibid.,* p. 342.

might be classed as elements of meta-expertise, and suggest how the concept of contextual knowledge may bridge the gap between highly specialized knowledge and complete ignorance.

2. Suspending the epistemic inferiority complex

2.1 Hardwig's ad hominems

At one point even Hardwig admits that laypeople's otherwise necessary inferiority can be suspended in a certain type of situations that he calls *ad hominem*:[11]

> The layman can assert that the expert is not a disinterested, neutral witness; that his interest in the outcome of the discussion prejudices his testimony. Or that he is not operating in good faith–that he is lying, for example, or refusing to acknowledge a mistake in his views because to do so would tend to undermine his claim to special competence. Or that he is covering for his peers or knuckling under to social pressure from others in his field, etc., etc.

However, before we get too optimistic and try to generalize, Hardwig warns us that these ad hominems "seem and perhaps are much more admissible, important, and damning in a layman's discussions with experts than they are in dialogues among peers", since ad hominems are easy to find out in science via testing and evaluating claims.[12] And apart from these rare and obvious cases, laypeople have no other choice left than blindly relying on expert testimonies.

Let us have a closer look at ad hominems.[13] The target of ad hominem arguments is not the content of claims but rather the circumstances of the interlocutor making these claims. Such an attitude is usually seen as fallacious or abusive, on the supposition that the truth of a claim has nothing to do with how, by whom, and in what circumstances the claim is made. This supposition, however, is far from unproblematic, but even without addressing it theoretically we may simply observe that – in some cases, like the

[11] *Ibid*.
[12] *Ibid*., p. 343.
[13] See e.g. Douglas WALTON, *Ad Hominem Arguments*. Tuscaloosa – London: The University of Alabama Press 1998; or Frans van EEMEREN – Rob GROOTENDORST, "The History of the *Argumentum Ad Hominem* Since the Seventeenth Century." In: KRABBE, E. C. W. – DALITZ, R. J. – SMIT, P. A. (eds.), *Empirical Logic and Public Debate*. Amsterdam: Rodopi 1984, p. 49–68.

ones above – *ad hominems* seem to give obvious and rational justification for the rejection of claims. Similarly, the plausibility of some claims made by politicians, diplomats, or salesmen is clearly effected by the knowledge of the circumstances in which the claims were made. What is important here is that epistemic access to the *context* is markedly different from epistemic access to the *content*, and this provides the layperson with at least a slight possibility of evaluating specialist claims.

In order to investigate the scope of this possibility, we now turn to some solutions, suggested in the literature on scientific expertise, to the problem of how laypeople can evaluate expert claims. It is not only the precise suggestions themselves that are relevant here but also the situations in which, according to the authors, laypeople's assessment of expert claims seems necessary and unavoidable.

2.2 Brewer and the Juries

Scott Brewer, a philosopher of law, considers the situation of court trials where non-expert judges and juries are entitled to evaluate expert testimonies, including scientific ones.[14] In these cases simple epistemic deference is obviously out of question, so instead, Brewer lists what he identifies as possible routes to "warranted epistemic deference", i.e. means of non-expert evaluation of expert claims. These are: substantive second guessing, using general canons of rational evidentiary support, evaluating demeanor, and evaluating credentials.

Substantive second guessing means that the layperson has, at least to some degree, epistemic access to the content of expert argument and she can understand and assess the evidences supporting the expert claim. Of course, as Brewer admits, such situations are rare since scientific arguments are usually highly technical. But the main problem here is theoretical rather than practical: the possibility of substantive second guessing blurs the distinction between experts and laypeople. Expertise, as we will see later, means restricted epistemic access, as expressed by the concept of epistemic dependence. What I suggest is that if there is second guessing in work here then it is circumstantial or contextual rather than substantive. The three other routes offered by Brewer may serve as examples.

[14] Scott BREWER, "Scientific Expert Testimony and Intellectual Due Process." *The Yale Law Journal*, vol. 107, 1998, p. 1535–1681.

The second route is using general canons of rational evidentiary support. If an expert argument is incoherent (e.g. self-contradicting) or unable to make or follow basic distinctions (in his example, between causing and not preventing) then, even for the layperson, it becomes evident that such an argument is unreliable. From the practical point of view, this possibility is available only when the argument is simple and non-technical enough for the layperson to follow, just like in the case of substantive second guessing, and it is rarely the case. But theoretically, this option is dissimilar from the previous one in that it is not the content of the argument non-experts need to have access to but rather the form, and this requires on their side skills and competences different from those of the expert.

Evaluating the demeanor is similar in this respect: the criteria used to evaluate demeanor are clearly different from those used to evaluate the content of claims. Laypeople may try to weigh up how sincere, confident, unbiased, committed etc. the expert is, and this obviously influences to what degree non-experts tend to rely on expert claims. In traditional rhetorical terms, all this belongs to the *ethos* of the speaker which has been held, especially in the past century, in high suspicion because of its capacity to contribute to persuasion (of any kind) as opposed to rational conviction. Brewer shares this suspicion and emphasizes the abusive potential in demeanor often exploited by the American legal system where there is a market for persuasive and competent-looking expert witnesses, and he concludes that demeanor is an untrustworthy guide. But for us it suffices to note here that however untrustworthy it may be, in some situations demeanor may be found to be informative (rather than simply persuasive) with respect to the plausibility of expert claims, and thus it serves as a means of evaluating experts.

The most reliable route, according to Brewer, is the evaluation of the expert's credentials, including scientific reputation. He adopts the credentialist position[15] even while acknowledging that it is laden with serious theoretical difficulties, such as the regress problem (ranking similar credentials requires asking additional experts), or the underdetermination problem (similar credentials underdetermine our choice between rivaling experts). In order to be able to evaluate scientific credentials, one needs to have some degree of familiarity with the institutional structure of science (rankings, positions,

[15] Similarly e.g. to Anthony KENNY, "The Expert in Court." *Law Quarterly Review*, vol. 99, 1983, p. 197–216.

organizations, etc.), which is another, quite specialized, type of contextual knowledge needed to assess claims made by scientific experts.

2.3 Goldman and rivaling experts

Another feature of legal court trials, in addition to the inherent necessity of the situation to evaluate experts by non-experts, is that in the typical case laypeople are confronted with two, usually contradicting, expert testimonies. Such circumstances are not restricted to the courtroom, of course, but the significance one attributes to them clearly depends on how widespread or general they are seen. Hardwig, for instance, is aware that simple epistemic deference is inapplicable in cases of divided expert opinion, but in his seminal paper he devotes only one paragraph to the problem,[16] perhaps because he thinks that such cases are exceptions rather than the rule. He suggests that laypeople should refrain from forming their opinion when faced with rivaling expert claims (i.e. incompatible claims about the same issue), or if they do form an opinion they have to keep in mind that they did it on irrational grounds. So the more frequent and typical these situations are, the less usable Hardwig's solution of simple epistemic deference becomes.

Alvin Goldman, a central figure in social epistemology, tries to identify those sources of evidence that laypeople can call upon when choosing from rivaling expert opinions–in situations where epistemic solutions of "blind reliance" break down.[17] According to him, these are: argument-based evidence, agreement from other experts, appraisals by meta-experts, consideration of interests and biases, and evidence of track-records.

Goldman distinguishes between two types of argumentative justification. "Direct" justification means that the non-expert understands the expert argument and is able to evaluate it, similarly to what Brewer means by substantive second guessing. Goldman tries to maintain the gap between experts and laypeople by saying that some expert arguments can be formulated in an exoteric language that is accessible to the layperson, and this is where direct justification is possible. But when arguments are formulated in an unavoidably esoteric language, non-experts still have the possibility to give "indirect" justification by evaluating what Goldman calls argumentative performance: certain features of the arguer's behavior in controversies

[16] HARDWIG, "Epistemic dependence," p. 343.
[17] Alvin GOLDMAN, "Experts: Which Ones Should You Trust?" *Philosophy and Phenomenological Research*, vol. 63, no. 1, 2001, p. 85–109.

(quickness of replies, handling counter-arguments, etc.) indicate the degree of competence, without requiring from the non-expert to share the competences of the expert.

Additional experts can be used in two ways in Goldman's classification: either by asking which of the rivaling opinions is agreed upon by a greater number of experts, or by asking meta-experts (i.e. experts evaluating other experts) for judgment on the expert making the claims. For Goldman, this type includes the credentialist solution as well, for credentials are issued by meta-experts and represent their evaluation of the expert in question. He deals with these cases simultaneously and claims that they are basically the same, since meta-experts use decision criteria that are as inaccessible to non-experts as the ones used by the subject level experts, so eventually all these cases boil down to comparing mere numbers. And that, as he argues at length, is unreliable.

Similarly to Hardwig's ad hominem cases, Goldman also considers the possibility of identifying interests and biases in the arguer's position. As interests and biases are usually easier to measure than arguments or credentials, he attributes considerable significance to these cases, even with the qualification that far too often both of the rivaling experts are interested and biased to the same degree which, as in Brewer's analysis of credentials, underdetermines the decision.

What Goldman sees as the most reliable source of evidence is track-record. He argues that even highly esoteric domains can produce exoteric results or performances (e.g. predictions) on the basis of which the non-expert becomes able to evaluate the cognitive success of the expert. While using this criterion requires from the laypeople to pay significant effort to examining and comparing different track records, in situations where the choice between experts leads to serious consequences (e.g. a courtroom situation surely belongs here) such an effort seems justified.

2.4 Studies of expertise and experience (SEE)

Despite their different answers to the question of most reliable decision criteria, Brewer and Goldman agree that sounder evaluation needs special attention, either by studying the institutional structure of science or by examining specialists' track-records. But why should laypeople take the effort of improving their contextual knowledge of science? If we turn from philosophical epistemology to the social studies of science and technology, we find an answer at the core of the discipline: because laypeople's lives are

embedded in a world in which both science and experts play a crucial role, but where not all experts represent science and even those who do, represent various, often incompatible, claims from which laypeople have to choose what to believe.

The program called "studies of expertise and experience" (SEE) evolved in a framework shaped by these presuppositions. It was initiated by science studies guru Harry Collins and Robert Evans when they advertised and urged the "third wave" of science studies.[18] Their initial problem is that "the speed of politics exceeds the speed of scientific consensus formation",[19] meaning that decision making processes outside science (politics, economy, the public sphere, etc.) are usually faster than similar processes in science. This gives rise to what they call "the problem of legitimacy":[20] how is technological decision making possible given the growing social uncertainty? They claim that solutions are already achieved, or pointed to, in the field of "public participation in science". However, a related but yet unsolved problem is "the problem of extension", i.e. to what degree should the public be engaged in technical decision making? The program of SEE is meant to provide normative answers to this question.

In this framework the term "expert" has a wide range of applications, since experts are defined as those "who know what they are talking about",[21] which is based on immersion in communicative life forms.[22] Forms of expertise range from ubiquitous skills (such as native language usage) to the highest degree of scientific specialization, as summarized in "the periodic table of expertises".[23] What is relevant here is that this table includes, in addition to types of specialist expertise, those forms of "meta-expertise" that can be used to judge and evaluate specialist expertise.

[18] Harry COLLINS – Robert EVANS, "The Third Wave of Science Studies: Studies of Expertise and Experience." *Social Studies of Science*, vol. 32, no. 2, 2002, p. 235–296; later expanded to Harry COLLINS – Robert EVANS, *Rethinking Expertise*. Chicago: The University of Chicago Press 2007.
[19] COLLINS – EVANS, *Rethinking Expertise*, p. 8.
[20] COLLINS – EVANS, "The Third Wave of Science Studies," p. 237.
[21] COLLINS – EVANS, *Rethinking Expertise*, p. 2.
[22] This conception is criticized e.g. by Evan SELINGER – John MIX, "On Interactional Expertise: Pragmatic and Ontological Considerations." In: SELINGER, E. – CREASE, R. P. (eds.), *The Philosophy of Expertise*. New York: Columbia University Press 2006, p. 302–321; or in Evan SELINGER – Hubert DREYFUS – Harry COLLINS, "Interactional Expertise and Embodiment." *Studies in History and Philosophy of Science*, vol. 38, 2007, p. 722–740.
[23] COLLINS – EVANS, *Rethinking Expertise*, p. 14.

As the theory distinguishes between, on the one hand, those kinds of specialist expertise that are based on esoterically available tacit knowledge and, on the other hand, those that are supported by exoteric information only, a similar distinction is introduced for meta-expertise. There are meta-experts who evaluate other experts as formal equals (scientists on other scientists), or as representatives of meta-sciences (political scientists on politicians, literary critics on writers, etc.) – i.e., professionally. But apart from that, a widespread deference to experts is a basic necessity in modern societies, and laypeople are thus forced to acquire skills and "social intelligence" needed to cope in an expert culture. So non-experts are able to bring decisions regarding technical questions on non-technical grounds, either when they have personal access to part of the social relations ("local discrimination"), or when they as complete outsiders come to decisions based on their social experiences ("global discrimination").

Also in this "periodic table" one can find "meta-criteria" for evaluating experts. One of these is credentials and, as opposed to Brewer, Collins and Evans find this source as the least reliable of all–especially in fields outside science where there are no credentials at all. They consider track-records to be somewhat more trustworthy, but the practical problem here is also that in many areas of expertise track-records are nonexistent. So what they find most reliable is the past experience of experts, but unfortunately it is not elaborated how an expert's experience could become accessible and measurable from the non-expert perspective. However, all these meta-criteria are such that they need special focus on the layperson's side to assess, while in most cases the public would want to come to decisions based on less local details.

In order to form technical judgments based on non-technical and relatively general warrants, laypeople need some kind of social intelligence to rely upon. As Collins and Evans claim:

> [The] judgment turns on whether the author of a scientific claim appears to have the appropriate scientific demeanor and/or the appropriate location within the social networks of scientists and/or not too much in the way of a political and financial interest in the claim.[24]

They illustrate the point with three examples: astrology, manned moon landings and cold fusion. In all cases they claim that people (or at least sufficiently informed people) in Western societies have enough social skills

[24] *Ibid*., p. 45.

to arrive at the correct conclusion–that astrology is not a science (since astrologists are not contained by the social networks of science), that moon landings are not faked (since such a huge conspiracy is not conceivable in our societies), and that cold fusion experiments did not succeed (and do not belong to the network of science anymore). To me, however, it seems that these examples are convincing only insofar the non-experts we are talking about are really informed, which is closer to an idealistic society the actual ones I know.

To sum up the main points of this section: It seems clear that despite all the possible theoretical difficulties, laypeople can and do make evaluations of expert claims, and since laypeople are not experts in terms of their cognitive domains, these evaluations are based on criteria external to the specialist domain. Also, such external evaluations are not only frequent but generally unavoidable in a world of rivaling experts and consensus-lacking controversial issues. But while the relevant external criteria are numerous and various, the reliability of these evaluations generally depends on some degree of focus and effort on the layperson's side toward knowing scientists as experts. In order to give a more systematic account, the concepts of layperson and expert need to be reconsidered.

3. Expertise and the public

3.1 Experts

The problem of experts has been present in the history of Western thought at least since Socrates of the early dialogues of Plato, who sought to find what knowledge is by asking and then confronting some of the most renown experts of his day. Recently the concept has received an intensified attention. "A significant milestone is reached when a field of scientific research matures to a point warranting publication of its first handbook", claims the beginning sentence of the first handbook of expertise[25] that summarizes mainly the relevant psychological research of the past few decades in 900 dense pages. What we have discussed so far illustrates that the topic has also been addressed in philosophy,[26] or in the social studies of science where the initiative

[25] K. Anders ERICSSON – Neil CHARNESS – Paul J. FELTOVICH – Robert R. HOFFMAN (eds.), *The Cambridge Handbook of Expertise and Expert Performance*. Cambridge: Cambridge University Press 2006, p. 3.

[26] See e.g. Evan SELINGER – Robert CREASE (eds.), *The Philosophy of Expertise*. New York: Columbia University Press 2006.

paper by Collins and Evans[27] has become one of the most frequent points of reference in the field. Other forms of an "expertise-hype" can be seen in the theory of management, in risk assessment, in artificial intelligence research, in didactics, and in a number of other fields having to do with the concept of "expert". Of course, the wide variety of relevant disciplines breeds many different concepts of expertise and poses many different questions, and there is no coherent theoretical approach covering even a whole discipline, not to mention all of these together. This implies that an intuitive understanding of expertise is insufficient here and, without wanting to build or use any full-fledged background theory, some points need to be explicated.

The conception of expertise this paper relies on is not an essentialist one. I am not interested in what or who experts are, i.e. what it is that makes an expert an expert. The psychological literature examines how experts perform better than non-experts and what cognitive or other factors display the difference. Brewer relates the concept of expertise to the notion of understanding and describes epistemic competence,[28] Goldman tries to define it in "veritistic" terms and connects it to information-processing know-how,[29] Collins and Evans refer to life forms and discursive communities.[30] My assumptions are perhaps even less demanding and purely phenomenological (in the broadest sense): it is an elementary experience (and at the same time presupposition) of our culture that in many areas there are such people as experts to whom we turn with our problems and questions.

On the other hand, nor does it seem satisfactory to suffice with a purely attributional conception, i.e. to say that being an expert is nothing more than being handled as an expert. The two minimal necessary conditions that represent the normative character of the concept are that it is experience-based and it is epistemically restricted. The experience requirement is already contained by the term "expert", coming from the Latin *expertus*, experienced. Prima facie, someone with experience is opposed to someone with indirect (testimonial) knowledge only, or someone with no knowledge at all. But experience is also in contrast with pure factual knowledge, or fake knowledge, etc. Moreover, skills based on experience can have different degrees depending on the amount and intensity of that experience, and this

[27] COLLINS – EVANS, "The Third Wave of Science Studies."
[28] BREWER, "Scientific Expert Testimony and Intellectual Due Process."
[29] GOLDMAN, "Experts: Which Ones Should You Trust?"
[30] COLLINS – EVANS, *Rethinking Expertise.*

means that expert skills are improvable.[31] Usually in organized cultures, relevant experience and resulting skills are improved by training, often in institutionalized forms.

The other normative requirement on expertise is that it means restricted cognitive access to a domain. This assumption goes counter to the theory of Collins and Evans, since they include ubiquitous skills among forms of expertise. But such an extension of the scope seems too wide in that those situations it covers in addition are such that they lack the relation of epistemic dependence, and so are not relevant to this paper. Reading, for example, is a skill that is based on experience and training, but we would not call it expertise simply because it is practically ubiquitous–while a thousand years ago it was an important form of expertise due to its restricted availability. In this sense expertise is an important form of cultural capital,[32] in case it offers skill or knowledge that is worthy and valuable for the society.[33]

The kinds of experts we deal with are epistemic experts: laypeople depend on them for their knowledge of "how the world is" in a certain area, and not for their ability to solve practical problems. In case of epistemic expertise, a further requirement seems to be that expert knowledge should be communicable to be shared with laypeople. Of course, experts' restricted access means that only some aspects of epistemic expertise can be shared with non-experts, but the question is still open what these aspects are. In the minimal assumption, experts need to be able to answer questions belonging their field of expertise, without being able or willing to share the reasons and arguments for their answers. This would suffice for simple epistemic deference, but it seems less satisfactory in case of divided expert opinion where laypeople need to choose from several expert claims. As we have seen, laypeople can still rely on a number of criteria if reasons and arguments are not given, but if it is in the expert's interest to convince her audience, it seems a better option to try to come up with cognitively accessible justification. All this depends on the audience–which takes us to the concept of laypeople.

[31] Expertise as a result of learning process is at the core of some conceptions such as Hubert DREYFUS – Stuart E. DREYFUS, "Peripheral Vision: Expertise in Real World Contexts." *Organization Studies*, vol. 26, 2005, p. 779–792.
[32] Pierre BOURDIEU, "The Forms of Capital." In: RICHARDSON, J. G. (ed.), *Handbook for Theory and Research for the Sociology of Education*. New York: Greenwood 1986, p. 241–258.
[33] E.g. Steve FULLER, "The Constitutively Social Character of Expertise." *International Journal of Expert Systems*, vol. 7, no. 1, 1994, p. 51–64.

3.2 Laypeople

Those who do not belong to the social networks of science are often referred to as "the public". In recent literature, two approaches are distinguished in the field of "public understanding of science": the deficit model and the contextual model.[34] In the deficit model the layperson is viewed as someone yet ignorant of science but capable of having their head "filled" with knowledge diffusing from science. Such a "filling process" increases, first, laypeople's scientific literacy (and their ability to solve related technical problems), second, their degree of rationality (following the rules of scientific method), and third, their trust in and respect for science. This model ruled the traditional conception of the field until recently when it has been criticized and widely replaced by the contextual model. According to the latter, members of the public do not need scientific knowledge for solving their problems, nor do they have "empty memory slots" to receive scientific knowledge at all. Instead, the public's mind is fully stuffed with intellectual strategies to cope with problems they encounter during their lives, and some of these problems are related to science. So the public turns to science actively (instead of passive reception), more precisely to scientific experts, with questions framed in the context of their everyday lives.

Now the questions the public is interested in can rarely be answered by "ready made science" deposited in textbooks, but they belong to "science in the making".[35] Instead of asking precisely how planets or pendulums move, to which there are answers that are consensual and yet mostly irrelevant to the public, they want to know e.g. what materials or activities are healthy, and these questions are (still) controversial in science. So people are faced with a plethora of different and partly contradicting expert opinions, from which they have to build their system of beliefs. If the contextual model provides a correct description of the basic situation here, then the problems of epistemic dependence and non-expert evaluation of experts become vital.

Such a conceptual shift in the public understanding of science is linked with recent fundamental changes in both the structure of science and the

[34] E.g. Alan G. GROSS, "The Roles of Rhetoric in the Public Understanding of Science." *Public Understanding of Science*, vol. 3, 1994, p. 3–23; or Jane GREGORY – Steve MILLER, "Caught in the Crossfire? The Public's Role in the Science Wars." In: LABINGER, J. A. – COLLINS, H. (eds.), *The One Culture? A Conversation about Science*. Chicago – London: University of Chicago Press 2001, p. 61–72.

[35] For the difference, see Bruno LATOUR, *Science in Action*. Cambridge, MA: Harvard University Press 1987.

social image of the role of science. These processes are related to the concepts of post-academic science[36] or mode-2 science[37], both re-describing science as transforming into a market-minded social structure. More directly relevant here is the idea of "post-normal science"[38], according to which decisions in the science and technology of our age are achieved under the circumstances of high risk and uncertainty. A similar idea was the initial premise of the SEE approach, i.e. the speed of decisions in science can never catch up with the speed of decisions outside science, and this always requires that the non-expert sphere should bring decisions in technical matters of scientific expertise.

All this together is the answer to what Collins and Evans called the problem of legitimacy: why laypeople should be engaged in decision making in fields of expertise. In social studies of science, similar and related questions have inspired numerous practical approaches, for instance, in the field of "public participation in science".[39] The three main orientations are the following:[40] 1. In the theoretical approach, general consequences of the socio-cultural phenomenon of epistemic dependence are sought (e.g. social epistemology). 2. The political approach discusses the possibilities of improving socio-economic decision-making processes by involving experts, in a situation where the socio-economic space of science have outgrown its classical epistemic niche (e.g. post-normal science). 3. The activist approach addresses non-experts and aims at making the public more knowledgeable, responsible and interested with respect to scientific and technological processes influencing their everyday lives.

Such a public is essentially different from the servile and passive laypeople compatible with Hardwig's description. External evaluations of scientific issues are part and parcel of present cultures. But the contextual model also

[36] E.g. John ZIMAN, "'Postacademic Science': Constructing Knowledge with Networks and Norms." *Science Studies*, vol. 1, 1996, p. 67–80.

[37] Michael GIBBONS – Camille LIMOGES – Helga NOWOTNY – Simon SCHWARTZMAN – Peter SCOTT – Martin TROW, *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London: Sage 1994.

[38] Silvio FUNTOWICZ – Jerome RAVETZ, "Science for the Post-Normal Age." *Futures*, vol. 25, 1993, no. 7, p. 735–755.

[39] For a summary, see e.g. Massimiano BUCCHI – Federico NERESINI, "Science and Public Participation." In: HACKETT, E. J. et al. (eds.): *The Handbook of Science and Technology Studies*. Third Edition. Cambridge: MIT Press 2007, p. 449–472.

[40] Based on Edward WOODHOUSE – David HESS – Steve BREYMAN – Brian MARTIN, "Science Studies and Activism: Possibilities and Problems for Reconstructivist Agendas." *Social Studies of Science*, vol. 32, no. 2, 2002, p. 297–319.

makes it clear that the non-expert's choice between expert opinions is not a matter of scientific knowledge (for if it was, laypeople would have to know more science than scientist themselves to make decisions about questions still controversial in science). Rather, it is a matter of external skills such as social, argumentative, and perhaps other forms of discrimination, what we call here contextual, as opposed to substantial, knowledge.

3.3 From laypeople to meta-experts

The discussion up to now might have created an impression of a group of laypeople facing another (albeit perhaps heterogeneous) group of experts, standing on the two sides of the expert/non-expert divide. However, since expertise is domain-specific, all experts are laypeople at the same time in all the fields outside their scope of expertise. And this entails that the epistemic dependence relation holds not only between scientists and non-scientists, but also between scientists representing different specializations.

This aspect was already examined in the classical paper of Hardwig who elaborated on the consequences of the division of epistemic labor necessarily inherent in the complex and cooperative scientific activity of present days (he analyses a scientific paper with 99 authors). In social studies of science, features stemming from the "disunity of science" have also been emphatically investigated,[41] and a number of concepts describing different boundary phenomena have been introduced, such as boundary work,[42] boundary object,[43] boundary infrastructure,[44] or boundary organization[45] – all heavily bearing on the political context. Another related concept, "trading zone"[46]

[41] Peter GALISON – David STUMP, *The Disunity of Science.* Stanford University Press 1996.
[42] Thomas F. GIERYN, "Boundary-Work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists." *American Sociological Review*, vol. 48, 1983, p. 781–795.
[43] Susan L. STAR – James R. GRIESEMER, "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39." *Social Studies of Science*, vol. 19, no. 3, 1989, pp. 387–420.
[44] C. BOWKER – Susan L. STAR, *Sorting Things Out: Classification and Its Consequences.* Cambridge, MA: MIT Press 1999.
[45] David H. GUSTON, "Stabilising the Boundary Between U. S. Politics and Science: The Role of the Office of Technology Transfer as a Boundary Organisation." *Social Studies of Science*, vol. 29, 1999, no. 1, p. 87–111.
[46] Peter GALISON, *Image and Logic: A Material Culture of Microphysics.* Chicago: University of Chicago Press 1997.

has been taken up by Michael Gorman[47] and then by the SEE program[48] to show how expertise is transformed in the dynamics of disciplinary interfaces in science. Perhaps it is worth adding that Collins started his career by studying the role of tacit knowledge in science,[49] later central to his concept of expertise, which he found so much local that it is inaccessible outside a small "core-set" working strictly together.

In sum, patterns of external evaluation and warranted epistemic dependence are present everywhere in and around science. The contextual model extends beyond its original scope (public understanding of science) toward the entire culture of expertise, including the inner workings of science. Of course, the need for external judgment can appear in several contexts and at different levels, and various forms of scientific "meta-expertise" may be distinguished in terms of the social context and function (e.g. the "periodic table" in SEE suggests a typology of meta-expertise). Instead of trying to introduce systematic distinctions or classifications, some forms of scientific meta-expertise are listed below to represent a possible spectrum in a complex cultural space.

Most generally, the informed public of present societies needs to evaluate scientific matters, as has been argued at length. If the term "meta-expertise" suggests that it is a kind of expertise itself then, as I claimed above, the more widespread the relevant skills are, the less we may see them as expert skills; while it seems a reasonable directive that all members of the public should benefit from improving their skills of evaluating scientific claims. But even if these skills do not satisfy the restriction criterion, some skills at least satisfy the experience criterion in that the reliability of external evaluations may be increased by focused experience, e.g. acquaintance with the workings of science–remember Brewer's solution of becoming familiar with credentials and organizations, or Goldman's suggestion of studying track-records, or even the idea in SEE to study past experience. The point here is not the small terminological issue whether ubiquitous, or at least ideally ubiquitous, skills might be called expertise or not, but that external judgments on scientific

[47] Michael GORMAN, "Levels of Expertise and Trading Zones." *Social Studies of Science*, vol. 32, no. 6, 2002, p. 933–938.
[48] Harry COLLINS, Robert EVANS – Michael GORMAN, "Trading Zones and Interactional Expertise." *Studies in History and Philosophy of Science*, vol. 38, 2007, p. 657–666.
[49] Harry COLLINS, "The TEA Set: Tacit Knowledge and Scientific Networks." *Science Studies*, vol. 4, 1974, p. 165–186; further elaborated in Harry COLLINS, *Changing Order: Replication and Induction in Scientific Practice*. Beverley Hills – London: Sage 1985.

experts are improvable, and if the improvement reaches a level of specialization then it becomes meta-expertise in a stricter sense.

A need for specialized meta-expertise appears in cases where political and economic decisions concerning science are made (science policy and administration, distribution of funds and supports, R&D investments, legal regulation, etc.). In these cases those who arrive at evaluations of experts as a necessary part of their job are "laypeople" in relation to those whom they evaluate, since the former's field of expertise is clearly different from, and usually not even overlapping with, the latter's. Science communication is similar in this respect since e.g. compiling and editing scientific news or reports or expositions for the public amounts to forms of expertise that include skills of evaluating and assessing scientific expert claims in general, in addition to other skills that are markedly different from those needed for doing science.[50]

Even scientists when relying on results of another field use meta-level evaluations. In case the expert's own field is not far from the one subject to evaluation, then "skills that have been learned in one scientific area" can be "indirectly applied to another", as Collins defines the category of "referred expertise",[51] in connection with multidisciplinary project managers who have to make decisions in areas outside their original field. But expert performance evaluations are more frequently made internally to fields of specialization, e.g. by refereeing publications and grants. An important question is whether evaluations within a specialty are fundamentally different from evaluations made by outsiders. There are two reasons why I tend to deny such a fundamental difference (but of course not any, or even any important, difference). The first is that as noted above, classical works in science studies showed that certainty and full cognitive access in science are extremely local,[52] and that all claims are highly indexical and contextual[53] – which casts serious doubt on the possibility of purely "internal" evaluations even between peers. Second, as Helga Nowotny argues,[54] expertise is

[50] For details see Massimiano BUCCHI – Brian TRENCH (eds.), *Handbook of Public Communication of Science and Technology*. London – New York: Routledge 2008.
[51] Harry COLLINS – Gary SANDERS, "They Give You the Keys and Say 'Drive It!' Managers, Referred Expertise, and Other Expertises." *Studies in History and Philosophy of Science*, vol. 38, 2007, p. 621–641.
[52] See COLLINS, *Changing Order*; or Trevor PINCH, *Confronting Nature: The Sociology of Solar-Neutrino Detection*. Dordrecht – Boston: D. Reidel 1986.
[53] Karin KNORR-CETINA, *The Manufacture of Knowledge*. Oxford: Pergamon Press 1981.
[54] Helga NOWOTNY, "Democratising Expertise and Socially Robust Knowledge." *Science and Public Policy* vol. 30, no. 3, 2003, p. 151–156.

"transgressive", firstly because it can never be reduced to purely scientific and technical matters, and secondly because its audiences are never solely composed of fellow-experts. To put it more simply, as scientific practice goes, not even the blind referee system of journals is devoid of non-technical, i.e. external, factors in evaluation.

To note, another type of meta-expertise is represented by scientific meta-disciplines such as history of science, philosophy of science, sociology of science, etc. But while these professional meta-experts may claim to have a profound understanding of what constitutes scientific expertise, often they avoid being meta-experts in the sense used so far, i.e. in forming evaluations of expert performance. Especially in the social studies of science, the initially dominant approach was shaped by the Edinburgh School's neutral descriptivism[55] and Collins' methodological relativism,[56] according to which analysts of scientific activity should completely refrain from making evaluations in the domain of science. However, such an avoidance of normativity has been explicitly challenged by the program of SEE, at least in the sense that scientific meta-experts should work out those criteria which can inform warranted evaluations of expert claims. The followings are meant to contribute to this project.

4. Meta-expertise

4.1 Assumptions

We have seen so far that the situation of epistemic dependence, as understood in the light of recent work in science studies, involves the generally widespread and unavoidable evaluation of scientific experts. Such situations are not specific to the public sphere outside science, nor are they limited internally to science, but they are present in a wide range of contexts in and around science, that is, contextually. Since expert knowledge means restricted cognitive access, evaluations always involve some amount of "contextual knowledge", and its proportion quickly increases with the distance of evaluators from the proper area of evaluated experts. Contextual knowledge makes it possible for the laypeople to know *with* experts without having to know precisely what experts know.

[55] David BLOOR, *Knowledge and Social Imagery.* London: Routledge and Kegan Paul 1976.
[56] Harry COLLINS, "What is TRASP: The Radical Programme as a Methodological Imperative." *Philosophy of the Social Sciences*, vol. 11, 1981, p. 215–224.

Before trying to outline the idea of contextual knowledge by giving examples of its elements, a commitment and a few assumptions need to be mentioned. The commitment is that the concept of meta-expertise used here has a normative character. The purely descriptive question of how people *do* evaluate each other's claims can be approached in a number of ways, e.g. by proper methods in social psychology[57], or by surveying discursive meta-evaluations[58]. On the other hand, epistemologists like Brewer and Goldman address the normative problem of how people *should* evaluate expert claims, i.e. how they can become rationally convinced, rather than merely persuaded. Such a conception of rationality presupposes that there are factors in selecting and evaluating epistemic experts that increase the reliability of decisions, as compared to those decisions based on more general cognitive mechanisms ignoring these factors. It also implies that it would be beneficial for individuals in our culture, and thus for the culture in general, to increase their attention to these factors, and it would be beneficial for relevant decision makers to make the contextual knowledge needed for judging scientific expert opinions more available to members of our society. While I share these authors' normative commitment, without further arguments for the reliability of choices and cultural benefit (which seems to be an issue at least as pragmatic as theoretical), I maintain that corresponding discussions should be informed by recent focuses and findings in the social studies of science, e.g. as summarized in section 3.

As regards my further assumptions, the first is that meta-expertise should be improvable (by experience), as already seen in connection with the general notion of expertise. There may be instinctive or unreflected factors that play some part, and potentially a major part, in our responses to others' claims, but here only such factors will be considered that communicative agents can control and consciously cultivate. Most aspects of

[57] For a summary of approaches, see Arie W. KRUGLANSKI – David SLEETH-KEPPLER, "The Principles of Social Judgment." In: KRUGLANSKI, A. W. – HIGGINS, E. T. (eds.), *Social Psychology. Handbook of Basic Principles.* 2nd edition. New York – London: The Guilford Press 2007, p. 116–137. For the case of epistemic authorities like experts, see Arie W. KRUGLANSKI – Amiram RAVIV – Daniel BAR-TAL – Alona RAVIV – Keren SHARVIT – Shmuel ELLIS – Ruth BAR – Antonio PIERRO – Lucia MANNETTI, "Says Who?: Epistemic Authority Effects in Social Judgment." In: ZANNA, M. P. (ed.), *Advances in Experimental Social Psychology*. Vol. 37. New York: Academic Press 2005, p. 343–392.

[58] I attempted to test the typologies of evaluative factors (summarized in section 2) on extensive blog discussions of a publicly relevant and controversial scientific matter, the H1N1 vaccine issue of 2009. See Gábor KUTROVÁTZ, "Trust in Experts: Contextual Patterns of Warranted Epistemic Dependence." *Balkan Journal of Philosophy*, accepted paper.

an arguer's "demeanor" are ignored on this ground, assuming that while they have a considerable impact on the audience's attitudes, they act at an unavoidably subconscious level. In other words, meta-expertise is a result of focused learning process.

Another assumption is that meta-expertise is domain-specific. While all communicative agents are able to make social discriminations as a result of their socialization process, ubiquitous skills are insufficient for attaining warranted evaluations of epistemic experts if specialized skills are also available. However, this assumption is not equivalent to the restriction condition of expertise mentioned earlier, since we do not necessarily describe meta-*experts* in the sense that their competence in judging scientific experts would make them cognitively valuable for those who epistemically depend on them for their meta-scientific evaluations. The normative commitment above requires from all laypeople that they should improve their specific skills of meta-expertise–while not excluding the possibility of there being others, engaged specifically in regular decisions about science, with higher degree of specialized meta-expertise based on more comprehensive experience. There are skills that are ubiquitous and still improvable to a degree of high specialization, like language use according to the SEE program, or car driving, a pet example of expertise in Hubert Dreyfus' theory.[59] All I assume here is that some relevant competences can be improved by *focused* experience and training.

4.2 Elements

Turning now to the constituents of contextual knowledge relevant to meta--expertise, a brief list of some elements is to follow. This is definitely not meant as a comprehensive collection of all the elements or even the types of elements, but as a slightly systematic expansion of some suggestions cited in section 2, in the light of the theoretical considerations of section 3. The purpose is to illustrate the kind of contextual knowledge efficient in judging experts, and not to build a complete theory of it. This will already suffice for offering some suggestions regarding directions of future research.

The first group of elements contains argumentative factors. Provided that arguments supporting expert opinions are given, laypeople can consider some general characteristics of these arguments. The claim here is that cultivated awareness of argument use and skills of argument analysis can

[59] DREYFUS – DREYFUS, "Peripherial Vision."

increase the reliability of judgments on experts. Argument evaluation as understood here does not include Brewer's "substantive second guessing" or Goldman's "direct argument justification", since these require substantial, rather than contextual, understanding of expert claims (although, as I argued above, purely substantial evaluations do not seem to exist). On the other hand, I also exclude a part of what Goldman called "dialectical performance", since the quickness and readiness of replies to objections seems to belong more to the arguer's demeanor than to the structure and strategy of argumentation, and thus fall on the side of psychological factors influencing mere persuasion–and while in some cases they tend to be informative indeed, often they are strongly misleading.

But there are several contextual discursive factors more closely tied up with the epistemic virtue of arguments. For example, consistency (and also coherence) of arguments, clarity of argument structure, supporting relations between premises and conclusions, etc. Of course, the more esoteric a domain's cognitive toolkit is, the harder it is for an outsider to differentiate between form and content, and to detect inconsistency or circularity and similar faults–still in many cases these factors are easier to judge than the soundness of substance. A similar matter is the degree of reliability of argument forms used by the expert.[60] Arguments can be weakened, albeit at the same time increased in persuasive potential, by different appeals to emotions and sentiments, or by abusive applications of ad hominems, or by irrelevant or misleading appeals to authority, etc. Also, dialectical attitude (instead of dialectical performance) can be highly informative, i.e. moves and strategies in controversies, including conscious or unnoticed fallacies such as straw man, red herring, question begging, shifting the burden of proof, and more generally, breaking implicit rules of rational discussion.[61]

It must be noted that all the factors mentioned above provide reasons for doubting opinions and withholding doubt, rather than enhancing agreement. Nevertheless, negative evaluation can be used in relative comparisons and thus give essential support to choices between expert claims. Moreover,

[60] As argued e.g. by Douglas WALTON, *Witness Testimony Evidence. Argumentation, Artificial Intelligence, and Law.* Cambridge University Press 2008.

[61] For a set of these rules, see Frans van EEMEREN – Rob GROOTENDORST, *A Systematic Theory of Argumentation: The Pragma-Dialectical Approach*. Cambridge: Cambridge University Press 2004, p. 190–196. As to how committing fallacies relates to these rules of discussion, see Frans van EEMEREN – Bart GARSSEN – Bert MEUFELS, *Fallacies and Judgments of Reasonableness. Empirical Research Concerning the Pragma-Dialectical Discussion Rules*. Berlin: Springer 2009.

fallacies can also be given a more context-sensitive analysis, and seen as moves in the process of "strategic maneuvering" negotiating between the persuasiveness and reasonableness.[62] The general point is that these competences, on the one hand, can be improved by experience and training in argumentation analysis and, on the other hand, are domain-independent and therefore different from the skills specific to restricted fields of expertise. Their range covers any area where patterns of reasoning and rational discourse are acknowledged, including all forms of epistemic expertise.

The other group of meta-expertise elements I consider here belong to the field of "social intelligence". Some of these are naturally such that we acquire them through living in a society, e.g. the detection of interests and biases, or of some general signs of trustworthiness, but precisely because these are ubiquitous they do not need focused effort and training to improve, so they are not seen as meta-expertise. But there are other social factors related specifically to the evaluation of epistemic experts (i.e., scientific experts in the typical case), about which laypeople have a lot to learn and experience.

Let us recall the examples given by Collins and Evans[63] mentioned in section 2.4, namely that most people, relying simply on their social intelligence, are able to arrive at correct judgments on matters such as the scientific status of astrology, or the reality of moon-landings, or of the failure of cold fusion experiments. Why I am not convinced by these examples is that I doubt whether ubiquitous social skills are enough to set these matters right: I believe that additional social skills targeted to the epistemic culture of science are needed in these cases. Unlike other important cultural spheres like that of politics, economy, or sports, about which laypeople are more likely to make reliable social evaluations, science as a social system is hardly known by the public. The assumption that social intelligence can inform technical decisions does not apply to the case of scientific matters if laypeople have much less social intelligence regarding how science works than knowledge of actual scientific "truths" taught in schools.

Meta-scientific knowledge informing meta-expert evaluations involves an understanding of the social dimension of the workings of science. For instance, in order to make the credentialist solution plausible, one needs to know about the social network of credentials, hierarchies of statuses and

[62] Frans van EEMEREN (ed.), *Examining Argumentation in Context. Fifteen Studies on Strategic Maneuvering.* Amsterdam: John Benjamins 2009.
[63] COLLINS – EVANS, *Rethinking Expertise*, p. 45–48.

institutions, types and functions of qualifications and ranks, etc. A similar knowledge is needed to detect more subtle interests and biases. It is also useful to understand patterns of communication in science, the role of different publications and citations, mechanisms of consensus formation, the nature of interdisciplinary epistemic dependence and resulting forms of cooperation, etc. Besides, transparency of sites and practices in science may also prove useful, including forms of local cooperation, the instrumental dependence of research, roles of uncertainty and skepticism, and so on.

While understanding all these phenomena may seem too strong an expectation from the public, it seems likely that becoming familiar with these requires less effort than learning substantial claims of the different sciences, partly because social structures and mechanisms are easier to understand (based on our fundamental experience with them) than abstract facts. Classical works in the social studies of science were often written with the explicit purpose of informing the public about how science actually works.[64] While the aim was improving the public's social intelligence regarding science, and thus informing their relevant decisions, *in vivo* descriptions of scientific research often triggered heated attacks for opening the way to science criticism.[65] However, the arguments in this paper have hopefully provided another reason why punctual and widely available descriptions of scientific practice are useful for present societies.

4.3 Areas

While contextual knowledge about science may be essential in societies that depend in manifold ways on the sciences, it is not obvious how and why the public attention could turn to these matters. If spontaneous focus on scientific meta-expertise might be unrealistic to expect from the public, there are organized ways to improve cognitive attitudes toward science.

[64] E.g., the Golem-series: Harry COLLINS – Trevor PINCH, *The Golem: What You Should Know about Science*. Cambridge: Cambridge University Press 1993; Harry COLLINS – Trevor PINCH, *The Golem at Large: What You Should Know about Technology*. Cambridge: Cambridge University Press 1998; Harry COLLINS – Trevor PINCH, *Dr. Golem: How to Think about Medicine*. Cambridge: Cambridge University Press 2005.

[65] See the "science wars", e.g. Paul GROSS – Norman LEVITT, *Higher Superstition: The Academic Left and Its Quarrels with Science*. New Haven: Yale University Press 1994; or Alan D. SOKAL – Jean BRICMONT, *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science*. New York: Picador USA 1998.

I briefly mention three areas: education, science communication, and public engagement.

From the preceding arguments the claim follows that school curricula should contain, besides (and perhaps sometimes, instead of) scientific material, meta-scientific elements as well. In a world saturated with scientific and technological issues, relevant historical, sociological, and perhaps philosophical considerations are at least as informative about science as scientific facts, since they contribute to the development of competences like that of the evaluation of expert claims, as seen in the preceding section. In many countries however, science curricula in schools is overwhelmingly dominated by knowledge *of* science, versus knowledge *about* science which usually fails to appear in any systematic form. Moreover, when it appears at all, knowledge *about* science often means to cover methodological issues inherited from traditional philosophy of science, i.e. those classical topics (verification and falsification of theories, induction and deduction, reduction and underdetermintation) that have more to do with philosophical abstraction than with the actual workings of science as cultural practice and institution. While opinions may divide as to whether explicit meta-scientific knowledge of this broader type is useful to scientists, the argument here implies that such a knowledge is indispensable for everyone effected by but not immersed in the scientific practice of a restricted field, including laypeople and other specialists alike.

In addition to offering meta-scientific knowledge, general school education should also focus on improving dialectical competences and skills of argument evaluation (critical literacy). This again increases the degree of reliability in decisions between expert opinions, as students gain organized experience, by practicing and studying mechanisms of rational deliberation and consensus formation, in how to participate in argumentative, instead of authoritarian, life forms. Here the departure from the classical content knowledge type of education toward experience-based training is absolutely vital. Again, there is a notable cultural invariance in the degree of focusing on "debating practices" and discursive deliberations in general school education (in many countries, frontal teaching of contential material is still overwhelmingly dominant), but increasing emphasis is given worldwide to related competences in education policies and directives.

In science communication, similarly to education, sensitivity to the social context of science is desirable. Keeping an eye on the needs of the public and another on the needs of scientific institutions, science studies can

efficiently inform different ways of communicating science.[66] This requires essential transformations e.g. in popular science writing and broadcasting. Classical works in science popularization were conceived in the framework of the deficit model, and they typically offered "heroic myths" of science in order to increase public respect. Compared to these, the more realistic images portrayed by recent science studies research, showing science as a human activity with all the consequences, may seem debunking or degrading. The increasingly explicit background question here is who should write popular science and with what purpose. The traditional way of scientists popularizing science is confronted with the growing need, typically claimed by science studies researchers, to improve public understanding of the social roles and capacities of science, in order to facilitate both communication and cultural and institutional support. Regarding this latter purpose, it is worth noting that, if popularizing works offer an image that is incompatible with the public's experiences with science (which are often related to the imperfect "human" side), they are likely to increase distrust rather than enhance trust.

Another area here is the presentation of scientific issues in the media. Usual information-providing communication practices (newspapers, news broadcasts, internet news portals) are most often ignorant of the actual social dimensions of science, and they are unable to improve the public image. Frequently journalists themselves lack the necessary understanding of scientific research and publication, and they are rarely able to locate the proper status of what certain scientists claim, or to contextualize assertions. The image emerging from typical media accounts is that of the deficit model ("science says so and therefore you should take it"), rather than giving contextual information, arguments and evidentiary support in order to enhance informed decisions in a public confronted with obvious but covert uncertainties and contradicting authoritarian claims. Increased awareness of how science is communicated in the news media is especially important since this information channel reaches a wider public than popular science.

Both education and science communication are areas where contextual knowledge informing epistemic decisions could reach the public in organized forms–while it remains a question, in the light of the contextual model, how open the public can be to these sources of information. In order to increase public attention to science, the most efficient way is to involve the public in scientific matters. We have already mentioned the increasing inter-

[66] Jane GREGORY – Steve MILLER. *Science in Public: Communication, Culture, and Credibility*. New York – London: Plenum Trade 1998.

est of science studies in phenomena related to the public engagement with science, and the shift from an image of autonomous science toward conceptions with political and economic focuses, but discussing the details would be beyond the scope of this paper. The point here is not ethical (the public should gain access to decisions influencing their lives) or political (related to practices of participatory democracy), but simply epistemological: the degree of contextual knowledge required to make warranted decisions about experts and matters of expertise depends on the public's interest in science, which in turn depends on their engagement with it.

5. Conclusion

While the original concept of epistemic dependence seemed to suggest simple deference to, and blind trust in, expert opinions, recent research in science studies have shown that epistemic dependence is closely tied up with choices between experts and evaluations of expert claims. Our need to rely on expert specialists in many walks of life does not eliminate our cognitive autonomy–rather, it offers meta-levels of epistemic practice. Expert claims amount to a chaotic and inconsistent sea of opinions without assessments at utilization. An essential aspect of human rationality consists of making justified decisions about claims made by others, even when these others are supposedly more knowledgeable.

The tension between the necessity of epistemic reliance on specialist claims on the one hand, and the necessity of evaluating these claims on the other, can be resolved only when the criteria used for evaluation are different from the epistemic criteria used by the experts for making their claims. This suggests a distinction between substantial knowledge and contextual knowledge, or between knowing something *simpliciter* (directly) and knowing something with others (indirectly). The distinction does not suggest ranking in terms of importance or even reliability: the contexts of use are entirely different in the two cases, as are the skills and competences the two types of knowledge require.

I have tried to illustrate the idea of contextual knowledge by giving examples of the factors that can rationally inform our meta-expert evaluations. Still, the paper's interest was primarily theoretical: a re-conceptualization of the epistemological profile of expert cultures with a high degree of specialization and cooperation. The major point is bringing epistemic dependence into the scope of rational cognition, so that we can know *with* experts without having to know what they know.