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The heel and the complement
Modular theory of scientific cognition and sociology of
scientific knowledge

*"As a navigator, one must not only
be able to find one's way at sea, but
must also show the world that one is
a navigator."*¹

The heel was the only injurable point on Achilles; the ingeniously enigmatic treatise of András Kertész hints at this well-known fact in its title: *Die Ferse und der Schild. Über Möglichkeiten und Grenzen kognitionswissenschaftlicher Theorien der Erkenntnis* (1995). The treatise is written – slightly ironically – in the form of a dialogue between Achilles and the Tortoise (*Testudo*), and is conceived as a continuation of their memorable race, though the field of science (*Einzelwissenschaft*) chosen is not mathematics but linguistics. In continuity of and in analogy with the Modular Theory of Language Behaviour of Manfred Bierwisch and his extended school, Kertész strives at a Theory of Scientific Cognition (TSC), which, though on an epistemic metalevel with respect to specific scientific disciplines (*Einzelwissenschaft*) avoids nevertheless the fallacies of the traditional metascientific epistemology (the Received View); i.e. avoids fallacies like normativity, *a priorism*, universality, regressivity, circularity etc. The new theory of science, like any other cognitive science, aspires at empiricity, *aposterior*ness, specificity (*Einzelwissenschaftlichkeit*), finiteness or at least renormalizability, non-circularity; but at the same time wishes to answer traditional epistemological questions like „How is scientific cognition possible?“, „How does scientific knowledge originate?“ „What about its structure and how does it function?“, „What about epistemic reflection and evaluation?“, „What is the epistemic role – if any – of reality?“ etc. I.e. on the one hand there should hold a kind of continuity („*Einzelwissenschaftlichkeit*“) between the new Theory of Scientific Cognition and the individual scientific disciplines as to their properties and means, but as to their aims or better to say roles there should remain a certain *a posteriori* distinction, maintaining an empirical (restricted) autonomy of the epistemological level. This complicated situation is expressed (and compressed) by Kertész in a witty paradox; „*The traditional epistemology is substitutable by individual empirical sciences like the subdisciplines of cognitive science if and only if it is non-substitutable by them.*“²

¹ Charles O. Frake (1995): *Dials: A Study in the Physical Representation of Cognitive Systems*. In: *The Ancient Mind. Elements of Cognitive Archeology*. Ed. by Colin Renfrew and Ezra B. W. Zubrow. Cambridge University Press, pp. 119-132.

² András Kertész (1995): *Die Ferse und der Schild. Über Möglichkeiten und Grenzen kognitionswissenschaftlicher Theorien der Erkenntnis*. Lang, p. 34.

Like so many paradoxes in the history of science,³ this Paradox of the Cognitive Theories of Scientific Knowledge (PCSK) may be regarded as the inauguration of a „Research Programme”; though of course Kertész would not subscribe to such a Lakatosian „taxonomy” (even if Lakatos himself may have been aware of the paradoxical nature of his (re)construction, at least in *Proofs and Refutations*).⁴ (In a somewhat similar situation confronting questions of *Naturalism, scientism and the independence of epistemology*, James Maffie at any rate applied a regular research programme to the resolution of the antinomy hidden in the „weak continuity reliabilism”, according to which „epistemology becomes continuous with science but neither identical to nor eliminated by science. Naturalists' claims about the absence of standpoints independent of science, etc., are understood as saying that the ends, norms, concepts and properties of epistemology may *be ascertained* and *applied* using the evidential resources of the sciences yet are nevertheless *not identical* to the evidential ends, norms, concepts and properties of science.”⁵ The requirements of the PCSK are, however, stronger than those of weak continuity and thus a simple „reliabilism” (i.e. a process making justification „a descriptive fact about cognitive means – epistemic ends relationships”) does not suffice to quench them. A complex two-level system of autonomous and interacting units forming a structure with inherent dynamics is needed to deal with the problems arising from PCSK; the first two days of *Die Ferse und der Schild* are in fact devoted to the description and introduction of this system and its proper dynamics. Fortunately, for the present purpose the particulars of the theory must not be mastered, it suffices to remember at units (theories, model, methods, etc.) of an „objectscience”-level and units of a „metascience”-level are connected by different kinds of inter- and intra-level connections, which are „reflexive” (i.e. a unit can be the target of interaction originated from itself) and are governed by the rules of a cognitive heuristic, corresponding to a modular structure (and functioning) of human behaviour in general and of scientific behaviour in particular. Both „modularity” and „heuristicity” are essential conditions. It is because of the latter that one can use freely, without the danger of circularity and regressivity, concepts and procedures of the objectscience-level (first of all notions, procedures, drafts, and formulas of a modular theory of cognitive behaviour, theories of language comprised) in a (quasi?) metascientific sense and context. „*Eine Heuristik zu praktizieren ist ja nichts anderes, als Regeln zu befolgen. Du brauchst dir diese Regeln nicht durch eine Beschreibung oder Erklärung auf der nächsthöheren Metaebene bewußt zu machen, genau so wie du eine Sprache fehlerfrei sprechen kannst, ohne jemals eine Grammatik in der Hand gehabt zu haben. Es besteht*

³ Cf. Imre Tóth (1969): „AHILE”. Paradoxele elente in fenomenologia spirituiui. Editura Stilintifica, Bucuresti. The book, while demonstrating the role of paradoxes in the construction and investigation of systems of thinking from Zeno and Parmenides to Gödel and Escher, can itself be considered as a huge „research programme” based upon the „negative epistemology” of the „Parallelenproblem”: the Euclidean geometry can be relieved by the non-Euclidean if it cannot be relieved. Cf. further: Imre Tóth (1995): Palimpsest. Teologia negativ a triumphiului. Humanitas.

⁴ László Vekkerdi (1984): Egy szenvedélyes kereső. Lakatos Imre: Bizonyítások és cáfolatok. Gondolat Kiadó 1981. Világosság 25, pp. 125-127.

⁵ James Maffie (1995): Naturalism, scientism and the independence of epistemology. Erkenntnis vol. 43, pp. 1-27.

zwar die *Möglichkeit* eines eventuellen Regresses, aber keine *Notwendigkeit* dazu.”⁶ A heuristic namely must be actually practiced; there are no heuristics *per se*, „genau so wie es keine Sprachregeln in sich, ohne die von ihnen erzeugten Sätze gibt. Sprachregeln existieren nur in Verbindung mit dem alltäglich praktizierten Sprachverhalten – und eine epistemologische Heuristik existiert in Verbindung mit spezifischen Theorien der wissenschaftlichen Erkenntnis, in denen sie realisiert wird.”⁷ Hence, there is no general solution to the PCSK, only a set of contingent „local solutions”, corresponding to different individual conditions and circumstances. Thus, each one TSC is different, each one is incomplete, each one has its borders elsewhere than another one and may afford something else: consequently, every TSC will differently perform its own Heuristic of Reflexive Interactivity. What one at most can do is to select *individual* TSCs, developed from a certain determined cognitive „unit” of a certain subdiscipline, and by applying them to the great problems of epistemology see whether the final effect will allow the mechanisms of the HRI or not.”⁸ This essential contingency of Theories of Scientific Cognition is transferred by the Heuristic of Reflexive Interactivity on objectscience-level „units” (theories, models, methods, hypotheses even) are here necessarily incomplete and are inherently underdetermined by the empirical-experimental evidence. Viewed from the empirical side, this of course is reflected as theory-ladenness.

Cognitive systems, however, are further loaded with another, less well-known kind of indeterminatedness, which is only revealed by properties of the Bierwisch-Kertész modular mental representations. Let there be given a set $\{T_i\}$ of a *Wissenschaftssprache*. (i.e., by and large, the „lexicon” of a Kuhnian „taxonomic structure”).⁹ „Eines der Module, deren Zusammenspiel die sogenannte „Bedeutung” eines Elementes dieser Klasse determiniert, ist mit Sicherheit das grammatische Modul, das sich allerdings in weitere Submodule untergliedern läßt. Die Repräsentationen, die diese Submodule determinieren, lassen sich vereinfacht als ein Tripel

(5) {PR, MR, SR}

darstellen. PR ist dabei die phonetische Repräsentation eines Termes T [...], MR die *morphosyntaktische Repräsentation* von T [...], SR schließlich ist die *semantische Repräsentation* von T.”¹⁰ SR, however, does not suffice in itself; in order to get the meaning of T, SR must be interpreted in a Conceptual Context KK: $Int\{SR, KK\}$. The representation KR so obtained $Int\{SR, KK\} = KR$, is determined by the Conceptual Module KM. Thus, SR and KR, connected by the Interpretation function *Int*, belong to two different modules (*Zwei-Stufen-Semantik*); SR belongs to the Grammatical Module GM, and KR to the

⁶ Kertész 1995 p. 64.

⁷ Kertész 1995 p. 67.

⁸ Kertész 1995 p. 88.

⁹ „According to Kuhn, a taxonomic structure contains “the taxonomic categories of the words and the similarity/difference relationships between them”” Xiang Chen (1994): How Do Scientists Have Disagreements about Experiment? Incommensurability in the use of goal-derived categories. *Perspectives on Science* vol. 2, pp. 275-301.

¹⁰ Kertész 1995 p. 124-125.

Conceptual Module KM:

(6) {{Pr, MR, SR}, KK, Kr}
GM KM

Thus, „meaning” may be defined as a triplet

{Sr, KR, Int}

where Int relates two different modules and KR is the context-dependent interpretation of SR. This semantic context-dependency has for its consequence, „daß die “Bedeutung” eines Termes T – wie paradox es auch klingen mag – *semantisch unterdeterminiert* ist. Somit ist SR in gewissem Sinne “leer” – denn das, was in einem bestimmten Kontext der Ausdruck T “bedeutet”, ist ja nicht etwas Semantisches mehr, sondern die konzeptuelle Repräsentation von T”.¹¹ In the language of Kuhn: every taxonomic structure has its own taxonomic categories. Obviously, we arrived herewith at the heels of the complement, the archexample of Ludwik Fleck in the *Entstehung und Entwicklung einer wissenschaftlichen Tatsache* (1935). But let us stay a while at the „ostwestfälische Lösung” von András Kertész.¹²

Let us remember that if HRI is an answer to the question of PCSK, it is always a concrete and local one. Heuristics do not provide us with complete and perfect solutions; a heuristic can work only in an ever-changeable, actually incarnating *praesens imperfectum*. Every heuristic and thus every (modular) cognitive system is contingent. Contingency – as it was guessed by Jacques Monod long before Many World Semantics and Cognitive Sciences – is *ab ovo* comprised in any „*con-naître*”, bringing about that familiar but rarely intelligible interplay of *hasard et nécessité* which, among others, can be beheld (and applied) in the practice of scientific research.¹³ The context-dependency of SR can clearly be projected by an appropriate HRI into an appropriate Modular Theory of Scientific Knowledge, and then it is not too difficult to imagine that MTSK and Sociology of Scientific Knowledge (more properly a special variant of SSK) can be joined in an Integrated Modular Theory of Science. This, in fact, was achieved in an exemplary logical manner by András Kertész in his *Artificial Intelligence and the Sociology of Knowledge. Prolegomena to an Integrated Philosophy of Science* (1993). The SSK selected for integration was the Strong Programme of David Bloor, since the representations of the social factors (S-factors) in it seemed all but ready to be united with the representations of the conceptual factors (C-factors) of *Modulare Wissenschaftstheorie*. Thus, IMTS so devised then suppresses the rather artificial contradictions between „rational” and „sociological” approaches to the problems of scientific knowledge. Of equal importance is,

¹¹ Kertész 1995 p. 127.

¹² Kertész 1995 pp. 66-67.

¹³ David Turnbull (1995): Rendering Turbulence Orderly. *Social Studies of Science* vol. 25, pp. 9-33. „Scientists impose order on nature, but they do so in part by the imposition of order on the disciplinary field. This second-level social ordering is often made manifest only as a consequence of a third-level ordering, that of the social analyst.”

however, the insight of Kertész that not all cognitive theories of science and not all SSKs are suitable for the process of integration; *viz.* in order to be integratable they have to fulfill special requirements. „An integrated philosophy of science should allow the possibility that in at least some cases those aspects of human information (whatever these may be) which can be simulated by computer programs are not independent of social factors.”¹⁴ This non-independence, however, must not be absolute, since „the system of C-factors and that of S-factors should be treated as autonomous in that neither of them is determined by the other”.¹⁵ But just the investigation (and the description) of the interactions of *relatively* autonomous systems is the *par excellence* task of Modular Theory of Scientific Knowledge, so one must not wonder that Kertész already in *Die Modularität der Wissenschaft* (1991)¹⁶ exhaustively deals with the cognitive incorporation of Bloor's famous Four Principles of Social Causation of Scientific Knowledge. The method is highly mathematical and rather awkward; its aspects most relevant from the present point of view, however, may perhaps be summarized – if I (mis)understand them well – in the simple statement that S-factors are joined to C-factors through mental representations determined by the motivational module. Thus, „social” will be represented on the same basis and in the same form as „conceptual”.¹⁷ In other words, „Social” must be brought into a „Conceptual” context, just as the Semantic Representation was to be conceptualized in order to fulfil its role as „Bedeutung”. This of course is merely a loose analogy; still it is perhaps not too far-fetched to consider „social” in a sense „empty”, gaining its full „Bedeutung” only by some Conceptual contextualization. That is, „Social” will be interpreted in function of „Conceptual”, and representations determined by the Motivational Module will be „socially underdetermined”. This first of all means that no SSK can vindicate the right to exclusivity, being every SSK necessarily and inherently a local solution and perhaps every sociohistorical case study somehow theory laden, hence for instance there can be written equally relevant studies about Galileo as courtier and *eretico*,¹⁸ and the SSK-picture of the same Boyle as a sophisticated gentlemanly manipulator¹⁹ and as a stout

¹⁴ András Kertész (1993): *Artificial Intelligence and the Sociology of Knowledge. Prolegomena to an Integrated Philosophy of Science.* Lang, p. 55

¹⁵ Kertész 1993 p. 61.

¹⁶ András Kertész (1991): *Die Modularität der Wissenschaft. Konzeptuelle und soziale Prinzipien linguistischer Erkenntnis.* Vieweg.

¹⁷ Cf. Michael Gorman and Robert Rosenwein (1995): *Simulating Social Epistemology.* *Social Epistemology* vol. 9, pp. 71-79. The article renders account of experiments on computer simulations of the relationship between cognitive and social factors in scientific problem-solving. „Cognitive” refers to factors such as heuristics, representations, and cognitive maps. „Social” refers to factors such as persuasion, source credibility, negotiations, conformity pressures, and minority influence. The term „relationship” is used to suggest that one does not necessarily privilege one domain or the other but wishes to create a site in which the effect of these factors is determining belief in science and can be systematically explored.

¹⁸ László Vekerdí (1995): *Galilei – eretnek vagy udvaronc? Tiszatáj* vol. 50, No. 3

¹⁹ Steven Shapin (1994): *A Social History of Truth. Civility and Science in Seventeenth-Century England.* University of Chicago Press. „Social” and „Conceptual” are brought together here in a sophisticated, exquisite, and subtle manner, but the final message of the book is quite simple; cf. p. 147: „Just as early modern theorists pointed to the importance of trust in effecting any coordinated civil enterprise, so the notable success of modern science is upholding consensual knowledge indicates that it too takes place in a field of trust. Nor is it the case that scientists have, as it were, first to be instructed in the principles of social order and civility and then in the knowledge and techniques of their discipline, for they learn about social order as they learn about the natural world. Correspondingly, trust and the moral economy of science are protected through scientists' investment in the knowledge they have and the

quasiartisan practician²⁰ may both be equally right. Moreover, as a scientist one must not only be able to find one's way at the sea of scientific facts, but must also be able to make others accept his way, i.e, show the world that one is a scientist. Thus, the origin and the development of a scientific fact will always be the result of a collective enterprise, even in the case of a lonely genius like Newton.²¹ Every scientific fact, every observation is functionally embedded in a *Denkkollektiv* and is determined by it; this fundamental thought of Ludwik Fleck is nowadays – thanks to Thomas S. Kuhn and his many followers – quite a banality. Fleck, however, went much further; he used his *Denkkollektiv* first of all in order to tell something very important about *die Beharrungstendenz der Meinungssysteme* and *die Harmonie der Täuschungen*: „Wenn eine Auffassung genug stark ein Denkkollektiv durchtränkt, wenn sie bis ins alltägliche Leben und bis in sprachliche Wendungen ringt, wenn sie im Sinne des Wortes zur Anschauung geworden ist, dann erscheint ein Widerspruch undenkbar, unvorstellbar“.²² And this unimagability of a contradiction becomes a strong disciplinary motivation in itself: specific domains of consistency will be limited by it, with more or less well defined boundaries, which rather rarely can be transgressed.²³ „Die Beharrungstendenz der Meinungssysteme beweist uns, daß sie gewissermaßen als Einheiten, als selbständige, stilvolle Gebilde zu betrachten sind. Sie sind nicht bloß Summe der Teilsätze, sie zeigen als harmonische Ganzheiten besondere Stilmerkmale, die jede einzelne Erkenntnisfunktion bestimmen und begleiten“²⁴ This *Denkstil-*

changes they may wish to work on existing knowledge. Scientists know so much about the natural world by knowing so much about whom they can trust.” And Boyle was assigned by birth, education, character and not the least by religion to play a key role in early modern „trust management”. However, Harry Collins (1994), after duly appreciating the social constructivist aspects of the book, notes at the end of his review: „There is no social history of truth, for a history of truth is a history of society. Trust may be everywhere necessary, but normal life and „normal science” do not need trust management; trust management is Shapin's topic.” *Nature* vol. 370. p. 605. Similarly, cf. Peter Dear (1995): Trust Boyle. *The British Journal for the History of Science* vol. 28, pp. 451-454: „could not the gentlemanly idiom and its moral functions be seen as simply as that – a means of accounting that gloss over the question of what particular people „really believed”?”

²⁰ Malcolm Oster (1992): *The Scholar and the Craftsman Revisited. Robert Boyle as Aristocrat and Artisan.* *Annals of Science* vol. 49, pp. 255-276.

²¹ J.L. Heilbron (1995): *Steven Shapin: A Social History of Truth.* University of Chicago Press 1994. *Annals of Science* vol. 52, pp. 521-523. „Newton worked at right-angles to the gentlemanly line cultivated by Boyle and his circle. Newton wanted to push his claims to conclusions and to force the assent of his fellows. In return, although he narrowly defined those claims to look like matters of fact („hypotheses non fingo”), contemporaries contested his assertions about the nature of light and the rules of planetary motion. He also departed gravely from the ideal of a gentleman in his unseemly fights with Flamsteed and Leibniz.”

²² Ludwik Fleck (1935): *Entstehung und Entwicklung einer wissenschaftlichen Tatsache. Einführung in die Lehre vom Denkstil und Denkkollektiv.* Mit einer Einführung hrsgg. von Lothar Schäfer und Thomas Schnelle. Suhrkamp 1980, p. 41.

²³ Fleck 1935, p. 42.: „Jede umfassende Theorie passiert eine Epoche der Klassizität, wo nur exact hineinpassende Tatsachen gesehen werden, und eine der Komplikationen, wo sich erst die Ausnahmen melden.”

²⁴ Fleck 1935 p. 53. These characteristic tokens of style determining and accompanying every function of cognition are under the control of the *Denkkollektive*, and this is a hard unifying condition. „Zugehörig einer Gemeinschaft, erfährt der kollektive Denkstil die soziale Verstärkung, die allen gesellschaftlichen Gebilden zuteil wird und unterliegt selbständiger Entwicklung durch Generationen. Er wird zum Zwange für Individuen, er bestimmt „was nicht anders gedacht werden kann”(p. 130.). These „Denkzwänge”, however, do not separate *Denkstile* impermeably from each other. „Fleck ist nicht so naiv anzunehmen, Denkkollektive seien geschlossene Gruppen, über deren Grenzen hinweg keine Verständigung möglich ist. Dies wäre nur der Extremfall. Wie häufig er realisiert ist, ist eine empirische Frage. Fleck sieht, daß Wissenschaftler oft Mitglieder verschiedener Gemeinschaften sind und somit über die kognitiven Mittel

dependent inertia is far from being a mere hindrance; it is the indispensable condition of every scientific work: „Jede formulierte Problemstellung fährt immer nur auf vorhandenen gedanklichen Geleisen zurück: nie wird eine Zukunft von der Vergangenheit – normal oder anormal – vollkommen frei, ausgenommen sie bricht mit ihr aus eigenen Gesetzen ihrer besonderen Denkstruktur.“²⁵

This compactness, consistency, harmony and relative impervadeability has, however, peculiar disadvantages, too, „Die Geschlossenheit der Systeme, die Wechselwirkungen zwischen dem Erkannten, dem zu Erkennenden und den Erkennenden verbürgen die Harmoie innerhalb des Systems, gleichzeitig auch die Harmonie der Täuschungen, die dann im Bereiche eines bestimmten Denkstiles auf keine Weise aufzulösen ist“.²⁶ The insight about the symmetry of sociological explanations with respect to failure and success – the best founded perhaps among the famous four requirements of the Strong Programme – certainly had not to await the subtle Psychological Social Imagery of David Bloor. But not only a large part – and may be the best – of SSK was effectively inaugurated by Ludwik Fleck. It was he, who first realized the importance of the „basic units“ of scientific research, the existence of „stilvolle Gebilde“, i.e. of relatively autonomous interacting domains within scientific cognition. One even may say that his *Denkstile* are somehow „Verhaltensinstanzen und als solche Überlagerungen von Repräsentationen“, though of course he did not specify mental representations in the precise sense of the Modular Theory of Scientific Cognition as given „durch die Interaktion der universalen Prinzipien verschiedener Module“. But his theory is also clearly „eher problem- als wahrheitsorientiert“²⁷; „und die den Problemlösungen zugrunde liegenden Heuristiken unterliegen“ also in Fleck's theory a kind of naive or pre-scientific „Parametrisierungshypothese“²⁸: the principles of a *Denkstil* governing scientific behaviour are specified (parametrisiert) according to motivational principles having their origin in diverse social interests and activities. This quasi-modular aspect of Fleck's *Denkstile* was duly emphasized by Tibor R. Szántó in his cogent survey on Fleck: „to put it concisely, a style of thinking is a disposition to directed perception and a corresponding objective mental assimilation of the observations so processed“.²⁹ Fleck analysed in great detail the motley *ouillage sociale* motivating the individual *Denkstile*, from the role of education, textbooks, scientific initiation, universities to institutions, laboratory work, problems of research communities, publication and so on. In fact, this matter-of-fact, history-conscious and practice-oriented investigation is the empirical gold standard behind the „*Denkstil-Denk-kollektiv*“ dialectic of scientific cognition, like actual

mehrerer *Denkstile* verfügen. Auch vertikale Ordnungen sind möglich, Über- und Unterordnungen von *Denkstilen* also.“ Klaus Fischer (1995): Braucht die Wissenschaft eine Theorie? *Journal for general Philosophy of Science*, vol. 26, pp. 227-257.

²⁵ Fleck 1935 p. 53.

²⁶ Fleck 1935 p. 53. Cf. Peter Simons (1995): *Mind and Opacity*. *Dialectica* vol. 49. pp. 131-146. „Representational opacity marks the mental [...]. To be minded is to be wrongminded, and therewith enters opacity.“ And therewith enters representational symmetry.

²⁷ Kertész 1995 p. 218.

²⁸ Kertész 1995 p. 176.: „(PH) Die Prinzipien des dem wissenschaftlichen Verhalten zugrunde liegenden konzeptuellen Moduls sind parametrisiert bezüglich der Prinzipien des motivationalen Moduls.“

²⁹ Tibor R. Szántó (1991): *Egy kelet-európai pionír*. *Valóság* vol. 34, No. 4, pp. 84-93 Cf. Fleck 1935, p. 130.

linguistic research experience and teaching practice is always behind the witty metatheoretical work of Kertész.³⁰ May be just this sound practice-oriented attitude was one of the chief factors making possible the smooth linking of the conceptual sphere to the social by two East-Central-European scientists separated by many decades and a nearly complete disciplinary abyss?

Achilles in *Die Ferse und der Schild* at any rate speaks with a deserved pride: „Wenn du mir die Frage stellen würdest, die du mir bis jetzt nicht gestellt hast, obwohl ich sie sehr gern beantworten würde und sie deshalb selbst stellen muß, nämlich, worin ich den größten Vorzug meiner Schöpfung sehe, so würde ich dir antworten: in (PH), die meines Erachtens der erstarrten und in letzter Zeit recht unfruchtbar gewordenen Debatte über das Verhältnis zwischen den konzeptuellen und den sozialen Determinanten der wissenschaftlichen Erkenntnis eine neue Wende geben könnte, falls die Teilnehmer darüber in Kenntnis gesetzt würden, worauf allerdings, wie sehr wir es uns auch wünschen, gegenwärtig wenig Hoffnung besteht.”³¹

This could have also been written word by word by Ludwik Fleck, sixty years ago. In the thriving folk of philosophers and sociologists of science (not to speak of historians) it is obviously not easy to show the world that one is a navigator.

³⁰ András Kertész (1993): Heuristik der deutschen Phonologie. Eine elementare Einführung in Strategien der Problemlösung. Akadémiai Kiadó.

³¹ Kertész 1995 p. 217.