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From Nancy to Copenhagen to the World: The internationalization of Laurent Schwartz and his theory of distributions

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Abstract

Between 1947 and 1950, Laurent Schwartz (1915–2002) went from being almost unknown outside of France to being an international mathematical celebrity. This paper accounts for Schwartz's rapid ascent by focusing on the social, institutional, and mathematical contexts of his crucial trajectory from Nancy, via Copenhagen, to the world stage, culminating in his 1950 Fields Medal awarded in Cambridge, Massachusetts. We identify, based on new archival findings, the pivotal role of Danish mathematician Harald Bohr along this trajectory. Our analysis reveals the emerging dynamics of early postwar international mathematics, and explains how certain individuals and theories could rise to prominence in this period.

Résumé

Inconnu jusqu'alors hors de la France, Laurent Schwartz (1915–2002) est devenu entre 1947 et 1950 un mathématicien célèbre sur le plan international. Cet article présente l'ascension rapide de Schwartz en se concentrant sur les contextes sociaux, institutionnels et mathématique de sa trajectoire, depuis Nancy, via Copenhague, jusqu'à la scène mondiale, culminant avec sa médaille Fields, attribuée en 1950 à Cambridge, Massachusetts. Nous identifions, à partir de nouvelles découvertes dans les archives, le rôle central du mathématicien Danois Harald Bohr, le long de cette trajectoire. Notre analyse révèle certaines dynamiques émergentes des mathématiques internationales dans l'immédiate après-guerre, et explique comment certains individus et théories ont pu prendre une place proéminente pendant cette période.

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Keywords: Laurent Schwartz; Theory of distributions; International Congress of Mathematicians 1950; Harald Bohr; Fields Medal; Postwar mathematics; Internationalization

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1. Introduction

Between 1947 and 1950, Laurent Schwartz (1915–2002) went from being almost unknown outside of France to being an international mathematical celebrity. His claim to fame was his theory of distributions, with which he proposed a generalization to the notion of function in mathematical analysis so that distributions (his generalized functions) always had well-defined derivatives. At first glance, Schwartz appears to have ridden his theory's obvious merits to greater and greater recognition, culminating in his receipt of a Fields Medal at the 1950 International Congress of Mathematicians. His rapid rise through the ranks of international mathematics could be attributed largely to his timely insight into the theory of differential equations and topological vector spaces, which mathematicians and mathematical physicists duly adopted for its conceptual advantages while crediting Schwartz as the theory's originator. On the testimony of Harald Bohr (1887–1951) from the Fields Medal presentation at the opening ceremony of the 1950 Congress, one could be forgiven for thinking Schwartz's fame derived naturally and inevitably from his theory's brilliance.

But first glances rarely tell the full story. A closer look reveals a rather different explanation for Schwartz's and distributions' international success, which was deeply embedded in the turmoil the international mathematical community confronted at the close of the Second World War. To be sure, Schwartz's idea for distributions could appear powerful and compelling, but it could hardly in 1947 (or even 1950) be called a fully fleshed-out theory. In the frayed and disarrayed channels of postwar mathematics, moreover, international recognition for even the most profound mathematical interventions was far from assured.[1] Indeed, Bohr's narrative entirely omitted what we have identified through archival research as perhaps the most important factor in Schwartz's early international recognition: the advocacy of Harald Bohr himself, with an important supporting role for Bohr's Copenhagen colleague and protégé Børge Jessen (1907–1993). While we dare not speculate about a counterfactual history where Schwartz and Bohr did not cross paths in 1947, it is clear to us that in the history that did indeed transpire Bohr was, again and again, the engine that helped drive Schwartz and distributions to international fame. That Bohr's role in this history has remained almost entirely unrecognized by historians or mathematicians is a testament to his thoroughgoing success at quietly and deliberately leaving his mark on the first postwar generation of mathematical leaders.[2]

With this paper, we integrate the evidence from early publications and reviews related to distributions with private letters that attest to Bohr's, Schwartz's, and others' personal efforts to bring distributions to the world. Our analysis pinpoints Bohr's precise role, relating it to developments in Schwartz's theory in the critical period from 1947 to 1950 when Schwartz entered the international stage. Mathematically, we show how problems from harmonic analysis (especially as related to Fourier transformations) dominated early discussions of Schwartz's theory, shaping both Schwartz's theoretical reception and his earliest international networks of interlocutors and advocates. We set this against the initial geography and chronology of Schwartz and his theory, identifying the steps that took both, as our title indicates, from Nancy to Copenhagen to the world.

While the pivotal progression of Nancy to Copenhagen to the world has been obscured by the celebratory amnesia of mathematicians' collective memory of Schwartz and distributions, this sequence's historical importance was clear to Schwartz at the time. Writing to Jessen not long after Bohr's death, Schwartz attested: "I have for Bohr an exceptional sympathy; he also remains linked for me to my first international collo-

[1] On these tensions and difficulties in the contested reconstruction of international mathematics in this period, see Barany (2016a), chs. 3–4.

[2] Lützen (1982, 160) detected Bohr's intention to promote distributions, and Paumier (2014, 2016) and Barany (2016a) have more recently indicated a more thoroughgoing role, which we synthesize here along with previously unreported findings.

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