

S. S. STEVENS'S 'LOST' PAPER OF 1939: "ON THE PROBLEM OF SCALES FOR THE MEASUREMENT OF PSYCHOLOGICAL MAGNITUDES"

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Abstract

In 1939, S. S. Stevens presented a paper, with the title, "On the problem of scales for the measurement of psychological magnitudes," to the Fifth International Congress for the Unity of Science, in Cambridge, Massachusetts, USA. Stevens's paper, together with several others delivered at the Congress, was scheduled for publication in Volume 9 of The Journal for Unified Science (Erkenntnis). Copies of those papers were printed for members of the Congress as though they were published, and a few of the papers, including Stevens's, were so cited later. But The Journal for Unified Science (Erkenntnis) ended with volume 8, volume 9 did not appear, and Stevens's paper was never published. A copy of Stevens's paper, as printed for members of the Congress, was found at Harvard's Psychology Library and is hereby being made more widely available: Nearly 70 years after it was written, Stevens's paper now appears in these Proceedings.

Every so often, scientists encounter historical mysteries – and some of us find the urge to solve them irresistible. A favorite example: The eminent color-vision researcher Gordon Walls (1956) recounted his efforts, expended over several years, to uncover the source of a cryptic reference in Helmholtz's *Physiological Optics*, efforts that led Walls to 'rediscover' the work of the possibly-pseudonymous G. Palmer – perhaps Giros de Gentilly? – who had conceived, before either Young or Helmholtz, the essentials of three-receptor color theory.

My own historical mystery began when Sergio Masin contacted me after seeking, unsuccessfully, to track down the following reference: S.S. Stevens, "On the problem of scales for the measurement of psychological magnitudes," *Journal of Unified Science (Erkenntnis)*, 1939, volume 9, pages 94-99. The paper has been cited several times, even by Stevens himself (Stevens, 1951, Stevens & Newman, 1940). Masin's trip to his library at Padua showed ... that the journal's final volume was number 8, dated 1939/1940. After volume 8, the *Journal of Unified Science (Erkenntnis)* ceased publication.

The *Journal of Unified Science (Erkenntnis)* itself had a rather tortuous history. It began as the *Annalen der Philosophie und Philosophischen Kritik*. Reflecting the rise of logical positivism, in 1930 the journal renamed itself *Erkenntnis*, as Hans Reichenbach and Rudolf Carnap became its editors. With the second issue of volume 7, the journal changed publishers and moved its site of publication – from Germany to Holland. The name changed again, to *The Journal of Unified Science (Erkenntnis)* in volume 8, published over the period 1939/1940. So *The Journal of Unified Science (Erkenntnis)* published only a single volume before going out of existence. Three and a half decades later, however, it started up again, once more under the name *Erkenntnis*, publishing volume 9 in 1975. The first issue of the new *Erkenntnis* opened with a brief article by its editor at the time, Carl Hempel, entitled "The Old and the New 'Erkenntnis'," in which Hempel described much of the history of the journal, as I recount it above.

In his article comparing the new *Erkenntnis* to the old, Hempel (1975) wrote that, "The vigorous life of the old *Erkenntnis* was terminated by the rise of National Socialism

and the outbreak of the Second World War (pp. 2-3).” With the Jewish Reichenbach an editor, it is not surprising that the old *Erkenntnis* moved publishing houses from Germany to Holland. Attempts thus far to learn of the fate of the Dutch firm W. P. van Stockum & Zoon, which had assumed publication of the journal, have so far been unsuccessful.

Hempel (1975) further noted that the new *Erkenntnis* was publishing a paper by Gomperz (1975) that had previously been scheduled to appear in volume 9 of *The Journal of Unified Science (Erkenntnis)*. A note appended to Gomperz’s paper reads, “Paper sent in for the fifth International Congress for the Unity of Science (Cambridge, Mass., U.S.A., 1939). This essay was supposed to be published on pp. 31-36 in Vol. IX of 'The Journal of Unified Science (Erkenntnis)' (planned publication in 1940), which could not be brought out in consequence of the events of the second world war. - It is unknown whether there still exist reprints of further essays of that volume (p. 10).” (See Note below.)

Not only was the 1939 International Congress for the Unity of Science held in Cambridge, Massachusetts, but at least some of the sessions took place in Harvard’s Emerson Hall (Kallen, 1946) – at the time, home to the Department of Psychology. Not surprisingly, Stevens attended the Congress, where he gave the paper, “On the problem of scales for the measurement of psychological magnitudes.” But the new *Erkenntnis* did not publish Stevens’s paper. A search of bibliographies of Stevens’s works (e.g., the Memorial Volume dedicated to Stevens, edited by Moskowitz, Scharf, & J.C. Stevens, 1975) revealed no mention of it.

Success finally came, with the help of Richard Kaufman at the Harvard Psychology Department’s Library: Someone – probably Annelise Katz, who had been, for many years before, the Librarian at the Psychology Department – had bound together a volume of Stevens’s papers, and that volume contains a copy of the ‘lost’ paper, one of several that had been printed for the members of the 1939 Congress and planned for publication in *The Journal of Unified Science (Erkenntnis)*. These printed copies carried the page numbers of the planned publication. Several papers from the Congress would eventually be published elsewhere, in journals or in edited volumes. The program itself has been published at least twice (Fifth International Congress for the Unity of Science, 1939/1940, 1976). I cannot determine, however, just how many of the 63 papers listed in the program were slated for publication in *The Journal of Unified Science (Erkenntnis)*.

Stevens’s paper is reproduced in these *Proceedings*, courtesy of his son, Peter. A reading of the paper itself suggests that, by 1939, Stevens was still far from the quadripartite system for classifying scales of measurement that would become, arguably, his single most important contribution to science. That system – of nominal, ordinal, interval, and ratio scales – he would formally propose seven years later (Stevens, 1946). In 1939, however, Stevens still relied on the tripartite classification into ordinal, intensive, and extensive scales. Indeed, upon later reflection, Stevens (1974) declared the 1939 paper to have been, in his inimitable words, “a botch” (p. 436).

What is clear in Stevens’s 1939 paper, however, is the distinction between what he would later call prothetic and metathetic continua. Not only did he already suggest that perceptual continua can differ with regard to the underlying neural mechanisms – involving the addition of neural excitation in the one case, and the substitution of different kinds of neural excitation in the other – but he further suggested that the two classes of continua may differ in the properties of their respective psychophysical scales.

In the year after the International Congress, Stevens and Newman (1940) published a paper on the scaling of pitch – a follow-up to an earlier study, by Stevens, Volkman, and Newman (1937). Although dated 1940, Stevens and Newman wrote the paper at the latest in 1939 (it was accepted for publication on August 31, 1939), and so it is not surprising that it cited “On the problem of scales for the measurement of psychological magnitudes” as being ‘in press.’ The third and last issue of *The Journal of Unified Science*

(*Erkenntnis*), volume 8, is dated (on its cover) April 1, 1940, and it contains the program of September, 1939, Congress. It is still unclear when Stevens discovered that his paper had not been published. Apparently not by 1951, when he cited it again. But almost certainly by the time he wrote his brief autobiography (dated 1970, although published posthumously). In his autobiography, Stevens (1974) referred to his talk at the 1939 Congress but did not mention that it had been slated at the time for publication.

When, then, did Stevens develop the quadripartite system for classifying scales? Clearly, he had not come to this classification by 1939. But he did have the essence of the quadripartite classification well before publishing it in 1946. For in that paper Stevens wrote, “A classification essentially equivalent to that contained in this paper was presented before the [Sixth] International Congress for the Unity of Science, September 1941. The writer is indebted to the late Prof. G. D. Birkhoff for a stimulating discussion which led to the completion of the table in essentially its present form” (p. 678, footnote 1).

How similar, I wonder, to the final system for classifying scales was the version presented to the Sixth International Congress, which met in Chicago in 1941? Do copies exist of papers presented at that meeting? Did Stevens leave a written manuscript?

This 2006 Fechner Day Meeting is taking place in St. Albans – and my quick consultation with a rail schedule shows that Baker Street, London, is only about a half hour away. The game is afoot!

Acknowledgements

I am greatly indebted to two individuals, without whom this historical foray would not have even begun or had its resolution. It was Sergio Cesare Masin who discovered that Stevens’s paper, though several-times cited, had not actually been published, and whose preliminary investigation and e-mail inquiry spurring my investigation. Thank you, Sergio. And it was Richard E. Kaufman, Librarian at Harvard’s Psychology Department, who located in the Department Library a copy of Stevens’s paper, as printed for the Fifth International Congress for the Unity of Science. Thank you too, Richard.

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Note

An historical archive of *Erkenntnis* appears on the website of Springer, the journal's current publisher. Curiously, this website contains a link to a 'volume 8' of the journal, listed between volumes 7 and 9, but published in 1976, the same year that *Erkenntnis* published, and the website gives a link to, volume 10 – and one year after *Erkenntnis* resumed publication with volume 9. Just as curiously, *Erkenntnis*, 1976, volume 8, contains a paper by Gomperz (1976) that is virtually identical to the one published the previous year (Gomperz, 1975). The only difference is that Gomperz (1976) lacks the end note indicating that the paper had originally been scheduled for publication in volume 9 of *The Journal of Unified Science (Erkenntnis)*. I have not been able to locate a printed copy of *Erkenntnis*, 1976, volume 9 – nor determine from the publisher whether it exists in printed form.

Erkenntnis of 1976, volume 9, contains, in addition to the paper by Gomperz, nine other papers from the 1939 Congress. I surmise that these nine too were among those scheduled for publication in the earlier *Journal of Unified Science (Erkenntnis)*, but I have not yet been able to confirm this. Nevertheless, it is reasonable to speculate that publication of volume 9 of *Erkenntnis* in 1976 represented, in part, an attempt to publish as many papers as possible of those planned for publication in volume 9 of *The Journal of Unified Science (Erkenntnis)*. On the other hand, *Erkenntnis*, 1976, volume 9, also contains other, contemporary papers. Is it fortuitous that the program for the 1939 Congress appears on pages 369-371 both in volume 8 of *The Journal of Unified Science (Erkenntnis)* and in volume 9 of *Erkenntnis*? I doubt it. Finally, note too that Carl Hempel was in 1939 a faculty member at City College in New York and authored a paper on the program of the International Congress.

In comparing the new to old *Erkenntnis*, Hempel (1975) reminded his readers of the terrible times that befell many of the European philosophers at the time that the old *Erkenntnis* ceased publishing; he wrote, most pointedly: "some, like Kurt Grelling, were 'exterminated' (p. 3)." Grelling had previously left Germany to work in Belgium with Paul Oppenheim. Although the program to the Fifth International Congress for the Unity of Science listed Grelling as single author of one paper and co-author with Oppenheim of another, Grelling was unable to secure a visa to come to the US and therefore was unable to attend. Soon after Germany invaded Belgium in 1940, Grelling was arrested. In 1942 he died at Auschwitz (Luchins & Luchins, 2000). More fortunate was Alfred Tarski, who had left Warsaw in August of 1939 to attend the Congress and thus found himself in the US, where he was able to remain, after Germany invaded Poland two days before the Congress began.

Like many others, Grelling had continued to think and to write, as best he could, until his arrest, under circumstances that now may be difficult to conceive – difficult, but, unfortunately, not impossible. Logical positivists, members of the Berlin and Vienna Circles, and others who at the time explored the possible 'unities of science' were working under the cloud of a totalitarianism that fundamentally opposed their scholarly, rational discourse. By making Stevens's paper more widely available to the scientific community, we endorse and, in a small way, contribute to the continuation of scholarly discourse.