



Philosophia Scientiæ

Travaux d'histoire et de philosophie des sciences

17-3 | 2013

Tacit and Explicit Knowledge: Harry Collins's Framework

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Electronic version

URL: <http://journals.openedition.org/philosophiascientiae/884>

DOI: 10.4000/philosophiascientiae.884

ISSN: 1775-4283

Publisher

Éditions Kimé

Printed version

Date of publication: 1 October 2013

Number of pages: 41-54

ISBN: 978-2-84174-641-5

ISSN: 1281-2463

Electronic reference

Trevor Pinch, « Tacit Knowledge and Realism and Constructivism in the Writings of Harry Collins », *Philosophia Scientiæ* [Online], 17-3 | 2013, Online since 01 October 2016, connection on 04 November 2020. URL : <http://journals.openedition.org/philosophiascientiae/884> ; DOI : <https://doi.org/10.4000/philosophiascientiae.884>

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Tacit Knowledge and Realism and Constructivism in the Writings of Harry Collins

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Résumé : Dans cet article, j'examine les écrits influents de Harry Collins consacrés à la connaissance tacite. Je me penche en particulier sur son récent livre, *Tacit and Explicit Knowledge* [Collins 2010] ou TEK, qui est sans doute l'exposé le plus complet et le plus systématique de la manière dont Collins conçoit la connaissance tacite. Tout en examinant la connaissance tacite telle qu'elle est développée dans cette contribution, je dégage, au sein des contributions majeures de Collins à la sociologie de la connaissance scientifique en général, une tension sous-jacente, entre d'un côté le réalisme qui sous-tend sa notion de « connaissance tacite », et, de l'autre, le constructivisme qui sous-tend son concept célèbre de « régression de l'expérimentateur » (tel qu'élaboré par exemple dans son fameux livre *Changing Order* [Collins 1992]). Pour construire cet argument, j'accorde une attention particulière à un aspect des écrits de Collins sur la connaissance tacite qui, je pense, mérite un examen plus approfondi : à savoir les types de support empirique qui sont invoqués en faveur des caractéristiques et des propriétés de la connaissance tacite visée. En bref, je pose des questions à propos de certains des exemples empiriques spécifiques invoqués et des conclusions qui en sont tirées.

Abstract: In this paper I examine Harry Collins's influential writing on tacit knowledge. In particular I turn my attention to his recent book, *Tacit and Explicit Knowledge* [Collins 2010], or TEK, which is arguably the most complete and systematic statement of what he means by the term "tacit knowledge". As well as examining tacit knowledge as elaborated in this contribution, I draw out an underlying tension in Collins's major contributions to the sociology of scientific knowledge in general between the realism underlying his notion of "tacit knowledge" and the constructivism underlying his other well-known concept, "the experimenters' regress" (as for instance, elaborated in his

well-known book *Changing Order* [Collins 1992]). In order to make this argument I pay particular attention to an aspect of his writings on tacit knowledge which I think is worthy of closer examination: namely the sorts of empirical support claimed for the features and properties of tacit knowledge to which he attends. In short I ask questions concerning some of the specific empirical examples and the conclusions he draws from them.

I want to begin this paper by praising Collins's latest book on tacit knowledge *Tacit and Explicit Knowledge* [TEK] [Collins 2010]. I should declare a certain degree of self-interest. Collins was my mentor and I have ended up becoming his friend, colleague, and coauthor. This of course only makes my task harder! TEK overall is vintage Collins. It is his best book since *Changing Order* [Collins 1992], not only because it is one of his shortest (and hence liable to be read as opposed to his massive and impressive tome on gravitational radiation, *Gravity's Shadow: The Search for Gravitational Waves* [Collins 2004]), but also because as with the earlier book, *Changing Order*, Collins shows great ingenuity in the examples he conjures up. *Changing Order* brought us not only a rich array of fieldwork instances, but also funny creative ideas like Popper Mice to illustrate the problem of induction. In TEK we also find numerous tantalizing ideas and examples culled not only from his own fieldwork, but also from his own experiences, reading, imagination, and his earlier books. Some gems include: a sociological version of string theory with analog and digital strings (to be used in thinking about explicit knowledge); husbands grunting at wives (is it a language?); saluting machines (we would be mad to build them); vegetarian dogs (could they even exist?), how androids learn to dance on Star Trek (can a robot carry out improvisation in the same manner as learning the basic steps of dancing?) and my personal favorite, Chinese cars exiting highways by the entrance ramp and the oncoming cars splitting neatly into two lanes to let the exiting vehicle pass (an example of what he calls Collective Tacit Knowledge). I have never been to China to witness such a terrifying spectacle.

TEK also has a nice counter-intuitive feel to it in that Collins spends the early part spelling out what explicit knowledge is, arguing that in a way the deeper issue is exploring what explicit knowledge consists of as opposed to tacit knowledge. Who is TEK written for? It is written for a wide audience who use and ponder the idea of tacit knowledge. This includes not only Science and Technology Studies scholars, philosophers and psychologists, but also people in business schools, educators, and organizational sociologists. The book should also be of wide interest to researchers working in robotics, HCI, and Artificial Intelligence. The main theoretical protagonists are, the chemist turned philosopher, Michael Polanyi—who first introduced the term tacit knowledge—and the philosopher Hubert Dreyfus, who agrees with Collins on most issues but who according to Collins gets it wrong mainly on the issue of Somatic Tacit Knowledge. To be added to this list is Bruno Latour and his many followers and acolytes (and especially the “lazy” followers!) whom

Collins disagrees with. Theoretically TEK builds on the three inspirations for much of Collins's work; the later philosophy of Wittgenstein, Peter Winch's little book *The Idea of a Social Science* and Thomas Kuhn—all, of course, given a sufficiently radical reading.

The main idea in the section of the book on tacit knowledge is to show that the term has been used to cover three different sorts of knowledge that need to be separated. Collins calls these three forms of tacit knowledge, Relational, Somatic, and Social. Relational Tacit Knowledge is knowledge that could be spelt out in principle but often stays implicit because of the way we organize tasks and pass on knowledge. In short whether it is made explicit or not depends on our relation to other communities or to the individual to whom the tacit knowledge is being passed on to. For instance, a crucial component in the replication of a scientific experiment, such as the length of leads on an electronic component in building early lasers, might not be specified by the scientists even though getting its length correct may be crucial to other scientists trying to gain the skills to repeat the experiment. The length could in principle be made explicit. Somatic Tacit Knowledge is tied to the corporeality of our bodies; it is in a way a form of bodily knowledge, such as learnt in playing a musical instrument. Your hands will correctly glide over the keys of the piano to play a Scott Joplin piano rag even though your mind may not be explicating each note you need to hit. Social Tacit Knowledge, the third form, is clearly for Collins the most important and is unlike Relational Tacit Knowledge which Collins calls “weak tacit knowledge”, and Somatic Tacit Knowledge which Collins calls “medium”. It is the sort of knowledge which is very specific to the living of a particular form of life, such as acquiring the rules to follow the rules—a point made by Wittgenstein and Winch. Because it depends upon the meaningful interpretive dimension of social life as lived within a very specific social context, even in principle Social Tacit Knowledge cannot be explicated in full. It is the sort of knowledge one needs to exit the highway safely in China.

This new three-fold distinction between, Relational, Somatic and Social Tacit Knowledge, reveals that Collins's own thinking on tacit knowledge is itself in movement. To make the new categories work he has to reinterpret his own earlier studies, such as the classic study of scientists building and attempting to replicate the first TEA Lasers [Collins 1974], the work of UK scientists trying to reproduce a measurement carried out on small sapphire crystals in the Soviet Union, known as the Q of Sapphire [Collins 2001], and parts of his earlier book, *Artificial Experts: Social Knowledge and Intelligent Machines* [Collins 1990] on the debates over expert systems and their role in Artificial Intelligence. Collins also uses ideas developed in earlier books such as the distinction between mimeomorphic and polymorphic actions outlined in the book with Martin Kusch, *The Shape of Actions: What Humans and Machines Can Do* [Collins & Kusch 1998], which is itself a refinement of the distinction between what he called “behavioral specific actions” and other sorts of actions first delineated in *Artificial Experts*. Collins also adds to the mix by

introducing the distinctions between different kinds of expertise, such as interactional and contributory expertise outlined in the book with Robert Evans, *Rethinking Expertise* [Collins & Evans 2007].

I want to focus here upon the sort of evidence Collins claims in support of his ideas of tacit knowledge. Tacit knowledge is famously a difficult thing to show empirically because due to its nature it cannot be articulated. It is in a way a negative (in the sense of something absent) and showing a negative empirically is always hard. One way to show it in the case of science is to point to the difficulties scientists have in repeating experiments and measurements. At one time, T(1), these measurements or experiments cannot be performed successfully, but at a later time, T(2), they can be successfully carried out. What has changed between T(1) and T(2)? The answer is that the scientists have acquired tacit knowledge. It is thus necessary to show that something was missing from the experimental activity which occurred at T(1). But the exact tacit knowledge that was missing can only be inferred because if what was missing could be spelt out it would mean that tacit knowledge could itself be explicated and it is the defining feature of tacit knowledge that it is knowledge which cannot be explicated (except of course in the case of Relational Tacit Knowledge—see below). Collins makes great use of examples where we can infer the missing knowledge. He draws especially upon his own earlier TEA laser study and the later Q of Sapphire study. These are both examples where scientists fail to do something earlier but are successful later. By interacting with and studying the scientists who struggle and fail and then who later succeed, Collins uses a kind of ethnographic fieldwork to elicit the missing tacit knowledge. His fieldwork is very rich, such as the follow up TEA laser study completed in 1975 with Robert Harrison where Collins actually worked alongside Harrison as he struggled to make his laser work [Collins & Harrison 1975]. The later “success” in replications forms as it were a control experiment as Collins and the scientists ponder over what exactly has changed and what they didn’t grasp quite right in their earlier failed attempts. These studies seem quite convincing at pulling out the inferred tacit knowledge and are some of the most careful studies of this type in the sociology of science. But note that these two studies mainly show what Collins now calls “Relational” Tacit Knowledge—that is tacit knowledge that could in principle be made explicit given the right circumstances. This gives the studies in hindsight a certain persuasiveness because some of the missing tacit knowledge can actually be explicated because it is relational in character.

1 A demonstrable example: broken text and repair

Now I move on to examine some of the newer different examples Collins brings to the table in his new book TEK. Collins’s examples at first blush seem

compelling. One of the most striking come in a section where Collins wants to show how we as humans are good at repairing passages of speech we mishear or words which are misspelled. We do this routinely by trying to make sense of the words. Collins highlights two paragraphs of text which both contain “broken” words (words that are misspelled) [TEK, 115]. One paragraph (the first one) appears as gibberish with the words not only misspelled but also seemingly rearranged randomly whilst the second paragraph, although full of misspellings, keeps the words in the correct order. The reader is invited to read the text him or herself. The example is used to demonstrate “our everyday ability to make good something broken while hardly thinking about it as long as it makes sense to us” [TEK, 115]. I participated in this demonstration myself as a reader. Sure enough, when instructed to read the first passage, I could not make sense of it and quickly moved on to the second passage which initially looked equally baffling and soon I had that “Ah hah” moment as I found the second passage, although containing the same broken words, started to make sense.

Collins uses this as a “demonstration” to argue for three things: (1) that because most readers can read the second passage so easily it must mean that reading is accomplished by searching for meaning, (2) that although Collins’s own spell-checker highlighted each word with a jagged red line, the copy editor at Chicago University Press will not even think about correcting either paragraph, and (3), that the reader will know when to give up reading the first passage but will persevere when reading the second.

Now it might seem churlish to try and cast doubt upon the power of this demonstration but I will try to do so. The first thing to note is that readers, especially reading books quickly, do not all read in a linear manner. In other words Collins has no control over how the reader actually reads the text and this may make a difference. For example readers often scan texts that they are about to read. When confronted with the two texts which appeared both at the scanning level to be gibberish I noticed my eyes were drawn to the misspelled word “Cmabrigde” which appears in both texts as this happens to be how I regularly mistype the word Cambridge (I often invert the order of letters when I type quickly, for example frequently typing “teh” for the word “the”). In the second text the misspelled word “Cmabrigde” is followed by the word “Uinervtisy” which is sometimes how I mistype the word “University” and which may have made me think that reading the second text would be more rewarding as it contained the meaningful (but misspelled) pair of words “Cambridge University”. This all of course all happens in the flash of an eye, but like subliminal cueing in advertizing experiments, this may make a real difference to how the task is carried out and what the results mean. One could also point out that the statement (2) above is not strictly correct as there are actually 41 words correctly spelt in both paragraphs, so Collins’s spell-checker will not highlight “*each word*” as is claimed. There are also plenty of copy editors who would try to correct or at least highlight the misspelled marked words despite it being part of an exercise. In my empirical work as a sociologist I

sometimes use transcribed speech excerpts with phonetic spellings and, despite explicit instructions, proofreaders and editors are always trying to clean them up. One could also point out on (1) that some subset of people (including my father and sister) suffer from a reading disability where they have to process each letter in a word at a time and hence would find it extremely difficult to read the second passage as well, and hence some small subset of readers will not as claimed in (3) persevere when reading the second passage. Also I noticed that the sentences in the two paragraphs are of different lengths. The first paragraph starts with a 7-word sentence and the second with a 12-word sentence. I am assuming this does not matter but it is a difference. Another difference is that the first paragraph contains a grammatical clue as to it being gibberish which is not present in the second paragraph—a question mark appears in the middle of the word “huh?and”. Maybe this difference provides an added sign that the first paragraph is likely to be “gibberish” and not worth pursuing. Knowing this—when to stop reading a text because it is likely to be gibberish—is what Collins calls part of “Collective Tacit Knowledge”. So the example would still work, but it would work to make a different point, namely demonstrating our ability to recognize gibberish rather than our ability to do repair.

These are, of course, quibbles—overall the demonstration works, it is convincing in the way that demonstrations should be according to Collins’s own writing on the difference between experiments and demonstrations. In his book *The Golem at Large* he claims, “demonstrations are designed to educate and convince” [Collins & Pinch 1998]. The reader is not being asked to experiment with the text in the sense of finding out new things about how reading broken text might be achieved but rather we are being asked to be convinced of “our everyday ability to repair”. And at first blush I was convinced.

2 A canonical example: riding a bike

I chose the broken text example because I believe that the “demonstration” character of many of the examples gives them a different warrant than the fieldwork cases. It is the very “demonstrable” quality of the examples which makes them powerful. This is the beauty of the most famous example of all in the tacit knowledge canon: Michael Polanyi’s example of riding a bicycle. We do not have to describe the detailed process of learning to ride a bicycle when using this example because nearly everyone knows from their own experience how they learnt to ride a bicycle. The key part of learning to ride a bicycle—the ability to balance and ride independently—seems to have been acquired in the same manner by everyone at least since bicycling became a common part of our shared culture. Nearly every child has shared that thrilling moment of “going solo”—riding on their own without training wheels or a parent or sibling pushing them and knows they have accomplished something. Bicycle riders also readily agree, as soon as it is pointed out to them, that they didn’t

acquire this knowledge by reading books or by learning about the physics of balance or by studying in a master class for bike riders! There is no need to actually stage a demonstration of all this because everyone is familiar with it already from personal experience. In a way the riddle of how to show that something that is tacit and hence missing can be made convincing is by appealing to a canonical example based on something even more compelling than demonstration—personal experience—a move which appeals to “what everyone knows” and which is therefore pointless to question.

Many of the examples given in TEK are backed up with Collins’s own fieldwork where he teases out exactly how the knowledge is acquired and what sort it is. But nearly all these examples are given in Chapter 4 on “Relational Tacit Knowledge”. It turns out that Chapter 6, “Collective Tacit Knowledge and Social Cartesianism”, the aspect Collins considers the “irreducible heart-land of the subject”, has the fewest examples from fieldwork. Indeed the only boxed example is the famous quote from Wittgenstein about if a lion could speak we would not be able to understand him. He does say that fuller treatments are available elsewhere and that he will only elaborate on issues on how Collective Tacit Knowledge relates to Somatic Tacit Knowledge (discussed in Chapter 5). But I worried about this lack of detailed case studies in the heart-land of the subject.

There is also something very different about the science examples Collins discusses from his fieldwork and other examples in the book. In the science examples there are very clear criteria for knowing when the scientists have acquired sufficient tacit knowledge to be successful. In the TEA laser example this is famously when the laser will vaporize a block of concrete. The Q of Sapphire example is messier because there is no dramatic outcome to show that the correct outcome has been achieved, but, as Collins points out in his fieldwork on that case, it seems clear when the scientists are able to correctly measure the Q factor, obtaining the same high values in the UK as were obtained in similar circumstances as earlier by the Russian group. The successful measurement, unlike, say, results in parapsychology and cold fusion, does not contradict existing knowledge. Thus the Western scientists when they first learned of and later watched the Russian scientists at work in their laboratory in Moscow successfully measuring the Q of Sapphire did not doubt the measurement could be performed. They came to trust the Russian scientists enough to believe that the high Q could be measured, even though at that stage they were not able to repeat the measurement themselves. Thus when the Q of Sapphire was finally measured in the UK it was immediately recognized that it had been done so successfully. Of course as Collins points out, accomplishing a task such as building a laser successfully once does not guarantee that you can do it again—the measure of the skill being acquired is being able to reproduce the result of interest. This is an important point and an issue we will return to later.

3 Bicycle riding revisited

This lack of examples for the existence of Collective Tacit Knowledge puzzled me. But perhaps there is something about the very notion of Collective Tacit Knowledge which makes it hard or impossible to illustrate with “knock down examples” or “demonstrations” or even with convincing fieldwork. Take for instance again the famous bike riding example which Collins now recasts as demonstrating Somatic Tacit Knowledge. Recently I observed my neighbors’ five-year old son, Sky, learn to ride a bike. He learnt in the standard way by his mother pushing him and letting go on the quiet suburban dead-end street on which we live. As we stood around on our driveway celebrating Sky’s success on the road, Sky turned into our driveway at high speed and, much to our horror, we realized he had no clue as to how to stop or, as Collins would put it, “navigate pedestrian traffic”. We leapt out of way as he skidded off his bike on the tarmac drive—he burst into tears, his pride hurt more than his body. This example is on the border line of Sky mastering bicycle riding as part of Somatic Tacit Knowledge and dealing with traffic (according to Collins part of Collective Tacit Knowledge). But how would we convincingly demonstrate how and when Sky had achieved Collective Tacit Knowledge as a competent bike rider? In other words how do we tell that he has learnt how to deal with traffic? We would have to follow him as he negotiated the main road at the end of our street, turning in various configurations, riding with other riders, riding in traffic of various sorts, negotiating Ithaca’s one and only round-about, and so on. But how would we be able to show that he had acquired such knowledge? One way to proceed empirically might be to find more instances such as the “crash” in our driveway where he *had not* acquired such skills. My point is this: *it is much harder empirically to show what is at stake and whether tacit knowledge has been acquired with respect to Collective Tacit Knowledge.* Another personal example of bike riding can be used to make the point.

I learnt to ride a bike as most British kids do. Because our family did not have a car I rode everywhere most of my childhood including to and from school every day along busy roads. I used to think of myself as a fairly accomplished bicycle rider. That was until I spent six months in the Netherlands! Collins claims that the Collective Tacit Knowledge needed for bicycle riding is different even for different cities, such as Amsterdam. I was in Maastricht. We had no car and since I had to get my daughter to school quite far away I borrowed a bicycle and rode with her on the back to and from school every day. Certainly bicycling in the Netherlands required me to learn new skills, negotiating bicycle traffic lights, knowing how to avoid young Dutch men and women on motor scooters who scooted along nonchalantly with cigarette in hand sharing the same bicycle paths as the much slower bicycles, and so on. One day my Dutch collaborator, Karin, passed me on her bike with her own daughter. Later that day over drinks she said she had to tell me that although I was managing OK on my bicycle I was not riding in “the Dutch way”. If TEK had been available

then, and I had read it, maybe I would have left the conversation at that and said: “Duh, of course, that is to be expected I haven’t yet mastered the Collective Tacit Knowledge necessary.” My own reaction was that of a typical Brit. I was upset at this assault on my bicycle riding prowess and quizzed her as to my inadequacies. The confidence and speed of Dutch riders and their elan in riding is notoriously high, but I felt that I had managed some of that. As she discussed it more and more I realized that her position was “that she just knew” I wasn’t doing it the “Dutch way”. Casting aspersions on the behavior of the non-natives is a familiar trope from anthropology and it is often used in everyday matters to do with driving or riding behavior. If you drive around Boston long enough with a Boston driver you will hear talk about “out-of-town drivers”. Brits arriving in my town in America will talk about “lousy American drivers”. It seems part of common folk wisdom that there are ways of riding/driving which develop in particular national contexts or even cities—they are part of the identity of living in such cities. Such ways of riding/driving are according to Collins part of Collective Tacit Knowledge.

But let us invoke for a moment another part of sociology—“impression management” [Goffman 1959], the social construction of identity, and so on. Supposing the claims that Maastricht bike riders have a particular style which “damn foreigners” can never achieve are merely part of identity building, how would we prove it? Where would the borderline between identity building and Collective Tacit Knowledge be placed and how would we as sociologists study it? One could imagine collecting video footage of bike riding and doing double-blind tests; one could imagine putting such a matter to the tests of Collins’s imitation game, but Collins does not do this in this book. He merely asserts it as something we all know. Here the politics of what is at stake when particular claims to hold tacit knowledge are made are relevant [Doing 2007]. I may claim that I have the Collective Tacit Knowledge to pass as a Maastricht rider and Karin may deny it. Who is right and how do we tell, especially given that we both have an “interest” in being right?

4 Judging skill in practice

So how do we actually know in cases of skill acquisition that someone has acquired the requisite tacit knowledge? Here is another obvious point—many skills require that judgment of the neophyte be made by someone who possesses the skill already and hence is capable of recognizing that the skill has been acquired. This is how many somatic skills are assessed. For example, one of the most difficult skills veterinary surgeons need to acquire is how to use the scalpel to open the skin of the animal on the surgeon’s table. Too much pressure could damage delicate internal organs, not enough pressure could lead to several cuts each of greater depth risking infection, more trauma and so on [Pinch, Collins & Carbone 1996]. In this case skilled surgeons are used to assess and guide the progress of the neophyte. Most such skills are learnt

gradually and credentialed in some way—but for many ordinary tasks where Collins claims Collective Tacit Knowledge is in operation, credentials are not applicable. Karin has no credentialed expertise that she is a proper Dutch bike rider. Perhaps she is an outlier—an over-meticulous Dutch rider whom other Dutch riders would never take seriously?

But then assessing skill is in many cases not straightforward because there are often multiple audiences for the skill who possess different levels of skill themselves. Take piano playing for instance. My daughter will play beautifully to my ears and I will be as fully moved as hearing any possible piano player, but then I am not a piano player and she will report back to me that her teacher is not satisfied with her playing. This is something performing musicians face all the time. I play in two musical groups both of whom perform live. I cannot tell you the number of times after a performance when we in the band say to each other “Well we really sucked tonight” only to receive extravagant plaudits from the audience. The truth of the matter is that it takes a lower level of skill to convince most audiences in clubs (and here the genre of music, location, and quality of the sound system, are also important as well as the skill set expected of the audience—playing in Berlin with the Berlin Philharmonic Orchestra before audience members reading the score is very different in terms of the skill set of the audience). The point is this, if we take skill as something *which is staged and performed* with possibly an audience present then whether the skill has been accomplished or not becomes a much less straightforward question. In many of Collins’s examples there is no audience or issue of people judging a skill—it seems that the skill is either carried out or not carried out. In short by removing the context or any possibility of disagreement this encourages an over-realist notion of skill.

I will use yet another example to show how this could change the analysis. Take again piano playing. The way kids learn to play piano in England and the US is that they have specialized teachers and their skills are assessed periodically by a system of tests which enables skilled practitioners to delineate the exact “level” your child is at. In New York State (where I live) your child has to play every year for an outside judge (at an event misnamed “festival”) who will grade the performance in terms of different musical criteria such as “interpretation”, “technique”, and “dynamics”. This then is a fine-grained skill assessment system based upon skilled practitioners doing the judging. But why should we accept this at face value? There are many ways to deconstruct such results—often parents don’t get to do so but I would like to relate an incident where the deconstructive work was done for me. My daughter was having her last such exam. Usually she obtains the grade of “superior” and three superiors in this system equals a gold cup. She had already won one gold cup and this was her last chance to win a second one—she just needed one more superior grade. She would graduate high school that year and would no longer be eligible. She was naturally nervous; she played her pieces—a rather tricky Rachmaninov piece as I recall—and eventually came out crestfallen to learn she had obtained only an “excellent” grade (one grade below superior).

No gold cup, alas! But later that evening her piano teacher called to say that the examiner had thought she was of “superior” quality, but felt that she was just holding back for some reason during this one performance. The examiner said she had wished she had known it was my daughter’s last chance because if she had known that she would have given her a “superior”. In short what I am pointing to is that there is a whole sociology of judging skill—judging skill itself is a skill—in Collins’s terms it involves Collective Tacit Knowledge: as to what stage the pupil is at, when to be harsh or generous and so on. The assessment of skill, the system of grading skills, and how this works for multiple audiences seems to be missing from Collins’s account.

5 Constructivist and realist tensions in Collins’s work

Why does all this matter? It matters crucially because of Collins’s other important early contribution to the sociology of scientific knowledge, his delineating of what has become known as the “experimenter’s regress” [Collins 1992]. Unlike the TEA laser case, there are a set of cases of experiments in science where the correct outcome of an experiment is ambiguous. These are the sorts of cases dealt with in the Golem series of books [Collins & Pinch 1994], [Collins & Pinch 2006]. For instance, claims to find cold fusion, large fluxes of gravity waves, or Vitamin C as a cure for cancer are all cases where experimental outcomes are highly contested. In such cases for a while it is not clear who are the skilled experimenters—the ones claiming the phenomenon of say cold fusion, or their detractors who find no evidence of cold fusion. There is no independent way of measuring the skills or competence of experimenters in such cases. There is no equivalent to, say, vaporizing the block of concrete as in the TEA laser case. Who has the requisite tacit knowledge in the cold fusion case? Is it Pons and Fleishmann who claim to manifest the phenomenon of cold fusion or the skeptics at MIT whose experiments fail to show cold fusion? In short there seems in these sorts of cases no way to “grade” tacit knowledge (for a similar point with a more meticulous working through of examples, see [Soler 2011]). Which of course *is* the very point of the notion of an experimenter’s regress. How does this constructivist side of Collins’s work fit with his realist account of tacit knowledge (realist in the sense that the individual or the community either have such knowledge or do not)?¹ The sociologist of science trained in the sociology of scientific knowledge might want to say that the outcome of the cold fusion controversy has been con-

1. This tension between realism and constructivism seems different to earlier debates about reflexivity and Collins’s claims that he is realist about the social but constructivist about the scientists’ claims. In this case it would seem that claims made by the participants to have particular sorts of tacit knowledge are themselves subject to interpretative flexibility.

structed in such a way that we now know Pons and Fleischmann did not have the genuine tacit knowledge to produce cold fusion. In short the consensus moved against them. But before the consensus has been reached how could we tell? My answer would have to involve a form of methodological relativism whereby I would say that for one community Pons and Fleischmann did have the requisite tacit knowledge but that for another community they did not. This immediately makes tacit knowledge much less realist and something that is also socially constructed with the phenomenon. We do not know who has the requisite tacit knowledge until the controversy is settled. Indeed with a nod to Collins we can frame this as the TACIT KNOWLEDGE REGRESS.

Q: How do I know in a case at the research frontiers of contested knowledge who has the requisite tacit knowledge?

A: It depends on whose experiments are deemed to be the correct ones.

Q: How do I know whose experiments are the correct ones?

A: It all depends on who has the requisite tacit knowledge.

Q: How do I know who has the requisite tacit knowledge?

And so on...

Even if Collins does not want to buy into the tacit knowledge regress it would seem that his work could be enriched by considering more how tacit knowledge is performed, the audience for such performances, and how institutions are set up (such as schools which grade and credential training in musicianship) and operate to assess and grade skilled performances. It would provide at the least a fuller picture of tacit knowledge.

My argument in this paper is that with the publication of TEK Collins has provided us with the most complete account of tacit knowledge to date. His arguments and examples concerning Relational Tacit Knowledge seem thoroughly convincing. I have not here entered into the debate over the importance or not of Somatic Tacit Knowledge. Collins plays that aspect down in favor of what he calls Collective Tacit Knowledge. Although Collins maintains that he has provided plenty of examples of Collective Tacit Knowledge elsewhere, in TEK we are left mainly with anecdotes from Collins own experience of social life to drive home the point. I have offered some counter-examples from my own experience to at least interrogate the veracity of such examples and to draw attention to what might be at stake in the sorts of examples Collins provides. By pushing on the realist versus constructivist nature of Collins's work I am pointing to a fundamental paradox of which Collins of course is well aware. Collins likes to do what he calls "compartmentalization" whereby he can avoid arguments he generates in one area being applied to what he deems as a separate compartment of his endeavor. For example, he claims he is a realist about the social and that this allows him to say without contradiction that he has shown in a realist mode how experimental results are constructed. He thus dodges or side-steps the issue of whether his own realist claims are constructed or not. The same tension appears in his work on tacit knowledge. During moments of experimenters regress tacit knowledge is constructed but at other moments it is "really" there for participants to possess. I suggest that

rather than relying on strategies such as compartmentalization which make the tensions go away, we should embrace an idiom of performativity which turns the questions of how tacit knowledge is staged and performed for different audiences, and how such assessments of tacit knowledge are institutionalized (such as at music schools), into an empirical endeavor which might give us an even more complete understanding of the deep mystery of tacit knowledge.

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