

The Third Culture: Literature and Science

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Beyond All Certainty: Wittgenstein and Turing An Account of a Philosophical Dialogue on Skill and Technology¹

Abstract. Dialogue as a means of clarifying issues within a community of human beings, and as a basic component of their reality, has been the subject of pictorial as well as dramatic and literary works since antiquity, perhaps the most famous example being Plato's Socratic dialogue. However, a philosophy of dialogue - i. e. attempts to elaborate on the phenomenon of dialogue itself as a basic component of human life and reality, something essential to human existence - belongs mainly to our own century. It concerns the deadlock between subjectivity and objectivity which was in evidence by the turn of the century, and the tension between unity and fragmentation of knowledge. This view of the formation of knowledge has been a prominent theme of the Dialogue Seminar held at the Royal Dramatic Theatre for the last ten years.

A number of theatrical productions have been presented as part of the Dialogue Seminar. One of these is "Beyond All Certainty," a philosophical dialogue. Cambridge, England, 1911. A young Austrian knocks hesitantly at the door of Bertrand Russell's study in Trinity College. Speaking in broken English, he explains to Russell that he wants to study the philosophy of mathematics. Russell later claimed, "I knew immediately that the young man, Ludwig Wittgenstein, would make one of the most significant contributions to twentieth century philosophy."

In eight brief scenes, "Beyond All Certainty" describes the impact of this contribution, and Wittgenstein's extraordinary life. Focussing on Wittgenstein's meeting with Alan Turing, the British mathematician whose work on breaking the German

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Enigma code laid the foundations for the development of the computer. The play examines the continuing significance of their different traditions of knowledge.

1.

Alan Turing attended Wittgenstein's lectures on the foundations of mathematics held in Cambridge in 1939. Embedded in their disagreement on the nature of mathematics is a conflict about the primacy of theoretical or practical knowledge. I take Turing to represent the former and Wittgenstein the latter. At the age of twenty-four Turing formulated the theoretical foundations of modern computer technology. These were published in 1936 in what has come to be regarded as a classic article.²

In 1954 Alan Turing took his life by biting an apple dipped in cyanide. His life was not a mystery, it was more of a Greek tragedy. He was a homosexual in a culture which regarded homosexuality as a fatal flaw. He felt that he was doomed, and the poisoned apple he chose as the means of ending his life was a symbol of this doom. Through the application of computer technology in working life and in the community, Turing's theoretical work introduced a higher degree of abstraction into our culture. This new, emerging culture is called the information society.³

In what follows I draw upon a play, *Beyond Certainty*, which I wrote with Anders Karlqvist. One of the reasons for writing the play was to express in dramatic form what appears to be an abstract and technical problem about mathematics. In this sense we were exploring the possibility of putting a basic feature of scientific culture, the priority it gives to mathematical knowledge, into a central humanistic form: drama. In writing the play we drew on a number of documentary sources, including Cora Diamond's edited notes of Wittgenstein's *Lectures on the Foundation of mathematics*.⁴

The play is not simply a composite of documentary sources. We took the liberty of creating meetings between Turing and Wittgenstein that did not actually take place, and of taking quotations out of their original contexts. Another of our motives relates to the epistemology of skill, one of the main concerns of which is the strong connection between knowledge and the form in which it is represented. Our play was an experiment in representing knowledge. We attempted to bring out the situated nature of their thinking in relation to their lives and the history of the times in which they lived.

² Turing: "On Computable Numbers, with an application to the Entscheidungsproblem," p.2.

³ Japan Computer Users' Development Institute, *The Plan for the information Society – A National Goal Toward year 2000*, Computerization Committee, Final Report, May 1972.

⁴ Wittgenstein: *Lectures on the Foundations of Mathematics*.

We also wanted to imagine knowledge in the making, to bring out the struggle and the drama of thought. I have included excerpts from the play in some of the sections that follows⁵

II.

Scene 1

Cue music (1)...A lecture by Wittgenstein, Cambridge 1939. Wittgenstein is seated as the audience enter, reading a cheap American detective novel. On stage a large blackboard with Wittgenstein 'graffiti' and a table with a model of Turing's enigma machine. As music ends, lights up. Wittgenstein notices audience and stands . . .

Witt: These lectures are on the foundations of mathematics. By what right can I, as a philosopher, talk about mathematics? I shall not give you any new calculations, I shall speak of the interpretation of mathematical symbols and devote myself to trivial facts that you know quite as well as I. I won't say anything which anyone can dispute. Or, if anyone does dispute it I will let that point drop and pass on to say something else.

I will try to show that the philosophical difficulties that arise in mathematics as elsewhere arise because we find ourselves in a strange town and do not know our way. So we must learn the topography by going from one place in the town to another and from there to another and so on. And one must do this so often that one knows one's way, either immediately or pretty soon after looking around a bit.

This is an extremely good simile. In order to be a good guide, one should show people the main streets first. But I am an extremely bad guide, and am apt to be led astray by little places of interest and to dash down the side streets before I have shown you the main streets.

Enter Alan Turing and two laboratory assistants. All three intent on studying Turing's notes. They are oblivious to Wittgenstein, as he is to them.

The difficulty in philosophy is to be able to find one's way about. And that is a matter of memory - memory of a peculiar sort.

One talks of mathematical discoveries. (*Turing and assistants notice Wittgenstein and approach him throughout remainder of his speech*). I shall try again and again to show that what is called a mathematical discovery had much better be called a mathematical invention. There is nothing for the mathematician to discover.

⁵ See Section IV: "Alan Turing and Ludwig Wittgenstein - A Meeting of Different Traditions of Knowledge," in Göranzon, ed.: *Skill, Technology and Enlightenment - on Practical Philosophy*.

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A proof in mathematics does not establish the truth of a conclusion; it fixes, rather, the meaning of certain signs.

Turing: I understand your point, but I don't agree that it's simply a question of grammar and giving new meanings to words.

Witt: I have no point, but we do not, and cannot disagree, because I have not advanced any thesis. If you do not agree with what I say, it is because you do not understand how I use certain words. (*Pause*) As you did not attend my last lecture, Mr. Turing, I would like to refer to what we discussed then, which was conducting experiments in mathematics. You will know ...

Turing: I'm still inclined to say that we can pursue a mathematical investigation in the same spirit in which we might conduct an experiment in physics. Just as we can place... weights on a balance and see which way it tips, we can suggest to someone that they take a few numbers, make a mathematical calculation, look up the multiplication tables, etc. and see what results they come to.

Witt: Yes, there appears to be a parallel, but where does the similarity lie?

Turing: In both cases we are interested in what the final result may be.

Witt: Let us suppose that we get someone to multiply two numbers by each other, where is the experiment in that? Do I want to know what results this person arrives at, or what? If *that* is the experiment, it doesn't matter what answer he writes down. $136 \times 51 = 6935$, for example.

Turing: Then the experiment was carried out wrongly. He did not follow the rules.

Witt: Yes, of course, we can say: we have taught him the rules, now let us see if he follows them. I cannot at the same time allow the result of an experiment to be the result of a mathematical calculation. If the result of the calculation is determined by rules, i. e. $136 \times 51 = 6936$, the result of the experiment is not *what* result he arrives at if he follows the rules, but *whether or not* he follows the rules...

Turing: But surely ...

Witt: No! The entire analogy between mathematics and physics is a complete mistake. In fact, what we have here is an important source of confusion. It may be that $20 \text{ apples} + 30 \text{ apples} = 50 \text{ apples}$ may not be a proposition about apples. It may be a proposition of arithmetic and in this case we could call it a proposition about numbers.

On the other hand, if we say that lions are four-legged - then that is a statement about lions, or that elephants are four-legged - then this is about elephants and not numbers. No! What I want to show with these examples is that there is an essential difference between mathematical propositions and experiential propositions that look exactly the same.

Turing: You seem to assert that mathematical truths are only conventions - a question of consensus of opinions.

Witt: Is that what I'm saying? No! There is no opinion at all, it is not a question of opinions, it is a question of consensus in action. A consensus in doing the

same things, in reacting in the same way. We all act in the same way. When we count, we do not express views. There is no opinion that says that 25 follows 24-- neither is there a special intuition. We express our opinions quite simply by counting. We demonstrate mathematics in action, in practice.

Turing: Yes, but you cannot be confident about applying your calculus until you know that there is no hidden contradiction in it. If one takes Frege's symbolism and gives someone the technique of multiplying in it, by using a Russell paradox he could get a very wrong application.

Witt: This would come to doing something that we would not call multiplying. Let us assume that I have convinced someone of Russell's Liar Paradox, and he says. . .

Assistant 1: I am lying.

Assistant 2: Which goes to prove that you are not lying.

Assistant 1: From which it follows that I am lying.

Witt: ... and we therefore have a contradiction and therefore $2 \times 2 = 369$. We could not call that multiplying. Does finding a contradiction in a system, like finding a germ in an otherwise healthy body, show that the whole system or the body is diseased? Not at all. The contradiction does not even falsify anything. Let it lie. Do not go there.

Turing: But if you look at it from a practical viewpoint, if you have a logical system, a system of calculations which you use in order to build bridges. You give this system to your clerks and they build a bridge with it and the bridge falls down. You then find a contradiction in the system.

Witt: There seems to me to be an enormous mistake there. You have confused two separate things. Your calculus gives certain results, and you want the bridge not to break down. I'd say things can go wrong in only two ways: either the bridge breaks down or you have made a mistake in your calculation - for example you multiplied wrongly. But you seem to think there may be a third thing wrong: the calculus is wrong.

Turing: No. What I object to is the bridge falling down.

Witt: But how do you know that it will fall down? Isn't *that* a question of physics? It may be that if one throws dice in order to calculate the bridge it will never fall down!

Turing: Although you don't know if the bridge will fall down if there are no contradictions, it is almost certain that if there are contradictions, then something will go wrong.

Witt: But nothing has ever gone wrong in that way yet. I don't understand why people are so puzzled about paradoxes like the Liar Paradox: I am lying, therefore it follows that I am not lying, from which it follows that I am lying and so on. You can go on like that until you are blue in the face. But why bother? Isn't it just an unusable language game? We are struggling with language, Turing. We are engaged in a struggle with language.

Turing: And you seem to be saying that if one uses a little common sense, one will not get into trouble.

Witt: No, that is NOT what I mean at all. A contradiction cannot lead one into trouble because it leads to nowhere at all. One cannot calculate wrongly with a contradiction, because one simply cannot use it to calculate. One can do nothing with contradictions except waste time puzzling over them.

Turing: If you're going to continue to lecture on the foundations of mathematics without admitting that contradictions are a fatal flaw in that system, then there can be no common ground between us.

III.

In his classic 1950 article Alan Turing posed the question "can machines think?" The article described a method of defining intelligence, the so-called *Turing Test*. A person is placed in one room and a computer in another. They are able to communicate with the outside world, but only in the form of typewritten texts. Another person is placed in a third room and, after interrogating both 'intelligences', that person has to decide which of them is human. Turing maintained that if the interrogator fails in his task, then one must be able to attribute intelligence to the computer. The 'trick' is to define intelligence in terms of behaviour. The ability to imitate a specific piece of behaviour is said to be 'intelligent'.⁶

This is the intellectual position that Joseph Weizenbaum, the American mathematician, attempted to get to grips with in his now classic *Eliza* computer program, which was intended to simulate the behaviour of a psychotherapist.⁷ Weizenbaum wanted to make people more aware of the limitations of computers. He found the reactions to his program were quite unexpected. The professional group in question - psychoanalysts - were enthusiastic. They saw the Eliza project as an opportunity to acquire an instrument which would shorten waiting times for psychiatric patients.

If the Eliza method proves beneficial, then it would provide a therapeutic instrument which could be made widely available to mental hospitals and psychiatric care centers which suffer from a shortage of therapists. With timesharing, a computer system designed for the purpose would allow the computers of today and tomorrow to deal with several hundred patients an hour.⁸

⁶ Turing: "Computing Machinery and Intelligence."

⁷ Weizenbaum: *Computer Power and Human Reason. From Judgement to Calculation*, p. 81

⁸ *Ibid.*, p.181.

Here, Weizenbaum demonstrates a practical application of the Turing test, and he wants to show that it is not satisfactory. It can be misleading. Its reception gave Weizenbaum insight into a fundamental problem: people are likely to attribute to a piece of technology, in this case diagnostic software in the field of medical care, more intelligence than it has. We lose our objectivity. An ironic consequence of Weizenbaum's project was a compulsion to see machine solutions as labour-saving devices. The requirements of rationalization and efficiency drive people towards attributing more intelligence to machines than they can possess.

In his 1982 essay, *Själens åtrå* (The Desire of the Soul) Willy Kyrklund, the Swedish author, wrote a literary version of Weizenbaum's Eliza program. In his introduction, he says this:

Eliza 812 is a psychiatric computer. According to a fine old tradition, all female psychiatric computers are called Eliza, and all male computers Higgins. Eliza is a research project, and her primary purpose is not to improve the level of psychiatric care: that comes later. Its purpose is to establish to what extent a computer can be made to compete and react in the same way as a person. The complex of issues has far-reaching consequences, and presupposes multidisciplinary research.⁹

Willy Kyrklund says that the physiology of a computer is different to that of man, and no matter how close its psychological characteristics are to those of man, it would appear impossible to have a computer acquire human experience. It is not the soul that separates computers from mankind, it is the body. Because they carry so much tacit knowledge, so much skill that cannot be formulated as algorithms or axioms, our bodies remind us of our finitude, our mortality.

In his 1988 collection of essays entitled *Om Godheten*, (On Goodness) Eliza is replaced by 'Amica Super,' a talking computer, a sophisticated word processor with its own formulation capacity.

When Amica answered the telephone, her voice was young and fresh as a spring stream, programmed for goodness based on Christian values.¹⁰

Willy Kyrklund's dosing words in *Om Godheten* are on the philosophy of language:

I have always striven to incorporate words into accepted phrases, phrases that are rooted firmly in everyday experience. The belief that words can function on their own, that words hewn from granite could fly on their own wings, appears to me to be an expression of the absurd hope that one can go beyond the limits of experience.

⁹ Kyrklund: *8 variationer*, p. 87.

¹⁰ Kyrklund: *Om godheten*, p.43.

It makes me think of the development of abstract art from transcendence to decoration; a path that leads to disappointment.¹¹

IV.

Do we discover mathematics
or do we invent it?
Do circles discover us, does the golden section surprise us,
Pi, the small limit values and incomprehensible infinity,
the great series of numbers, the sine curves, the neat circle of unity the
fourth degree equations?¹²

This is the introduction to the Swedish poet Eva Ström's *Upptäcker vi matematiken?* (Do We Discover Mathematics?) Alan Turing said that mathematical reality was outside ourselves; that it was our task to discover or observe it, and the (theorems' we prove and which we pompously regard as our own creations' are quite simply the results of our observations.

Ludwig Wittgenstein takes a radically different view, one which opposes the existence of norms that are free from human practice, norms we can refer to without any opposition or disagreement. In challenging the claim that rather than a human invention, mathematics is about the world, Wittgenstein questions the status of mathematics as a form of knowledge, thereby making a contribution to an epistemology of skill. He appears to suggest that mathematics is one of a number of ways in which we find our way about the world, but there is nothing numinous or God-given about it. The fact that the results of our calculations are usually the same is to do with the way we learn mathematics. Wittgenstein discusses the way our confidence in acting in a practice is affected by the increasing use of technology. In *Remarks on the Foundation of Mathematics* he writes:

We may trust mechanical means of calculating or counting more than our memories. Why? - Need it be like this? I may have miscounted, but the machine, once constructed by us in such-and-such a way, cannot have miscounted. Must I adopt this point of view? - Well, experience has taught us that calculating by machine is more trustworthy than by memory.

¹¹ Ibid.

¹² Upptäcker vi matematiken
eller uppfinner vi den?
Upptäcker cirklarna oss, överraskar oss det gyllene snittet,
Pi, de små gränsvärdena och den ofattbara oändligheten,
de stora talserierna, sinuskurvorna, den prydliga enhetscirkeln
fjärdegradsekvationerna?

It has taught us that our life goes smoother when we calculate with machines. But must smoothness necessarily be our ideal (must it be our ideal to have everything wrapped in cellophane)?

Might I not even trust memory and not trust the machine? And might I not mistrust the *experience which* gives me the illusion that the machine is more trustworthy?¹³

When people who are active in a practice begin to doubt their certainty in action, there is reason to be cautious. This may be put in even stronger terms: once a skilled person begins to question his certainty, we should become alert to what is happening to the professional skill.

v

In scene from *Beyond All Certainty* has Wittgenstein met Turing at the beginning of the 1950s. They had not met since 1939, when Turing attended Wittgenstein's lectures on the foundations of mathematics in Cambridge.

Wittgenstein: Do you still hold the opinion that mathematics *is* more of a discovery than an invention? You thought I wanted to introduce some kind of bolshevism into mathematics.

Turing: You wanted to reduce complex mathematical argument to some kind of everyday language. You constantly came back to the idea that the only thing that had any meaning was common sense and the meaning we give to words.

Witt: I wanted to sow a seed with a jargon in which irony was juxtaposed with the idea that it should be necessary to have one's starting point in logic Russell's logic -as some kind of basis for all thinking. It is pretentious and pernicious to give anyone the idea in a lecture that logic would be a way of penetrating the complexity of reality more deeply. This *is* incredibly stupid.

Turing: You mocked me because I counted instead of thinking. You maintained that one of the most dangerous ideas was that we think with, or in, our heads.

Witt But that argument does not appear to have made any significant impression on you. I recently read an article of yours in - "Mind"? It posed the question "can machines think?" Are you joking? I think the question is as meaningful as "Does the figure three have a color?" Turing, don't think of your common sense as an umbrella you can lay aside. Don't think about what you are to say: it will become apparent, like the next move in a game of chess!

Turing: We wouldn't have got very far at Bletchley Park with your general speculations about good and bad analogies or arguments about the difference between

¹³ Wittgenstein: *Remarks on the Foundations of Mathematics*, p. 32.

an experiment in physics and an experiment in mathematics. It was a matter of working hard to break the code.

Witt: As a philosopher, one must act as a masseur for mental cramps.

Turing: Do you honestly think that people like us were consulted about the way our discoveries would be put to use?

Witt: The pilot who bombs civilians risks his life, but the scientist doesn't. But pilots who drop atom bombs over a completely vanquished Japan risks nothing of course. For God's sake, I'm not saying that I know how one should act in your shoes. People who write such harmless things as I do should probably say nothing about your problems.

"A young man, thirsting for knowledge, came to Archimedes," and I quote, "Initiate me in the divine art that has given our fatherland such a wonderful fruit And protects the city walls against the mangonel." "Do you call my art divine, my son? It was, when it did not yet serve the state."

Turing: Well, if you're going to foist that Schiller rubbish on me as the ultimate truth! That poem can only have been written by someone who had not been exposed to war and had been -blunted by happiness! I can swear on the life of my mother that I had no idea that our ("brothers" on the other side of the Atlantic would commit such a crime without warning. . . .

Witt: Two atomic bombs are reason enough to tackle a problem that not even Schiller was up to. Yet who was capable of tackling that problem? Not even you. And I am not up to it because I have the kind of profession which, according to you, "blunts you with happiness."

Turing: Look, the Americans made the bomb because Einstein -the pacifist! wrote to Roosevelt assuring him that...

Witt: Roosevelt was a decent man! He would never have used the bomb on the Japanese if victory had already been assured!

Turing: He was fortunate enough to die at the right moment. The question is, would Einstein have committed such a terrible crime if he had not written to Roosevelt. Einstein had every reason to believe Nils Bohr when he said that they were working on the bomb in Berlin. *(Pause, and then suddenly)* I thought you were Jewish.

Wittgenstein slowly stands to face Turing

Witt: Half Jewish, why? What does that tell you? I am indignant about the fact that the bomb was developed to be used against Hitler, but was then used on a people who were not making atom bombs. And who did not bomb cities. And who did not murder millions of people in gas chambers. Was it also mere coincidence that the atom bomb was dropped on the Japanese because it wasn't ready until a month after Berlin had fallen? That is even more shocking.

Turing: So, we didn't stop the atrocities of the concentration camps by breaking the Enigma code. Or did we?

VI.

The eighteenth century was a difficult and complex period, and the same may be said of the times we are living in. There was a reaction against attributing to science - most of all mathematics - an almost divine ability to explain the world. A document from that time which more than any other problematizes the way knowledge was perceived, is Denis Diderot's *Rameau's Nephew*, in which he describes not only how difficult it is to live by a principle, but also the confrontation between different kinds of knowledge. He sets "knowing that" against "knowing how," thereby challenging a central tenet of modern philosophy, namely that practical knowledge ultimately has a theoretical basis.

In Diderot's view, the practical and the theoretical, the knowledge by familiarity and propositional knowledge, are not only radically incompatible with one another, but actually in competition with one another in our society. But the significance of the dialogue hardly ends there. Diderot brilliantly juxtaposes two different ways of perceiving knowledge and life itself, not so that they are brought into question, ridiculed or rejected, but in a way that shows how they problematize one another. The contradictions are not resolved. It is agreed that there is a discord that cannot be bridged. The mastery of *Rameau's Nephew* lies in the fact that Diderot does not take sides in the struggle between senses and intellect, but retains the complex and contradictory aspects of the interaction between the different layers of one's own person that may be seen as a description of the Encyclopedia Project's paradoxical view of knowledge. It is the epistemology of professional skill that Diderot calls attention to in his famous dialogue and in all his works.¹⁴

Diderot anticipates Wittgenstein's view of language. In his manuscripts and notebooks, Wittgenstein made a number of references to Shakespeare and the theatre. He believed that a path to knowledge was through the paradoxical power of the actor.

VII.

The preoccupation with skills grew from reflections on case studies from the late seventies and early eighties. These case studies addressed problems found at the workplace, and covered nurses, doctors, foresters, social insurance office staff, meteorologists and others. The focus was on the epistemology of skill in working life. As the question "what is skill?" emerged as a central aspect of work life research, the idea evolved that work had to be understood from the

¹⁴ Josephs: Diderot's "Dialogue of language and gestures

perspective of the philosophy of science. Traditional epistemology shed little light on this issue because the concerns it addressed were too abstract. Skill, on the other hand, is something very particular, and its particularity cannot be captured in general theories; it can only be grasped through case studies. These case studies provide examples of the way solid judgement is built up over time, as a novice at the workplace gradually develops competence and, with talent and perseverance, expertise. Both security and certainty are the hallmarks of the expert judgement that results from this process. Its distinctive characteristic is its success in dealing with unforeseen problems. Expertise - skill in the fullest sense-is not so much a matter of knowing more as a matter of knowing better.¹⁵

Skill is developed through doing something. It is typical of a skilled person that he can give an example of "doing" something. Erland Josephson takes an example from an unforgettable meeting with Sir John Gielgud, who gave him a lesson in delivering Shakespeare's verse. "We spent two hours on these fifteen lines. Gielgud was tireless. Eagerly, he gave of his knowledge / ... / I was supposed to observe all the punctuation and mark the end of every line. All these signs and rules constituted a tradition that had been handed down, knowledge that had been developed and refined over hundreds of years. They reflected hard-won knowledge, a battle with phrasing, with feelings and insight, technique and clarity, with characterization and with contact with the audience."¹⁶

Acting as a general model for skill is taken from Diderot. Erland Josephson says that an actor's intelligence "... requires a different kind of resolution than that required to grasp a thought. / ... / The actor's intelligence is restless and hungry, its main objective is not confirmation, but, new experience."¹⁷

Here, Erland Josephson's reflections on the art of acting "from within" have become of particular interest, not least in making analogies with earlier case studies in research in the field of skill and technology.

This ability to "grasp a thought" is a different kind of intelligence; it is an analytical, mathematical intelligence. Arthur Schopenhauer drew attention to the limitations of the mathematical method that were discussed in a contribution to the *Edinburgh Review* of January 1836 by Sir William Hamilton, Professor of Logic and Metaphysics. Its conclusion is that the value of mathematics is only indirect, and is found to be in the application to ends that are attainable

¹⁵ See: Göranson, ed.: *Job Design and Automation in Sweden*. - Göranson: "Professional Skill and, Computerization: The Insurance Employees' Union and EDP in the National Insurance System: A Case Study." - Göranson: *The Practical intellect. Computers and Skill*

¹⁶ E. Josephson: "We Must Safeguard the Freedoms of our Craft." Göranson, ed.: *Skill, technology and Enlightenment*, p. 89.

¹⁷ *Ibid.*, p. 15.

only through *it*. In itself, however, mathematics leaves the mind where *it* found it. It is by no means necessary; in fact *it* is a positive hindrance to the general formation and development of the mind. This conclusion is not only proved by extensive dialogical investigation of the mind's mathematical activity, but it is also established by a very learned accumulation of examples and authorities. The only immediate use left to mathematics *is that it can accustom fickle and unstable minds to focussing their attention* (my italics).¹⁸

It is generally accepted that art adds something to nature, but when we examine this phenomenon more closely, we find it impossible to say what we are talking about. This phenomenon is noted in Diderot's observation of a certain emptiness - blind spots at the core of common-sense aesthetic ideas.¹⁹ The expression of rhythm is an indication that a technique has been mastered.

What is rhythm? The musical imitation of rhythm was not an unprocessed expression of sensations. It was rhythm created after an agonizing struggle with words. The mind listens attentively to its own movement; the critical intellect is, always lucidly, always actively, considering sensations which show them naturally in the spontaneous gestures of thought.²⁰

According to Diderot, the ability to observe -and control the surge of one's thoughts, to make the proper gestures and rhythmic expressions, is a result of reflection. The point of Diderot's study of the paradox of the actor is that the action is not subordinate to the emotion he is projecting. Actors who play from their souls, who are sensitive, are never consistent in playing their parts.

It is quite different with the actors who act after thinking and after studying human nature, and who always have some ideal picture to follow, building their parts on the power of their imagination and their memories.²¹

VIII.

Georg Henrik von Wright published *Explanation and Understanding* in 1971. This book had a decisive impact on research in the field of skills and technology, the development of which I myself have been involved in since the midseventies. In the

¹⁸ Sir William Hamilton: *Edinburgh review*, January 1836.

¹⁹ Lars Gustavsson: "Some Reflections on Diderot's Paradox." Göranzon, ed.: *Skill, Technology and Enlightenment*, p. 93.

²⁰ Josephs: *Diderot's "Dialogue of Language and Gestures,"* p. 15.

²¹ Diderot: *The Actor and his Role*, p. 19.

first chapter, von Wright outlines two traditions of knowledge: the tradition of Aristotle and the tradition of Galileo. The importance of this book became widely recognized, not least because it introduced hermeneutics into scientific discussions.²²

Hermeneutics has as a starting point a view of art as a source of knowledge. *Explanation and Understanding* penetrates human actions, and von Wright says that efforts to understand human actions are closely linked to an understanding of work, to the epistemology of work and to the value of work in our culture.

Let us consider our final excerpt from *Beyond all Certainty*, where, in an encounter with Bertrand Russell, Wittgenstein reflects upon the latter part of the time he spent at Cambridge.

Witt: It's a long time since I was here last, and it shows. There is a completely new generation of students. Fortunately not many of you attend my lectures. I discuss aesthetics and religious belief, and not mathematics or general philosophy. I don't want my students to take notes. Some day someone may publish them as my considered opinions. That would be regrettable, and against my own will. All this will need a lot more thought and better expression.

What I am trying to do is persuade people to change their style of thinking. The worship of science and the scientific method has had a wretched effect on our whole culture. Aesthetics and religious belief are two areas of life in which the scientific method is not appropriate, in which efforts to make it so lead to distortion, superficiality and confusion. People nowadays think that scientists exist to instruct them, poets, musicians, etc. exist to give them pleasure. The idea that these have something to teach them - that does not occur to them!

We must *see* connections that we did not discover before, see what is gripping, beautiful and so on.

Russell: Shakespeare!

Witt: Yes, that troubles me.

Russell: Troubles you? What, that Shakespeare was a great writer and poet?

Witt: I am troubled that everyone thinks so.

Russell: But surely you don't think the whole world has been bluffing for hundreds of years?

Witt: No, I don't think so. But I am unable to accept Shakespeare as a great poet. His metaphors and similes are, in the ordinary sense, bad. Take that passage from Richard II: - "within my mouth you have engaol'd my tongue / doubly portcullis'd with my teeth and lips."

²² Wright: *Explanation and Understanding*.

Russell: Well, that's not so bad. Perhaps the reason you don't like it is that you don't like English culture in general.

Witt: Yes, that's true. But I cannot see Shakespeare as a great human being. I can only stare in wonder at Shakespeare; never do anything with him, He has such a supple hand and his brush strokes are so individual that each one of his characters looks significant. One can talk 'of "Beethoven's great heart" - but nobody could speak of "Shakespeare's great heart." Nor could he regard himself as a prophet or as a teacher of mankind. People stare at him in wonderment, almost as a spectacular natural phenomenon. They do not have the feeling that this brings them into contact with a great human being. Rather with a phenomenon. *Russell'* But you yourself have said that understanding music, poetry, painting and humor are reactions that belong to, and can only survive in, a culture.

Witt: Yes, and you could have added philosophy too. What is required here is not the discovery of facts, nor the drawing of logically valid inferences from accepted premises, nor still less the construction of theories - but, rather, the right point of view", - It's the same with humor, it's not a mood, but a way of looking at the world., The Nazis managed to destroy an entire style of life when they stamped out humor.

Russell: But philosophy. What has music to do with philosophy?

Witt: Appreciating music is a manifestation of the life of mankind.

Russell: But how should we describe it to someone? You cannot capture the sense of a piece of music by using words to describe what the music means.

Witt: It's the same with philosophy. Understanding a sentence is like understanding a theme in music. To me a musical phrase is a gesture. It insinuates itself into my life. I adopt it as my own. Like the infinite variations of life, musical expression is incalculable.

It is impossible for me to say one word in my book about all that music has meant in my life. How then, can I hope to be understood?

IX.

Wittgenstein's last work on the theory of knowledge is to be found in a book called *On Certainty*, It covers issues that he had already been confronted with in his meeting with Alan Turing - *au fond*, the significance of *following a rule*. In 1972 Georg Henrik von Wright wrote an article on *On certainty*. The research that has focussed on skills was stimulated by the view of knowledge that von Wright developed in that article. The philosopher Kjell S. Johannessen, of the University of Bergen, Norway, has devoted the past fifteen to twenty years to this theme;

the different aspects of knowledge taken up by von Wright from the works of Wittgenstein.²³

Knowledge contains something more than the propositional knowledge that we can verbalize. It is important to focus on two *other aspects* of the nature of knowledge, namely the knowledge of familiarity and the knowledge of practice that derive from experience, that is to say from my own experience and the experience of others. The fundamental issue is: how can we develop our ability to reflect on our experience?

The Swedish author Bodil Malmsten's novel *Den dagen kastanjerna slår ut är jag långt härifrån* (The Day the Chestnut Trees Blossom I Shall Be Far Away) (Bonniers, 1994), contains fragments that are reflections on creative work, and they are related to what Wittgenstein said about following a rule:

I don't know what it is you do when you are good. I just know that suddenly you *are* good, suddenly and inexplicably; suddenly you are floating on air, suddenly everything begins to come right. Suddenly, it's there - the presence, the concentration; the only thing I know is that it's no good without concentration. And that what remains after all the effort, all the performance anxiety, all the heaviness, must appear effortless. Simple. Obvious. .

"Rules are there to be respected," says Jargen, "and then to be broken. You may only break a rule that you have mastered; you must have respect for rules before you can take liberties with them."²⁴

There is a *coercive aspect* to following a rule as part of a practice. The coercive aspect is absolutely essential if we are to pass beyond rules and bring a creative approach to new situations. Breaking rules is not basically a question of opposition to traditional authority, but rather a process of outgrowing it. It calls for reflection, not defiance.

²³ K. Johannessen: "Rule-following, Intransitive Understanding and Tacit Knowledge: An Investigation of the Wittgensteinian concept of Practice as regards Tacit Knowing." Göranson and Florin, eds.: *Skill and Education*, pp. 41-65.

²⁴ Malmsten: *Den dagen kastanjerna blommar är jag långt härifrån* (The Day the Chestnut Trees Blossom I Shall Be Far From Here).