Tradition, Authority and Originality in a Post-critical Perspective

Zhenhua Yu

ABSTRACT Key Words: tradition, authority, originality, critical philosophy, post-critical philosophy.
In his post-critical philosophy, Polanyi challenges the intellectual trend in modern Westen philosophy which exalted critical reason and denigrated the uncritical elements of knowing, such as belief, tradition and authority. In this paper, the author focuses on Polanyi's thoughts on tradition, authority and originality in a post-critical perspective. On the one hand, Polanyi, against modern critical philosophy, fully acknowledges the important role played by tradition and authority in science, on the other hand, he also tries to show the tension and the deep unity between tradition, authority and originality.

The subtitle of Polanyi's *magnum opus Personal Knowledge*—"Towards a post-critical philosophy," indicates Polanyi's self-understanding of an important aspect of his philosophical goal. The term "post-critical philosophy" contrasts with "critical philosophy." In the history of Western philosophy, the term "critical philosophy" is conventionally understood as denoting Kant's philosophy. However, it is interesting to note that Polanyi expands the extension of this term and uses it in a broader sense, so that it is not just confined to Kant's philosophy, but rather applies to a whole philosophical trend in the modern West which exalted doubt and critical reason on the one hand, and denigrated the uncritical elements of knowing, such as belief, tradition and authority, on the other hand. To Polanyi, Descartes, Hume, Kant, Mill, Russell, and most other modern philosophers are representatives of critical philosophy. Polanyi fully acknowledges the historical significance of critical philosophy:

> The critical movement, which seems to be nearing the end of its course today, was perhaps the most fruitful effort ever sustained by the human mind. The past four or five centuries, which have gradually destroyed or overshadowed the whole medieval cosmos, have enriched us mentally and morally to an extent unrivalled by any period of similar duration.[1]

Nevertheless, Polanyi argues that critical philosophy's overestimation of critical reason and its blindness to the positive role played by the uncritical elements, such as belief, trust and the acceptance of tradition and authority in the shaping and holding of knowledge is untenable. In his post-critical philosophy, Polanyi 1) attempts to draw our attention to the important role played by the uncritical (even a-critical) elements in the act of knowing, and also 2) attempts to offer a sound account of the relationship between the critical and the uncritical. This can be seen clearly in his fiduciary program. In this paper, however, I will try to illumine the essence of the post-critical philosophy by investigating Polanyi's reflections on tradition, authority and originality in science.

Tradition

As Edward Shils rightly points out, Polanyi was one of those philosophers who first attached great importance to tradition in science.[2] From the 1940's, he started reflecting on this issue and the theme of scientific tradition ran through his later writings. In order to bring his insights on tradition into sharp relief, I will refer to other authors as well in my presentation of Polanyi's thoughts. In my view, the following five points merit attention.

1. The rehabilitation of tradition

Since the 17th century, especially after the Enlightenment, tradition has been in disrepute. As Edward Shils points out,

> Traditionality became associated with a particular kind of society and culture. Traditionality was regarded as the cause or the consequence of ignorance, superstition, clerical dominance, religious intolerance, social hierarchy, inequality in the distribution of wealth, preemption of the best positions in society on grounds of birth, and other states of mind and social institutions which were the objects of rationalistic and progressivistic censure. Traditionality became the ubiquitous enemy to every critic of the ancien regime; it was thought that when traditionality yielded place to reason and to scientific knowledge, all the vices which it sustained would fall away.[3]

In a word, tradition was depicted as the opposite of reason and freedom by the rationalists and progressivists. While fully acknowledging the historical significance of the Enlightenment's critique of tradition, we cannot but agree with Gadamer who incisively emphasizes that, by setting tradition in opposition to reason and freedom, the Enlightenment failed to capture the essence of tradition. Even Romanticism, a critical reaction to the Enlightenment, fell into the same pitfall by conceiving tradition as an abstract antithesis to freedom and reason. According to Gadamer, tradition does not take shape naturally by means of inertia. It needs to be affirmed, embraced and cultivated. That is to say, preservation is the essence of tradition. "[P]resevation is an act of reason, though an inconspicuous one."[4] "[P]reservation is as much a freely chosen action as revolution and renewal."[5] Thus, the unconditional antithesis between tradition, on the one hand, and reason and freedom, on the other, is illusive. To Gadamer, there is no abstract, absolute reason. Reason exists only in concrete, historical terms. Reason is not tradition-free. In order to overcome the Enlightenment's and even Romanticism's conception of tradition, Gadamer proposes a rehabilitation of tradition.

It is not difficult for people to understand that tradition plays a prominent role in arts, literature and even in human sciences. However, when it comes to the natural sciences, people tend to think that they are tradition-free. For instance, Dilthey uses tradition to differentiate the humanities from the natural sciences. Gadamer, at least in *Truth and Method*, though with some reservations, holds that the element of traditionality is only of secondary importance in the natural sciences and mathematics, while in the human sciences it constitutes its real nature and is its distinguishing mark.[6] However, this conception of science is itself a result of the Scientific Revolution and the Enlightenment, which represents only a superficial observation of the practice of science and does not recognize the crucial role that tradition plays in the progress of science. Michael Polanyi, with his intimate knowledge of the practice of science, advocates something like a rehabilitation of tradition in the natural sciences, similar to what Gadamer does with respect to the human sciences. At this point, philosophy of science and hermeneutics converge.

Polanyi notes that, modern science, in its formative period, championed a violent rebellion against all traditions and authorities, which was echoed by nearly all the prominent scientists and philosophers of the period. The slogan was reasonable at that time; modern science had to fight all traditional authorities, especially the Roman Catholic Church, in order to take shape. However, when the enemies were defeated, this slogan remained and came to imply that science, as a rational and free enterprise, must repudiate all traditions and authorities. This is misleading. In Polanyi's view, scientific research cannot reject all traditions and authorities, because the

existence and development of science is based upon scientific traditions and scientific authorities. I will discuss the issue of authority in the next section, but, for the moment, let me focus on the question of tradition.

2. Why tradition is important in creative endeavours

The importance of tradition lies in the fact that the existence of tradition, or the lack of tradition, will directly affect the creativity of our work in a certain area and the quality of our products. Karl Popper once recalled, when he was in New Zealand, that he got a set of American records of Mozart's "Requiem." Because the musician, according to Popper, under whose directorship the records were made, was untouched by the musical tradition handed down from Mozart, the quality of the music of those records was very poor. Popper told us that the incident made him understand what the lack of a musical tradition means.[7] The situation is quite similar in science. Polanyi pointed out that modern science originated in Europe; the long-established tradition in this area makes Europe scientifically more competitive and fruitful than elsewhere. He claimed that in some non European countries, even though more money and resources were available for scientific research, research there could hardly make much progress due to the lack of an established tradition.[8]

3. Two dimensions of tradition

In his discussion of the rational, scientific tradition, Edward Shils says:

> Each generation of scientists acquires what its predecessors have achieved through their successive experiences and analyses; the fruits of these experiences and analyses are passed onward. Many of these fruits are subjected to severe rational scrutiny and refined articulation. But not all that is presented and received is assimilated into this process. Some of it remains unarticulated, but that too is presented and received. The transmission of the articulated part of the rational, scientific tradition is made effective by the reception and mastery of its unarticulated part. The mind of the recipient is formed by this reception of both the articulated and the unarticulated.[9]

Scientific tradition has an articulated part and an unarticulated part. The articulated part is composed of the established theories, which can be viewed as a body of propositions. The unarticulated part refers to things such as the skill of carrying out research, the sensitivity to important problems, the insight or hunches in scientific discovery, and the ethos of scientific community. These are the "overtones" of a scientific tradition. They can hardly be codified, that is, systematically articulated with strict, formal rules or principles. I suggest that we adopt Polanyi's terminology and simply call the articulated part of a scientific tradition the explicit tradition, and the unarticulated part, the tacit tradition. If we aim at a complete understanding of a scientific tradition, both the explicit tradition and the tacit tradition are equally indispensable.

With the two dimensions of tradition in mind, we will see an important difference between Polanyi and Popper. Both are among the first modern philosophers who took seriously the issue of scientific tradition. But Edward Shils senses the difference between Popper and Polanyi in terms of Polanyi's clear consciousness of the distinction between two parts of the scientific tradition. Shils claims,

> Polanyi went further than Popper in the analysis of the tradition of science. With all due respect to Popper, Polanyi's analysis was deeper. Beyond his statements about the existing

> states of theoretical knowledge as the tradition to which every scientist has to respond, Popper touched only briefly upon the scientific sensitivity to problems and possibilities in a short passage on the difficulties to establishing a scientific tradition in a society in which there has been none previously. Here Popper showed that he knew that there is more to the scientific tradition than the givenness of theories at any particular point in time. He did not go any further. This Polanyi did.[10]

This is, no doubt, an acute comment. Let me try to spell out more clearly and more concretely the difference between Popper and Polanyi in the direction that is pointed out by Shils.

Basically, Popper stresses the importance of tradition in scientific research from the standpoint of critical rationalism. He argues that the growth of science is not, as conceived by empiricists, a result of collecting or accumulating empirical data. It is a result of producing hypotheses and theories, then testing them. The role of observation is not to produce theories, but rather to test and criticize them. Scientific investigation begins with established hypotheses and theories; it cannot start from scratch. We must stand on the shoulders of our predecessors. By way of getting familiar with the established theoretical framework, the young scientist establishes contact with a scientific tradition. Obviously, Popper primarily understands scientific tradition in terms of established scientific hypotheses and theories. Scientific hypotheses and theories can be articulated in principle, and hence fall under the category of explicit tradition. In contrast, Polanyi has a broader vision of the scientific tradition. He does not confine himself to hypotheses and theories in his understanding of the scientific tradition. He often talks about the transmission of the art of scientific research, delving into the tacit dimension of the scientific tradition. His deep insights into tacit knowing make his theory of tradition distinctively profound.

The distinction between two dimensions of tradition is implicit in Polanyi's discussions. Scholars like Edward Shils and Struan Jacobs make it explicit.[11] This is an important contribution to Polanyi scholarship. Fully acknowledging their achievement, I, nevertheless, believe that more can be found embedded in Polanyi's thoughts on tradition. In the following, I will try to press this line of thought by showing how the distinction between explicit tradition and tacit tradition can shed light on explicating the locality of tradition and the irretrievability of tradition once it is lost.

4. The locality of tradition

An important feature of tradition is that it often is a local one. This is shown by the fact that many schools of thought are named after a certain place. For instance, the Vienna circle (of logical positivism), the Frankfurt school of critical theory, the Chicago school of economics, the Copenhagen school of quantum theory, the Bergen school of meteorology, Boston Confucianism. The local character of tradition makes it difficult to transplant from one place to another. Popper says: "Certain types of tradition of great importance are local, and cannot easily be transplanted."[12] Scientific tradition is one of them. Talking about his experience in New Zealand, Popper points out that it is important for a country which lags behind in scientific research to establish a scientific research tradition. Polanyi also holds that modern science is based upon a local tradition. As mentioned above, the origin of modern science is in Europe and Polanyi emphasizes the importance of the local European tradition for the spread of science to other places: "Without the opportunity offered to young scientists to serve an apprenticeship in Europe, and without the migration of European scientists to the new countries, research centers overseas could hardly ever have made much headway."[13]

The local character of scientific tradition should lead us to reexamine the widely spread saying: "Science is beyond borders." The claim is rich in its implications. However, I will leave aside its political and moral implications, and simply focus on its epistemological significance. I believe this claim represents an incomplete understanding of the nature of science in the sense that it applies only to explicit knowledge, but not to tacit knowing which focuses upon the art of research and the task of cultivating insights or hunches leading to discovery. Polanyi remarks, "While *the articulate contents of science* are successfully taught all over the world in hundreds of new universities, *the unspecifiable art of scientific research* has not yet penetrated to many of these."[14] With this in mind, we can certainly continue to claim that "science is beyond borders," but we should not forget to add one more sentence which is important: "research is tradition-bound" and very often, as we have seen, the best research is carried out and taught in a local tradition.

Why are traditions often local? Can one account for the local character of tradition from an epistemological perspective? Both Popper and Polanyi see the fact that scientific tradition is a local tradition. However, Popper's narrow conception of tradition as only the explicit scientific tradition, prevents him from coming up with a satisfactory account for the local character of tradition. Polanyi accomplishes this with his theory of tacit knowing. The difference between the two philosophers is not difficult to understand. As shown above, explicit knowledge can be successfully distributed globally, so what makes scientific tradition local can only be its tacit dimension. Or to put it bluntly, explicit tradition is global. It is tacit tradition that is local.

Polanyi explains the local nature of tradition in the following way: "An art which cannot be specified in detail . . . can be passed on only by example from master to apprentice. This restricts the range of diffusion to that of personal contacts, and we find accordingly that craftsmanship tends to survive in closely circumscribed local traditions."[15] What is true for art in craftsmanship is also true for art in scientific research. As Polanyi puts it in his early philosophical writing,

> [S]cience as a whole is based—in the same way as the practice of any single research school—on a local tradition, consisting of a fund of intuitive approaches and emotional values, which can be transmitted from one generation to the other only through the medium of personal collaboration.[16]

As to the transmission of tacit knowing, the personal contact between master and apprentice is crucial. By means of intimate association with, empathy with, and imitation of, the exemplified acts of the master, the apprentice acquires the skill or art of research, the connoisseurship, taste, etc.[17] Thus, on the one hand, the master-apprentice model proves to be an efficient mode for the transmission of tacit knowing, but on the other hand, it is this very model that restricts the transmission of tradition to a limited area and endows tradition with a local character.

In this connection, it might be helpful to take a look at the interesting epistemic fact expressed by a Chinese proverb that says "elite master produces elite apprentice." In her study of the scientific elites, the Nobel laureates, H. Zuckerman draws our attention to the fact that there is widespread sociological inbreeding within the community of laureates. That is, the master-apprentice relationship obtains among a large number of laureates.[18] A paradigm case in this respect is J.J Thompson and E. Rutherford at the Cavendish laboratory, where there were altogether 17 laureates apprenticed to them. A widely shared agreement among the Nobel laureates was that the most valuable thing that they learned from their masters was not specific knowledge. So far as the scientific literature concerning a specific problem was concerned, sometimes the apprentice knew even more than the master. An elite master embodies the criteria of excellence of scientific research, shows scientific

taste, and is sensitive to important and deep problems and their elegant solutions. An elite apprentice, following the elite master in his or her socialization into the scientific community, gradually internalizes the criteria of excellence, develops his or her scientific taste and obtains the skills of research. Polanyi gives us a wonderful description of the master-apprentice relationship:

> In the great schools of research are fostered the most vital premises of scientific discovery. A master's daily labours will reveal these to the intelligent student and impart to him also some of the master's personal intuitions by which his work is guided. The way he chooses problems, selects a technique, reacts to new clues and to unforeseen difficulties, discusses other scientists' work, and keeps speculating all the time about a hundred possibilities which are never to materialize, may transmit a reflection at least of his essential visions. This is why so often great scientists follow great masters as apprentices.[19]

Thus, we may conclude that the basic epistemic fact that "elite master produces elite apprentice" indicates the decisive role played by tacit knowing in knowledge transmission and knowledge innovation. This will become more and more apparent against the background of the rapid development of information technology and the much easier acquisition of explicit knowledge in this age. With a click of mouse, one can have easy access to various data bases, but how to use them for creative purposes, is another story.

To some extent, the locality of tradition is a manifestation of the spatial limitation of tradition. There have been various ways to overcome the limitation so as to advance learning. In ancient China, there was a scholarly practice called "You Xue", which literally means, learning by traveling. In the modern academic world, we have the institutional arrangement of visiting scholar programs, which enables scholars to get deeply involved in a tradition with which they are not familiar. Norwegian philosopher Gunnar Skirbekk provides us with an interesting description of this process and dubs it an intellectually "deep tourism":

> However, since there are differences in professional background within a discipline, it is particularly useful to travel, to go somewhere else, to experience how qualified colleagues, with another professional background, do their work. Through a process of resocialization one then learns concretely how they handle questions, methods and notions. (There is, in this way, an intellectually "deep tourism", side by side with superficial tourism.)[20]

Different from superficial tourism whereby we have a glimpse of some scenic spots, intellectually deep tourism purports to offer an opportunity for a visiting scholar not only to get to know the explicit part of a certain scholarly tradition, but also to dig into the deep, tacit dimension of the tradition, and to assimilate things like the skill, the taste, and the ethos of the practitioners in that tradition.

5. Tradition is irretrievable once lost

Tradition is not only spatially limited, but also temporally limited. Polanyi reminds us that an art, having fallen into disuse for a period of one generation, will be completely lost. Once lost, it is irretrievable. "It is pathetic to watch the endless efforts—equipped with microscopy and chemistry, with mathematics and electronics—to produce a single violin of the kind the half-literate Stradivarius turned out as a matter of routine more than 200 years ago."[21] Popper also mentions that some local traditions (including scientific tradition) are precious, and "it is very difficult to restore them once they are lost."[22] In his view, the scientific tradition was

destroyed two thousand years ago in Greece. It did not take root again for a very long time. Like the local character of tradition, the irretrievability of a lost tradition again cannot be accounted for in terms of explicit tradition. It can only be explained in terms of tacit tradition. Tacit knowing grounds personal knowledge; it can be efficiently transmitted only through personal contact. When a tradition is lost, the chain of personal contact is broken and tacit knowing can in no way be passed down. After a period of a generation or so, according to Polanyi, the tacit knowledge of that tradition falls into oblivion. That explains why it is so hard for later generations to restore the lost tradition.

To sum up, I claim that, on the one hand, tradition is essential to science and scholarly work; it is a decisive factor which directly affects the creativity and the quality of our work in a certain field. On the other hand, it is very fragile, and apparently has its spatial and temporal limitations. In an age when innovation has become a sweeping ideology, what is said above is intended to be a reminder that tradition is both precious and fragile, so that we must be very patient to preserve, cherish, foster and cultivate our scientific and scholarly tradition.

Authority

As mentioned above, in the Enlightenment, authority, together with tradition, was denigrated. The very concept of authority was deformed at that time by being construed as implying blind obedience, thus being in diametrical opposition to reason and freedom. However, according to Gadamer, this is not the essence of authority. Authority

> is ultimately based not on the subjection and abdication of reason but on an act of acknowledgement and knowledge—the knowledge, namely, that the other is superior to oneself in judgment and insight and that for this reason his judgment takes precedence, i.e., it has priority over one's own. . . . It rests on acknowledgement and hence on an act of reason itself which, aware of its own limitations, trusts to the better insight of others.[23]

In short, authority does not imply obedience; rather, it grows out of the recognition of the limitation of one's own understanding and the superiority of other people's judgment, which itself is an act of reason. Thus, authority is not essentially in opposition to reason and freedom.

Polanyi shows great sympathy with modern science in its violent rebellion against the external religious and political authorities during its formative period. However, he argues that the impression, which took shape at that time, that science, as a rational and free enterprise of inquiry, should be free of authority per se is both misleading and detrimental to science itself. In this regard, I think, Polanyi would fully agree with Gadamer's critique of the Enlightenment's view that authority is antithetical to reason and freedom. Again, distinct from Gadamer's hermeneutic perspective, Polanyi develops his thoughts on authority within the philosophy of science. To Polanyi, scientific authority is just as indispensable and constitutive to the practice of science as scientific tradition.

Polanyi distinguishes two kinds of authorities, general authority and specific authority. The difference between them lies in the fact that the former lays down general presuppositions, while the latter imposes specific conclusions. Polanyi claims that any form of specific authority in science will only turn out to be destructive. He invites us to engage in the following thought experiment: Imagine that the President of the Royal Society has

the final power to make decision on every scientific issue and to impose his views on all scientists. The result would be that science would stop right away. Nobody with a love for truth would join any such institution. A general authority assumes that each individual in the scientific community is capable of making genuine contact with reality. Everyone can make original contributions to science. Innovation takes place at numerous growing points throughout the community. Scientific opinion is formed on the basis of the interplay of the individual scientists. A general authority is only a more or less organized expression of scientific opinion. In contrast, a specific authority presupposes that only the official center has authentic contact with reality. All the important innovations are made by the center. It demands not only each individual's devotion to the tenets of a tradition, but also the subordination of everybody's judgment to the official center. In sum, general authority presupposes freedom, while specific authority demands obedience.

Science, as an enterprise of free inquiry, must liberate itself from those specific authorities which are in conflict with it. The authority of the Roman Catholic Church in the formative period of modern science was such a specific authority. However, science cannot operate without any authorities. For science, general authority is indispensable. On the basis of the distinction between general authority and specific authority, Polanyi goes further and provides us with a careful and detailed analysis of three forms of general authorities in science.

1. The authority of the master over the apprentice

According to Polanyi, science is based on some fundamental premises or presuppositions. He argues that these premises are normally not transmitted in the form of explicit precepts. In the master-apprentice relationship, the apprentice, in his personal contact with the master, acquires the methods of scientific research, accepts the standards of scientific values, and grasps the premises and presuppositions of science. The process of the apprentice's assimilation into the premises of science is based on a recognition of the authority of the master and of what the apprentice is going to learn from him. "[N]o one can become a scientist unless he presumes that the scientific doctrine and method are fundamentally sound and that their ultimate premises can be unquestioningly accepted."[24] Of course, the teacher will also foster criticism and originality on the part of the student. However, Polanyi emphasizes, "[T]his must remain within proper limits; the process of learning must remain on the acceptance of authority. Where necessary this acceptance must be enforced by discipline."[25]

As the student reaches intellectual maturity and becomes an independent scientist, the authority of the teacher is eclipsed and he will rely more and more on his own judgment and conscience in the practice of scientific research. However, this does not mean that he will get rid of all authorities. As a member of the scientific community, he has to submit to a new form of authority, namely, the mutual authority between scientists in the form of scientific opinion.

2. The mutual authority between scientists

Admittedly, a contribution to science is assessed according to its professional standards. According to Polanyi, the professional standards of science are composed of the following three items. 1) Sufficient plausibility: a contribution whose results apparently conflict with the current scientific view of the nature of things will be totally discredited by the scientific community. 2) Scientific value: the scientific value of a contribution is determined by three factors, its accuracy, its systematic importance and the intrinsic interest of its subject matter. 3) Originality: the originality of a contribution will arouse intellectual surprise among fellow scientists.

The assessment of scientific research is important, because it directly affects the allocation of resources (like posts, publications, research grants, and laboratories) among different scientific fields. The problem is that every single scientist is only familiar with a small fragment of the entire domain of science. It is difficult to compare the scientific value of the contributions from different branches of science, such as astronomy and medicine, which are remote from each other. This poses an important question: How can we abide by the same professional standards in different scientific branches? How is it possible to assess the contributions from different areas according to the same professional standards of science?

As an answer to this question, Polanyi puts forth the principle of mutual authority or the principle of mutual control:

> It consists, in the present case, of the simple fact that scientists keep watch over each other. Each scientist is both subject to criticism by all others and encouraged by their appreciation of him. This is how scientific opinion is formed, which enforces scientific standards and regulates the distribution of professional opportunities. It is clear that only fellow scientists working in closely related fields are competent to exercise direct authority over each other; but their personal fields will form chains of overlapping neighborhoods extending over the entire range of science. It is enough that the standards of plausibility and worthwhileness be equal around every single point to keep them equal over all the sciences. Even those in most widely separated branches of science will then rely on each other's result and support each other against any laymen seriously challenging their authority.[26]

The direct mutual authority or mutual control in neighboring branches, by the principle of overlapping neighborhoods, extends over the entire domain of science. Scientific opinion is based upon mutual authority between scientists and this makes possible a mediated consensus among scientists. This consensus guarantees the uniformity of professional standards in different scientific branches so that we can make reasonable assessment of contributions from areas which are far remote from each other. It is true that in the scientific community, authority is not equally distributed. The opinions of some distinguished scientists are more valued than those of others. But this does not change the fact that the authority of scientific opinion is essentially mutual. If a contribution by a scientist of high distinction is in sharp conflict with the current scientific opinion about the nature of things, it will equally be turned down. Scientific opinion operates *among* scientists, *not above* them. Scientific opinion is not the opinion of any single mind, it is held by numerous individual scientists. They directly or indirectly exercise authority over each other.

3. The authority of the scientific community over the general public

Scientific opinion is not only the foundation of the autonomy of science, but also the precondition for scientists as a whole to exercise authority over the general public. There are different interpretations about the universe, for instance, magical, mythological/theological, and naturalistic/scientific interpretations. After centuries of struggle, the majority of the general public has chosen science. To them, the naturalistic/scientific interpretation of the world is more convincing than other alternatives. Polanyi considers this a great historical achievement. The general public's acceptance of the authority of science is a prerequisite for science to continue to exist on the modern scale. Only with the support of the public can science get various resources that are necessary for its development. Of course, as it happens sometimes, the scientific authority might be in conflict

with the opinion of the lay public and laymen might challenge the judgment of the experts. Under such circumstances, Polanyi makes it crystal clear that scientists should defend the authority of science by upholding the professional standards of science and remain immune to the interference of the lay public. Using as a case study the Velikovsky affair, Polanyi argues strongly in favour of the authority of science over the general public.[27]

The above may serve as an outline of Polanyi's understanding of how authority functions in science. Of course, he admits that scientific authority is fallible. When the enforcement of scientific authority is mistaken, valuable or original contributions of science might be ignored or even suppressed. In his scientific life, Polanyi himself has experienced this when his theory of absorption was suppressed for about half a century by the scientific authority which finally turned out to be the wrong.[28] However, Polanyi argues, the risk is worth taking. The discipline embodied by scientific authority is indispensable for the healthy development of science. Without the discipline imposed by scientific authority, science cannot be sustained. Polanyi gives us a vivid description of what happens when scientific discipline is lacking:

> In parts of the world where no sound and authoritative scientific opinion is established, research stagnates for lack of stimulus, while unsound reputations grow up based upon commonplace achievements or mere empty boasts. Politics and business play havoc with appointments and the granting of subsidies for research; journals are made unreadable by including much trash.[29]

When missing the constraints of scientific authority, the enterprise of science can hardly be carried on. Under such circumstances, science as an institution will inevitably be trapped in chaos and even collapse.

Originality

We have seen that a contribution to science is assessed according to the professional standards of science. And the professional standards of science, according to Polanyi, consist of sufficient plausibility, scientific value and originality. Originality is no doubt a highly cherished scientific value. Polanyi observes,

> Since the Romantic movement originality has become increasingly recognized as a native endowment which alone enables a person to initiate an essential innovation. Universities and industrial research laboratories are founded today on the employment of persons with original minds. Permanent appointments are given to young scientists who are credited with signs of originality, in the expectation that they will continue to produce surprising ideas for the rest of their lives.[30]

In Polanyi's view, the knowledge of an approaching discovery is the paradigm case of scientific knowledge,[31] and "originality is the mainspring of scientific discovery."[32]

It is evident that, in contrast to originality, the other two elements shaping the standards of science, plausibility and scientific value, emphasize scientific discipline. They require that scientific opinion reject contributions which are not compatible with the present view of science about the nature of things, and which lack sufficient scientific value, so as to maintain the quality of scientific contributions and to guarantee that science will operate with a reasonable standard. Discipline implies authority. And tradition is a form of

authority. Polanyi not only has deep insights about tradition and authority, he also makes brilliant observations on originality, especially scientific originality. Let me try to summarize his thoughts on originality as follows.

According to Polanyi, scientific research in a broad sense is composed of two kinds of work, namely, the heuristic work, such as scientific discovery, and the routine work, such as measurements, calculations, and making maps etc. In his efforts to bring to light the nature of scientific research by differentiating two kinds of scientific work, Polanyi uncovers various aspects of scientific originality.

Original scientific research crosses the logical gap between a problem and its solution. Not every solution of a problem can be accredited as a discovery. Polanyi distinguishes the systematic solution and the heuristic solution of a problem.

> By ransacking my flat inch by inch, I may make sure of eventually finding my fountain pen which I know to be somewhere in it. I might solve a chess problem by trying out mechanically all combinations of possible moves and countermoves. Systematic methods apply also to many mathematical problems, though usually they are far too laborious to be carried out in practice. It is clear that any such systematic operations would reach a solution without crossing a logical gap and would not constitute a heuristic act.[33]

In contrast to a systematic solution, a heuristic solution crosses a logical gap. Polanyi maintains that only a heuristic solution which crosses the logical gap can be viewed as a scientific discovery, and the width of the logical gap is taken as the measure of the ingenuity that is required to solve the problem.

According to *Personal Knowledge* (120-131), Poincare and Wallas see a discovery as composed of four stages: preparation, incubation, illumination, and verification. Illumination is the most critical stage. It is a leap by which the logical gap is crossed. Illumination displays itself as a process of spontaneous emergence, rather than a deliberate act. Here we see a further distinction between the systematic solution and the heuristic solution of a problem. According to Polanyi, a systematic solution is wholly deliberate, while a heuristic process is a combination of deliberate and spontaneous stages. In the four stages of a scientific discovery, preparation and verification are essentially deliberate, while incubation and illumination are basically spontaneous. In the period of incubation, nothing is done and nothing happens on the level of consciousness; the coming of the period of illumination is the result of earlier efforts, but is not in itself an action of the investigator, it simply happens to him. In a word, by emphasizing the logical gap between a problem and its solution, and by distinguishing the systematic and the heuristic solution of a problem, Polanyi reveals that scientific originality implies an intellectual leap and has the character of emergence.

Because a scientific discovery crosses a logical gap, and changes our interpretive framework, it is logically impossible to arrive at a scientific discovery by applying the existing interpretive framework. Polanyi claims, "The application of existing rules can produce valuable surveys, but does not advance the principles of science."[34] Since Francis Bacon formulated a procedure for empirical induction, there has been a popular belief that scientific discovery can be accomplished by applying a set of explicit rules to empirical data. In Polanyi's view, the modern objectivistic, formalistic conception of science is far from adequate to account for what is really going on in science and Bacon's methodology of induction is a travesty of scientific research. It is unable to explain scientific originality.

Polanyi distinguishes two kinds of rules, namely, the strict rules and the vague rules. In scientific work, both kinds of rules are relevant. The manuals of experimentation, measurement, calculation, and map-making fall under the category of strict rules. They will enable us to carry out these operations rapidly and accurately. However, according to Polanyi, carrying out these operations according to strict rules is only the routine work of a scientist. "Only routine progress—such as the production of good maps and charts of all kinds—can be made by rules alone."[35] Scientific discovery is in sharp contrast to the routine work of a scientist. "Admittedly, there are rules which give valuable guidance to scientific discovery, but they are merely *rules of art*. . . . The rules of scientific enquiry leave their own application wide open, to be decided by the scientist's judgment. This is his major function. It includes the finding of a good problem, and of the surmises to pursue it, and the recognition of a discovery that solves it."[36] Admittedly, there are some vague rules to follow in scientific discovery; however, the application of these rules is decided by scientists' personal judgment. A great scientist exhibits his genius in such judgment. As a creative activity, scientific discovery involves things that are not exhausted by rules; personal judgment is only one of them. Polanyi also revealingly probes into other elements in scientific heuristic work, such as imagination, intuition, intellectual passions, belief, conscience, and commitment. The secret of scientific originality is hidden in these elements, which cannot be exhaustively described in a set of rules. In sum, scientific discovery, as heuristic work, cannot be reduced to a set of procedures, or a set of rules. By following established procedures and existing rules, we can only do routine work and make routine progress.

The above two features of scientific originality imply that heuristic feats are irreversible, in contrast to the reversibility of more routine scientific work. Inspired by Piaget, Polanyi understands the reversibility of a procedure "in the sense that it could be traced back stepwise to its beginning and repeated at will any number of times, like any arithmetical computation."[37] Polanyi claims, "Intellectual acts of a heuristic kind make an addition to knowledge and are in this sense irreversible, while the ensuing routine performances operate within an existing framework of knowledge and are to this extent reversible."[38] The work to carry out operations according to the previous procedures and existing rules within an established interpretive framework is reversible. This is typical of routine work. In contrast, scientific discovery changes our interpretive framework, and makes us see the world in a different way. In this process, our intellectual personality undergoes an irrevocable transformation. Once we cross the logical gap, the previous heuristic tension disappears, and we will never be puzzled by the previous problems, just as we will never guess what we have known.

With regard to its content, each scientific discovery is a disclosure of new aspects of reality.

> The most daring feats of originality are still subject to this law: they must be performed on the assumption that they originate nothing, but merely reveal what is there. And their triumph confirms this assumption, for what has been found bears the mark of reality in being pregnant with yet unforseeable implications.[39]

This is where Polanyi's concept of reality becomes relevant. According to Polanyi, to say that something is real means that "it has the independence and the power for manifesting itself in yet unthought of ways in the future."[40] Polanyi is a firm realist. Reality is independent of mind. It is the object of human cognition. He reiterates that scientific truth is a grasp of rationality in nature. It is the result of our contact with reality. He is strongly opposed to the positivistic attempt to substitute the simplicity, symmetry, economy, and fruitfulness of scientific theories for scientific truth. The independence thesis is the common ground of all realists. What makes Polanyi's conception of reality distinctive is that it is essentially dynamic. According to Polanyi, external reality is to a great

extent hidden. It will manifest itself in unforseeable ways in the future. Different things have different capacities to manifest themselves. Thus they have different degrees of reality. The goal of original scientific research is to discover new aspects of this dynamic reality.

Original scientific research frequently elicits surprise among fellow scientists. Scientific discoveries are very often unexpected. The more audacious, and ingenious a scientific discovery is, the stronger the surprise it produces. "The originality of a discovery is assessed by the degree of surprise which its communication should arouse among scientists."[41] The features of originality noted above imply this psychological effect. However, one more factor merits attention. Originality will not be achieved by following public paths. Uniqueness, which is inseparably from solitariness, is definitive of originality. As Polanyi points out, originality in science is the gift of a lonely belief in something that no one else at the time will consider profitable to pursue. Established rules of inference offer us public paths for drawing conclusions from existing knowledge, but the original mind tends to deviate from the commonly accepted process of reasoning, and by crossing a logical gap, reaches his own unique conclusions that will surprise his colleagues. What originality points to is the unique insight into the nature of things, not the consensus among members of a scientific community. An original mind finds no one else to rely upon. He or she must find his way out all by himself. Innovators always feel lonely. Originality manifests itself in solitary situations.

"Originality must be passionate."[42] The objectivistic conception of science claims that scientific research should be carried out soberly and dispassionately. Popper's falsificationism, according to Polanyi, is a paradigm case of the objectivistic conception of science. It holds that scientists are not only indifferent to the outcome of their surmises, but also seek to refute them. Polanyi argues that this view of science is not just contrary to experience, but also logically inconceivable. When a scientist puts forward surmises, what he or she aspires to is success, namely, scientific discovery. He has to risk failure, but never seeks it. The surmises of a scientist embody all his hope. They entangle every fiber of his being. The scientist is passionately committed to his surmises. Intellectual passions are indispensable to scientific research. They are not just psychological by-products, but have a logical function. Scientific originality finds its root in the intellectual passions of a scientist, in his deep love of his work. "You cannot expect that love to be replaced by a sense of duty, as it may perhaps be in marriage; for no one can make discoveries from a sense of duty without creative passion."[43] This is the passionate aspect of originality.

In summary, original scientific research crosses the logical gap between a problem and its solution. It takes the form of an intellectual leap and displays itself as a spontaneous process of emergence. One cannot make original progress by applying the existing procedures and rules. Originality is essentially irreversible. It is a disclosure of the new aspects of dynamic reality. Very often, it is accomplished in solitary situations and will produce surprising results. Originality is not rooted in a sense of duty, but in the intellectual passions of a scientist. These ideas recur in Polanyi's writings in different stages. As a well-established scientist himself, Polanyi has a deep understanding of scientific originality.

The Dynamics of Conformity and Dissent

By arguing that scientific tradition and scientific authority are constitutive of science, post-critical philosophy fully acknowledges the role of the uncritical in the pursuit of scientific truth. The emphasis on the importance of originality implies its recognition that being critical is essential to the progress of science, since, as shown above, originality can only be achieved by breaking through the existing intellectual framework. One can easily feel that there is certain tension between tradition and authority, on the one hand, and originality on

the other. The tension is also reflected in the three constituents of the professional standards of science. "Both the criteria of plausibility and of scientific value tend to enforce conformity, while the value attached to originality encourages dissent. This internal tension is essential in guiding and motivating scientific work."[44] Evidently, in contrast to originality, which encourages dissent, tradition and authority in science are on the side of enforcing discipline and conformity. What we have discussed so far shows that these two aspects are both indispensable for the healthy development of science. Without originality, scientific progress lacks momentum; without discipline drawn from tradition and authority, scientific research is doomed to anomie. This means that in the practice of science, these two opposing aspects are united and reconciled. Then the issue becomes how this is possible. How can one account for the unity and reconciliation of originality and discipline, conformity and dissent in the practice of science? More specifically, one might ask how, given the indispensability of discipline which implies authority and tradition, to account for the possibility of originality? In Polanyi's own words, the issue is "how the conformity enforced by current judgments of plausibility can allow the appearance of any true originality."[45]

As I understand it, Polanyi's answer to this question can be captured in the form of two arguments. One is an argument based upon his conception of rules. The other might be called a metaphysical argument.

The first argument relates to Polanyi's understanding of rules. As mentioned above, according to Polanyi, there are two kinds of rules, namely, the strict rules and the vague rules. Rules of art are vague rules.

> Being incapable of precise formulation, rules of art can be transmitted only by teaching the practice which embodies them. For major realms of creative thought this involves the passage of a tradition by each generation to the next. Every time this happens there is a possibility that the rule of art be subjected to a significant measure of reinterpretation.[46]

The question becomes how to reinterpret a rule. According to Polanyi, we cannot reinterpret a rule with another rule. The tiers of rules are limited. If we try to interpret rule 1 with rule 2, and interpret rule 2 with rule 3, the regress will soon come to an end. If we assume that all existing rules constitute a code of rules, then such a code cannot contain prescriptions for its own reinterpretation.

What is the point of this argument? In my view, Polanyi's argument has negative and positive implications. Negatively speaking, it shows that the interpretation of rules of art cannot be accomplished by appealing to existing rules. Positively speaking, it indicates that the interpretation of rules of art always involves an element of innovation. In his words,

> [E]very process of reinterpretation introduces elements which are wholly novel; and hence also that a traditional process of creative thought cannot be carried on without wholly new additions being made to existing traditions at every stage of transmission. In other words, it is logically impossible for tradition to operate without the addition of wholly original interpretive judgments at every stage of transmission.[47]

Polanyi illustrates this point by referring to what happens in the major realms of creative thought:

> The major principles of science, law and religion, etc., are continuously remoulded by decisions made in borderline cases and by the touch of personal judgment entering into

> almost every decision. And apart from this silent revolution steadily remoulding our heritage, there are the massive innovations introduced by the great pioneers. Yet each of these actions forms an essential part of the process of carrying on a tradition.[48]

Here we see that, on the basis of his analysis of the nature of the reinterpretation of vague rules, Polanyi brings to light the dialectics of tradition and innovation: Innovation is inherently demanded by tradition. The emergence of originality is a precondition for tradition to be successfully transmitted and take effect.

The metaphysical argument has to do with Polanyi's concept of reality. As mentioned above, reality, according Polanyi, is dynamic; it will manifest itself in unforeseeable ways in the future. In parallel, science, which attempts to offer us insight about an aspect of reality, is also conceived as a dynamic process; it will manifest its truth inexhaustibly and often surprisingly in the future. The working scientist sees in the existing body of scientific knowledge an aspect of reality, which is an inexhaustible source of new, promising problems. Polanyi holds that this view of science is a metaphysical belief of working scientists. It is in this belief that they conduct their research, teach their students and exercise their authority. They teach their students to respect the value of the existing body of scientific knowledge, to accept the established intellectual framework. Meanwhile, they grant their students independent grounds and encourage them to make genuine contact with reality on their own, to start their own research and finally to make their own discoveries. These future discoveries are very likely in conflict with, or even in opposition with the existing intellectual framework. Polanyi claims:

> This dual function of professional standards in science is but the logical outcome of the belief that scientific truth is an aspect of reality and that the orthodoxy of science is taught as a guide that should enable the novice eventually to make his own contacts with this reality. The authority of scientific standards is thus exercised for the very purpose of providing those guided by it with independent grounds for opposing it. The capacity to renew itself by evoking and assimilating opposition to itself appears to be logically inherent in the sources of the authority wielded by scientific orthodoxy.[49]

This is how Polanyi, on metaphysical grounds, reconciles the two seemingly opposing aspects of professional standards of science, namely, discipline and originality, conformity and dissent. Based upon his dynamic realism, and a dynamic understanding of scientific truth, Polanyi expounds the dialectic of tradition, authority and originality: the existing body of knowledge and the established intellectual framework are guidelines and clues to future discoveries. Put differently, scientific orthodoxy (tradition and authority) inherently contains a challenge to, a revolt against and even a negation of itself. It inherently points to originality. Stimulating innovation is the real purpose of scientific orthodoxy.

Now we see that in Polanyi, the prejudice against tradition and authority since the Scientific Revolution and the Enlightenment is overcome. The apparent opposition between originality and discipline is sublated. They are reconciled in the actual process of scientific development. Polanyi's two arguments, one based upon his understanding of rules, and the other on his concept of reality and scientific truth, converge at this point.

To sum up, on the one hand, Polanyi acknowledges the tension between tradition, authority and originality, while on the other, he uncovers the deep unity that reconciles them. With this dialectic between tradition, authority and originality, post-critical philosophy demonstrates the dynamics of the critical and the uncritical in the act of knowing in a new perspective.

Endnotes

[1] Michael Polanyi, *Personal Knowledge*, London: Routledge, 1958, pp. 265-266.

[2] Cf. Edward Shils, *Tradition*, London: Faber and Faber, 1981, p. 101. In note 24 on this page, Professor Shils offers us a list of publications by various authors which treated the issue of tradition in science in a roughly chronicle order. Polanyi's *Science, Faith and Society* occupied the first place in this order. Cf. also Edward Shils, "On the Tradition of Intellectuals: Authority and Antinomianism According to Michael Polanyi" (*TAD* 22:2 [1995-1996]: 11), where Shils claims, "Michael Polanyi was one of the first writers of the twentieth century to call attention to the traditional element in the natural sciences. Polanyi put forward his views on tradition in scientific activity in the Riddell lectures which he delivered at the University of Durham in 1946. A few years later than Polanyi, Karl Popper published his essay."

[3] Edward Shils, *Tradition*, London: Faber and Faber, 1981, p. 6.

[4] Gadamer, *Truth and Method*, second, revised Edition, translation revised by Joel Weinsheimer and Donald G. Marshall, London: Sheed &Ward, 1989, p.281.

[5] Gadamer, *Truth and Method*, p. 281-282.

[6] Gadamer, *Truth and Method*, P. 283-285.

[7] Karl Popper, *Conjectures and Refutations*, fifth edition (revised), London: Routledge, 1989, p.122.

[8] Polanyi, *Personal Knowledge*, 1958, p. 53.

[9] Edward Shils, *Tradition*, p. 22.

[10] Edward Shils, "On the Tradition of Intellectuals: Authority and Antinomianism According to Michael Polanyi", *Tradition and Discovery*, Vol 22, No.2, 1995-1996, p. 13.

[11] Struan Jacobs recognizes the fact that Polanyi actually operates with two concepts of tradition. He claims that "Polanyi has two distinguishable concepts of tradition. One of these concepts concerns articulate lore or culture; the other concept, to which Polanyi is more inclined to apply the name of tradition, receives its fullest analysis from him with reference to science and it concerns the art of creative practice. " See Struan Jacobs, "Polanyi on Tradition in Liberal Modernity", in *Emotion, Reason and Tradition*, eds. Struan Jacobs and R. T. Allen, (Hampshire: Ashgate, 2005): 69. Jacobs further argues that Polanyi's focusing on the art of science makes his study of tradition unusual, and his interest in articulate lore is only secondary. (79)..

[12] Karl Popper, *Conjectures and Refutations*, p. 121.

[13] Michael Polanyi, *Personal Knowledge*, p. 53.

[14] Michael Polanyi, *Personal Knowledge*, p. 53.

[15] Michael Polanyi, *Personal Knowledge*, p. 53.

[16] Micheal Polanyi, *The Logic of Liberty*, Chicago: University of Chicago Press, 1951, 56-57.

[17] Popper takes imitation as an important aspect of tradition. "[O]ne of the connotations of the term 'tradition' is an allusion to imitation , as being either the origin of the tradition in question, or the way it is handed down." In Popper's view, imitation is an important feature which distinguishes tradition from institution. Cf. *Conjectures and Refutations*, p.134.

[18] Cf. Harriet Zuckerman, *Scientific Elite: Nobel Laureates in the United States*, New York: The Free Press, 1977, chapter 4, pp. 96-143.

[19] Michael Polanyi, *Science, Faith and Society*, Chicago: The University of Chicago Press, 1964, pp. 43-44.

[20] Gunnar Skirbekk, "Contextual and Universal Pragmatics: Mutual Criticism of Praxeological and Transcendental Pragmatics", in *Philosophy Beyond Borders*, edited by Ragnar Fjelland, et al., Bergen: SVT Press, 1997, pp. 318-319.

[21] Michael Polanyi, *Personal Knowledge*, p. 53.
[22] Karl Popper, *Conjectures and Refutations*, p. 121.
[23] Gadamer, *Truth and Method*, p. 279.
[24] Michael Polanyi, *Science, Faith and Society*, p. 45.
[25] Michael Polanyi, *Science, Faith and Society*, p.46.
[26] Michael Polanyi, *The Tacit Dimension*, Gloucester, Mass.: Peter Smith, 1983, p. 72.
[27] Cf. Michael Polanyi, *Knowing and Being*, edited by Marjorie Grene, London: Routledge, 1969, pp. 73-85.
[28] Cf. Michael Polanyi, *Knowing and Being*, pp. 87-95.
[29] Michael Polanyi, *Knowing and Being*, p. 57.
[30] Michael Polanyi, *Personal Knowledge*, p. 123.
[31] Michael Polanyi, *The Tacit Dimension*, p. 25.
[32] Michael Polanyi, *The Logic of Liberty*, p. 10.
[33] Michael Polanyi, *Personal Knowledge*, p. 126.
[34] Michael Polanyi, *Personal Knowledge*, p. 143.
[35] Michael Polanyi, *Science, Faith and Society*, p. 33.
[36] Michael Polanyi, *Science, Faith and Society*, pp. 14-15.
[37] Michael Polanyi, *Personal Knowledge*, p. 123.
[38] Michael Polanyi, *Personal Knowledge*, p. 77.
[39] Michael Polanyi, *Personal Knowledge*, p. 130.
[40] Michael Polanyi, *The Tacit Dimension*, p. 32.
[41] Michael Polanyi, *Knowing and Being*, p. 54.
[42] Micheal Polanyi, *Personal Knowledge*, p. 143.
[43] Michael Polanyi, *The Logic of Liberty*, p. 43.
[44] Michael Polanyi, *Knowing and Being*, p. 54.
[45] Michael Polanyi, *The Tacit Dimension*, p. 67.
[46] Michael Polanyi, *Science, Faith and Society*, p. 58.
[47] Michael Polanyi, *Science, Faith and Society*, p. 58.
[48] Michael Polanyi, *Science, Faith and Society*, pp. 58-9.
[49] Michael Polanyi, *Knowing and Being*, p. 55.