Truth and Adequacy.
Remarks on Petrażycki's Methodology

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Abstract:
The paper discusses the concept of adequacy central for Pertażycki's methodology. According to Petrażycki any valuable scientific theory should be adequate, that is, neither limping (to broad with respect its actual scope) nor jumping (too narrow with respect to its actual scope). Consequently, adequacy of a theory is a stronger condition than its truth. Every adequacy theory is true, but not conversely. However, there is problem, because scientific laws are conditionals (implications). This suggests that adequacy is too strong conditions, because the consequence of an implication has a wider scope than its antecedent. Thus, laws should have the form of equivalence. The paper shows how model-theoretic characterization of theories allows to recognize truth and adequacy, consistently with Petrażycki's claims.
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Leon Petrażycki (Eng. spelling: Petrażycki) considered methodology of science as the fundament of successful scientific research. His methodological considerations were mainly addressed to social sciences, in particular, to legal theory. According to Tadeusz Kotarbiński [2, p. 439] (page reference to 2nd edition; unfortunately, this fragment is omitted from English edition published as Kotarbiński 1966): "We constantly note tendencies to form the humanities in the shape of theory, not only history. We maintain that Petrażycki's writings present the peak point of such claims form the point of view of methodological self-knowledge."

Kotarbiński's assessment is related to a well-known controversy in the philosophy of science concerning the nature of the humanities. This controversy was particularly vivid in German philosophy in the second half of the 19th century. One camp (mostly Neo-Kantians from the Badenian school) considered the humanities as *idiographische Wissenschaften* (idiographic sciences) aimed at description of facts (historical, religious, linguistic, etc.) and not pretending to formulate general laws. Max Weber defended the view that the humanities, at least a part of them, can be *nomothetische Wissenschaften* (nomothetic sciences), that is, producing (or discovering) laws. In France, August Comte listed sociology (science on social facts) as one of general sciences. Note that the German term *Wissenschaft* (and French science has the wider scope than English "science"

– the latter refers to natural sciences, but the former – to all academic fields. In what follows, I am using the term "science" as synonymous of *Wissenschaft.*

Petrażycki's position win the controversy over the status of humanities was closer to Weber and Comte, although he did not refer to these authors. In fact, he mentioned in his methodological writings no name of protagonists participating in the related polemics. As a person who studied in Germany at the end of the 19th century, Petrażycki had to know what was going in discussions on the general methodological problems as well as special issues, like the prospects (or not) on converting the humanities into genuine systems. As I earlier note, Petrażycki formulated his methodological claims as directed to jurisprudence, particularly legal theory. Let us say that "jurisprudence" is a generic term and all legal investigations fall into its scope. Traditionally, legal history and doctrinal studies on law (*Rechtsdogmatik*) belong to jurisprudence beyond all doubts. The problem is with the field called legal theory. In German speaking world, *Rechtstheorie* is a part of jurisprudence (*Rechtswissenschaft*) as a general science of law. This use was adopted in Russia as well as in Poland. Petrażycki wanted to reform legal theory as *Rechtstheorie.* According to him, the traditional legal theory was too much dominated by *Rechtsdogmatik* and this fact very negatively influenced related investigations. Roughly speaking, Petrażycki argued the subject-matter of doctrinal studies of law (this field analyzes so-called positive law) did not constitute the proper object of legal theoretical research. The subject-matter of legal theory is different than of *Rechtsdogmatik.* Petrażycki identified law as a collection of psychic entities of a kind, namely emotions in which rights and duties are correlated. They constitute law as a real phenomenon. Consequently, legal theory is about law in this understanding.

Although Petrażycki was mostly interested in the foundations of legal theory, his methodology has a very general character and can be analyzed independently of its applications in the *Rechtswissenschaften.* I take this course and will consider Petrażycki's ideas as belonging to general methodology.

Bibliographical Remark

Petrażycki presented his methodological views in his book *The Study of Law and Morality: The Bases of Emotional Psychology* (St. Petersburg 1905, 2nd ed., 1907, 3rd ed. 1908; Polish tr., Warszawa 1930, 2nd. ed., 1959). Chapter 1 of the collection L. Petrażycki, *Law and Morality* [5] contains main Petrażycki's methodological ideas. The entire methodological part of Petrażycki's book of 1905 was translated into German as *Methodologie der Theorien des Rechts und der Moral, Zugleichn eine neue logische Lehre von der Bildung den allgemeine Begriffe und Theorien*, Librare du Recueil Sirey, Paris 1933. Finally, let me mention L. Petrażycki, *O prawie i moralności. Selected Writings* (On Law and Morality), ed. by A. Kojder, Państwowe Wydawnictwo Naukowe, Warszawa 1985, which contains extensive selections from Petrażycki's methodogilocal works.

The concept of scientific theory and conditions of its correctness are central for Petrażycki's methodology [5, pp. 17-21]. According to him, a theory is a collection of truths about some classes of objects. In particular, even a single general statement can be a theory. For simplicity, I will consider this last case (I use modern notation; the sense of * will be explained later):

(1)$\forall x(Sx * Px)$

be a scheme of a theoretical statement. It contains two predicates S and P which refer to concepts. The character of concepts is of the utmost importance for Petrażycki. He regards theoretical concepts (notions occurring in theories) as class-concepts. A class is a set (collection) of objects possessing certain property. If Q is a such property, every object which satisfies the condition $Q(x)$ belongs to the class related to Q. For instance, if Q means 'is white', every object satisfying the condition 'x is white belongs the class-concept denoted by Q. This understanding of classes is extensional. In more traditional terminology, a class constitutes the scope of a common noun.

Generality is necessary but not sufficient condition of theoreticity, so to speak. Thus, not every general concept is a useful class-concept. Although Petrażycki did not formulate the sufficient

condition, one of his remarks is very important. We can formulate several general statements on vegetables from the point of view of cooking or about game (animals) from the point of hunting, but it would be improper to say that such assertions form a theory. Interests of cookers or hunters are governed by practical tasks. According to Petrażycki using words in a way suggested by practical aims is common in ordinary language. Hence, scientific terminology should be independent of such prejudices. For instance, the meaning of the word 'law' (in legal sense) is usually suggested by practical needs of lawyers. This circumstance decides that lawyers identify law with positive law. This tendency make difficult to observe that law is a psychological phenomenon (see above). Class-concepts must, according to Petrażycki reefer to uniform collections of objects. He tried to explain the mentioned uniformity by invoking some methods of forming concepts and justifying theories. Petrażycki did not believe in simple inductive methods consisting in observing particular instances and making generalizations. He claimed that we should discover essential causal connections via careful applications of Mill's canons of eliminative inductions. Although this part of his methodology appears as quite traditional, Petrażycki's view on theories was quite modern. He considered theories not as reproductions of reality, but rather as a scheme of explaining and predicting phenomena.

An instance of the scheme (1) in order to be a genuine theory must be adequate. According to Petrażycki, the requirement of adequacy formulates the most important condition of correctness of scientific theory. Petrażycki, working in the style of traditional logic, did not uses (1), but a form
(2) Every S is P,
where S is a subject-term and P – a predicate-term. However, both express class-concepts in the outlined sense. I will denote relevant classes by bold capitals, in particular **S** and **P**; I will use common notation for relations between sets, for instance inclusion ($\subset$ – strong inclusion, and $\subseteq$ – weak inclusion).

Petrażycki characterizes adequacy negatively, that is, by pointing out, when a theory (I recall that even a single general statement can be a theory) is not adequate. Let T be a statement pretending to be a theory. Petrażycki [5, pp. 19-20]:

> A theory may be inadequate either (1) because the predicates are related which are too narrow; (2) because the predicate is related to a class which is too broad. [...]. Inadequate theories of the former type may be said to "limp", those of the latter to jump. Science should admit adequate theories only. [...]. Often something predicated of a narrow class turns out to be true of a broader class: the theory then "limps and we must to refashion it by selecting the concept of a genus – not of a species as been done tentatively – as the logical subject. [...]. If it turns out that the theory "jumps", we must cut it down by selecting a class concept – appearing as a species of the one we have already tried – as the logical subject.

The statement 'All cigars are subjected to gravitation' is an example of a "limping" theory, but the sociological assertion that all social phenomena are determined by economic factors, illustrates the case of "jumping" theories. Returning to the problem of class-concepts, their forming as good notions strongly depends on theories. Thus, we check the quality of concepts by investigating their behaviour in theories, particularly by observing whether they lead to "limping" or "jumping". Petrażycki assumed that the reality is ordered by the relation species/genera and hence, his recommendations that improving inadequate theories consists in cutting species to genera or broadening in the reverse direction.

Tadeusz Kotarbiński [3, p. 499] (this chapter also contains historical remarks on the concept of adequate theory) gives the following characterization of adequate theories:

> Petrażycki exhorts us to build adequate general theorems. He means, subject-predicate theses able to satisfy the following condition. Each such thesis ascribes [...] a property to a set of all past, present, future and possible objects, provided that such share a defi-

nite property specifically common to them. It ascribe to them not only correctly, but also reasonably, in conformity with the methods of correct foundations of connections between properties with respect to logical or causal nexus. The property so ascribed must also be exclusively of the elements of the class under discussion, which is the criterion of adequacy. Hence, such and only such a scientific theory is adequate which predicates neither too narrowly nor too broadly, but simply, but simply as to required; this can be guaranteed only in the founding of the connection between the content of predicates and the specific characteristic of the elements of the class under consideration (*qua* its elements).

Kotarbiński's summary clearly shows that there are for general issues related to the problem of adequacy of theories: (I) What is adequacy as such?; (II) How to achieve adequacy?; (III) How to test adequacy (every theory must be justified)?; (III) How to improve inadequate theories in order to make them adequate? My further remarks are mostly addressed to (I). I use some material published in [6] and forthcoming in [7].

The first issue consists in interpreting the sign * in (1). Using the equivalence between extensional and intensional understanding of classes, we can say that if $S \subset P$, a given theory limps (I omit quotes, because limping and jumping become technical terms). We can says that a property expressed by the predicate P applies to a broader class (set) that S. For instance, the property 'being subjected to gravitation' can be predicated on a broader class than the set of cigars. If we have that $P \subset S$, a given theory jumps. For instance, the predicate 'being influence by economic factors' refers to narrower set than the scope of the predicate 'being a social phenomenon'. Taking $S \subset P$ and $P \subset S$ together, we obtain that a theory T is adequate if and only if $S = P$. The adequate is a theory 'All material bodies are subjected to gravitation' as well as a theory (it is a controversial claim, but let us take it as granted) 'All elements of law are emotions in which rights and duties are correlated". Adequacy of theories is a stronger condition that their truth. Each limping and adequate theory is true, but not reversely, because there are true limping theories which are not adequate. On the other hand, jumping theories are false. By the way, there is an ambiguity concerning the word theory, because if we require that a theory must be true, jumping statements are not theories. Eventually, one can say that a jumping theory is true about a part of the class denoted by S. Petrażycki also distinguished absolutely inadequate theories, that simultaneously limping and jumping. They concern the empty scopes. I will ignore them in my further analysis.

Employing the equality $S = P$, (1) can rewritten as

(3) $\forall x (Sx \Leftrightarrow Px)$

Thus, every adequate theoretical statement has a form of equivalence. However, this view provokes serious doubts [see: 4, for criticism of Petrażycki]. Whereas the implication $\forall x (Px \Rightarrow Sx)$ should be rejected as jumping and thereby not adequate, the status of the conditional $\forall x (Sx \Rightarrow Px)$ is more complex. Petrażycki's illustrations of limping are somehow extreme as the statement about cigars and gravitation. On the other hand, it is easy to formulate non-trivial limping implications, for instance, 'All planets move according to Kepler's laws' or 'Every man is a mammal'. Even if we say that such statements are fragmentary (partial), they are true and it would be difficult to question their theoretical importance in astronomy or biology. The implication $\forall x (Sx \Rightarrow Px)$, assumes that the inclusion $S \subseteq P$ holds. This dependence is consistent with the constraint of adequacy in Petrażycki's sense, but does not force it.

Contemporary methodological approach to scientific theories is different than that of Petrażycki. Theories are considered as axiomatic systems. This means that a theory T (the letter T refers to a set of sentences) is a set of a collection of axioms. Formally speaking, there is a set $X \subseteq T$ (usually, it is assume that $X \subset T$) such that $T = CnX$ (I assume that X is consistent and $T = CnT$, that is, a deductive system). We can assert that the content of T is contained in its axioms. How to define adequacy of axioms of X. The best answer appeals to semantics. Since X is consistent, it has a model (it is also a model of T), let say, M. Its universe can be identified with S, but references of predi-

cates constitute **P** (more precisely, properties and relations on **S**). In this perspective, a theory T is limping if its model **M** validates a broader class of truth than following from X, and jumping if this class is smaller.

From a purely abstract point of view, T can have various, even not isomorphic, models. However, in the case of empirical theories (I do not consider mathematical theories), we are interested in so-called intended models. Roughly speaking, an axiomatic X is adequate with respect to an intended (standard) model **M** (usually, empirical procedures determine single models – if a theory T has a class of models, my considerations can easily adapted) if and only if X generate all truths in this model and nothing more. Suppose that X is an adequate axiomatic of T and $B \in CnX$**.** Consequently, B it is less general than X. Thus, B is inadequate. On the other hand, the set of all consequences of X is adequate, because equivalent with a given axiomatic. Thus, T is adequate. In particular, the logical form of axioms is a secondary issue. They can be conditionals, equivalences, equations, etc. In other words, adequacy is a global property of theories, but not a local property of single theoretical statements.

The argument outlined in the last paragraph shows that the presence of inadequate statements does not result in non-adequacy of the entire theory. For example, consider Kepler's law as consequences of classical mechanics. They are not adequate in Petrażycki's sense literally taken. However, one can argue that axioms of Newtonian mechanics adequately characterize the set of material points. Under this supposition, this theory, understood, as the set of consequence of three principles of dynamics plus the law of gravitation is adequate – this property is derivative from its axioms. Clearly, there are some additional problems. Models qualified as intended function relatively to the stock of available knowledge. For instance classical mechanics is valid not absolutely, but in models admitting velocity much lesser than c. Hence, intended models have to be corrected and this fact seems to be essential in the development of science. This circumstance suggests that limping or jumping theories should not be considered as *a priori* as absolutely wrong, if they are suitable to generalization (correcting limping) or specialization (correcting jumping). By the way, Petrażycki himself pointed out that improving of theories proceeds by improving already available knowledge. From the point of view of models, generalization consists in extension of models, but specialization – in reduction of models. Both procedures can be strictly defined in model theory [1]. Finally, the property of adequacy is difficult to be achieved. Scientific theories, particularly in natural science, are usually limping, rarely jumping. In the humanities and social sciences, the situation is just reverse. Petrażycki was strongly influenced by peculiarities of fields similar to legal theory, where criticism in terms of adequacy is important. On the other hand, his ideas about adequacy and construction of concepts have relevance for abstract methodology of sciences.

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