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Johannes von Kries's Conception of Probability, its Roots, and Modern Developments: Introduction

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The papers in this special section originate from a two-day conference on "Johannes von Kries's conception of probability, its roots and impact", held in September 2012 in Bonn. Johannes von Kries (1853–1928) was a renowned physiologist and professor at Freiburg, who also worked on the methodology and foundations of science. In 1886, he published his "Die Principien der Wahrscheinlichkeitsrechnung. Eine logische Untersuchung" (The Principles of the Probability Calculus. A Logical Investigation). This book had considerable influence at its time and was re-issued unaltered in 1927. In 1916, von Kries concisely described his core ideas on probability also in a comprehensive work called "Logik. Grundzüge einer kritischen und formalen Urteilslehre" (Logic. Outlines of a Critical and Formal Theory of Judgment). In the "Principien", von Kries is less concerned with the calculus of probability—there are almost no formulas contained in the book—than with the meaning and background of ascriptions of numerical probability. In modern terms, his issue was with the truth conditions of such statements. Von Kries suspected that precise numerical statements of probability are without proper foundation in many fields, and he set out to clarify the circumstances in which they are meaningful. He rejects probabilities as subjective degrees of confidence ("psychologism"), the classical, Laplacean account ("logical interpretation") as well as the relative frequency theory ("empirical interpretation") of probability. He then puts forward, carefully explicates and explores an original proposal, which explains the importance of the book.

Von Kries's core notion is that of a measurable "Spielraum" (range, leeway), and his "Spielraumtheorie" or range conception of probability is the first to use a fundamental idea

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in the interpretation of probabilities that came to be known later in a somewhat different guise as the "method of arbitrary functions". Von Kries locates the truth conditions of probability statements in the generating conditions of the phenomena to which the calculus of probability can be successfully applied. He identifies these, roughly speaking, as phenomena with generating conditions such that all attachments of continuous probability distributions to these yield the same outcome probabilities for the events of interest. In its core applications, the approach presupposes a classical mechanical setting with instability (similar initial states may lead to different outcomes), and in addition, that an event of interest is represented with constant proportion all over the state space. The same basic idea was later put forward and developed in different ways by several other writers. Today, the best known of them may be Henri Poincaré. While von Kries's treatment lacks mathematical rigour, he had a genuine grasp of the origin of probabilistic phenomena in deterministic settings. He was the first to take such an approach to probabilities and their interpretation, but the exact nature of the von Kriesian probabilities is not easy to determine. He strongly influenced logicists like John Maynard Keynes as well as frequentists like Hans Reichenbach.

Nowadays, views on probability that share central features with von Kries's account are, e.g., taken by Marshall Abrams, Jacob Rosenthal, and notably Michael Strevens. They may be said to constitute a third way on objective probability, besides frequentist and propensity accounts. (We take David Lewis's best-system analysis of probabilistic laws of nature and objective chance to be a sophisticated version of frequentism. If this means stretching the label "frequentism" too far, we have to reckon with still another way on objective probability.) Although it never became mainstream, the basic idea of the "third way" is ever-recurring and can be explicated in various ways with non-trivial differences. Many of its versions were developed independently of von Kries, but he may nevertheless be called the originator of the whole approach, and so his particular account deserves attention. As indicated, von Kries is difficult to understand in certain places. In particular, it is not fully clear whether he proposes an objective interpretation of probability in the current sense, or whether his account is rather meant to be epistemic (or, as he might have said, "logical") in kind. This corresponds to the fact that "arbitrary functions" on a state space can be understood in several ways, e.g., as representing empirical distributions of relative frequencies, or as reflecting our ignorance with regard to the obtaining particular initial state. Outcome probabilities that may be called "objective" result either way, but in the latter case, these "objective" probabilities are nothing but resilient subjective or epistemic ones. It may, however, be a mistake to force our distinction between subjective (or epistemic) and objective (or ontic) probabilities upon von Kries.

The papers collected in this special section address historical as well as systematic issues connected to the "Spielraumtheorie" or range conception of probability. We use this von Kriesian label as an umbrella term for the third way on objective probability, although there are considerable differences between von Kries's original account and, say, Poincaré's "method of arbitrary functions", Michael Strevens's "microconstant probability" or Marshall Abrams's "mechanistic probability". The overarching term is justified in view of the shared basic idea and analogous problems. Helmut Pulte's paper investigates the background of the "Spielraumtheorie". He puts the von Kriesian ideas in their historical setting and explores the underlying philosophical and scientific views of von Kries. From there, he addresses certain problems of and tensions within von Kries's original account. The interpretation of this account is the focus of Sandy Zabell's paper. He carefully explores von Kries's central notions as well as the relation to and impact on several of his contemporaries, with a view to "principles of insufficient reason" in particular. Jacob

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Rosenthal puts forward and discusses a modernized version of von Kries's account, relating it to current alternatives. John Roberts addresses a basic problem that besets the whole third way on objective probability, namely, the status of the "input probabilities" or "arbitrary functions" the approach seems to presuppose: what their meaning is, and how to justify the required smoothness condition. Claus Beisbart fruitfully contrasts the range conception to the currently most influential account of objective probability: David Lewis's best-system approach. Last but not least, Bernd Buldt provides a comprehensive and detailed bio-bibliography of Johannes von Kries.

While the papers of Buldt, Pulte and Zabell share a historical focus on von Kries and his contemporaries, Beisbart and Roberts refer to variants of the approach that are in vogue today and discuss it in a systematic way. Rosenthal's paper is somewhat in between and provides a link between von Kries and modern writers. On the whole, the papers offer a historical as well as systematic account of the range conception as the third way on objective probability. We would very much like to thank the DFG for funding the conference, the Journal for General Philosophy of Science for publishing this special issue, and above all the speakers and contributors for their papers and many exciting and in-depth discussions.