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A POLANYIAN APPROACH TO THE PROBLEM OF DISCOVERY

INTRODUCTION

I would like to make my title more precise. It reads "A Polanyian approach to the problem of discovery", which suggests much wider material than will be presented here. In fact my paper is just a case study inspired by Polanyi's concept of tacit or personal knowledge. I mean the example from the history of physics that can serve as evidence for the presence, in the discoveries made by physicists, of a kind of knowledge that cannot be derived from pure experiment: the discovery of the theory named after Lorentz, viz., the Lorentz-Maxwell theory of electrodynamics.

I am going to concentrate on one, but a very important aspect, of discovery, i.e., the evaluation of theories. I start by presenting the way the evaluation of theories influences the problem of discovery. Then I discuss very briefly the case of the Lorentz-Maxwell theory. I shall finish by pointing out the importance of the tacit component of knowledge in the evaluation of theories in scientific practice and therefore in the domain of discovery.

I. DISCOVERY AND THE EVALUATION OF THEORIES

Why do we have the problem of discovery? To answer this question one needs to notice that one of the crucial aspects of the problem of discovery is the problem of the evaluation of theories. Any attempt to understand the way discoveries are made needs to take evaluation into account, since evaluation is the only way to justify the statement that a discovery has been made at all.

Let us examine the way the standard empirical approach treats the problem of discovery. Doing so will illustrate how a view about the evaluation of theories influences the problem of discovery.

The standard approach to the problem of scientific discovery concludes that there is no philosophical problem of discovery. How that conclusion is reached can be summarized in the following steps:

1. "True" philosophy of science is analytical philosophy.
2. Analytical philosophy is based on empiricism and logic.
3. Experiment and logical analysis are the only tools applicable to the evaluation of theories, and evaluating theories is the only proper (justified) way of using them.

This, of course, implies that the evaluation of existing theories is the only action that can be considered justified from a philosophical point of view. The very origin of discovery becomes, therefore, a kind of illumination process that can, perhaps, be explained within psychology but not the philosophy of science.

So we have

4. The problem of discovery is psychological rather than philosophical.

II. WHAT IS WRONG IN THE STANDARD APPROACH?

Polanyi's main argument against the standard approach to the problem of discovery starts from noticing the following fact. If the claims of logical positivism were true, discoveries would happen at random or there would be no discoveries and, consequently, no progress of science at all. Of course that is not true. We do science, and new theories are constructed. That is why Polanyi argued that we must possess a kind of knowledge, "tacit" or "personal" knowledge, which we can use even if we are unable to verbalize it. 1/

This means that philosophy of science contemporary to Polanyi did not reflect scientific practice well enough. Especially it did not reflect the scientist's practice of doing science. Further, it did not describe the process of evaluation of theories in a way that corresponds to what scientists, especially physicists, do. For example, according to positivistic standards we would have no reliable procedure to evaluate and compare theories which do not differ on an experimental basis. Moreover, scientists would be unable to evaluate any theories for which there is not yet any experimental evidence. That is why true progress in science would occur at random or there would be no progress in science at **all**.

Of course the empirical standards of evaluation of theories are the most reliable tools we have, but are they just the ones used by the scientists when they come to discover a new theory? Definitely not, since the first evaluation of a new theory is the one performed by its discoverer, who usually has no experimental evidence for the new consequences of the theory. Despite of the lack of experimental evidence, he surely can decide if there has been any progress made. Polanyi is then right to say that scientists must use knowledge different from that based on experimental evidence. The question is, however, whether we can learn anything about this knowledge if it is "tacit." Here again we can utilize Polanyi's concept of transferring personal tacit knowledge, which, although it cannot be transferred by a lecture, can be learned by example. So to examine the problem of discovery we should turn to the scientific practice of great scientists and try to describe their work, not on the sophisticated basis of a presumed methodology but referring to "experimentally" given reality.

1/ See, e.g., *Polanyi's discussion of Meno's paradox.*

III. LORENTZ'S EXAMPLE

Let me now present to you briefly the case from the history of science that is known as the discovery of the Lorentz-Maxwell electron theory. First, it would be useful to present the theoretical background at the moment Lorentz started his work.

Maxwell's theory (1864) was the synthesis of theories about electricity and magnetism. It is a field theory. Not only is the electromagnetic field described in terms of four fundamental fields E, D, H, B , but also electrostatic quantities are treated in the field manner form (charge density). The same applies to the properties of matter characterized by the two quantities e and l . The main success of Maxwell's theory was the prediction of electromagnetic waves, actually observed by Hertz.

The theory needs, however, some extra assumptions to explain matter and structure-dependent effects like para and ferromagnetism. These are not the only disadvantages. The theory cannot explain such effects as the influence of body movement on light velocity. There is no theory of refraction and no experimental evidence for the strange equality between the square of refractive index and inductive capacity.

The last three points are the strongest arguments used by opponents of Maxwell's theory. Another one was the concept of the displacement current, which seemed very strange. However, as it is very important in understanding electromagnetic waves, Thompson and Ludwig Lorenz constructed their own theories based on modifications of electrostatic potential. In fact L. Lorenz's theory was equivalent to Maxwell's.

There were, however, other theories of electromagnetism.

One of them was the Weher-Fechner electron theory. It was based on the assumption of the electron structure of matter. Electrons of differing charges travelling in opposite directions form electric current. On the basis of certain assumptions (alike charges attract while going in the same direction, opposite if they go in different), one can write a formula for electrokinetic energy and together with Ampere's law understand induced currents.

The other one was Riemann's theory. It used an alternative formula for electrokinetic energy.

Clausins's theory contained another formula for electrokinetic force and did not require equal velocities.

The Fresnel-Stokes theory was the theory that explained the effects connected with the transmission of light in moving bodies. Ether is dragged (Stokes) and it carries part of the velocity of light, so the resulting velocity is not the sum of velocities as required by Newtonian mechanics.

The moral coefficient originates in the necessity of science. We need science in order to *lead a good life*.^{6/} Science is an example of the good life. ^{7/} The *telos* of our interest in science is to have a good life. But science is not a means for any other activity. It is pursued for its own sake. ^{8/} The essence of science is the love of knowledge, and this knowledge should not be used as a stepping stone to gain economic benefit or political power. That science is for science's sake and the good life is for the good life's sake is reminiscent of Aristotle's conception of *eudaimonia*, happiness. ^{9/}

4. Science, comprising autotelic activities, is an example of the good life. What is a good life? The life whose purpose is in itself? The answers to these questions requires a close analysis of Polanyi's whole philosophical outlook; that is beyond the purpose of the present study. ^{10/} However, to provide some hints, it is proper to raise another question: In what respect is science an ideal model of the good life? A partial answer to this very complicated question is that scientists form the body of a great and good society. ^{11/} One of the distinctive characteristics of a good society is freedom. A free society has an end in itself. ^{12/} This end should not be imposed from outside. The good life requires a good society and a good society is a free society in the sense that it determines its own end. Notice that the desiderata for the good life are similar to those for science. The good life is a free, autonomous, autotelic, self-determined life. The same applies to science.

^{6/} What is the criterion of being moral? What distinguishes the moral from the non-moral? This is not the place to examine deeply this controversial issue. Roughly speaking, the moral is what is related to the possible answers given to the following question: "How should I live?" Any philosophical issue that revolves around this question can be taken as an ethical issue. Since "to lead a good life" has a conceptual link with some of the attempted solutions to this main question, it is a genuine ethical concept.

^{7/} LL, 6.

^{8/} SFS, 7.

^{9/} *Nicomachean Ethics*, 1097b 1-20.

10/ The members of a good society respect truth, desire justice, and love their fellows (LL, 30). Truth, justice, and love, these three conceptions may indicate an answer to the question of what the good life is. It is only possible in the good society. This society consists of compassionate, just members who can use their tacit powers, being able to dwell in their knowledge, and have their personal responsibilities for truth. An explication of the italicized terms will be given in the rest of the paper.

^{11/} LL, 6.

^{12/} LL, 30.

What is crucial in this point is that without making use of ethical vocabulary it is impossible to describe science sufficiently.

It is high time to ask the Kantian question: "How is science possible?" Or, in the same vein, "How is the good life possible?" At first glance, we can find several different answers to this significant question depending on our point of view as exegetes of his philosophical texts. My answer is very simple: freedom. Self-government, self-determination, and self-regulation make scientific studies possible. Without academic freedom, a scientist cannot be considered responsible for his other actions. We cannot talk about commitment and fiduciary program at all. Once again we encounter a genuine ethical concept that lies at the core of science and the good life: freedom. Of course, at least within Kantian philosophy we cannot doubt that freedom is an ethical concept.

What, then, constitutes academic freedom? "The right to choose one's own problem for investigation, to conduct research free from any external control, and to teach one's subject in the light of one's own opinion." ^{13/} This brings us to the problem of how we steer freedom in science. Freedom is a form of organization; ^{14/} it is necessary to guard science against alien control. ^{15/} It has social importance, since the survival of a scientific society (a good society!) necessitates freedom. But to maintain freedom we need power. This great amount of power can easily suppress freedom itself. How shall we control freedom? Though this question sounds paradoxical, it reveals one of the important aspects of a free society. Complete freedom, freedom without maintaining power, leads to chaos. Freedom is not the freedom of the "Open Society," ^{16/} that of detached isolated individuals. A scientist occupies a definite position within the framework of an institution. Unless institutions are free, individual freedom is not possible. ^{17/}

5. Why doesn't science degenerate? Science can survive, because its values and ideals can be embodied in a tradition that can be maintained by a scientific community. Each group of scientists sets up its own standards in freedom for its members allowing among them reasonable criticism and communication. Both the transmission of traditional values and the addition of wholly original interpretations occur at every stage of scientific activity. The scientific community has its own authorities, one of which demands freedom, while the other demands obedience. Without intellectual authorities such as mentors and masters the continuation of science cannot occur. Novices are trained to share the ground that makes

¹³¹LL, 33.

¹⁴¹LL,34;SF,63.

¹⁵¹ LL, 29-30.

¹⁶¹LL, vi.

¹⁷¹SFS, chaps. 2 and 3.

possible the transmission of traditional values and problems. But this scientific authority should be received into the scientific community by individual scientists at their own discretion. Free consensus is necessary to hold traditional values. Otherwise science cannot constantly be "revolutionized and perfected by its pioneers on a constant basis being firmly rooted in its tradition." 18/ So, the love of science, the creative urge, should go hand in hand with devotion to traditional scientific standards. The task of cutting the Gordian knot falls upon the individual scientist: S/he accepts the example of great scientists in the past, and trusts his/her colleagues, but at the same time "strives against self-deception and for a *true feeling of reality*." 19/ His/her love and solicitude to every original effort saves him or her from being a slave of the community. 20/ How does "a true feeling of reality" provide him with emancipation from the restraints of the pre-established workings of the authority of his society?

To repeat, science is an example of an ideal society and the good life. This society, in principle, can be free from external control. In fact, it should be free from outside manipulations. Otherwise it loses its character of being a paragon of the perfect society. We have seen that an individual scientist within its institutions should protect the autonomous character of his/her society. Unless one's society has a self-determining structure, one cannot be free. On the other hand, maintenance of social freedom requires the freedom of individuals. But, oddly enough, the rock bottom of an individual scientist's freedom is his/her "feeling of reality." How is a "feeling of reality" justified in Polanyi's system? What is its relation to the moral coefficient of our knowledge? *Is an act of knowing inherently moral?* These are some of the questions I will tackle in the next sections.

6. "Feeling of reality" is a belief. Belief occupies the core of Polanyi's philosophy. His "fiduciary program" bases itself on this concept. Why do we need beliefs? From the evolutionary point of view, human beings have developed certain perceptual powers by the aid of which they have a body of knowledge about reality. In fact, science is an extension of perception. 21/ In the mechanism of perceiving an object, despite gaining information about the object, we lose many aspects of it. There is no perception that can grasp its object perfectly. This deficiency inherent in our perceptual mechanism can be overcome only by believing in our perceptions as well as the knowledge provided by them. So, to see how and where belief

18/ *SFS*, 56.

19/ *Emphasis is mine*.

20/ *SFS*, 55.

21/ *LP*, 28.

begins to play its important role, let us look at Polanyi's description of our defective as well as insufficient knowledge of reality.

"There is no firm, exact rule either for verification or refutation of the proposed solution of a problem." 22/ This means that the logical positivist's dream of constructing a logic of science, even in the phase of justification, has to be abandoned. All knowledge bearing on reality is indeterminant. This is the first indeterminacy. The second is the indeterminacy stemming from the impossibility of giving a precise rule for establishing true coherence in nature. Thirdly, we may not know on what grounds we hold our knowledge to be true. Fourth, defect stems from the fact that we cannot demarcate clearly, i.e., articulate particulars around the object of focal attention (see below). When we focus our attention on a certain object, we lose sight of its background and context. Lastly, we have indeterminacies in our choices in modifying the grounds of scientific judgment. 23/

"What to accept as finally established cannot be wholly derived from any explicit rules, because scientific conscience cannot be satisfied by the fulfilment of any rules, since all rules are subject to its own interpretations." 24/ To justify a rule we need another rule, and to prevent an infinite regress, we have to stop somewhere. Where to stop cannot be pre-established by any rule. Hence "a real feature of nature which, as such, exists beyond our control." 25/ Reality is something that reveals itself indeterminately in the future. Reality as understood in that way puts us in a hopeless situation: How can we know it, how can be sure that we know it? This is the point where "belief" becomes crucial.

A detached state of mind, a disinterested attitude, cannot help us overcome the deficient character of knowledge. When stuck in such an attitude, we are homeless, ineffective, insufficient to discover reality. Then, what we need is to find a way out of this difficult condition. The way out is a drastic change of attitude. Just as Husserlian "epoche" can be achieved by the change of natural attitude, 26/ so Polanyian "belief" requires the abandon-

22/ *LP*, 27

23/ *LP*, 29-30; *SFS*, 40-58; *KB*, chap .8.

24/ *SFS*, 30, 40.

25/ *SFS*, 10.

26/ *Ideen zur einer reinen Phenemonohgie*, p. 48.

ment of detached attitude.²⁷ We don't need to be filled with sorrow that any explicit claim about reality has indeterminate content; on the contrary, we can be proud of the fact that *we can see beyond established facts. For we can know far more than we can tell.* This means that we believe in our tacit powers! In our bodily mechanism of knowledge formation there is inherent insufficiency for which the disinterested attitude cannot provide compensation. That is why we need belief, *commitment.* We commit ourselves on the strength of our belief. Note that this belief is not an arbitrary, blind one, but a belief with open eyes. 28/ It is our will-power. To solve a serious scientific problem will-power is needed. 29/

At this point a proper metaphor will not be amiss. Reality is a dark realm. To see it, a light beam is necessary. The light beams are sent by us. 30/ In a detached philosophy of knowledge, e.g., empiricism, light comes from the outside. But in our case, through commitment, we

27/
*It can be asked whether the Husserlian way of the drastic change of natural attitude, or rather, commonsensical attitude, can be comparable to the relation between the detached and committed attitudes in Polanyi's philosophy. Do people usually know what they know in the detached manner? Is the detachment natural or common? Detachment and disinterestedness in the name of "objectivity" were overemphasized in scientific knowledge by the "positivistic" philosophies. Is the "fiduciary program" a reaction to it? It may be. Polanyi strived against some effective world-views of his time: Marxism, Logical Positivism and Empiricism, Utilitarianism and Behaviorism. He felt the threats of depersonalized outlook dominating Western culture. For Polanyi, in nature, the detachment can be achieved only "in a state of complete imbecility well below the normal animal's level" (LL, 25). So, in the cultural life where the sole creator is the intelligent human being, detached knowledge is impossible due to the fact that humankind is at the top level within the hierarchy of beings through evolutionary development. Yet, detachment and disinterestedness somehow had been thought to be a necessary condition of having scientific knowledge. This was the prevalent opinion of the day. Husserl's famous assertion "Ziiruck zu den Sachen selbst" (back to the things themselves) reflects a protest against the dominant philosophies of his time. He thought that a radical attitude change in philosophy was inevitable (see, for example, *Logische Untersuchungen II*, p. 6: "Philosophic als Strenge Wissenschaft", in *Logos*, p. 340). In a similar way, Polanyi's appeal to our body as a root of our knowledge may be interpreted as a passionate desire to convert a "seemingly natural" attitude, into a genuinely natural, that is, a fiduciary one. Hence, Husserl and Polanyi, among others, have one common point.*

28/LL, 31.

29/SFS, 39.

30/ In *Carl Med.*, p. 12, Husserl says: "Habe ich die Welt aus mir..." (I have the world from me...).

believe that we can know as yet unknown things. So shed a light on reality! We can fiducially feel invisible sights of reality as long as we believe that we can.

So far, we have understood that there are invincible barriers to the possession of personal knowledge, when seen in detached manner. A shift from this attitude towards a fiduciary one can put us on the way to reality. If reality is surrounded by a dark ring, don't wait for a light from it; on the contrary, have the courage to send a light towards it. Now we can see how the "light sending" works, what it achieves and, of course, why it can.

7. The "root metaphor" of Polanyi's system is perception. I use the term "root metaphor" somewhat in Pepper's sense.^{31/} The root metaphor of a philosophical system is its basic principle from which other ideas develop accordingly. Thale's root metaphor was "water", for example. In Polanyi's description of the perceptual mechanism, we can find any philosophical clue we need. This is not a rash claim; I don't think that I am incautious. Here is its justification. Suppose that the tacit mechanism that he describes is false. In that case, we cannot have terms like "commitment", "indwelling", "trust", "responsibility", even "personal". This may reveal the fact that all these terms conceptually originate in the "from-to" or "from-at" relation of the perceptual working of our bodily sense organs, let alone "semantic" and "functional" aspects of the very relations that, I believe, are somehow extensions of this perceptual model. First things first. To understand his fiduciary program, we start with Polanyi's conception of perception.

For any act of perception there are two kinds of awareness, *focal* and *subsidiary*. When we have one of them, for instance the focal one, the other inevitably lies in the background. We cannot see an object at the same time in two different ways. (Remember, for example, the duck-rabbit figure!) When we focus our attention on a certain object, we perceive not only that object but also many other things that lie in its background and context. These are *subsidiarily* perceived. These subsidiary particulars are perceived not as things in their own right but as pointers or clues to the object of the focal attention. Though focal awareness can be expressed articulately and explicitly, it has its own limitations, and it is to be complemented by subsidiary awareness, which has tacit character. On the basis of our prearticulate abilities we perceive and recognize these subsidiary particulars. We shift attention from these particulars to the thing focused upon. We cannot specify these particulars clearly. We tacitly integrate them as clues into a whole, and over this process of integration we have no control. We can know but we cannot express them. In order to obtain articulate knowledge about them shift of attention is necessary, but in that case, when they are in focus, they cease to be subsidiary particulars.

Starting with this brief description of Polanyi's root metaphor, we may now draw a somewhat different yet faithful picture (I hope) of his theory. Human knowledge has two aspects, tacit and articulate. Around all articulate knowledge, there lies its tacit component

^{31/} S.C. Pepper, *World Hypotheses*, p. 91-114.

or, to use Polanyi's word, its tacit coefficient. This fact becomes clear when you want to *use* your articulate knowledge. Suppose your knowledge about the rules of chess are articulately clear. As soon as you begin to make use of this explicit information, you rely on your tacit powers; or to put it otherwise, you activate your prearticulate abilities, your memory, sense organs, nervous system, over which you have no control and about which you have no explicit knowledge. Hence, no explicit knowledge without a tacit component.

8. Ontologically speaking, objects of reality are always on two realms depending upon our *epistemological orientation*. On the focal, articulate realm which I call *foreground*, we have an object of which we can explicitly be aware or articulately think. In the subsidiary, inarticulate *background* realm we have subsidiary particulars that are waiting to be integrated by a knower as described above. The objects of these realms cannot be fixed; it depends, among others, on our shift of attention in the case of a simple perception, and on our antecedent stock of knowledge, with our cultural and emotional atmosphere, when we deal with more complex cases. For example, as our knowledge of mathematics improves, some objects on the background realm shift into the foreground, or the reverse may happen, due to the loss of memory, if the objects of the foreground evacuate this realm. The background realm mostly plays a gestalt role, a frame on the basis of which the foreground can be constructed. Our vision of reality is doomed to have a dichotomous character. We cannot exhaust the background realm, it will always occupy an irremovable place in our knowledge of reality, it is an obstinate, dark partner that accompanies what we have already discovered, i.e., the objects that are the inhabitants of the foreground. No *ne plus ultra* should be stated in the foreground, since there will always be more to be found.

The crucial point for my purpose in this paper is to seek an answer to the following questions: what determines the structure of the *background*? Why do we have tacit knowledge? Is it indispensable? How can we cope with such uncontrollable tacit factors that interfere with our pursuit of gaining knowledge? How can we prevent adverse effects coming from the tacit dimension? How can we get along with our background realm in order to enrich and deepen the structure of the foreground?

When I listen to a piece of music, the meaning of the music is in my foreground, if I am a competent listener. Let us see what lies in the background. It comprises several types of clues from which the knower "springs up to the foreground". (Remember the fact that all knowledge is a "from-to" or "from-at" relation!) Firstly, there are bodily involvements. Some sound waves come to my ear, and certain changes occur in my ear. There are certain responses coming from my sense organs and also from my nervous system. Over these responses of my body, I do not have complete control. I cannot trace the origin of these effects. *Bodily processes* of the knower are the first clue, in the background. Secondly, there are other sounds accompanying the music that may come from the nearby physical environment. Moreover, along with the auditory stimulations there might also be visual effects (e.g., the sight of an orchestra in a concert), which jointly constitute *epistemic clues*. Foreknowledge and all previous experiences of the knower can also be considered as epistemic clues. *Beside bodily and epistemic clues*, the third important clue is the one which

has a social, economic and cultural character. Inhering in any knower, at the stage of her education, is her community's form of life as her tradition through language. Language with its social and cultural character provides subsidiary clues especially during communication between knowers. *Communicative and social clues* form the important component of this tacit ground. No knowledge without communication. No communication without society, culture and economic life.

These three types of clues are the basic constituents of the background. Of course, there are more to be found. For our purpose this much is enough. These factors jointly shape the main structure of the background. Notice that the background is not that which is formless, like Aristotle's *hyle*. But it does not have a fixed, predeterminant structure. That is why our will-power as knowers works here. How? Let us see.

9. When we are in the foreground we *rely on* the clues provided by the background. We *believe* that we are at home with these clues, *fides quarens intellectum*. Unless we have faith in the search for understanding, we cannot carry clues to the foreground, *nisi crediteris, non intelligis*. 32/ So, to make "transportation" from the first ground to the second, the fiduciary attempt, the fiduciary decision, is necessary. 33/ There is no royal road to the foreground, no exact, pre-established, firm rules. The scientist is not a truth-finding machine. 34/ Belief is the power that we exercise in the act of jumping from the background to the foreground. This is our tacit power to integrate clues, and to send them to what they point to, namely its place in the foreground. It is tacit, because we cannot tell how we integrate them.

This is where the *ethical component of tacit integration* should be discussed. The use of our tacit power requires belief. This belief is not subjective. If we truly believe in something we are ready to commit ourselves on the strength of our belief. In committally reached foreground, we believe in the presence of something real, external to us. 35/ In this sense, there is no external authority, or an Archimedian point on the basis of which someone can check whether our belief contains truth, just because the same authority needs the belief in order to be able to assert so. We will return to this point below with respect to "responsibility". It suffices to say now that commitment in Polanyi's sense is universal. If it is universal, it is valid for those who commit themselves in a similar way. Then, when we put together all the clues in the background committally, we are an *ethical person*. Ethicality is involved

³²¹PK, 266.

³³¹At this point, I agree with Giere who eventually comes to believe that in scientific reasoning, not inference but making a decision is more significant (*ExplainingScience*, p. xvi).

³⁴¹SFS, 30.

³⁵¹PK, 202.

here due to the fact that *wepromise* that we are on the right path to discover reality. Epistemic commitment in this sense always bears an ethical component. Without promising to our fellow knowers who commit themselves to the same problem, without the promise that we will find the truth committally, our commitment will lose its strength and significance. Any jumper from the background uses his or her epistemic as well as *ethical tacit power (an act of knowing is inherently moral)*. In the same vein, we may claim that the way from clues to what they point can be traveled only by having the ethicality of our commitment. In sum, each commitment has an indispensable ethical coefficient.

When we use a tool skilfully, our body is always in the background. Knowing resembles using a tool. To apply a theory in order to understand nature we interiorize it; by dwelling in the theory, we learn to use it as a tool. 36/ For example, a mathematical theory cannot be understood until we use it as a tool. By participating in the tool, bodily being becomes a being in the world. 37/ In the foreground there is the tool we dwell in, and our bodies are *extended to include* the tool. So, two grounds at that point join together! I include myself in the tool (or rather, to my knowledge used as a tool!). Here, we are witnessing the participation of the knower in the world s/he knows. We pour ourselves into what we know. We form a bridge between two grounds. 38/ Indwelling, bridging, extension of our bodies, inclusion of ourselves to what we know *-all these have moral character*. Indwelling cannot be carried out automatically! It requires again commitment. We may conclude that even in seemingly spontaneous, ethically neutral bodily actions, when seen from within, we may observe an inherent ethical coefficient.

10. So far, in my description of the ethical structure of Polanyian epistemology, I have found a one-to-one correspondence between the elements of the background and the ethical coefficients of knowledge. During the integration of epistemological clues, the knower commits herself to what they hint at. Commitment requires (implies) an ethical standpoint. Bodily clues through indwelling add an ethical dimension to our knowledge. Now, we come to the last type of clue and its ethical aspect.

As a member of an epistemic society, a society of knowers, I cannot but affirm the things I believe, relying on the clues. These clues can be put together, integrated and stated linguistically. Nobody but I myself am *responsible* before the other members of the society for holding such beliefs. I have at least two kinds of responsibility. One is for my fellow knowers, the other is for myself, for my own commitment. The latter means that I am res-

36/*SaMP*, 63.

37/ *In this sentence, the spirit of Heidegger, his "in der Welt sein," can be felt!*

38/ *By dwelling in external manifestations, with actions of mind in the background, its intentions, purposes, and meanings can be understood. By bridging the two by indwelling we can bridge over the difficulties of the classical mind-body problem!*

possible enough to be *a person*. Ethically speaking, being a person is a character trait, in fact, in a sense, a *virtue!* Remember the well-known expression of Polanyi, "For I believe so." 39/ "I" in this expression is not an ordinary grammatical pronoun, or any indexical word, but an English word representing a person who holds the sole responsibility of beliefs against the *hazards* of their fallibility. In this respect, to be a person requires two sorts of ethicality. One is a person's *obligations* to the members of the epistemic society. S/he should trust and communicate with them about her or his beliefs or findings. S/he should share convictions and fellowship, cooperating with the other knowers, and freely obey as well as criticize authorities in the society. 40/ Persons in the community should recognize each other as persons. The other is to have "a moral feeling" of being a faithful follower of the search for truth. S/he is not only epistemically respectful of the evidence but also morally obliged to be a person who independently obeys the dictates of her or his own conscience. Moral obligations are laid down for oneself by oneself. In the last resort one is responsible only for oneself, if one has the virtue of being a person.

Now a question arises: Is there any difference between ethical (moral) and epistemic responsibilities? In Polanyi's system, it will be a bit of an exaggeration to seek such a difference. To a certain extent, for the sake of analysis, the difference can be put in the following way: epistemic responsibility is the one held for the body of knowledge. Ethical responsibility, on the other hand, is the responsibility of a person for his or her own epistemic as well as other types of societies! In this regard can we say that a committed scientist who tries to be a person, though epistemically virtuous, may be ethically vicious. That is, he has epistemic but not ethical responsibility. I think in this case he can be considered as suffering from "split-personality". Such a kind of schizophrenia might be found in scientific communities in every age. How honest are they? What is honesty? Shall I still be an honest person if I appeal again to the same difference between epistemic and ethical honesty? I quit the discussion here, though much remains to be said. 41/

Why is a person responsible? At first glance the question sounds like: why is a person a person? But the search for an answer to this question is not trivial. 42/ Who is a person? A

39/LL,31.

40/PK, 212.

41/ On this point Polanyi seems to defend the integrity of the intellectual and moral dimensions of the self: "A man ... may be a man of genius yet be also sycophantic... moral rules control our whole selves rather than the exercise of our faculties" (PK, 215).

42/ We dwell in what we know. This means that somehow we add our selves to reality. The part of the reality we know becomes our possession! That is why we are responsible for our knowledge. It is our possession. Appropriation of our knowledge holds us responsible. How can we be indifferent to our possessions?

person is a believer, not in an ordinary sense of course, but an open-eyed believer who appreciates the risk of her or his beliefs. One is a committed individual, as explained above, and also *passionate*. One has intellectual passions for discovering truths. One has a love of hidden reality, a "shirt of flame" blazing with passion. 43/ Because one desires to discover rationality (order) in nature, this desire goes far beyond a person's understanding. One is alone before an as yet undiscovered part of reality. The only source for supporting the claims one makes comes from one's faith in oneself. One's responsibility based on such a faith functions as a tie between person's assertions and reality. One's desire for truth, and objectivity, cannot be satisfied subjectively. The personal and the universal mutually require each other. 44/ In fact, here one asserts oneself. Outspokenly, one claims that what one asserts is universal, not a subjective whim or caprice, not something erected on wishful thinking. This is a very risky claim indeed. One has great responsibility. Responsibility for the fellow knowers, for the tradition one inherits, and what is more important, for the future! One is deep in one's knowledge, dwells in it, lives up to it. So, knowledge becomes inherently part of one's mind, body, life. The ethical question "how should I live?" becomes "How should I know?" Ethical and epistemic dimensions are merged to form the integrity of human life which in our age suffers from the loss of commitment, personhood, and severe disintegration.

At this stage a novel frame of mind develops. Intellectual passions that seek reality can only be satisfied by intellectual joys. A passionate knower from that point on will be in pursuit of discovering the beauty of reality.

Epilogue

This is an attempt to reveal Polanyi's ethics. Being unavoidably an imperfect study, it gives only some hints and intends to pave the way for further discussions.

In what directions can Polanyi's "potential ethics" be pursued, or how can it be developed further?

Historically speaking, Polanyi's conception of a "good life" and ethical aspects of his vision of science and knowledge indicate that there is a close connection between Aristotle's *phronesis* (prudence) and Polanyi's personal responsibility and choice. 45/ Roughly, *phronesis*, in a sense, is the virtue of practical intelligence, of knowing how to apply general principles in particular situations. Polanyi accepts moral rules, 46/ but "like the

⁴³¹ PK, 64.

⁴⁴¹ PK, 308.

⁴⁵¹ *Nicomachean Ethics* U40a24-b30.

⁴⁶¹ PK, 214-5.

artist and scientist, moral man strives to satisfy his own standards, to which he attributes universal validity". 47/

Polanyi's ethics is akin to a virtue ethics, recently developed by A. MacIntyre and P. Foot in English-speaking philosophy. 48/ To them, certain traits of character rather than an appeal to moral law or to the maximization of benefits is important. To be a person is a virtue. The point is to understand in what this virtue consists. It is the subject matter of further studies.

Again Polanyi's ethics may be compared and contrasted with Jonas' "ethics of responsibility" 49/ and, interestingly enough, with recently developed eco-ethical studies. 50/

My final remarks on the development of his ethics are the following:

1. To clarify the main concepts of his ethical system, exegetical studies are necessary. A critical survey of his published and unpublished works from an ethical point of view will be helpful for this purpose.

2. Such studies can be supported by the comparison of his ethical ideas with other ethical systems.

3. The critical analyses that reveal hidden presuppositions as well as the coherent structure of his system should be carried out.

4. Polanyi's valuable experiences and his moral sensitivity as a scientist should be appreciated. What can be learned from his ethical vision should be philosophically pinpointed.

5. We must work on his system of ethics in order to reveal its insufficient, incomplete and defective points, if there are any.

6. Amendatory studies on these points should be encouraged.

7. Inspired by his ethics, we must prepare ourselves to develop different ethics.

47/PK, 214.

48/ MacIntyre, *Alasdair, After Virtue*, 1981; *Whose Justice? Which Rationality?*, 1988; Philippa Foot, *Virtues and Vices and Other Essays in Moral Philosophy*, 1978.

49/ H. Jonas *The Imperative of Responsibility*, 1984.

50/ H. Skolomowski, *Eco-Philosophy*, 1981; see also discussions in the journal - *Environmental Ethics*.

Finally, I add a list of principles derived from Polanyi's ethical ideas, that might be picturesquely called the *Polanyian Ten Commandments*.

1. RESPECT AND LOVE TRUTH.
2. DO NOT MULTIPLY ARTICULATIONS BEYOND NECESSITY.^{51/}
3. USE YOUR TACIT POWER.
4. ACTIVATE THE PERSON IN YOU.
5. IMPROVE YOUR INTELLECTUAL PASSIONS.
6. FREELY CHOOSE YOUR OWN MASTER, BE FAITHFUL TO HER/HIM, AS FAR AS YOUR CREATIVE URGE AND SENSE OF INDEPENDENCE ALLOW.
7. NO BLIND SUBMISSION TO AUTHORITIES.
8. LIVE UP TO STANDARDS THAT NO ONE BUT YOU CAN ESTABLISH.
9. REVEAL THE ETHICAL DIMENSIONS OF YOUR KNOWLEDGE.
10. KEEP IN MIND THAT ALL KNOWLEDGE IS FOR A GOOD LIFE.

51/ It is reminiscent of Occam's Razor: Entia non sunt multiplicanda praeter necessitatem. Do not multiply entities beyond necessity!

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(3) Citing a rule (or giving a rule-formula) can be a way of explaining the meaning of a term used in a language-game, but language-games are not types of activity governed by sets of precisely defined rules; naturally occurring language-games are often (or involve) rule-following activities, but the competent use of language is not the application of a calculus of rules.

'Precise' rule-formulations can always be misunderstood or applied incorrectly, while language-games which rely on a diffuse understanding of the meaning of, e.g., spatial terms, can work perfectly well ('Come over here!'). If need be, one can regulate the use of terms according to strict rules, but this is not a generally necessary condition of the meaningfulness of a word or sentence. The meaning of a term is not a sharply demarcated shadow which cannot be trespassed, projected by precise rules of its use in the language. Meaning as constituted in language-games is an inherently imprecise notion.

(4) The meaning of a word is what is explained when its meaning is explained - and that is its use in a language-game. 28/ Also: the meaning of a word is what is understood or known when its meaning, its use in a language-game, is understood: there is an internal connection between explanation and understanding, because for a speaker to be able to explain correctly the meaning of a word is itself a non-contingent expression, or criterion, of his possessing a correct understanding of the use of the term, i.e. that he knows its use in the language-game.

For Wittgenstein, linguistic knowledge as knowledge of meaning must be (at least 'in principle') completely transparent to the language-user in the sense that in referring to the ordinary practices of the use of a word (and that includes the 'meaning-explanatory' use) a complete understanding of its meaning can be achieved. Knowing how to use a word correctly consists in having mastered a technique: the technique of competent participation in the practices of the language-games concerned. It is therefore obvious that linguistic knowledge cannot be equated with knowledge of (precise) rule-formulations; it is to be conceived on the model of a practical ability, not as a form of 'cognitively hidden' theoretical knowledge (only) applied in contexts of language-use.

(5) Language-games are public objects: even acts like trying to convince yourself of the truth of some proposition have descriptions as meaningful acts which put them in the space of public performances. Whether language-games are inherently social objects, in the sense that to use language correctly in a rule-following way a language-user has to share in a practice, custom or institution factually shared by another language-user, has been a matter of heated debate. Proponents of the inherently social nature of meaning have gone so far as to claim as the central tenet of 'Philosophische Untersuchungen' a conception of meaning which drops (Tractatus-related) truth-conditions in favour of conditions of justified use of language as the main explicatory notion. 29/

28/ Wittgenstein (3), par. 560,

29/ Vid. Kripke; see also the excellent book by McGinn.