

**LA PRUEBA DE HIPOTESIS HISTORICAS: ACERCA DE LA APPLICACION  
DE LA TEORIA GENERAL DE KUHN SOBRE EL DESARROLLO  
CIENTIFICO A LA PSICOLOGIA DEL SIGLO XIX**

**The test of historical hypotheses:  
On the application of Kuhn's general theory of the development  
of sciences (GTOTDOS) on the psychology of the 19th century**

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Today, Kuhn's (1962) general theory of the development of sciences (GTOTDOS) is freed to a large extent from unclarity, vagueness and ambiguities which were attributed to it by some of its early critics. In the main due to the work of Høyningen-Huene (1993), we can now specify precisely a lot of its central concepts. In particular, the universal phase model of scientific development, consisting of prenatal phases, normal-, extraordinary and revolutionary science, is specified by sets of indicators. Additionally, some peculiar science related events which are intrinsically connected with parts of the 'historical schema' are specified in an exact way as well.

The indicators assigned to the different phases refer to or imply concrete historical events or data. That entails two things at least: the meaning of the phases is confined to or given by these historical-empirical indicators and nothing else. Secondly, the reversal holds true: if a certain set of indicators or historical data can be demonstrated or shown to occur, the corresponding phase or state is given, can be assumed to exist.

Obviously, as stated above, the meaning and detection of these phases and processes intertwined with a phase are determined by the indicators.

In regard to the science related events just one example will be given.

As a science is developing into a certain stage several outer manifestations emerge. For instance, the number of publications increases when textbooks and journals appear.

Within Kuhn's GTOTDOS however, chance does not rule the production of different forms of publication. Journals will be established soon after a first paradigm was accepted. That event on the other hand is responsible for the foundation of scientific associations later on and there will be a curricular place for the paradigm too. All this relates to an early normal-scientific phase.

Concomitant with these events is the publication of the first textbook on a scientific field. According to Kuhn, this form of scientific publication functions to construct an area from its most basic principles. New concepts are introduced by expli-

cation and given proof. This division of labour between textbook author and researcher enables the latter to concentrate on his endeavour and to start with his research where the textbook ends.

Moreover, a textbook presents those achievements which are subject to consensus within a scientific community and apt for training of students. In other words it involves a paradigm whose consequences are not restricted to the text itself.

So far we have - as promised above - presented by samples a relatively broad and well specified theory on scientific development. But how can it be applied to certain questions the historiographer of science is interested in? Can the theory help to solve problems the historiographer intends to solve?

I will not answer these questions right now, but postpone that to later. For, in order to answer it, it seems useful to consider at first the enterprise of application of a historical theory for a moment.

The historiographer usually has his sources, his historical material which must be treated in a way. In addition, we have Kuhns GTOTDOS as well. How, that's our problem now, can the gap be bridged, how can we bring together both?

It cannot be the task here to tackle the problem of theory application on most general grounds. Surely, that's a problem for philosophy of science. However, it seems suitable to introduce a procedure which implements theory application. To that end serves as a key methodological device the simple concept of historical hypothesis, followed by its test and evaluation of evidence. That entails for the historiographer two pragmatic tasks at least: at first, the formulation of historical hypotheses derived from theory; and secondly their test by confronting them with historical material.

Finally, when all relevant historical sources have been collected, brought together and processed the degree of evidence for the hypotheses can be evaluated and estimated.

As Buksinski (1985) has shown, testing historical hypotheses gains its full power when concurrent ones are put forward and each is subjected seriously to proof.

In order to avoid longer preparatory reasoning and get some concrete results, it seems useful to raise a certain historiographical question and to show the way to manage it by means of the simple procedural suggestions just given.

The question which will be raised here refers to the development of psychology in Germany during the 19th century. Above that subject there is almost ubiquitous consensus that experimental psychology as a new science came about during that time. Let us ask therefore: how took place this and in particular which developmental phases followed to each other.

Translation into GTOTDOS immediately leads to the hypothesis that a normal-scientific psychology developed in the 19th century as a consequence of some prephases. Which prephases resulted in normal-scientific psychology and which phase followed from then on is still open. It must be scrutinized later by means of GTOTDOS after the first analysis concerning the establishment of normal science is carried out.

Even though we have entered the theory already, a point of departure is to be fixed. We choose as starting place a preliminary hypothesis about a developmental state - as explicated and indicated by GTOTDOS. The next step requires the hypothesis test. In case of success, further historical hypotheses relating to the question raised above, structured by GTOTDOS must be formulated which in turn must be tested again in the following.

So we start with the tentative hypothesis „if a normal-scientific psychology was called into existence in the nineteenth century, its outer manifestations will be demonstrable“

Now searching for historical-empirical indicators like first journal, scientific association and curricular representation while a first textbook did appear already delivers us the following results:

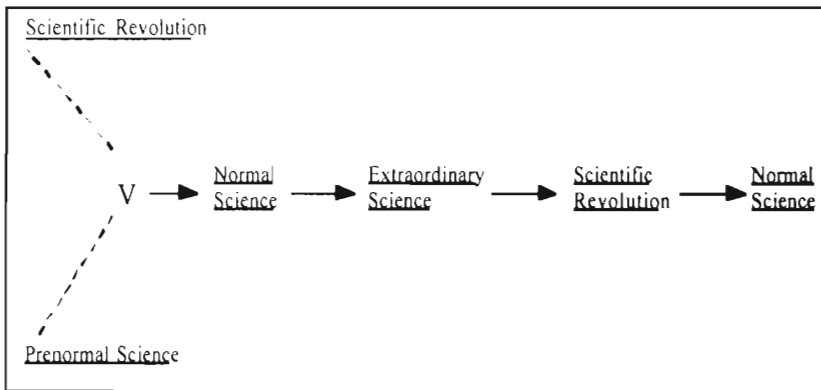


Figure 1

#### Survey of Kuhn's universal phase model of scientific development (upmsd)

There cannot be much doubt about the positive evidential strength of that sources in regard to our hypothesis.

Within Kuhn's GTOTDOS, we are able to infer with confidence that an early normal-scientific phase took place.

Up to now we are acquainted only with outer manifestations but do not know anything about the inner content of that detected science. In this awkward position theory will guide us once more.

It tells us, that a first paradigm should be involved in early normal-science. Therefore we formulate the hypothesis, that a paradigm exists already. Let us try to look for historical evidence.

In the first place, the historical material from which the paradigm can be extracted is offered by the first textbook. Closer inspection of Wundts „Outlines“ reveals a two level construction. On more general grounds there is an introduction wherein the new psychology is primarily summarized by its main features. In the content part of the textbook proper there is a conceptual classification, a detailed taxonomy of psychological concepts. Some of them are connected tightly with new experimental research. For Wundt this experimental research serves as a necessary and firm empirical base for the concepts.

The twofold historical material requests a sequential procedure adapted to it. At first, the extractions of the paradigms involved, based on the summarizing introduction and on the systematic content parts. Because the latter requires to take into consideration two research traditions, their paradigmatic compatibility must be assessed. Afterwards, a comparison with the results from the introduction can indicate whether just one paradigm consisting of compatible components will be representative for the textbook and for this reason for the early normal-scientific phase of experimental psychology too.

While the sources for the paradigm extraction based on the introduction are lying in the text, the material for extracting the paradigm of the concept-related experimental research lies in already longer lasting research traditions. Therefore, in this case we have to quit the textbook and must deal with the research traditions themselves.

The result of the extraction of the paradigm based on Wundts textbook introduction alone - carried out by the indicators for a paradigm illustrated before - depicts

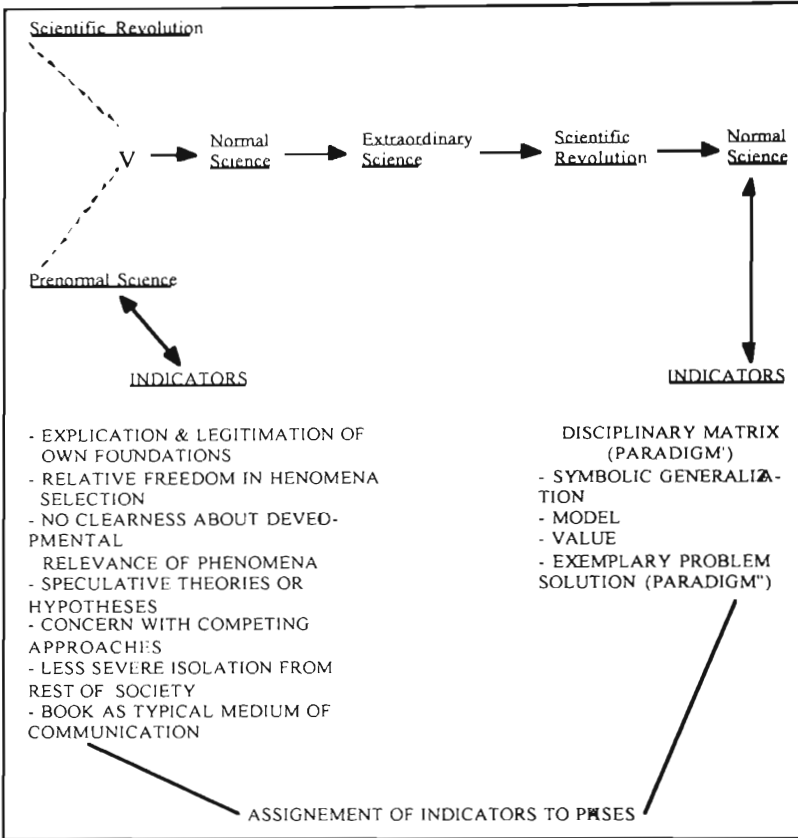


Figure 2.

**Assignment of indicators to phases (selected sets)**

The extraction of the other paradigms deals - as mentioned above - with 2 research traditions, which are longer lasting already.

Shortage of space does not allow to go into further details here. But it can convincingly shown from the sources, that the two traditions are pertaining to psychophysics and time measurement (see Brauns, 1993). Their paradigms consisting of the respective paradigmatic elements are compiled in figure 3.

<p style="text-align: center;"><b><u>PLACE IN CURRICULUM</u></b></p> <p>„PSYCHOLOGY OF SENSE-SENSATIONS (PSYCHOPHYSICS) AND SENSE-IMAGINATIONS“ DURING WINTER TERM 1880/81 BY EBBINGHAUS, UNIVERSITY OF BERLIN</p> <p>„PSYCHOPHYSICAL EXERCISES FOR MORE ADVANCED STUDENTS“, SUMMER TERM 1881 BY WUNDT, UNIVERSITY OF LEIPZIG</p> <p style="text-align: center;"><b><u>FOUNDATION OF JOURNALS</u></b></p> <p>IN 1883 „PHILOSOPHICAL STUDIES“, EDITOR: W. WUNDT</p> <p>IN 1890 „JOURNAL OF PSYCHOLOGY AND PHYSIOLOGY OF SENSE-ORGANS“ EDITORS: H. EBBINGHAUS &amp; A. KÖNIG</p> <p>IN 1903 „ARCHIVES FOR THE WHOLE PSYCHOLOGY“ EDITOR: E. MEUMANN ET AL.</p> <p style="text-align: center;"><b><u>FOUNDATION OF SCIENTIFIC ASSOCIATION</u></b></p> <p>SOCIETY FOR EXPERIMENTAL PSYCHOLOGY, I. CONGRESS 1904 AT GIESSEN</p> <p>INITIATOR: G.E. MÜLLER; COMMITTEE OF INITIATION: EBBINGHAUS, KÜLPE, MEUMANN, SOMMER, SCHUMANN; LATER ON JOINED BY S. EXNER, GROOS, E. HERING, V. KRIES, SIEBECK, STUMPF, ZIEHEN</p> <p>EDITION OF A CONGRESS REPORT</p> <p><b><u>I. TEXTBOOK:</u></b> 1874, W. WUNDT: „OUTLINES OF PHYSIOLOGICAL PSYCHOLOGY“ (1880, 2. ED., 1887, 3. ED.; 1893, 4. ED.; 1903, 5. ED.; 1908-1911, 6. ED.)</p> <p>1897, H. EBBINGHAUS: „OUTLINES OF PSYCHOLOGY“ (1905, 2. ED.; 1911, 3. ED.; 1919, 4. ED.)</p>
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Figure 3.

**Preliminary identification of a disciplinary developmental state by means of indicators of early normal science after Kuhn**

Comparing the components shown in Figure 3 as announced earlier leads to the following statements:

Very essential is consensus on the main values. In this respect Fechner does not deviate in any degree from Weber and Wundt because his value conception of exactness and mathematization implies experimental precision measurement.

Consensus in regard to the models exists in so far as sensation is unanimously seen as the first and simplest psychic phenomenon.

Coincidence of consensus is too prevalent with the exemplary problem solutions in so far as they all are experiments realizing sensations or events strictly composed of them as it is the case with Wundt's time measurement by means of his pendulum.

Finally, all symbolic generalizations are laws either won by empirical generalization (Weber, Wundt) or mathematical deduction (Fechner) and subjected to further experimental test.

After these unanimities we are in the position to summarize: the comparison between the two research paradigms delivers their compatibility. This result in turn allows to go one step further.

For this reason, the next task ahead is the aggregation of the research paradigm with the paradigm extracted from the introduction in order to see whether one paradigm can be applied to all.

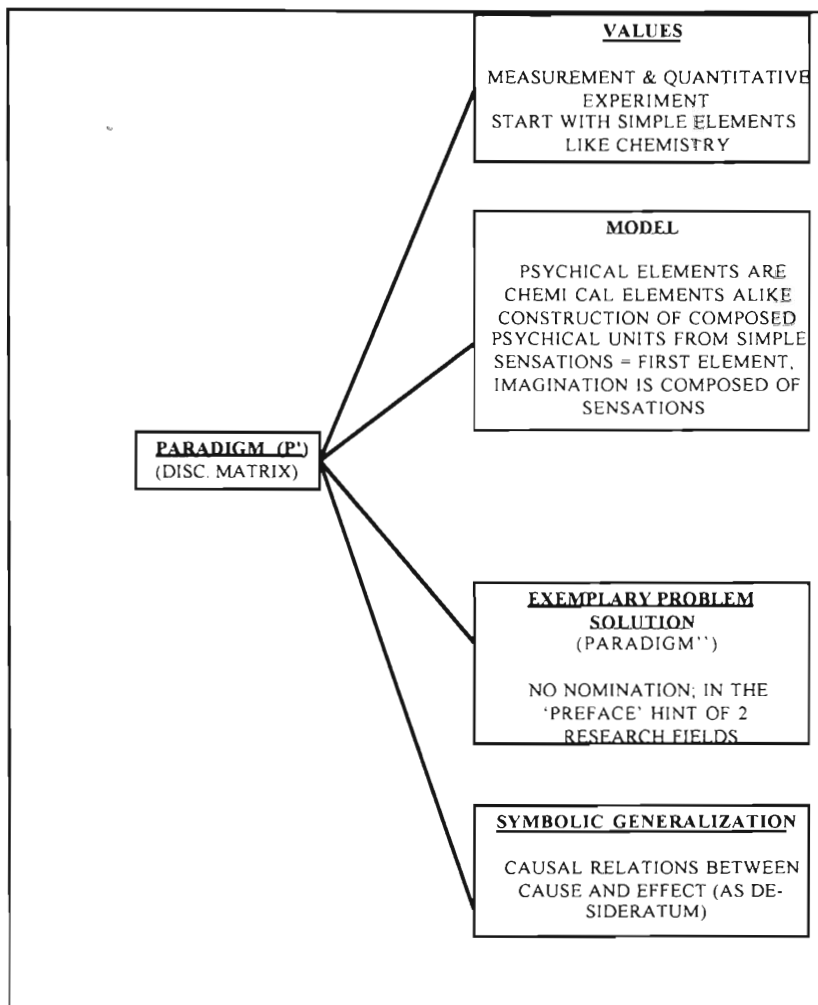
Comparison of the research paradigm with the introductory one reveals a higher level of abstraction for the latter. Obviously, this circumstance does not exclude further analysis. As can easily be seen, the values are congruent as well as the expression of symbolic generalizations in the sense of causal relations. That ultimate aim exists for Fechner not less than for Weber or Wundt.

The higher level of abstraction of the introductory paradigm can be nicely recorded in regard to the model too. The analogy with chemical elements implies the irreducible elementary character of sensations and therefore yields congruity.

It is interesting to note the omission of exemplary problem solutions in the introduction. Perhaps that is an inevitable consequence of its relatively high abstraction level.

Alternatively, the nomination of the 2 research traditions in the preface of the textbook may serve as a substitute for more concrete information about the real exemplary solutions.

Putting all together in order to abstract communalities of the compatible paradigmatic elements just discussed enables us to introduce - as a final product of the application of Kuhn's GTODOS - the aggregated paradigm of the first textbook and of the early normal scientific phase of experimental psychology.



With that result we now have attained a second important goal. We extracted the paradigm of Wundt's first textbook on the new psychology. That gives us positive evidence for the respective historical hypothesis tested.

Because it is the first textbook (the next will be written by Ebbinghaus in 1897) we can infer within the framework of Kuhn's GTOTDOS an early normal-scientific phase with sufficient support. Or we may say as well, that experimental psychology reached about 1880 the early edge of a normal science.



We are in the position to state too, that the result of the first hypothesis relating to outer features of early normal science converges with the result of the second test, based on the content of the scientific field under consideration.

We now more firmly claim an early normal-scientific phase of the new experimental psychology as put forward by Wundt about 1880.

After this first analysis we turn now - as indicated above - to possible pre-phases and later phases.

In this respect Kuhn's theory gives rise to prognostic and retrognostic historical hypotheses concerning developmental stages. Lack of space however, does not allow to go into further detail.

To conclude:

Less by the last statement but perhaps convincingly more by the procedures and results reported before we are finally in the position to give the answer postponed to the questions above:

How can Kuhn's GTOTDOS be applied to certain questions the scientific historiographer of psychology is interested in?

Indeed, the key procedure which promises some success is the formulation of historical hypotheses with all their necessary consequences implemented above.

Can the theory help to solve problems the historiographer of psychology intends to solve? Obviously, the availability of a theoretical language with statements of relations serves as useful tool for historical research.

Therefore, after all the answer should be „Si“. Nothing seems to be better for historical research than theory.

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