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Jens Mammen

A New Logical Foundation for Psychology

With Commentaries from Niels Engelsted
and Ehtibar N. Dzhafarov

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Series Editor's Preface

A New Theory of Categories and Its Abductive Potential

Theories in psychology can be built on multiple axiomatic grounds. The basic criterion that can be used to evaluate their consistency is their deductive elaboration that eventually leads to their arena of bridging with the phenomena under study. Can an abstract theory selectively help us to derive generalized understanding of basic principles from the phenomena? Or is such theory merely a nominal label for various games of "empirical science" played at the junction of the phenomena and "the data"? Psychology of today is filled with many examples of the latter. In a refreshing contrast, Jens Mammen systematically outlines an example of the former. His message in this book is powerfully clear—principles of psychology have generality similar to that of other basic sciences. His elaboration of one of such general frameworks in this book—based on the axiomata of classical logic of Boole and Aristotle—proves the verdict of Immanuel Kant wrong. Kant—in the late eighteenth century—predicted that two disciplines would never be capable of becoming *Wissenschaften* for reasons of lack of mathematical formalizability. One of these was chemistry, the other being psychology. For chemistry, Kant was proven wrong between 1813 and the 1870s by Berzelius and Mendeleev (Klein, 2004). For psychology, Jens Mammen accomplishes this task almost two centuries later, in this book.

But why has it taken psychology to go beyond Kant so long? The key for theoretical progress in a science is based on the issues of relation between the deductive and inductive lines of thinking—that the adequacy and generative power of the given theoretical structure can be determined. An abstract system of thought can lead to an innovative view upon the phenomena. Yet, equally easily, it can lead to a fixed perspective that turns theories into dogmas. The latter is the end of *Wissenschaft* and the beginning of social-political games played under the label of "empirical science" in societies that value the practical usefulness of "evidence-based" accumulation of experiences. The latter does not need theoretical advancements to guide itself to new knowledge—the nominal use of theoretical labels as fashionable categories is enough. In psychology, the historical road from positivism to "positive

psychology"—through the purgatory of intense fights against "dualisms" in the twentieth century—has led to de-emphasizing the centrality of theory in the science of human ways of being.

Jens Mammen in this book reverses that trend. Psychology needs general abstract theories—and his meticulous elaboration of the theory of categories in this book provides the reader with a beautiful example. Let me—based on the reading of this book—introduce the notion of the **field of abductive potential (FAP)** that would allow us to analyze the generativity of a theoretical system. It is the potential of an abstract system to give rise to new perspectives on the phenomena that have previously been overlooked. FAP is built on the understanding of the process of abduction—in contrast to deduction or induction—introduced by Charles Sanders Peirce over a century ago. In his version, abduction is a "jump" in our understanding of the phenomena where a new explanatory principle becomes introduced on the basis of otherwise unexplainable (by accepted theoretical frame) known principles. If a surprising fact X is observed, and known principles A and B fail to explain it, introducing a new one—C—would explain the fact in a matter of course. A theory that can introduce the C to add to A and B has FAP > 1; a theory that sets strict limits on all facts to be explained by either A or B (or their "interaction" A & B) has FAP = 1. In psychology, the general linear model that dominates theoretical discourses has FAP = 1. It needs to expand to allowing for nonlinearity since all psychological phenomena are better assumed to be of that kind and be organized by principles of catalysis rather than those of causality (Cabell and Valsiner, 2014).

Abductive leaps are rare and emerge slowly in histories of sciences. The Riemann-Lobachevsky move to extend the Euclidean geometry is an example of where an obvious potential idea remained overlooked for two millennia. It took contemporary biology to replace the dogmas of genetic determinacy by new thinking in terms of epigenesis about 150 years since Jean-Baptiste Lamarck first dared to hint at the possibility of practice leading to biological innovation. In psychology, such oversights come from the link of the science with the sociopolitical and socioethical premises of human living. This is both the curse and the savior of the discipline as a science of human *being* (Valsiner, Marsico, Chaudhary, Sato, and Dazzani, 2016). We affectively relate to our own selves—creating borders for our own understanding of the human psyche as we ourselves as human beings escape from some of its revelations (Devereux, 1967).

FAP highlights the generative potential of a theory. For some theories, FAP can be 0 (these would be theories that serve as "umbrella" covers for labeling empirical research practices as if "theoretically based"), for others 1 (theoretical systems that account for precisely the empirical evidence it claims to cover—but has no extension potential to new evidence). It is evident that FAP of the magnitude >1 is what any theoretical breakthrough in a discipline would need. Some examples of the building of empirical theoretical psychology (van Geert, 1998) exist—a theoretical model based on observable evidence needs to be testable, empirically or theoretically, on the whole range of *possible* evidence. Much of the latter may never be empirically accessible, or it may be by luck or persistence that it becomes so. The half-century search for gravity waves (Collins, 2003) is an example of the latter—a

theoretical model led to active and overwhelming search for the momentary phenomena that would be crucial for proving the theory. At the same time, the "big data" accumulated were irrelevant for the search—until the moment of the detection of the *single instance* of the actions of the gravity waves. At that moment, that single instance becomes crucial empirical evidence—and the huge accumulation of empirical data vanishes in its importance. Psychology—in its focus on data collection—may have much to learn from astrophysics. FAP value of a theory leads to interpretation of the data—while no theory can grow out of the data, through inductive generalization.

Mammen's theory as outlined in this book clearly has FAP > 1. Starting from classical logic, he moves into realms of derived argumentation that opens new alleys for asking questions about our everyday life practices. The unity of his two kinds of basic parts of the whole—which he calls *choice* and *sense* categories in this book—opens the door to transcend the hegemony of the cognitive science to look at the unity of affective and mental processes within the same whole. All of our human psychological phenomena are of such united kind. Psychologists may differ in their allocation of primacy of one kind over the other—but it is the unity of both within the same theoretical system that leads to new empirically testable hypotheses and new social practices. Jens Mammen's book is a clear and concise example of how building a highly abstract theoretical framework can innovate the discipline. The thoughtful readers of this book will not be disappointed—while the representatives of the "empirical science" believers in psychology may pass it by as too complex a reading in our contemporary world of fragmentation of knowledge and quick evaluative opinions. Yet it is not the opinions that will prevail, but carefully constructed theoretical systems. This book is a pleasure for the *connoisseurs* of the latter.

Aalborg, Denmark Jaan Valsiner
July 2017

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Author's Preface

My interest in the issues treated in this short volume has a long personal history. Already when I from 1960 to 1962 was studying mathematics, physics, and chemistry at the renowned Niels Bohr Institute,[1] University of Copenhagen, I wondered what tied two physical variables together in a functional relationship.[2] If you drop a heavy object and let it fall to the ground, there is a mathematical formula describing how far it has fallen as a function of the time passed since you dropped it. But what ties the two variables together is the fact that it is the same object you are following the whole way down, and to which the variables "belong," and not another object in the interval of observation. That may seem trivial in this case. But when dealing with objects which are not being observed continuously, or even can't be traced individually, or when dealing with parts of matter in quantum mechanics, it is not trivial at all.

Despite that, the question of identification of particular parts of matter was not explicit in physical theories but in the hands of qualified experimentalists.

Perhaps my interest in the problem was influenced, not only by an attitude of "practical realism" but by questions raised in the existentialist philosophy of Søren Kierkegaard about the significance of the singular or particular, which I had brought with me from my high school lessons in religion.

Anyway, when I in 1961 turned to also studying psychology at the University of Copenhagen,[3] I had the same problems, but now much more dramatic. Here the identification, and even existence, of particular objects in our world was not just ignored theoretically; it was explicitly denied in the descriptive, subjectivist, and solipsist so-called Copenhagen phenomenology. As I wrote in a critical paper

[1] That was the colloquial name, also internationally, until it in 1965 became the official name of the institute.

[2] In fact the problem already emerges in mathematics, where a functional relationship between variables is defined by pairing of elements, not defined by belonging to the same physical entity, but by a choice of pairing by "someone" (see later discussion of the axiom of choice).

[3] At that time, it was possible to follow two studies in parallel.

(Mammen, 1967): "If you want to secure the identity of an object, it is wiser to lock it in than to describe it.[4]" In a way, that has been my guide since then.

The hegemony of this Copenhagen school, which of course was a provocation for others than me, was one of many motives for the Danish student rebellion in 1968, starting March 21, 1968, with an action[5] with very broad participation of students and soon after also many younger teachers and professional psychologists. Eventually, it resulted in extended participatory influence for students and non-fullprofessor teachers, more intense teaching and tutoring forms, and first of all greater pluralism in curriculum and teaching (Mammen, 2010).

This did not mean that the problems of identification of objects were solved. On the contrary, it was just carried on in mainstream psychology, e.g., in cognitivism and its computer models of human cognition.

The problem may seem as being very theoretical and even sophisticated. The point is, however, that the missing solution has severe consequences for our understanding of human cognition, motivation, and affection and also for practical psychology. In fact it even has consequences for our difficulties with bridging natural and human (including social and historical) sciences.

In my thesis in 1983 (Mammen, 1996), I argued for the necessity for psychology of a new "infinite" logic based on the duality between identification and description of objects, including persons, and I showed how modern mathematics could be used to catch this duality in a precise way.

In many following publications, I have argued that this is not only a question of finding a new formal basis for psychology and to establish a conceptual frame for a better understanding of our cognitive and practical interaction with the world but first of all for a better understanding of our affections and bonds to other people and to significant objects in our lives, which is also central for psychology as an analytical, critical, and practical tool. It even has implications for our moral and political lives.

The present short volume is an attempt at a coherent presentation of this "new logical foundation for psychology." Compared to what I planned, it is a little too compact, too little flesh compared to the backbone, too little documentation and discussion.[6] I hope it can be compensated to some extent by references to earlier writings covering broader issues and implications and with further references.

Especially I wanted to present some more empirical and practical support for the theoretical exposition. Instead I also here have to refer to my earlier work and to the listed works on developmental and cognitive psychology by Krøjgaard (2000, 2007, 2009, 2016, 2017) and on personality and clinical psychology by Neumann (2016).

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[4] My translation. I was at that time further inspired by the Danish statistician Georg Rasch who stressed the same points in his concept of "specific objectivity" (Mammen, 2008b; Rasch, 1977), partly referring to analyses of Kurt Lewin (1935) and the Scottish physicist James Clerk Maxwell (Rasch, 1960).

[5] In fact it was planned at a meeting the day before in my wife's and my apartment.

[6] Further, an important mathematical proof (Hoffmann-Jørgensen, 2000), only readable for experts, has been moved to an Internet link. The same is done with an attempt at a popular explanation of quantum mechanical entanglement (Mammen, 2016c).

Some of the "backbones" presented in this volume have been published before in slightly other versions. Especially for pages 58–88, the text is closely following an earlier one in Mammen (2016a). This has been necessary to avoid breaking a very strict step-by-step logic of presentation and proofs.

I want to thank the editor of this series of Springer Briefs, Jaan Valsiner, for providing me the chance in this way to sum up and elaborate my work through many years but also for lot of inspiration and encouragement and many very useful discussions. The Niels Bohr Professorship Centre for Cultural Psychology at Aalborg University, headed by Jaan Valsiner, has been a stimulating and open-minded context for developing and discussing old and new ideas.

I will thank my wife Anne Bjerg, also a psychologist, for reading and commenting drafts and for very useful discussions of both the text and its broader implications.

Many colleagues should be thanked for discussions and inspirations through times. A special thanks shall be directed to my colleague Niels Engelsted, soul mate and comrade-in-arms for more than 35 years. I want to thank Peter Krøjgaard for many years of fruitful cooperation, Ib Madsen and Jørgen Hoffmann-Jørgensen for essential help and for useful commentaries on the mathematical presentation, and Jens Kvorning for congenial help with the figures illustrating the mathematical ideas. Thanks also to Magnus Dahl for corrections to the manuscript and ideas for further development.

Aalborg, Denmark Jens Mammen
July 2017

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[7] All works by Mammen can be downloaded freely from http://engelsted.net/mammenbibliografi.htm (until 2011) or from the links listed.

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Jens Mammen is an emeritus professor from Aarhus University, Denmark, and since 2009 has been honorary professor at Aalborg University, Denmark. He is also affiliated with the Niels Bohr Professorship Centre for Cultural Psychology. He studied mathematics, physics, and chemistry at the Niels Bohr Institute from 1960 to 1962 and psychology from 1961 to 1968, also at the University of Copenhagen. He graduated in psychology in 1969 from Aarhus University as a magister with theses on cybernetic models in psychology and experimental investigations of visual perception. He received his D.Phil. in psychology in 1983 with a thesis on the logical structure of psyche, using mathematical topology. He was associate professor and docent until 2000 when he was appointed professor in cognitive psychology at Aarhus University. He has been dean of faculty, head of department, and chairman of the governing board for the Danish Research School in Psychology and held several other academic posts.