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From integration to modelling. On a neglected function of the methodology of humanities

ABSTRACT. The aim of this paper is two-fold: to engage the contemporary discussion about the nature of relations between different scientific disciplines, as well as to disentangle the concept of integration of sciences from superstructures of rival proposals. The authors start with a critical analysis of the Polish contribution to the discussion about the nature of integration of sciences from the second half of the XXth century. Such a step is followed by elaborating a refined account of integration and by disentangling the concept of integration from superstructures of rival proposals – unification and interdisciplinarity. On the grounds of such a refined account the authors deliver a reconstruction of a successful scientific integration. In doing this they introduce the idea of connective knowledge as generated by the methodology of humanities. After reconstructing the successful integration trial, in the concluding remarks their account of integration is specified and summarized.

KEYWORDS: methodology of humanities, integration, unification, interdisciplinarity, model of primitive magic syncretism, Poznań Methodological School.

1. Introductory remarks: integration of sciences as a challenge for methodological research

Addressing the question of how to theoretically grasp the relations between different scientific disciplines has a long tradition in the systematic reflection on science across the academia. Among the most prominent approaches that were formulated and advocated for over the years are the following three: unification

approach [cf. Kitcher, 1981; Petkow, 2015], interdisciplinarity approach [cf. Klein, 1990, 2010; Lattuca, 2001] and integration approach [cf. Bechtel, 1986a; Mitchell, Dietrich, 2006; Gerson, 2013]. The peculiarity of the discussions that took place in the second half of the XX century in Poland was the special focus on the third approach, namely the integration of sciences. Undoubtedly, merits for thorough study of integration of sciences go to scientific journals such as *Methodological Studies* (pol. *Studia Metodologiczne*), *Problems of Science of Science Quarterly* (pol. *Zagadnienia Naukoznawstwa*) and *Philosophical Studies* (pol. *Studia Filozoficzne*), which created institutional conditions for exchange of scientific information, coordination of research and consultation of results. Among questions that were attempted to address during this discussion the three following are of special importance to our further investigations:

- definition of integration;
- levels of integration;
- structure of integration.

The paper is organized as follows. In the next section we will sketch the Polish contribution to the discussion about the definition, levels and structure of integration of sciences, as well as will offer our refined account of integration. This will be followed by an attempt to disentangle the concept of integration of sciences from superstructures of rival proposals, namely that of unification and interdisciplinarity (section 3). On the grounds of our refined account on integration we will deliver a reconstruction of a successful scientific integration trial. In doing this we will introduce the idea of connective knowledge as generated by the methodology of humanities (section 4). Finally, in the concluding remarks we will specify and summarize our account on integration of sciences.

2. Underlabouring for clarification of the idea of integration

2.1. Problems with definition of integration

As regards the first question – definition of integration, during this discussion it was recognized that the lack of commonly accepted definition of integration was due to the fact that the very term ‘integration’ has been sys-

tematically equipped with many different meanings [Lazari-Pawłowska, 1975, p. 32]. To tackle with such a polysemy, some initial conceptual distinctions and partial findings were offered:

“there are many misunderstandings in the understanding integration as such. First of all, it should be underlined that processes of bringing together various disciplines *need not be related to their merging* (pol. *scalanie*) that is gradual disappearance of some of them; on the contrary – by *participating in integration processes* particular branches of research can gain conditions for a fuller development” [Topolski, 1965, p. 6; emphasis added; authors’ translation];

“Let us start with a question – what the integration of science is. This term does not mean *merging* various disciplines but rather aiming at *connecting* (pol. *wiązanie*) them, while keeping their autonomy” [Maisel, 1973, p. 80; emphasis added; authors’ translation];

“Organic integration versus external integration. The second element of the (...) opposition can be characterised relatively easily. External, „mechanical” integration, i.e. – to use a somewhat humorous name – „bookbinder” integration takes place when one *juxtaposes* (pol. *zestawiać ze sobą*) mechanically, for instance in the frame of a monograph, research results from various disciplines concerning – *prima facie* – the same subject-matter” [Kmita, 1975, pp. 8-9; emphasis added; authors’ translation].

The above-mentioned quotes allow us to identify keywords which we will use to explicate the meaning of the term ‘integration’:

- juxtaposition (pol. *zestawienie*);
- connection (pol. *powiązanie*);
- merging (pol. *scalanie*).

In the light of the foregoing clarifications, integration is about connecting findings of various scientific disciplines; it is not only a juxtaposition and it is not yet a merger. Thus, in the first specification integration is neither about juxtaposition nor about merging. It is more than juxtaposition but less than merging. In this sense these discussions and their partial conclusions and suggestions remain valid and maybe they are even more valid today than then. Let us take the following example of clarification of integration from more recent literature:

“Integration thus means *more than simple juxtaposition* of efforts in the same location, and more than relationships that consist solely of market relations. Rather, it includes

coordinated efforts to pose and solve new research problems that can redefine specialty boundaries. (...) Integration of specialties is *almost never complete*, in the sense of a full epistemic and organizational *merger of two specialties*. Instead, both epistemic and organizational integration are *partial*; that is, lines of research in two different specialties conduct their work using common concerns, approaches, or styles, *without merging* or abandoning their other concerns” [Gerson, 2013, p. 516; emphasis added].

Given the above findings, in the first place one should differentiate between integration and juxtaposition. Even though we do not yet have at our disposal a commonly accepted definition of integration, we do have some baseline common vocabulary to discuss this notion and its cognates, such as interdisciplinarity or multidisciplinary [Holbrook, 2013, p. 1866]. By referring to this vocabulary we can state that there is a minor discord among the commentators involved regarding the latter of the two concepts. Multidisciplinarity is in fact a juxtaposition of findings from two or more disciplines regarding a given problem [e.g. Miller, 1982; Richards, 1996; Klein, 2010]. A multidisciplinary juxtaposition is not about an integrative connection, thus some slightly ironic names, such as ‘bookbinder integration’ or ‘mechanical integration’ appear. They are meant to point out that in fact it is not integration, or else that it is some pseudo-integration. Therefore, multidisciplinary as such is not the subject of our investigations, although we do refer to it while contrasting multidisciplinary, unification and integration in terms of discipline-specific world-views.

The issue looks completely different in the case of interdisciplinarity: there are clear-cut tendencies “to glue” interdisciplinarity to integration and that interdisciplinarity presupposes or implies integration. Such tendencies are predominant and widespread to the point that, as J. Britt Holbrook put it, “to question whether ID [interdisciplinarity] involves integration is almost heretical” [Holbrook, 2013, p. 1877]. In the following sections we will try to show that it can be legitimately questioned. It should first be noted that scopes of terms ‘interdisciplinarity’ and ‘integration’ intersect in a non-empty way. Another issue is to disentangle relations between the concepts of integration and unification, because contemporary discussions about integration of sciences are still burdened with unificatory intentions. It can be illustrated by interchangeable use of terms ‘integration’ and ‘unification’ or by excessive use

of the expression ‘integration or unification’ [e.g. Grantham, 2004; Kaplan, 2017; Driscoll, 2018].

1.2. Difficulties with levels of integration

As regards the second question – the levels of integration, the main emphasis in the discussion that took place in Poland in the second half of the XXth century was put on distinguishing three levels of integration:

- *epistemic-methodological* – that relates to possible mutual impact of at least two different disciplinary systems of knowledge;
- *practical-institutional* – that relates to possible interaction of at least two types of specialists or groups of specialists with different disciplinary background;
- *ideational* – that relates to possible interplay between at least two types of so-called social methodological consciousness that consists, among others, in different discipline-specific world-views [Łojewska, 1976, pp. 57-61].

Such a proposal finds support in a growing number of works from recent philosophical and methodological literature on integration of sciences. Let us recall here only one case that make use of the concept of levels of analysis. In the first the concept in question has been already clearly explicated and systematically utilized [Mitchell et al., 1997, pp. 103-125; Mitchell, 2009]. According to this proposal, there is no basic level of analysis to which other can be reduced. However, it does not imply that all levels are isolated from one another. The question is rather how to carefully identify connections between them, remembering at the same time not to analytically confuse them.

Let us now go back to the first level of integration – the epistemic one. It relates to possible mutual impact of at least two different disciplinary systems of knowledge. During the discussion in Poland the issue of exploratory potential carried by integration trials was signaled. Let us illustrate this issue by recalling selected quotations from the discussion:

“We mean here the form of integration of science, which is about(...) *connecting (and not merely mechanically juxtaposing) results* of research from various disciplines, ex-

ceeding however beyond the task of suggesting ideas” [Topolski, 1965, pp. 7-8; emphasis added; authors’ translation];

“There is an expectation that all humanities (...) should take into account *synchronic connections* between particular forms of social consciousness (...) It therefore imposes (...) the need to *integrate research* on the methodological basis which *respects* – what is especially worth underlining – *a relative autonomy of each of the disciplines*” [Kmita, 1973a, pp. 79-80; emphasis added; authors’ translation].

These remarks are supported by contemporary scholars working on the idea of integration of sciences. Let us take the following example of clarification of the exploratory potential of integration from the literature:

“the linkage between the fields was *discovered only after a critical reconceptualization* occurred in each field separately (...) The integration of research (...) involved identifying relationships between entities that had been studied independently that allowed researchers in each field to *learn new information* about the entities that were of primary interest to them” [Bechtel, 1986a, pp. 45-46; emphasis added].

In a sense this discussions and their partial conclusions and suggestions remain valid and maybe they are even more valid today than then. In recent discussions it is indicated that integration can have an explanatory goal although it is not a necessary condition. Its heuristic goal is more and more often underlined, i.e. that integration in practice is not directly oriented towards providing explanations [Grantham, 2004, p. 144]. Integration is often guided by exploratory questions, for instance of ‘what if’ type, which do not set a narrowly determined scope of research and therefore play an important integrating function. Exploratory questions are open-ended and they tend to sustain and help integrate research activities. Integration in the exploratory use “can produce novel insights into [...] phenomena, stimulate new fields of research, and generally reconfigure expectations of scientific practice” [O’Malley, Soyer, 2012, p. 58]. Novel insights into research phenomena can take the shape of answers to novel questions, models, hypotheses or new research methods. It has to be remembered though that integration is not a goal of science *per se*. Quest for integrated research perspective “can be a useful heuristic, but it should be viewed as a heuristic, not as *the* aim of science” [Waters, 2017, p. 104, emphasis in original]. Heuristic quest for novel insights manifests especially

in affecting the shape of theoretical models and the conceptualization of an object of research. In this respect successive integration “might lead to the transformation, or reshaping, of one model or *conceptualization of the system of interest* by another” [Plutynski, 2013, p. 470; emphasis added]. Thus a successful integration, when considered on the level of the system of scientific knowledge, may provide new data, new or refined modeling strategies, as well as new or refined conceptualizations of an object of research. It means that integration carries some exploratory potential.

This is how we arrived at the second level of integration – practical-institutional. It relates to possible interaction of at least two types of specialists or groups of specialists with different disciplinary background. During the discussion in Poland the question of social and institutional arrangements, as distinct from theoretical and methodological conditions, that make possible integration of two (or more) kinds of research was raised [Kmita, 1975, p. 8]. Let us illustrate this issue by recalling selected quotations from the discussion:

“*Institutional integration is an important aspect of integrating scientific research because cooperation of large teams of specialists requires such an organizational structure of research units which would stimulate research ventures and secure the process of their realization*” [Łojewska, 1976, p. 57-58; emphasis added; authors’ translation];
 “*integration of scientific research from the organizational side implies that researchers from various specialties take up joint research. This way of understanding integration can be described simply as cooperation which can take the form of a) a team research using the same (or similar) method for various problems b) a multi-faceted investigations of one problem using different ways or c) a joint research in which different approaches intersect*” [Maisel, 1973, p. 81; emphasis added; authors’ translation];
 “*integration of sciences is related to the most important cognitive, methodological and organizational tasks of science. In this last domain one should equally strictly differentiate between the autonomy of cognitive processes and organizational matters as well as properly defined practical postulates*” [Czartoryski, 1967, p. 13; emphasis added; authors’ translation].

Distinguishing this level may be considered hardly insightful and the sociology of science or studies on technology and science address this question in a detailed way. But still, investigating it in the context of integration of sciences and focusing on relations to other levels may provide new insights. There are some works from the philosophical and sociological literature that

clearly distinguish this level of integration from the epistemic one. According to Elihu M. Gerson, there are two kinds of integration – epistemic and organizational. The latter “consists of the ways that the work of laboratories, associations, universities, sponsors, and other organizations mesh and change in forming the system of research institutions” [Gerson, 2013, p. 515]. As there are no simple and clear-cut relationship between these two kinds of integration, what is needed is to identify various intersection in which the epistemic integration interacts with the organizational one. What is more, as Wim J. van der Steen put it, the question is not only about the intersection of the epistemic and practical kinds of integration. According to him, one has to be aware that materialization of only the institutional conditions (e.g. exchange, cooperation, publications) without fulfilling the theoretical-methodological ones is not enough for the successful integration. To avoid the accusation of pseudo-integration both kinds of conditions have to be met [van der Steen, 1993b, p. 349].

As it has been already stated, distinguishing the epistemic and practical levels of analysis of integration of science is quite common in recent literature. What distinguishes, however, the discussion about integration that took place in Poland in the second half of the XXth century was the identification of the third level of analysis of integration. This level relates to possible interplay between at least two kinds of social methodological consciousness that consists, among others, in different discipline-specific world-views. Let us begin the investigation into this level of analysis by shortly clarifying the idea of methodological consciousness. This idea was of major importance to the Poznań Methodological School¹. As Jerzy Topolski addressed the question to the audience of practicing historians: “[m]ethodological principles, together with the ideal of science and the view of the world and Man (...) constitute what is called methodological consciousness” [Topolski, 1985, p. 149]. Methodological

¹ The Poznań Methodological School is an inherent part of the Polish (and not only) intellectual landscape. It was one of the more unique and creative philosophic-methodological *Denkkollektiv* in the post-war Europe. It was founded in the mid-60s of the XX century by such scholars as Jerzy Topolski (1928-1998), Jerzy Kmita (1931-2012) and Leszek Nowak (1943-2009). For a detailed discussion about the meta-methodological characteristics of the Poznań Methodological School, see: [Boruszewski, Nowak-Posadzy, 2017].

consciousness contains, apart from the cognitive norms and methodological directives, also the researcher's world-view (*Weltanschauung*). All these components are objects of methodological reconstruction. The structure of researchers' methodological consciousness consists of five major components:

- cognitive norms;
- methodological directives;
- meta-scientific attitudes concerning aim of scientific cognition;
- world-view (*Weltanschauung*);
- vision of Man.

This was an interesting attempt to conceptualize the third level of integration in terms of methodological consciousness with special focus on world-view as carried by different disciplines (specialties) engaging the integration trials. As the concept of world-view is not new in discussions from the field of philosophy of science [cf. Mormann, 2018; Rouse, 2015; Aerts, Van Belle, van der Veken, 1999; Aerts, Apostel, De Moor, Hellemans, Maex, Van Belle, Van der Veken, 1994; Cobern, 1991], let us now explicate its meaning and present the way in which it was utilized in the discussion about integration. By the world-view it was meant a system of beliefs which determines both (i) a set of superior positive values (i.e. ultimate values that the person espouses) and (ii) types of connections between those superior positive values and practical values which are either means to achieve those superior positive values, or to prevent their achievement, or are neutral with respect to their achievement [Kmita, 1991, p. 168; Kmita, 1979, p. 299]. From this perspective a science is not only one of the most important factors shaping the world-view belief system, but also its own internal development and research activities are in a sense influenced by a world-view [Łojewska, 1986, p. 211]. This remarks allow us to differentiate respectively between scientific world-view (pol. *światopogląd naukowy*) and world-view in science (pol. *światopogląd w nauce*). Regarding the former, a world-view is scientific when (i) a scientific knowledge determines ways of materializing the superior positive values and (ii) a scientific knowledge guarantees the possibility of doing this [Kmita, 1979, p. 301].

For the purpose of the article we will focus here only on the very concept of world-view in science which needs, however, some further clarification.

As we investigate here the type of world-views that may interplay in integration trials we have to differentiate between: (i) a world-view behind a science that is presupposed by science (or a given discipline) a general image of the world and (ii) a scientist's world-view which can be attributed to a particular researcher. The difference between these two is not irrelevant: "in the first case it is about such a world-view which will have methodological and theoretical implications and will thus influence the methods applied and conclusions formulated; in the second case, there can be world-views which do not have the above-mentioned implications and therefore cannot be treated as components of the general world-view accepted by science" [Łojewska, 1986, p. 216]. There appear the question of the relation of this level to the epistemic one. It has to be carefully stated that there seems to be no direct and unambiguous connection between results of scientific research and explicitly accepted or implicitly respected system of world-view beliefs [Ibidem, p. 212].

It was recognized in the discussion in question that the important problem in the disciplinary division of labour does not stem from any excessive specialization occurring in sciences, but rather from an insufficient degree of methodological (self)consciousness [Ziemiński, 1966, p. 3; Kula, 1963, pp. 80-81]. A general issue hardly any participants of the debate in Poland contested was that if one take integration seriously, then the dissemination of "a methodological culture" across disciplines was needed for any successful integration trial [Kmita, 1975; Kmita, 1973a; Kmita, 1973b; Lazari-Pawłowska, 1967, p. 34; Łojewska, 1976; Łubnicki, 1967, p. 20]. Some discrepancies appeared in the debate when it comes to the question of consequences of the interplay between two kinds of methodological consciousness behind disciplines engaged in the integration trial to the discipline-specific world-views. Once more, let us illustrate this issue by recalling selected quotations from the discussion:

"Investigating the domain of culture as constituted by the science via methodology plays a particularly *important role in shaping a coherent, rational world-view (...), scientific image of the world.*" [Kmita; 1973a, p. 75; emphasis added; authors' translation]; "The increase of mutual connections between particular disciplines (...) proves useful for the development of science in at least two aspects. First of all, it can *enrich* research methods of particular sciences and secondly, it can increase the scope of questions formulated within a given science via inspiring uses of results of one science for others

(...) Such cooperation aims at *enriching particular sciences* rather than blur differences between them.” [Topolski; 1965, p. 3; emphasis added; authors’ translation];
 “When specialization was not so advanced, theories used to be very general and not very precise. However, they provided a *coherent world-view*. Today a mosaic of thousands of specialist news cannot always be formed into one coherent world-view which determines our specific place in the world and in the society, as well as indicates us global goals in life. *The longing for all-encompassing cognition* constitutes one of additional causes for quandaries one would like to eliminate by integrating sciences.” [Koj, 1975, p. 82; emphasis added; authors’ translation].

On the grounds of the above suggestions and some more recent findings in the following table we illustrate the differences between three philosophical agendas in terms of consequences of the interplay of different specialties to the discipline-specific world-view:

Table 1: Integration and discipline-specific world views.

Philosophical agenda	Kind of relation between research results	Consequences to the discipline-specific world-view
multidisciplinarity	juxtaposing	inviolability
unification	merging	reconciliation
integration	connecting	enrichment

This table needs some comments. The presupposition is that each scientific discipline has its own specific world-view [Miller, 1982; Newell, Green, 1982]. Depending on the philosophical agenda taken and respective kind of relation between interplaying specialties, one can draw at least three possibilities regarding consequences to the discipline-specific world-views. Please notice that we are talking here about consequences and not aims. It is so because discipline-specific world-views are to a large degree rather of tacit (or implicit) nature. Let us now clarify these possibilities:

- multidisciplinary juxtaposing of research findings from at least two specialties tends to be accompanied by the inviolability of initial discipline-specific world-views of contributing specialties; is means that multidisciplinary trial is acknowledged to leave initial discipline-specific world-views invariant (intact);

Such a view is supported by some recent works which argue that “*multidisciplinary research* involves low levels of collaboration, does not challenge the structure or functioning of academic communities or hierarchies and *does not lead to any changes in the worldviews* of the researchers themselves” [Lyll, Bruce, Tait, Meagher 2011, p. 13; emphasis added];

- unificatory merging of research findings from at least two specialties tends to be accompanied by the reconciliation of initial discipline-specific world-views of contributing specialties; it means that unificatory trial is acknowledged to arrive at all-encompassing world-view;

However, a difficulty arises for an unification trial to be successful once world-views behind interacting disciplines are radically different (fully incomparable or uninterpretable). As Donald G. Richards put it, “[s]ynthesis, or interdisciplinary *integration* [in its strong or literal sense] as it is often otherwise expressed, may in some contexts be *infeasible due to irreconcilable differences* in epistemological, or value, terms among the world-views of the contributing disciplines, or the variants of these disciplines” [Richards, 1996, p. 126; emphasis added]. In the situation where “the likelihood of a reconciliation of these divergent world-views is remote, or impossible, those who place primary importance on achieving an integrated view of things *will be forced into* adopting one of these fundamental perspectives and excluding the others” [Richards, 1996, p. 123].

- integrative connecting of research findings from at least two specialties tends to be accompanied by the ideal of enrichment of initial discipline-specific world-views of contributing specialties; it means that integrative trial is acknowledged to exceed (transcend), but not beyond necessity, the narrow scope of discipline-specific world-views of contributing specialties.

Such a view is supported by some recent works which argue that “[i]t is clear, then, that the two can yield a “*synthesis*” *only in a loose* [a weak, or instrumental], “enriched-view-of-the-world” sense. There would seem to be unbreachable epistemological barriers preventing genuine integration in such cases. This does not, however, necessarily de-legitimize this type of interdisciplinary cooperation. *An enriched view of the world, or of a particular issue, is a noble academic objective*” [Richards, 1996, p. 122; emphasis added]. In other words, in integration trials there is always a discipline-specific world-view for

which some 'parts' of other discipline-specific world-view are incomparable or uninterpretable [Kmita, 2000, p. 202]. However, it does not exclude the possibility of achieving an enriched world-view; only the possibility of both full reconciliation and invariance of different world-views are here denied.

Before we go to the preliminary analysis of the problem of the structure of integration, two additional remarks have to be made. Firstly, apart from the main question of the consequences of the interaction of different specialties to the discipline-specific world-views, there arises similar problem whether discipline-specific world-views behind interacting specialties may counteract successful trials. This question has been already addressed within the philosophical literature. It is sufficient here to state, as Lele and Norgaard recently put it, that: "[t]he first kind of (...) barrier (difference in values) is neither directly discernible nor easily separated from the second (*difference in theories, models, or worldviews*)" [Lele, Norgaard, 2005, p. 968]. Our second remark concerns the conspicuous trend toward entanglement of the concept of integration in nostalgic pretense to reconciliation of mutually incoherent disciplinary insights [Newell, Green, 1982] or to re-integration of social sciences which in XIX century were united [Szell, Shujiro, 1993]. Firstly, a successful integration trial does not require complete inclusiveness, sometimes it even requires some exclusiveness and it does not assume a lasting state of unity – it can be merely tentative, contingent, occasionally durable and longer-term it can be undurable. Secondly, a successful integration does not require a complete convergence of respective world-views behind the specialized disciplines engaged in integration trial. In other words, due to the fact that the discipline-specific world-views are at best only partially comparable or interpretable, what is sufficient for integration is only to transcend the narrow scope of discipline-specific world-views to achieve a richness of insight without longing for reconciliation.

1.3. Exposition of the structure of integration

As regards the third basic question – the structure of integration, what is important here is the problem of property attributed to the relation of integration. In contemporary discussions concerning the integration of sciences

it is strongly emphasized that integrating exhibits the mutual nature which suggests that the relation of integration is a symmetric one. As it has been already pointed out, such a mutuality is equally discernible on the epistemic level of integration where connecting research findings from various disciplines is followed by reciprocal impact, as well as on the ideational level where enriching of discipline-specific world-views encompasses each side engaged in integration trial. Let us now take the following examples from recent literature to support the claim that the relation of integration is symmetric:

“Partial integration among specialties is embodied in a system of alliances that span multiple specialties. Partial integration depends on several different kinds of stable coordinative arrangements that join specialties without reducing their epistemic integrity. These include, for example, the use of model data systems; conventions for theorizing and for collecting, analyzing, and visualizing data; and the encumbering of one line of work by another as an “obligatory point of passage” or, more simply, obligation (...) *Such coordinative arrangements are integrative in the sense that two or more lines of work become mutually dependent upon one another for success*” [Gerson, 2013, p. 518; emphasis added];

“In many cases, the commitments (“background assumptions”) of one of the integrating lines do not coincide with those of the other, and this typically necessitates *mutual adjustments in order to make the intersection work effectively*” [Ibidem, p. 516; emphasis added].

In light of the above considerations, the property of symmetry, suggested by usage of the expressions ‘mutually dependent’ and ‘mutual adjustments’, can be legitimately attributed to the relation of integration. Therefore we conceptualize integration as a mutual and not one-sided relation between at least two parts. However, during the discussion that took place in Poland in the second half of the XX century and was continued in the beginnings of XXI century the question of the symmetric nature of the relation of integration was not explicitly thematized and it was rather taken as a default. The claim that the relation of integration is a symmetric one means that if x is being integrated with y , then y is being integrated with x . We thus have two integrated sides. However, this question generates a basic problem whether the property of symmetry can be secured when the relation of integration is conceptualized as a binary relation. In classical discussions about this issue, when the problem of reduction was addressed, integrating was considered as such a binary relation but one of

the disciplines involved in the integration trial was given a privileged status. Therefore one of the sides of integration provided means for actually carrying out the integration. This, however, implies that in the last instance the relation in question is not mutual but one-sided. When integration is conceptualized as a binary relation, the property of symmetry is significantly violated: x is being integrated with y , but by means supplied by either x or y . Moreover, as the second quotation suggests, the question occurs what is the basis for such a mutual adjustment. Thus two issues need to be distinguished and discussed here:

- the question of the substantial parts being integrated: *what is being integrated?*
- the question of what facilitates the integration: *how is it integrated, by means of what is it integrated?*

Let us now turn to the Poznań Methodological School, whose some leading members (Jerzy Topolski, Jerzy Kmita, Anna Pałubicka) were actively engaged in the discussion about integration. The numerous works by this School can be informally classified into two types: “the canonical” (or “core”)² ones that are the results of systematic research and “the apocryphal” (or “peripheral”) ones that are rather the by-products of many intellectual exchanges. Given such a distinction, the contributions of the members of the Poznań Methodological School to the discussion about the idea of the integration of sciences should be labelled as “the apocryphal” ones. There are at least two successful cases when this “peripheral” idea was put into research practice: the project by Jerzy Topolski to integrate economic history and economic theory [Topolski, 1964, 1991, 2009] and the project of integration of archeology and ethnology [Pałubicka, 1979; Kowalski 1997]. In the 80. and 90. of the XX century the discussion about integration of sciences in Poland weakened and the interest in applicatory works diminished. However, the idea of integration reappeared in the Poznanian circle in the beginning of XXI century under the label of “integrated humanities.” We will go back to the issue of successful integration of archeology and ethnology via methodology of humanities in one of the following sections of this paper.

² By the “canonical” works we mean the works of Jerzy Topolski on methodology of history and theory of non-source-based historical knowledge [Topolski, 1976], Leszek Nowak on the idealizational theory of science [Nowak, 1980] and Jerzy Kmita on historical epistemology [Kmita, 1988] and socio-regulative theory of culture [Kmita, 1996].

It was the Poznań Methodological School that provided some suggestions and partial answers useful in addressing in more detail the two questions enumerated above. The members of this School were aware that there has to be some basis for the mutual adjustment in integration trials and thus focused mostly on the second question. The answer they provide to the question of how at least two disciplines are integrated and by means of what, is that methodology of science can play a facilitating role in such a trial. This is how the discipline of general methodology of sciences entered the scheme of integration. Let us illustrate this issue by recalling selected quotations from the discussion:

“*General methodology of science can give a lot in the area of integration of science since in recent years it has been increasingly seeking for contact with the so-called special sciences thus strengthening their inclination toward methodological reflection in their respective domains*” [Topolski, 1965, p. 4; emphasis added; authors’ translation]; “regarding (...) the aspect (...) which encompasses theoretical-methodological conditions of the process of integration of science, philosophy, and in particular the branch called *methodology of science, can play a special role* in the analysis of this aspect (...) I am stating here only possibility, not the factual situation” [Kmita, 1975, p. 8; emphasis added; authors’ translation]; “methodology as *means of integrating* scientific research represented by particular humanistic specialties” [Kmita, 1973a, p. 76; emphasis in original].

While the methodology does not enter the scheme of integration as a substantial part, on equal basis with the disciplines being integrated, still its inclusion in the integration trial suggests integration is a ternary relation. In our view, there are three parts of integration: the sides being integrated (x and y) and the integrative side (the integrator, z) *via* which the integration of x and y is taking place, x is being integrated with y *via* z^3 . However, in the classical, reductionist account of integration this ternary relation collapses to become a binary one, because one of the integrated sides and integrative side are identical, $y = z$. If we take an anti-reductionist account of integration, a symmetry takes place: if x is being integrated with y *via* z , y is being integrated with x *via* z . The integration of x and y is symmetric relative to the

³ We leave open here the question whether integration of x with y by starting from x and *via* z , will result in the same effect as if we integrated y with x starting from y and *via* z .

integrator z . Therefore, a symmetric anti-reductionist account of integration assumes the existence of two symmetrical integrated sides and an integrative side which differs from them. In that sense, the sides undergoing integration are not privileged, while the integrative side is not a basic discipline, it is a connective one. Therefore, we propose the general methodology of science as a candidate for the integrator (integrative discipline).

Let us now consider what makes general methodology a discipline capable of actively participating in integration trials and successfully playing the role of an integrator. As the Poznań Methodological School did not provide any clear-cut answers in this respect, we make an attempt at filling this gap by using some recent basic findings of Nicky Priaulx and Martin Weinel. The authors offer an “agenda for addressing the kind of extra-disciplinary knowledge that might help to stimulate, enhance and initiate cross-disciplinary collaboration” [Priaulx, Weinel, 2018, p. 15]. They distinguish two kinds of knowledge: ‘of-knowledge’ which implies a detailed understanding of a given field acquired in the course of collaboration with researchers from other fields and ‘about-knowledge’ which implies some basic familiarity with information about other fields and issues crucial to them. The latter is not knowledge of connections between different fields or disciplines, but connective knowledge “that makes connections possible” [Priaulx, Weinel, 2018, p. 15]. Although the authors do not explicitly point to methodology as a domain of “about-knowledge”, it appears that general methodology of science can meet expectations of being such a domain provided it is viewed in a non-traditional way, i.e. neither as a descriptive discipline (“what are the connections between disciplines in integration trials?”) nor as a normative one (“what should be the connections between disciplines to make integration trial successful?”). Instead, one could ask “what might the connections between disciplines be?”, focusing on the programming role of methodology, even though with “no guarantee that such connections will be made, or that if made, that they will be successful” [Priaulx, Weinel, 2018, p. 15]. ‘About-knowledge’ enhances then the awareness of potential connections between different fields⁴.

⁴ In other words, such awareness consists in researchers’ attitudes towards their own research specialization and the place of the latter in the whole system of science, as well as attitudes towards other domains of knowledge and of culture [Łojewska, 1976, p. 58].

To sum up our preliminaries, critical analysis of the discussion about the definition, levels and structure of integration of sciences enables us to clarify our account on integration in the following way:

- *integration is about connecting research findings* – it is more than juxtaposition but less than merging;
- *integration is about enriching discipline-specific world-views* – it transcends the narrow discipline-specific world-views but not beyond necessity, being thus less than reconciliation;
- *integration is a trinary relation* – it involves at least two integrated sides and one integrative (connective) played by the general methodology of sciences.

It is now clear enough that some partial conclusions and suggestions that were generated during the discussion about the definition, levels and structure of integration in the second half of the XX century in Poland remain still valid. However, as the aim of this paper is both to engage the contemporary discussion about the nature of relations between different scientific disciplines, as well as to disentangle the concept of integration of sciences from superstructures of rival proposals (unification and interdisciplinarity), these partial conclusions and suggestions need to be refined and supplemented. On the one hand, the refinement consists in introducing and adapting the concept of connective knowledge, as well as localizing it as belonging to the domain of the methodology of humanities. On the other hand, the supplementation arises from the need to update the Poznań Methodological School's account on integration and to tailor it to the context of scientific practices that to a large extent are based on the method of modelling. As there is a multiplicity of types of models and their functions in scientific investigations, we argue that integration of sciences may be conducive to a certain type of modelling, namely the exploratory one. Finally, our investigations aim also at meeting some recent postulate raised by the community of philosophers of social sciences that “[i]ntegration is another popular term desperately in need of analysis” [Mäki, 2016, p. 338].

3. Disentanglement of the concept of integration from unification and interdisciplinarity

3.1. Integration / unification

We have already said that in contemporary discussions terms ‘integration’ and ‘unification’ are often used interchangeably or the terms or their derivatives are too often put together with an ‘or.’ Undoubtedly, it is not conducive for the clarity of discussion on problems of integration of sciences. However, one can point to some non-trivial examples of differentiating between these concepts. Some of them are contextual and rather vague. They are in a way a by-product of considerations which are not directly oriented to these topics although they are related to them. For instance, Jaakko Hintikka and Ilpo Halonen by questioning the relation between unification and explanation and by making reference to the example of the special theory of relativity, noted that this theory “was an attempt to integrate the laws of electrodynamics with the laws of mechanics, in the first place with the laws of motion. Einstein’s theory is not an explanation of either set of laws; it is a synthesis of the two. (...) Historically speaking, it nevertheless is somewhat dubious to call that integration process unification” [Halonen, Hintikka, 1999, p. 38]. Also in contemporary broad discussions concerning the reduction of psychology to neuroscience, a similar problem is noted: “psychology and neuroscience are and should be connected and perhaps integrated, but not unified” [Schouten, Looren de Jong, 2007, p. 21]. What is more, a growing number of scholars distinguish these concepts explicitly. Instead of using the misleading phrase ‘unification or integration’ we get the following:

- “integration without unification” [Mitchell, Dietrich, 2006];
- “unification beyond integration” [Marquis, Wibler, 2008];
- “unification versus integration” [Miłkowski, 2016].

The most important distinctions that have been pointed out include:

- globality / locality [Bechtel, 1993, pp. 277-278; Wylie, 1999, p. 300; Mitchell, 2003, p. 190; Brigandt, 2010, pp. 306-307];
- non-exclusionarity / exclusionarity [van der Steen, 1993, p. 273; Marquis, Wibler, 2008, p. 351; O’Malley, 2013, p. 559; Breitenbach, Choi, 2017, p. 397];

- simplicity / complexity [Mitchell, 2003, p. 190; Brigandt, 2010, pp. 306-307; Gerson, 2013, p. 517; Miłkowski, 2016, p. 16].

The first option, integration without unification, is first of all related with the criterion of globality / locality. There can be successful integration trials without general theoretical frameworks. In this sense general theoretical frameworks are not required for integration. It is particularly visible in sciences in which fundamental theories are not available. We can then paraphrase integration without unification option in the way that unification is not a *sine qua non* condition of integration, which, as a result, allows us to make integration trials but not unification trials. What is more, as Wim van der Steen noted: „ideal of unification as such is not *sufficient* as a warrant for integrationism” [van der Steen, 1990, p. 34; emphasis in original]. We then get a very informative statement on the relations between unification and integration:

Unification is neither a necessary nor sufficient condition of integration.

The second option, unification beyond integration, is typical for proponents of unification, who are often opponents of integration. One of them is for instance David Trafimov, who discusses the issues which are of interest for us in psychology. He notices that integration tendencies in psychology do occur although they insufficiently take up unification efforts: „integration falls well short of unification. Psychologists should unify but, at best, they integrate” [Trafimov, 2012, p. 702]. Thus, for proponents of unification, integration appear to be excessively eclectic and they consider it results not in a unified whole but in heaps. In order to move towards a holistic approach, one needs to go beyond integration. Therefore, the unification beyond integration option is tightly related to the criterion of exclusionarity / non-exclusionarity, because unification understood in such a way is a “radically nonexclusionary approach” [Marquis, Wibler, 2008 p. 351]. The non-exclusionarity criterion is particularly strongly exposed in contemporary unification accounts, which are intended to be in line with the stance of pluralism in science. The claim that the goal of unification is the pursuit of the final state of unified science is rejected, while unification means a common, continuous cooperation on given problems. This creates room for the cognitive value of pluralism – when pluralism is linked to a joint,

collective engagement, thus allowing for overcoming cognitive limitations of particular individuals, it contributes to cognitive progress. A considerable consequence of such an approach is that an important limitation can be established:

“Unified pluralism embraces a wide range of pluralisms but imposes one important, governing limitation: it rules out ways of proceeding that undermine the continued cooperation and collaboration necessary to make a virtue out of pluralism. Unified pluralism thus *excludes only but all exclusionary projects*” [Breitenbach, Choi 2017, p. 397; emphasis added].

Proponents of unified pluralism consider as an exclusionary approach for instance treating evidence against a given concept as evidence in favor of it. It is characteristic of, for instance, the so-called conspiracy theories. The notion of unification, as it is stated in the above-mentioned extract, *excludes only but all exclusionary projects*. In this respect integration opposed to unification is less inclusive or at least integration can in particular cases exclude more than just exclusionary projects. As Maureen O’Malley put it: “integration does not always mean greater inclusiveness of data, methods or explanation [...]. *Integration may involve considerable exclusiveness* to achieve the desired integrative aim” [O’Malley, 2013, p. 559; emphasis added]. Of course, one should not understand it in a way that exclusivity is a necessary condition of integration but rather than:

Non-exclusionarity is not a necessary condition of integration.

The option unification versus integration strongly opposes two convergence tendencies. In this sense, we can treat it as an exclusive disjunction. It is particularly visible when we take into account the simplicity / complexity opposition. In this aspect integration is related to complicating, gradually increasing the complexity of the object of research and it is opposed to simplification and idealization, which are typically linked to unification. Instead of providing simplification, we then recognize connections between various parameters and this way we increase the complexity of the object of research. The following statements in this respect are symptomatic:

“Integrative models would have to be very complex” [van der Steen, 1990, p. 29];

“Without (...) a unified theoretical framework (...) one is left with a piecemeal approach to integration. This view recognizes (...) the nonindependence of at least some of the contributions to complex combinations” [Mitchell, 2003, p. 207];
“partial integration connects specialties in complex and occasionally durable ways without leading to unification of them” [Gerson, 2013, p. 517];
“greater integration leading away from simplicity toward greater complexity” [Plutynski, 2013, p. 470];
“the results of integration need not be simple, beautiful, or general, (...) [T]he resulting scientific representation may be highly redundant, violate parsimony considerations, and so forth” [Miłkowski, 2016, pp. 18-19].

Taking into account the above statements, increasing the simplicity reduces redundancy. In this respect, Marcin Miłkowski warns that reducing redundancy always comes at a cost. One should pay attention to the fact that increasing simplicity beyond necessity (as the Occam’s razor principle puts it) can lead to undesired consequences:

“first, it may make the representation more susceptible to error (as redundancy helps error detection); second, it requires more computational effort to handle non-redundant representation. For this reason, models of mechanisms should be as simple and parsimonious *only* as far as it aids their uses” [Miłkowski, 2016, p. 26; emphasis in original].

Unification, contrary to integration, leads to formulating general, simple and global theoretical approaches of the investigated phenomena. Integration, on the other hand, is focused on tackling more local problems, taking into account their complexity – their multi-aspect character and plurality of relations. Unification and integration are therefore guided by different aims. One could thus risk to say that:

Simplicity and integration are inversely correlated with one another.

2.2. Integration / interdisciplinarity

In many discussions which took place in 70-90. of the XXth century interdisciplinarity was strictly associated with integration. It was a common conviction that integration is the necessary condition for the success of inter-

disciplinary projects. The relation between integration and interdisciplinarity is however questioned. William Bechtel pointed out that if researchers from various disciplines exchange information and share ideas but remain closely attached to their own disciplines, we then have interdisciplinarity but without integration [Bechtel, 1993, p. 295]. What is more, if the exchange does not concern some uncharted territory which can be explored thanks to cooperation and working out new approaches, methods or research instruments, then we have interdisciplinary clusters but not integration of sciences [Bechtel, Hamilton, 2007, p. 405]. Although, as we have signaled in the introduction to this article, while questioning the relation between integration and interdisciplinarity could be viewed as a heresy, it contributes to the clarity of the discussion and makes possible to better conceptualization of the former. One should not infer that the approach already considered as traditional, that is defining interdisciplinarity via integration becomes entirely questioned. It just becomes one of the three options we have in this context:

- “interdisciplinary integration” [Klein, 2010];
- “(successful) interdisciplinarity without integration” [Grüne-Yanoff, 2016];
- “integration without (much) interdisciplinarity” [Brigandt, 2013].

Conceptual oppositions, which serve to explicate the difference between integration and interdisciplinarity are then as follows:

- distal / proximal [Karlqvist, 1999, p. 382];
- loose / strong links [van der Steen, 1990, p. 34].

When it comes to the first option – interdisciplinary integration, it is considered a classical one, because this is how interdisciplinarity is the most often being distinguished from multidisciplinary. Successful interdisciplinary integrations, which have resulted in the emergence of new scientific disciplines, also fit into this area. Classical example in this respect is biochemistry, which should not be treated as applied organic chemistry but as a discipline with its own domain [Bechtel 1986b, pp. 97-98].

When it comes to the second option – (successful) interdisciplinarity without integration, the relation between integration and interdisciplinarity was firmly questioned by Wim J. van der Steen, who in a way denounced certain interdisciplinary projects as pseudo-integration. He qualified as such the extension of sociobiology to humanities, biological theories of culture and

some research from the area of biological psychiatry. The key to denounce the pseudo-integrational character is the excessive use of overgeneral, “diluted,” concepts and failing to see the distinctive conceptual character of objects of research in various disciplines. An example of this first flaw are overgeneralizations of concepts from the area of evolutionary biology (for instance, adaptation), which is how they become uninformative. An example of the second pseudo-integration is the failure to notice distinct conceptualizations of culture (biology versus anthropology) or altruism (sociobiology versus ethics). We then have to do with only a superficial and illusory similarity of the objects of research. The conclusions the author draws here are clear:

„The use of overgeneral concepts tends to suggest that there is theoretical coherence, within or among disciplines, where none in fact exists” [van der Steen, 1990, pp. 24-25; emphasis in original];
“Pseudo-integration is common in science” [van der Steen, 1993, p. 272].

While van der Steen focused on denouncing pseudo-integration in interdisciplinarity, Till Grüne-Yanoff presented case studies in which the successful interdisciplinary interaction neither is based nor leads to the integration of disciplines. The conclusion is that the integration is not the necessary condition for successful interdisciplinarity [Grüne-Yanoff, 2016, pp. 358-359]. One of such case studies is the example of evolutionary game theory, which is the effect of interdisciplinary exchange between biology and economics. An important argument here is that it was an authentic interdisciplinary interaction and not only a multidisciplinary juxtaposition. First of all, there was a mutual exchange, “mutual adoption”. First, the biologists imported the game theory from economics and then economists re-imported it from biology. What is more, as a result of this exchange there was a double impact of these disciplines on one another. The disciplines were affected by one another and in this sense they both changed their identity:

“the involved disciplines are substantially affected. (...) the interdisciplinary exchange lead to epistemic success – to more detailed explanations, better control, and higher scientific activity. Crucially, the interdisciplinary exchange was an important causal factor in the production of this success. (...) From either transfer, the importing discipline came out considerably affected” [Grüne-Yanoff, 2016, p. 349].

Although the example of the evolutionary game theory is not a juxtaposition of results of biology and economics, the author claims it is not an example of integration either. Even though we had a situation of mutual exchange and mutual impact, there was no convergence of knowledge. Attempts of integrating these two sciences met with difficulties of ontological and methodological kind. What is interesting, “disintegrating” occurred during the attempts of overcoming these difficulties: “The real changes, instead, arose from attempts to deal with these obstacles. In trying to overcome them, scientists from both discipline worked out discipline-specific concepts and methods, and in that process moved their discipline away from the other” [Grüne-Yanoff, 2016, p. 349]. Therefore, we get interdisciplinarity but without integration. In this respect, stating that interdisciplinarity “presupposes as a minimum that some sort of *inter*-action and *integration* between at least two relevantly different *disciplines* take place” [Hvidtfeldt, 2017, p. 38; emphasis in original] is inadequate because this minimal condition is too narrowly defined. It is the interaction condition that should be treated as a minimal condition and in this sense as a *sine qua non* condition [Lattuca, 2001, p. 14; Holbrook, 2013, p. 1874]. On the other hand, interaction understood as a symmetric relation, interchange or in short just exchange, implies a mutual impact between the disciplines. In this respect we have a “genuine interdisciplinary episode that left *both disciplines considerably transformed*, but not integrated” [Grüne-Yanoff, 2015, p. 708; emphasis added]. From the above, we can draw a following thesis:

Interaction and not integration is a necessary condition of interdisciplinarity.

The above-mentioned considerations should be accompanied by an important comment. Formula “interdisciplinarity without integration” should not be treated in an absolute manner, i.e. that there is no trace of connections whatsoever. It should be understood in a way that there occur interconnections in the non-integration interdisciplinarity but they are loose or weak [van der Steen, 1990, p. 34; Wylie 1999, p. 301]. A good case in point here are sustainability sciences. They are also a good example of interdisciplinary exchange as we have

a transfer between the disciplines which are very distant from one another, for instance, oceanography and political sciences. In this respect, the integration is very unlikely. For sustainability sciences the key to interdisciplinarity is the problem-feeding – the transfer of problems and their solutions between different, sometimes pretty distant disciplines. Integration is then unlikely and is not a necessary condition but cooperation and the transfer of problems do occur:

“the theoretical interconnections that must be in place in order for problem-feeding to ensue can be comparatively weak. *Some* connection needs to be in place, but nothing as substantive as, say, an interfield theory needs to exist. (...) Most philosophical treatments concentrate on disciplinary fields that are in many respects proximate. They share much at the outset, and this makes the sharing and shifting of problems a lot smoother. Within sustainability science this is decidedly not the case –at least, when it comes to integrating the natural and social dimensions of sustainability. However (...) this does not undermine the recognition that problems *need* to be transferred” [Thorén, Persson, 2013, pp. 351-352; emphasis in original].

We could therefore risk the following thesis:

Interdisciplinarity is impossible without even loose interconnections.

We are facing an analogical problem when we consider the third option – the opposite possibility i.e. integration without interdisciplinarity, because to be precise we have a situation in which “such integrative accounts do not involve much interdisciplinarity” [Brigandt, 2013, p. 461]. We then consider neighboring research fields or we stay within the realm of one discipline. It does not mean though that integration remains a trivial task here. It is about integration of knowledge pertaining to different levels of organization or research on different levels of analysis. There occur epistemological and methodological problems specific to integration, which concern relations between levels and, what is particularly important, relations between different levels but concerning the same phenomena.

In the level-of-analysis approach from the field of biological sciences it is assumed that each hypothesis or model comes within one of four distinguished levels: evolutionary, functional, ontogenetic and mechanistic. Lack of differentiation between these levels leads to terminological misunderstand-

ings and unwarranted polemics. Another important issue of levelism is that competition between alternatives occurs only within the realm of particular levels and not between them [Sherman, 1988, pp. 616-617]. Sandra Mitchell, advocate of integrated pluralism, accepts the first element of levelism but rejects the second one. According to the author, accepting the second element of levelism leads to isolationism which is unjustified from the point of view of research practice of biological sciences:

“While the levels-of-analysis approach correctly recognizes the diversity of questions that can be raised, it fails to acknowledge that the answers at one level may well influence what can be a plausible or probable answer at another. (...) The view of pluralism that I endorse is not “anything goes” or “winner takes all” or “levels of analysis” but rather *integrative pluralism*, which attempts to do justice to the multilevel, multicomponent, evolved character of complex systems. But, one may reasonably ask, what kind of integration?” [Mitchell, 2009, pp. 112-114; emphasis in original].

Answering to the above question we could state that:

- *integration is not isolationist* – interrelatedness between particular levels is assumed; questions formulated on one of the levels cannot be answered in a satisfactory manner without considerations on other levels; it is especially important in a situation when considerations on one of the levels limit the scope of possible answers on the remaining levels;
- *integration is not reductionist* – it does not call for a privileged level, which should be targeted by all the proposed explanations;
- *integration is not formalistic* – there is no a purely formal procedure or algorithm of interlevel integration.

The author of integrative pluralism illustrated her account with examples from biological sciences. However, as she underlined: “[b]oth the ontology and the representation of complex systems recommend adopting a stance of integrative pluralism, *not only in biology, but in general* [Mitchell, 2004, p. 81; emphasis added]. The stance of integrative pluralism is also possible in the social sciences and humanities. Communication studies can be an example, where we have three levels of analysis defined by Claude Shannon: transmissional, semantic and effectiveness. In this respect we can also have isolationist or reductionist approaches. However, an integrative approach is

possible in communication studies, where interrelatedness between levels of analysis can be seen [Boruszewski, 2017, pp. 22-24]. Of course, an inter-level integration generates epistemological and methodological problems of sort – above all it requires caution and big awareness of the levels of analysis and interrelatedness between them: „Integrating across levels of analysis is tricky business. (...) Although there is risk of confusion, careful consideration of one level of analysis can benefit at the other” [MacDougall-Shackleton, 2011, p. 2083].

In the light of the above considerations, we could therefore state the following thesis:

Distality as such makes integration more difficult, while proximity as such does not make it easier.

Let us now sum up this section. In the following diagram we illustrate the way in which we conceptualize the relations of integration to unification and interdisciplinarity:

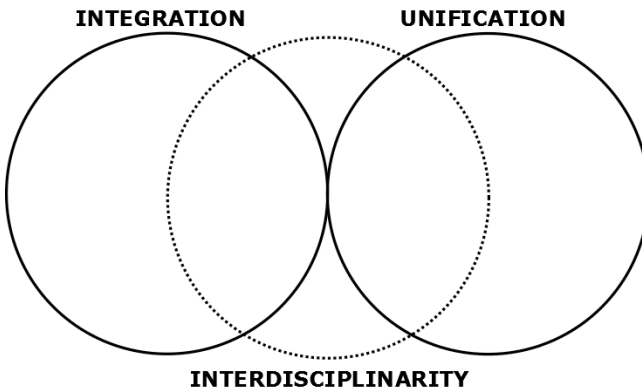


Diagram 1: Disentanglement of integration from unification and interdisciplinarity.

We consider the scopes of concepts of integration and unification as disjunctive although adjacent. In other words, these concepts are mutually exclusive although some transitions (“leaps”) between them are possible, namely

unification beyond integration and integration without unification. In this sense we treat the overused phrase ‘unification or integration’ as denoting the union of scopes of these two concepts with an empty intersection. Meanwhile, the scopes of the concepts of integration and interdisciplinarity intersect in a non-empty way. What is more important, however, are the differences of scopes of these two concepts and the fact that they also are not empty sets. In this respect, phrases such as ‘interdisciplinary integration’ are not trivial as it was the case in traditional approaches. We propose an analogous solution in the case of unification and interdisciplinarity although as it is not the subject of this article, we leave the question open.

4. A successful integration – a case study

As we have already specified our account of integration of sciences and disentangled it from the superstructures of unification and interdisciplinarity, let us now support it with a case study. We take into consideration a model of magical archaic culture with its central formula in the form of the idea of primitive magic syncretism to show a successful integration trial, which meets the main characteristics of integration presented in our account. This theoretical model may be considered as the effect of an encounter of groups of specialists with different disciplinary background including archeologists (Henryk Mamzer, Andrzej P. Kowalski), ethnologists (Wojciech Burszta, Michał Buchowski) and methodologists of humanities (Jerzy Kmita, Anna Pałubicka). This meeting resulted in connecting various autonomous research findings concerning interpretations of material remnants (archeology), indigenous knowledge of contemporary small-scale traditional societies (ethnology), as well as relicts of magical thinking in speech (linguistics). Establishing this connection was possible only when accompanied by a critical reconceptualization of the empirical basis of historical sciences about culture (epistemic level). In order to go beyond the traditional view that archeological remnants are merely remainings of material culture to be catalogized, the empirical basis was reconceptualized so as to include the idea that such remnants also played a sacral or ritual function which has to be reconstructed. The idea was to reconstruct the place of

a magical world-view in the past, but also in various domains of contemporary culture, e.g. art, religion or, as Jerzy Kmita put it, even in science (ideational level). Last but not least, such an integration trial would be hardly possible without the methodology of humanities entering the scheme of integration as the integrator. It was possible, because, as Kmita has recognized, methodology “belongs (...) to the sphere of the historical sciences about (symbolic) culture” [Kmita, 1974, pp. 47-48]. Let us now go to the case study.

The project of a theoretical account of magic was worked out by Anna Pałubicka and then developed in an milieu of researchers with different disciplinary background. The basis of this project is *a model of magical archaic culture* [Burszta, 1991, p. 101; Kowalski, 1997, p. 166; Bińczyk, 2007, p. 102]. The basic problem for us is how to investigate archaic preliterate cultures, when we are faced with unsurmountable epistemological difficulties in their discovering? The complexity of this problem manifests itself already at the basic, conceptual level – how the term ‘culture’ is understood in prehistorical research. Pałubicka paid attention to the dual understanding of the term. In the first sense we speak about archeological culture, a defined set of material artifacts located in time and space, while in the second understanding the culture takes the form of beliefs shared in a given community and remnants are its symptoms and a base to reconstruct the culture: „the starting point in this process of reconstruction is made by the data from archeological culture, and the point of arrival – aim – data which make culture” [Pałubicka, 1979, p. 60]. Here appears the first cognitive barrier in investigating of magical cultures – it is practically impossible to reconstruct a magical culture solely based on the archeological sources. It is not possible to present the past in a purely physical way and certainly one cannot attribute a cultural status to material objects as such without making a reference to a given model of culture. Also, one cannot limit oneself to describing the purely physical qualities of objects because presumably these qualities were linked to their symbolic function: „classes of objects like Neolithic polished stone implements may have been, in the culture of that age, a metamorphic presentation of sky gods or a sacral force manifesting itself through the lustre, for example” [Kowalski, 2009, p. 36]. Without a reference to a theoretical model of culture objects were under a certain illusion of direct contact with the past – an illusion of cultural transparency of objects.

On the other side of the spectrum, the “purely mental” one, there appears the second cognitive barrier – the impossibility to understand archaic cultures in the sense of antinaturalistic methodology of humanities. More precisely, the way of thinking characteristic of primary societies is uninterpretable or hard to comprehend to contemporary people from the Euro-Atlantic cultural circle. The reality of archaic culture is usually incomprehensible to us:

“This is why the cultures alien to our culture, that is, the ‘primitives’ cultures which accept the states of affairs and the ‘mystical’ relations between them that we take to be unacceptable are unintelligible to us. The states and the relations can be expressed in our concepts, and therefore comprehended by us in this sense. Still, we cannot recognize their objectivity. This is the obstacle that makes our attempt to understand them vain. Although it is possible for us to find out what the states of affairs and the relations between them are present in the ‘primitive’ cultures, we are not able to understand how one can believe in such things” [Paľubicka, 1998, p. 186].

The model of archaic culture is therefore meant to enable an approximative description of this culture, its conceptual articulation. At its basis, three historical forms of world-view valorization are distinguished, that is ways of combining practical activities with convictions concerning world-views. This way we single out *magical*, *religious* and *modern* valorization [Paľubicka, 1985]. Then the above-mentioned problem is how to characterize communities belonging to magical cultures from the modern culture perspective. Subjects participating in modern culture usually distinguish three spheres of culture: technical-instrumental, symbolic-communicative and world-view. According to the central hypothesis of the model, spheres of consciousness in primeval societies made up a united syncretic whole. For primeval people particular activities were a technical, communicative and world-view act at once. In other words, in primeval minds metonymical (cause-effect, whole-part) and metaphorical (symbolization) relations coexisted. Therefore, the primeval mind does not perform a mutual transformation of these relations on one another because it would mean that it differentiates between them. The differentiation between metonymy and metaphor appeared only later on:

“The formula: *primitive magic syncretism* – is supposed not only to show that primitive magic is involved, but, in the first place, *that syncretism is stressed* which does

not mean (as it is generally understood) combining already distinguished elements, but – on the contrary – the combined appearance of elements which only from a later point of view are considered to be different” [Kmita, 1989, p. 157; emphasis added].

The central formula of the model, that is the primitive magic syncretism, could be also developed into a full hypothesis concerning participation in the primitive magical culture: “*Each* participant of the production *is at the same* time the producer, the sender of the message and the advocate of world view (magical) valorization” [Pałubicka, 1985, p. 65; emphasis added]. The simultaneous coexistence of metonymy and metaphor in primitive magic syncretism is sometimes called a *palimpsest* [Leach, 1976, p. 25]. This term is instructive in the sense that it reveals additional difficulties in translating statements taken from magical cultures, for instance ‘A stag is a feather’, ‘We are Araras’, into a language understandable for us. Each attempt of translation and interpretation can be a partial paraphrase at most. What is more, if we have many of such partial paraphrases, their sum also won’t be an adequate rendition of the unique sense of expressions from magical cultures. A translation of a metonymic-metaphorical palimpsest is in principle impossible because in the magical thinking “there is neither metaphor (...) nor statement about metonymy (...); it consists of both of them at once, and at the same time it has none of these meanings in pure form” [Buchowski, 1996, pp. 307-308]. Therefore, one cannot attribute a purely symbolical status to magical linguistic statements because it would be an imputation on the side of the researcher. Similarly, one cannot attribute a purely instrumental, technical character to material objects (for instance, a piece of pottery or biface) without taking into account their symbolic sense. It is also a bias on the side of the contemporary western culture: “through our own research method, we imply the priority of the technological role of culture over its other, especially symbolic, aspects” [Mamzer, 2009, pp. 96-97].

The model of primitive magic syncretism is the result of integration in a twofold way. The first one concerns the interdisciplinary and integrative character. In developing this model mainly the output of historical sciences, ethnology and archeology is used, with addition of research work in the field of linguistics and religious studies. It does not come as a surprise because

the archaic culture, which is the particular and specific subject-matter, is the object of interest of many disciplines. What is much more important here is that methodology of humanities serves as the integrating means (the integrator). Secondly, we have to do with integration of two levels of analysis – the physical level and the mental level. The archeological findings can be described in two ways – as a physical object and as an object used in a given way in a certain community. On the first level we have a description of the portion of the matter occurring in given time and taking a specific space, while in the second description we place a given find in a cultural context adequate to it. The context equips the find with a cultural sense, thanks to which the object described in a physical way becomes a cultural object. In this respect one can distinguish two different account of the empirical basis in the research on preliterate culture. The first of them, the traditional one, means cataloguing – making descriptions of physical objects using terms of their observed properties. In the second one the empirical base is: “interpretatively construed within the perspective of readiness-to-hand. Hence, the tools interpreted by meaning ascription make up the empirical basis for further investigation of culture” [Pałubicka, 2009, pp. 63-64]. These descriptions cannot be inferred from one another and cannot be reduced to one another, in particular a mental description is irreducible to a physical description. The integration of two levels of analysis in researching old cultures enables to show the particular interaction between them. As Andrzej P. Kowalski noted, the model of primitive magic syncretism is useful in prehistorical research although not as a basis of classification of archeological matter, because archeology has worked out its own methods in this respect. However, this model makes it possible *to re-interpret and to correct* archeological interpretations, to which the researchers attributed a cultural character. It allows us to explain the cultural dimension of the presence of given objects in a given culture [Kowalski, 1997, p. 166]. In this respect taking into account of the mental description imposes a certain requirement of interpretive criticism on spontaneous acts of ascribing a cultural sense to old tools. This spontaneity is expressed in that the researcher to some extent unintentionally ascribes a sense from their own culture although “since spontaneous recognition of meaning may in many cases be misguided, it is necessary to explore further research techniques like methodical and critical

interpretation which aim at meaning-ascription” [Pałubicka, 2009, p. 61]. The other way round, physical descriptions can serve as basis of selecting mental descriptions and thus reduce the speculative character of humanistic considerations. This speculativity is expressed in arbitrarily ascribing subjective intentionality, which can lead to a situation, in which scientific analysis of old cultures is driven out by eseistic visions of the researcher. The physical description therefore represents a criterion of selecting mental descriptions although it does not form the foundation for investigating culture. We therefore have mutual interaction between the levels of description: *correction of spontaneity* (mental-physical relation) and *selection of speculation* (physical-mental relation). In this respect we can point to a significant cognitive value of the integrated model of primitive magic syncretism.

5. Concluding remarks: methodology of science as an integrator in integration trials

In considerations regarding the problems of integration two of its levels are clearly underlined: the practical-institutional one and the epistemic-methodological one. Analysis of the notion of integration show they both play an important role. Van der Steen, when denouncing the pseudo-integration, he paid attention to the fact that even though certain institutional conditions are met (exchange, cooperation, publications), adequate methodological conditions were not met. According to the author, integration “would be possible only if certain institutional resources would be available *and* if certain methodological criteria could be satisfied” [van der Steen, 1993b, p. 349; emphasis in original]. The author expressed a strong disappointment with the then (first half of 1990s) philosophy of sciences in this respect:

“Philosophers who do not care for *elementary reconstructions of live science* will end up with a very biased view of science” [van der Steen, Sloep, 1993, p. 23; emphasis added];

“In order to make philosophy of science more practical, one had better start with application of *elementary*, relatively uncontroversial philosophy (especially logic) to problem of science” [van der Steen, 1990, p. 24; emphasis in original];

“It is unfortunate that conceptual analysis is not very popular in the philosophy of science nowadays” [van der Steen, 1993a, p. 265].

The three quotations mentioned above illustrate this disappointment and their content undoubtedly remains relevant. One can therefore speak of a certain methodological deficit in the analysis of integration of science. It is visible for instance in a specific renunciation of the analysis on the basic, conceptual level or even in setting aside some inconvenient problems:

“it can also take the form of a denial of the persistent heterogeneity of the conceptual bases of science in progress and, on the whole, this heterogeneity is seldom analyzed. (...) But, for a cross cutting critique to be possible, and for real progress to be made in the integration of scientific knowledge, it is necessary to build analytical frameworks that allow take into account that every research programme claims its own domain of demonstration and its own validation criteria. That is why it seems necessary, at a meta level, to construct analyses which on common bases explicate the hypotheses of heterogeneous research programmes, their criteria of scientificity, the part of arbitrary of each approach, and the limits of empirical validity of their results” [Laurent, 2012, p. 230; emphasis added].

The above comments should not be understood in a way that a need emerges to work out a super-science or a meta-discipline which will automatically deal with the above-mentioned problems. It is also not about constructing a new high-level formal theoretical apparatus. Classically such hopes have been pinned on the General Systems Theory and integration of science remains an evergreen challenge for this theory [Solem, 1993]. However, the success in this respect is at the very least doubtful. Still, it is a perspective of a different kind – the GST can play a certain role in integration but it does not constitute rudimentary knowledge. And this science has to be more implicit and rather focused on know-how because it is to constitute the basis for commitments in integration. Instead of taking up the evergreen challenge for the high-level general theory, it seems much more fruitful to take up the actual challenge by using the good old tools from the methodological toolbox. Having a common specialist knowledge is one thing, but it is about having some common basic knowledge. The latter is treated as a condition of successful integration because it facilitates coordination without explicit communication, common knowledge acts as a kind of infrastructure for the social world that it supports. Common knowledge is built, modified, and used jointly; by its nature, no one can have exclusive use, possession, or control of it. In this respect, common

knowledge is analogous to the system of public roads, or utility networks [Gerson, 2013, p. 518]. In this respect it is not about having knowledge of another field or discipline, but knowledge about it. Integration by sharing common knowledge-of is possible only in rare cases when we have specialists from the field of at least two disciplines. In this respect the requirement of the specialistic knowledge-of can prove impractical or excessive because it is important to have the knowledge-about the other integrated part, i.e. connective knowledge, which is:

„a range of fairly simple facts and information about the sorts of problem domains and approaches that populate different fields and specialisms” [Priaux, Weinel, 2018, p. 8];
“a far lower-level and rudimentary knowledge about the kinds of work and approaches that populate a range of academic fields and specialisms” [Ibidem, p. 12];
“Connective knowledge in this sense is not knowledge of connections, but the kind of knowledge that makes connections possible” [Ibidem, p. 15; emphasis in original].

Considerations on connective knowledge suggest that in the scheme of integration a third element should appear, that the relation of integration is in fact a trinary relation. This third element can be called an integrator. In order to explain how much adequate such an approach is, let us recall similar considerations concerning unification, where issues pointing to the existence of a third element appeared. It can be for instance ethics of science understood as unifier of science [Agassi, 1969, p. 470]. A more important proposal in this respect can be the correction in the understanding of unificatory relation of reduction proposed by Adam Grobler. Let us remind that in the classical unificationist approach, reduction is a binary (there is the reduced and the reducing side) and asymmetric relation. The correction is aimed at the following extremely important remark: „problem does not consist in which (present-day or future) science is being reduced to which one, but *by means of which one*” [Grobler, 1982, p. 91; emphasis in original]. In this proposal the relation of reduction is a trinary relation – apart from the reduced and the reducing theories, there is also a third theory, via which the reduction is realized – a reducer. The author of the notion of reducer paid attention to the fact that some branches of mathematics can act as reducers. We can therefore paraphrase a passage

from Grobler: the problem does not consist in what to integrate with what but *via* what. We then get the following *scheme of integration*:

x is being integrated with y via integrator i

Therefore, the candidate we propose as integrator or integrative discipline is the general methodology of science. This role of methodology of science is different from the ones traditionally associated with it (descriptive methodology, normative methodology). It is about the already mentioned programming role (“how it can be”), which was well expressed by Jerzy Kmita. What is important then is “to identify the kinds of potential connections that *might* be made by combining one’s own expert knowledge with other fields” [Priaulx, Weinel, 2018, p. 9; emphasis in original]. In this respect the project of pragmatic methodology by Kazimierz Ajdukiewicz, which was the basis of the Poznań Methodological School, remains valid. Pragmatic methodology deals not so much with the products of scholars’ activity but with science understood as profession of researchers, whose three main tasks are:

- analysis of types of activities carried out in research work;
- descriptions of research procedures;
- finding out the goals for which researchers in the various fields strive [Ajdukiewicz, 1974, p. 188].

In the analysis of integration projects, specialized methodology obviously plays the most important role but this does not mean that general methodology does not play any important role. It is visible for instance when we have “cognitive operations which occur in all disciplines, even though *they may play different roles in different sciences*” [Ibidem, p. 186; emphasis added].

Therefore, as we can see, such an understanding of integrator is coherent with the analysis of integration projects, where the problem of methodological deficit has been identified. This problem, however, does not concern insufficient advance when it comes to the pragmatic methodology but its omission. In this respect we have the possibility to “identify the lowest level of cognition about other fields” [Priaulx, Weinel, 2018, p. 12]. This level does not “yet” concern the explanation, which is a much higher level. On

the lowest level we have conceptualization problems with *conceptualizing the units of analysis* being the most basic of them [O'Malley et al., 2014, p. 823]. In this respect in particular cases of integration trials one should take into account local diversity of conceptualizations, parametrizations and thought styles. In a sense this task may seem to be elementary and rather unambitious. However, even if it lacks high-level abstractness, it does not mean it cannot take a sophisticated analytical form: “[l]ocal analyses are as large as they are made. If one can find a way to make connections between disparate events, one will have an extended analysis. (...) there is no theoretical limit to the size of the analytical network that one creates” [Stump, 1996, p. 285]. Our account on integration of sciences as a trinary relation, as elaborated in this paper, is an attempt to rethink the function of the general methodology of science and humanities so it can play the role of integrator in integration trials.

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