THE CONCEPT OF TACIT KNOWING

Prof. dr. Georg Hans Neuweg
Abteilung für Berufs- und Wirtschaftspädagogik
Johannes Kepler Universität, Linz
georg.neuweg@jku.at

Abstract: This article starts by presenting a rough sketch of what the so-called tacit knowing view is all about and questioning the intellectualistic and objectivistic view of knowledge (section 1). Then, different meanings of the term "tacit" and different types of tacit knowledge are distinguished (section 2). Finally, some implications for the process of acquisition of knowledge are discussed (section 3).

Key words: tacit knowing, intuitive actions, connoisseurship, knowing-how, learning-by-doing, experiential learning

1 Knowledge as a substance?

Talking about 'knowledge' (and not, for example, about skill, mastery of an art, understanding, ability, judgment ...) invites us to seek not competences but invisible cognitive repertoires that are supposed to underlie competent behaviour: that is, a hidden mental substance (propositions, programmes, rules, algorithms, theories ...), as well as mental processes using that substance. But in ascribing knowledge to people, we impute to them not mentally stored knowledge of this or that sentence, but the ability to perceive, to think, and to act skilfully. We are interested in knowledge *in use* rather than in knowledge *as a state*.

Basically, the tacit knowing view (a) concerns know*ing*, i.e. not mental storage places and their contents, but processes (e.g. perception, judgment, action, thought, discernment, contrivance) and the underlying human dispositions; (b) focuses on the relationship between knowing and its articulated counterpart; and (c) argues that *we know more than we can 'tell'*. This latter proposition usually has one or both of the following meanings:

(Some) human dispositions are *unformalisable*. It is impossible to program a computer so that, by means of rules, it simulates a knowing person with regard to the particular disposition.

(Some) human dispositions are *unteachable* solely *by verbal instruction*. It is impossible to instruct a learner verbally in such a way that he follows in the teacher's footsteps with regard to the particular disposition (i.e. so that he understands/can do the same without first-hand experience or demonstrations).

Both meanings are informed by the conviction that it would be dangerous to believe that explicit knowledge of propositions, rules, or theories is a *sufficient* condition

for knowing; and that it is even dangerous to believe that such knowledge is always a *necessary* condition. Furthermore, an important corollary is the assertion that all (even the most academic) professions have a craft side, which, once learned, is undetachable from the knowing person.

Such a view stands in opposition to mighty traditions of thought on human insight and action. From the intellectualist or cognitive viewpoint (for a detailed critique see Neuweg, 2000, after Ryle, 1949), knowledge is essentially propositional. Roughly speaking, everything we do is seen as deriving from propositions in our head and from thought processes dealing with these propositions. Seen this way, to do something intelligently is always to do a bit of theory and a bit of practice, practice being nothing but applied theory. (The view admits that we are often unable to articulate how we proceed in carrying out a task. But this is said to indicate the proceduralisation of previously conscious rules, the execution of which is now mere routine.) Given this picture, teaching seems to be just transfer of information, and learning seems to be just storage of information.

This concept, of a memory full of conscious and unconscious 'mental' rules and schemata that 'cause' intelligent behaviour, has some important consequences. For the scientist, it suggests that, in order to detect the 'causes' of skilful doing, research in knowledge has to focus on the 'mind', its content and its architecture, rather than on observable behaviour over time. And it suggests that the elicitation and codification of the expert's knowledge is not only of theoretical interest but also of practical importance. To view knowledge as some bulk of conscious and unconscious propositions entails viewing it as more or less easily detachable from knowing subjects. This would have important practical benefits. For example, externalising the substance hidden in the expert's brain enables us to shorten a beginner's learning process. Indeed, if all we know were transposable into words and detachable, we could impart many years of experience to a learner in just a few weeks. Furthermore, if people's knowledge is put down to rules and external procedures, people become replaceable either by machines and technology or by other people.

But not only educationists and business economists find the idea of 'objective' knowledge tempting, its more famous intercessors have already been seduced. Popper (1972, 107, 108), for example, intends to show the existence of a so-called 'world 3' of objective thoughts, existing *independently* of, and in addition to, the (physical) 'world 1' and 'world 2' (the world of states of consciousness, mental states or dispositions to act). Imagine, he says, that some catastrophe destroys our machines and tools together with our subjective knowledge of them and their use, while libraries, as well as our capacity to learn from books, survive. It is clear, he argues, that we would not have difficulty in rebuilding our civilization. Is it?

In the late 1960s, a Canadian research laboratory succeeded in constructing a special device, the so-called TEA-laser. Harry Collins (1985) studied attempts by British laboratories to build copies of the device. The findings strongly challenge Popper's thoughts: (1) No scientist succeeded in building the laser by using only information found in written sources; they all obtained a crucial component of knowledge through personal contact. (2) No scientist succeeded in building the laser where the informant was a 'middle man' who had not built the device himself. (3) Even where the informant had

built a device himself, the learner would be unlikely to succeed without some extended period of contact with the informant. (4) The flow of knowledge was partly invisible, so that scientists did not know whether they had the relevant expertise until they tried it. Collins concluded that tacit knowledge is a crucial component in laser building, and that, therefore, written information alone turned out to be an inadequate source.

From the predominant intellectualist point of view, such findings are surprising. Given that intelligent action is the outcome of deliberation and knowledge, why should experts be unable to express all that they are able to do in words?

Because practice is not always a client of its theory.

Firstly, there is empirical evidence against the intellectualist viewpoint. If knowing and deliberating are *necessary* conditions for skilful action, then what about the skilled expert doing his job intuitively? Following Michael Polanyi (PK, 49) '*the aim of a skilful performance is achieved by the observance of a set of rules which are not known as such to the person following them*.' Although, for example, the cyclist knows how to ride a bicycle, he is unable to state the rules of the art; i.e. that in order to compensate for a given angle of imbalance we must take a curve on the side of the imbalance, of which the radius should be proportional to the square of the velocity over the imbalance. And, on the other hand, if knowing and deliberating were *sufficient* conditions for intelligent action, then what about theorists being unable to do what they know? In an experiment conducted by Renkl et al. (1994), for example, it was shown that graduate students of economics were less successful than laymen in controlling a computer-based economic simulation—maybe not despite, but *because of*, their broader base of explicit knowledge. And finally, it is well known that expert performance can break down if subjects try to focus on specific components of the skill and govern its execution by rules (see, for example, Masters, 1992).

Secondly, there is a strong logical argument against the intellectualist point of view (cf. Ryle, 1949). If action is caused by deliberating, intelligent action presupposes intelligent deliberation. Following the intellectualist's construction, deliberation must be caused by further instruction to be intelligent. In order to avoid an infinite regression, the intellectualist must suppose deliberation to be intelligent in itself. That is not just plain wrong (people might deliberate very unintelligently), it is also inconsistent. If there are second-order acts that are intelligent *per se*, why should there not be also first-order acts that are intelligent *per se*?

2 The concept of tacit knowledge

Given the fact that people need not necessarily think before acting intelligently (think of the intelligent fluent speaker who talks fluently because he does *not* contemplate his words before he speaks), and that people definitely cannot prescribe all their intelligent behaviour (due to an infinite regression, one could never start acting at all), in what sense, then, are we allowed to ascribe knowledge to people?

It is important to distinguish carefully between knowledge in a psychological sense (first person's knowledge) and knowledge reconstructed from the observer's point of view (third person's knowledge). According to the intellectualist viewpoint, the intuitive actor has propositional knowledge 'in mind', albeit unconsciously. Ryle (1949) has shown that this point of view is subject to a category mistake. The ascribed knowledge-base merely functions as a construction to describe, explain and predict behaviour; the only objective mode of existence for this knowledge is behaviour over time, or, as Ryle (1949, 57, emphasis G. N.) puts it: 'Overt intelligent performances are not clues to the workings of minds; they *are* those workings.' People behave as they do, not *because* they have 'unconscious' rules in mind, but, at best, *as if* they had. In this sense, tacit knowledge is essentially implicit in one's behaviour and does not consist of internally represented rules—although it can be partly reconstructed and symbolised, either by the subject or by the observer. And memory is not a storage place of symbolic representations, it is 'the name we give to the capability of behaving in similar ways in similar situations' (Clancey, 1990, 61).

This is not to say that the relationship between know-how and explicit knowledge is just one between practice and its description. It is also one between practice and its intrinsic or extrinsic instruction, of course. But the question, 'What knowledge does the expert unconsciously apply?' turns into two totally different and more fruitful questions:

To what extent does third person's knowledge *describe* the knowledge of the first person? (Or: To what extent can explicit know-that simulate know-how?)

To what extent is explicit knowledge suited for *instructing* know-how?

2.1 Main meanings of the term 'tacit'

We are now ready to look at three different—though interrelated—meanings of 'tacit', which can be found in the pertinent debate.

(a) Tacit knowing often means doing something intelligently in an intuitive manner. Experienced women and men ordinarily reveal a kind of knowledge that does not stem from a prior act of deliberation. Although somebody might be able to articulate corresponding rules *before* or *afterwards*, there need not be any self-instruction *during* the course of action. (In some sense, every kind of acting is intuitive, as it is impossible to do something and to reflect upon one's own action *at the same time*.) Consequently,

'"thinking what I am doing" does not connote "both thinking what to do and doing it". When I do something intelligently, i.e. thinking what I am doing, I am doing one thing and not two. My performance has a special procedure or manner, not special antecedents' (Ryle, 1949, 32).

(b) By reflecting on our actions we can try to make descriptions of the knowing implicit in them. Know*ing*-in-action becomes know*ledge*-in-action. It is important to note that the term 'knowing' refers to a dynamic quality, whereas 'facts', 'rules' or 'theories' are static. Therefore, descriptions of knowing-in-action are always constructions, 'attempts to put into explicit, symbolic form a kind of intelligence that begins by being

tacit and spontaneous' (Schön, 1987, 25). This leads to the second meaning of 'tacit knowing' as the residue left unsaid by a defective articulation. In this stronger sense, tacit knowledge means that 'we can know more than we can tell' (Polanyi, TD, 4): somebody is able to judge or act skilfully without being able to articulate what it is that he knows or, at least, to articulate it appropriately.

The workaday life of the professional, Schön (1983, 49, 50) argues, depends heavily on this kind of knowing:

'Every competent practitioner can recognise phenomena—families of symptoms associated with a particular disease, peculiarities of a certain kind of building site, irregularities of materials and structures—for which he cannot give a reasonably accurate or complete description. In his day-to-day practice he makes innumerable judgments of quality for which he cannot state adequate criteria, and he displays skills for which he cannot state the rules and procedures. Even when he makes conscious use of research-based theories and techniques, he is dependent on tacit recognitions, judgments, and skilful performances.'

(c) Even if the actor is unable to articulate fully what it is that he knows, this need not cause serious problems for detaching knowledge from people: The third person's analysis might reveal the first person's knowledge. In a third and still stronger sense, tacit knowledge means that even the third person is unable to describe intelligent action in terms of rules. Here we meet a crucial point. Some psychologists think of tacit knowledge as an assemblage of 'unconscious' rules computed by the actor that careful analysis could reveal. And it might well be that in some cases this view is appropriate. But are these the really interesting cases, when we have human expertise in complex environments and ill-structured domains in mind?

Rules are abstract and standardised, whereas the expert has to deal with concrete cases and their variations. As no general proposition can fit every detail of the particular state of affairs, the expert must be sensible. But if we view his good sense as a product of the acknowledgement of further general principles, we end up in an infinite regression of rules and principles. To put it another way: 'To a partly novel situation the response is necessarily partly novel, else it is not a response' (Ryle, 1976, 125). Note that the point here is not that skilful acting is 'intuitive'; it might well be highly conscious. But it does not follow strict and formalisable rules. It is creative. And this is Ryle's point against the reduction of thinking to mere computation:

'When considering abstract questions about the intellect we are apt to treat arithmetical computation as its most typical exercises—as if the best thinkers in their best moments are doing in their heads the sort of things that computing machines do, only much faster, in their complex insides. I don't know where this superstition comes from. Computation is, though very important, so low a form of thinking that a well trained cashier can do lengthy and complex computations while thinking about something else. Moreover, pure computation-tasks offer no scope whatsoever for originality, talent, flair, horse sense, taste, judiciousness in the weighing of evidence, or constructiveness in the building up of chains of argumentation' (Ryle, 1979, 52).

We sometimes refer to tacit knowledge of this kind as 'common sense'. To deepen our insight into this meaning of 'tacit', it is helpful to distinguish between two

types of acts (cf. Collins, 1995). *Behaviour-specific acts* maintain routines. Examples include 'production-line'-type action, such as that portrayed by Charlie Chaplin in 'Modern Times'; the standard golf swing; or simple arithmetical operations. Anyone or anything that can follow the set of rules describing the behaviour can, in effect, reproduce the act. Hence these acts are mechanisable. If we turn to *regular acts*, we see that in important cases the same act can be and must be instantiated by many different behaviours, depending on the context at hand. Although this kind of acting is usually 'rule following' and sometimes 'rule establishing', it is very difficult to describe the rules which we follow when we are doing regular action. Collins gives an instructive example:

'(I)t is clear that there are rules applying to my actions as a pedestrian because I will get into trouble if I break them—perhaps by walking too close to the single person on an otherwise deserted beach, or by trying to keep too far away from others in a crowded street—but I cannot encapsulate all that I know about the proper way to walk in a formula. The little bits of rule that I can provide—such as those in the previous sentence—are full of undefined terms. I have not defined "close", "distant", nor "crowded", nor can I define all my terms on pain of regress. What is more, what counts as following the rule varies from society to society and situation to situation. A set recipe for walking will be found wanting on the first occasion of its use in unanticipated circumstances; perhaps the next people on the beach will be actors in a perfume advertisement playing out the mysterious attractiveness of a particular aroma, while the next people in the street will be living in the time of a contagious epidemic disease!'

Note that to act skilfully in working life we mostly have to act regularly, not behaviour-specific. It is very common that an effective form of industrial disruption is to act too uniformly, to 'work to rule'. This point becomes especially important where bureaucratic work systems are replaced by individual and organisational flexibility.

2.2 Three different types of tacit knowledge

It should be pointed out that the use of the term 'tacit knowledge' outreaches the realm of doing. We can see this in distinguishing three different types of tacit knowledge.

(a) Whenever we talk about *arts*, e.g. the art of cooking, the art of teaching, or the art of managing, we refer to tacit *knowing-how*, the tacit side of expertise which is more or even other than just the application of theory. Tacit knowing-how comprises all dispositions to judge or act, and forms what Polanyi (PK, 87) has called the 'ineffable domain'. Polanyi emphatically invites us to accredit 'skills and connoisseurship as valid, indispensable, and definitive forms of knowledge' (M, 32, 33), not least because of the necessity of bringing the theoretical body of science to bear on experience:

'Students of chemistry, biology, and medicine [...] seek to bridge the gap between the printed text of their books and the facts of experience. They are training their eyes, their ears, and their sense of touch to recognise *the things* to which their text books and theories refer. But they are not doing so by studying further textbooks. They are acquiring the skills for testing by their own bodily senses the objects of which their textbooks speak. [...] Textbooks of chemistry, biology, and medicine are so much empty talk in the

absence of personal, tacit knowledge of their subject matter. The excellence of a distinguished medical consultant or surgeon is due not to his more diligent reading of textbooks but to his skill as a diagnostician and healer—a personal skill acquired through practical experience. His professional distinction therefore lies in a massive body of personal knowledge' (M, 31, 32).

The tacit component in connoisseurship and skills is easy to see if we consider motoric skills and impressionistic knowledge. It is difficult to explain how to juggle with five balls, how to class cotton, or how to interpret a patient's *facies*; typically the expert will refer to the 'right feel'. But it is important to see that there is a tacit component even in the most abstract forms of judgment and action. Take, for example, our ability to reason correctly without considering the rules of logic, the art of applying theories of different kinds in a context-sensitive way, or to maintain intelligent practices for which there are no written rules at all; e.g., the practice of invention.

(b) In our behaviour we also show a lot of tacit *knowing-that*, which is difficult if not impossible to describe. It is knowledge taken for granted, our cognitive background, interpretative frameworks, viewpoints, paradigms, mental models, beliefs. Again, it is Michael Polanyi (TD, 64, 65) who gives an instructive example of the way tacit knowing-that functions. He refers to a letter published by *Nature*, the author of which 'had observed that the average gestation period of different animals ranging from rabbits to cows was an integer multiple of the number π. The evidence he produced was ample, the agreement good. Yet the acceptance of this contribution by the journal was meant only as a joke. No amount of evidence would convince a modern biologist that gestation periods are equal to integer multiples of π. Our conception of the nature of things tells us that such a relationship is absurd, but cannot prescribe how one could prove this.'

Following Searle (1983, ch. 5), it would be a hopeless endeavour to specify all our tacit beliefs, not only because a great number of them are submerged in the subconscious but also for two further reasons: firstly, they are not individuated (we do not know, for example, how to count them); secondly, in trying to explicate them we would encounter states that are in a sense too fundamental to be called 'beliefs'" or elements of 'know-that' (e.g.: 'objects offer resistance to touch'—whatever one does with objects, one does not in addition think subconsciously that they offer resistance to touch).

(c) If we use the prevalent signs for knowledge, for example the spoken sentence, the text-book, the database, are we then really talking about knowledge? We are not. Sound waves, printing ink, and magnetic disks are just physical objects, not knowledge, until somebody understands what he or she reads or hears. Knowledge is a psychological phenomenon, not a physical one. Therefore, 'tacit knowledge' might also refer to the *tacit roots of all our explicit knowledge*, i.e. to its semantic and pragmatic basis. 'There is a possibility of knowledge only if one *understands the concepts* used and the contexts in which the sentences are normally used, and that is not the same as having the ability to repeat the sentences parrot-fashion', Molander (1992, 14) remarks rightly. And as it is meaning that constitutes knowledge, 'a *wholly* explicit knowledge is unthinkable' (Polanyi, KB, 144). All knowledge is, at bottom, tacit, because deprived of their tacit coefficients, all spoken or written words would be meaningless; explicit knowledge must rely on being tacitly understood and applied in order to be knowledge at all.

3. Transmitting and acquiring tacit knowledge

3.1 Basic didactical ideas

It is common knowledge that the acquisition of practical knowledge requires learning by doing. 'We learn *how* by practice, schooled indeed by criticism and example, but often quite unaided by any lessons in the theory', Ryle argues (1949, 41). And indeed, shifting the emphasis from expertise in verbalising to expertise in doing supports the view that 'what we need is not so much theories, articles, books, and other conceptual matters, but, first and foremost, concrete situations to be perceived, experiences to be had, persons to be met, plans to be exerted, and their consequences to be reflected upon' (Kessels/Korthagen, 1996, 21).

Given that experts always know more than they can tell and even more than anyone could ever formalise, it seems clear that expert knowledge cannot be transmitted by prescription alone. Hence, tacit knowledge, at least in the strong sense, has to be learned implicitly: 'An art which cannot be specified in detail cannot be transmitted by prescription, since no prescription for it exists' (Polanyi, PK, 53). Some authors even define the concept of tacit knowledge by its didactical implications, as does Molander (1992, 11):

'Knowledge transmitted through models or exemplars—through exemplary action, as in the master-apprentice relationship—and knowledge which is attained through training and personal experience may be called "tacit knowledge". This is a good label because the core of such knowledge does not consist of verbal or mathematical formulations, it consists of abilities to make judgments and to do things in practice, skilfully and with insight.'

Although tacit knowledge is not teachable, it is coachable. What must be left unspoken is to be attained through personal experience and is to be transmitted within master-apprentice relationships and cultures of expert practice. Polanyi's analysis of tacit knowledge leads him to advocate apprenticeship as indispensable for the acquisition of tacit knowledge. He emphasises that skills, whether practical or intellectual, can be passed on only by example from master to apprentice: 'By watching the master and emulating his efforts in the presence of his example, the apprentice unconsciously picks up the rules of the art, including those which are not explicitly known to the master himself' (PK, p. 53). Because the range of diffusion is restricted to that of personal contact, traditions of how to act skilfully may be lost if they fall into disuse for the period of a generation. Polanyi gives the example of violin-making (SC, 387): 'It is pathetic to watch the endless efforts, equipped with microscopes and chemistry, with mathematics and electronics, to reproduce a single violin of the kind that half literate Stradivarius turned out as a matter of routine more than 200 years ago.' Furthermore, Polanyi argued that this apprenticeship must be an uncritical one. The more hidden the rules, the more the apprentice must surrender himself uncritically to the imitation of the master and the

more he has to be convinced that there is something important to learn. Indeed, the paradox of learning a new competence lies in the fact that 'a student cannot at first understand what he needs to learn, can learn it only by educating himself, and can educate himself only by beginning to do what he does not yet understand' (Schön, 1987, 93).

Within the realm of tacit knowledge, Polanyi pays special attention to connoisseurship. This faculty has to be trained case-based. The importance of case-based instruction can be exemplified by the practice of Common Law (PK, 53, 54). Courts follow precedents considered in other courts, for they see the rules of law embodied in prior decisions. In doing so, they recognise that practical wisdom is more truly embodied in action than in expressed rules of action. From this, common education in schools and universities could learn a lot. It often teaches what to do in situations of a certain type by representing these situations as verbal vignettes. But in reality, we have to react to situations, not words. To choose a particular course of action requires a correct subsumption of the concrete situation in general terms. This faculty of judgment and discrimination is essential for applying the appropriate rules (if there are any). But it cannot be developed by simply giving further rules, for what one must learn to recognise is a situational pattern in which the elements might vary, and the meaning of a situational detail is always context-related (cf. Neuweg, 2001, ch. 12, for more details on expertise and pattern recognition).

Beyond these more or less obvious didactical ideas, further hints can be derived by studying Polanyi's concept of tacit knowledge more closely. It basically rests upon an analysis of the architecture and working of human consciousness. Within this framework, learning appears as a process of *interiorisation*, of making things function as if they were part of our body (cf. Neuweg, 1998). The learning process aims at the instrumentalisation of elements, objects, actions, theories, in the service of some purpose. Therefore, the master ought to encourage the learner to direct his or her attention primarily to the object being worked on, and only subsidiarily to the theoretical and practical means applied. To establish relationships between parts and wholes and between means and ends, to endow parts and means with meaning, the learner must concentrate on the 'distal' (Polanyi), the situation's 'back-talk' (Schön), the overall context or purpose. By doing so, the learner becomes aware of elements, objects and actions not in themselves but as tools; in terms of operational results achieved through their use. For if the learner experiences his actions

'only subsidiarily, in terms of an achievement to which they contribute, its performance may select from them those which the performer finds helpful, without ever knowing these as they would appear to him when considered in themselves. [...] Hence the practical discovery of a wide range of not consciously known rules of skill and connoisseurship which comprise important technical processes that can rarely be completely specified, and even then only as a result of extensive scientific research' (PK, 62).

Polanyi would have strongly agreed with Schön (1987, 158) in saying that the learner needs to grasp a skill 'as a whole in order to grasp it at all [...]; for the pieces tend to interact with one another and to derive their meanings and characters from the whole process in which they are embedded.' This is not to say that all tacitly learned pieces would be unspecifiable; but drawing attention to them would disintegrate performance and deprive them of their meaning.

3.2 Some caveats and qualifying remarks

Parts of the tacit knowing debate tend to overemphasise the difference between theoretical and experiential knowledge, and to overlook the benefits of critical reflection. At least the following remarks should therefore be added:

(1) Much of what we learn is picked up incidentally, and often one can do the learning better if the mind does not get in the way of its analysis and rules. But even if knowledge has to be considered as tacit to a large extent, this does not imply that it has to be learned wholly implicitly, i.e. without explicit instruction and without conscious attempts to detect underlying rules. In most cases, learning involves some balance or see-saw between relatively controlled, analytical and more spontaneous, integrative processes, the right blend varying both with the person and the subject being learned. In particular, it is sometimes necessary to draw the learner's focal attention to the details and to formulate pedagogically helpful rules (for this reason, a master is not necessarily a good teacher for beginners).

Although Polanyi argued that 'an unbridled lucidity can destroy our understanding of complex matters' (TD, 18), he was fully aware of the benefits of analysis, and thought 'an oscillation of detailing and integrating' to be 'the royal road for deepening our understanding of any comprehensive entity' (SEP, 333). A continual journey back and forth between analysis and synthesis is highly desirable, provided that analysis helps to render more of the tacit components focally known, without disintegrating our central focal meaning beyond repair. Polanyi gives the example of motion studies, which tend to paralyse a skill, but will improve it when followed up with practice. In cases of this kind, 'the detailing of particulars, which by itself would destroy meaning, serves as a guide to their subsequent integration and thus establishes a more secure and more accurate meaning of them' (TD, 19). Furthermore, in many cases the destructive effects of analysis can be counteracted by explicitly stating the relation between the particulars. 'Where such explicit integration is feasible', says Polanyi (TD, 19), 'it goes far beyond the range of tacit integration.' (Nevertheless, one must see that an explicit integration cannot replace its tacit counterpart. The skill of a driver cannot be replaced by schooling in the theory of the motorcar, nor are the rules of rhyme or prosody necessary conditions for enjoying a poem, and indeed, they can even destroy enjoyment.)

(2) Polanyi's idea of a see-saw between experience, analysis, reflection, and integration is closely related to the more elaborate concept of reflection to be found in the work of Donald Schön (1983, 1987). If a practitioner reflects in the midst of action, he focuses 'interactively on the outcomes of action, the action itself, and the intuitive knowing implicit in the action' (Schön, 1983, 56), always attending to the peculiarities of the situation at hand. This is what Schön calls reflection-in-action. He makes clear that it would be mistaken to view the alternation between analysis and integration as nothing more than an intermediary state in the process of becoming an expert. The very practice that leads to expertise also endangers it: tacit knowledge is often tacit blindness. Therefore, the question, 'how one could combine a critical stance towards knowledge with the protection and cultivation of "tacit" aspects of knowledge, if this is at all

possible', has rightly been identified as a key problem concerning unarticulated knowledge (Molander, 1992, 10). An expert is not only a person who acts intuitively, but also someone who has not ceased to learn!

(3) In many domains, the emphasis on tacit knowledge should not seduce us into underestimating the necessity of a broad theoretical background for skilful action. Take the example of medical diagnosis, to which Polanyi often refers. The identification of a specific disorder surely requires massive experiential background; but the expert's ability to perceive significant patterns of illness is also necessarily dependent upon his knowledge of medical theory. In general, the relationship between tacit knowing and the professional knowledge taught in schools should be treated as an open question, the answer depending on the respective task.

What remains tacit and has to be learned experientially, however, is the knowledge of how to apply theory to phenomena. Application can never build upon a theory of application. Furthermore, what might become tacit in the course of time are the details of theory in its propositional form. The expert might be aware of the theory just in terms of the phenomena that are seen in its light, because for gaining an understanding of a situation, one need not be fully conscious of what one has studied in order to use it interpretively: 'A theory', Polanyi argues, 'is like a pair of spectacles; you examine things by it, and your knowledge of it lies in this very use of it. You dwell in it as you dwell in your own body and in the tools by which you amplify the powers of your body' (M, 37; see also Broudy, 1970, for an analysis of tacit 'knowing with').

(4) Given that instruction and theoretical studies form an essential part of a curriculum, where should they be placed? Remembering that all explicit knowledge has and must have tacit roots, it is clear that not only do we sometimes need a great deal of instruction to understand experience; we also need a great deal of experience to understand a theory's meaning or what instruction is telling us. What the learner sees is to a large extent dependent on what he hears the master say; yet the meaningfulness of what he hears is itself at the same time dependent on his capacity to see what the words indicate. That is why Schön (1987, 103) pleads for instructions in the context of the student's doing: 'Instructions are always and inevitably incomplete. Unless we already know how to do the thing in question, there is always a gap between the instruction and the action it describes—a gap we are unlikely to detect, except when we listen in the mode of operative attention.' Polanyi strongly agrees that rules should be observed within the context of skilful performance, as 'the premises of a skill cannot be [...] understood if explicitly stated by others, before we ourselves have experienced its performance, whether by watching it or by engaging in it ourselves' (PK, 162).

Theoretical as well as experiential learning might therefore benefit greatly if connected in parallel. If we synchronise language and things, we will always find a dual movement of comprehension (and if the two fall wholly apart we risk the danger of a lack of comprehension in both realms). To illustrate this dual act of sense-reading, Polanyi uses the vivid example of a medical student attending a course in X-ray diagnosis of pulmonary diseases. He watches shadowy traces on a fluorescent screen and hears the radiologist commenting to his assistants. At first he can see nothing that is talked about nor does he understand the language used. But as he goes on listening for a few weeks the pictures begin to make sense—and so do the comments made about them:

‘Thus, at the very moment when he has learned the language of pulmonary radiology, the student will also have learned to understand pulmonary radiograms. *The two can only happen together.* Both halves of the problem set to us by an unintelligible text, referring to an unintelligible subject, jointly guide our efforts to solve them, and they are solved eventually together by discovering a conception which comprises *a joint understanding of both the words and the things*’ (PK, 101, emphasis mine).

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Zusammenfassung: In den letzten Jahren hat das Konzept des impliziten Wissens zunehmend mehr Aufmerksamkeit auf sich gezogen. Der Beitrag charakterisiert im ersten Abschnitt das theoretische Rückgrat dieses Konzepts und stellt den tacit knowing view als Gegenposition zur intellektualistischen und objektivistischen Auffassung von Wissen vor. Im zweiten Abschnitt werden verschiedene Bedeutungen des Begriffes "implizit" und unterschiedliche Formen impliziten Wissens differenziert. Im dritten Abschnitt schließlich werden Implikationen für den Prozess des Wissenserwerbs erörtert.

Schlüsselbegriffe: implizites Wissen - intuitiv-improvisierendes Handeln - Kennerblick - Know-how - Learning-by-doing – Erfahrungslernen