The Myth and the Medal

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1 Prologue

The weekend before the start of the 2014 International Congress of Mathematicians, I contributed an op-ed to the *New York Times* about the history of the Fields Medal. The article treated two topics that are familiar to many mathematicians, if not necessarily to the general public. I suggested that a previously unrecognized connection between these two stories, discovered in the course of my research, helped illuminate the relationship between politics and modern mathematics.

The first relatively well-known story involved the lack of a Nobel Prize in mathematics and the creation of the Fields Medal some three decades later. While the criteria, compensation, and other aspects of these awards have always been quite different, many have seen the Fields Medal's origin as a response to the lack of a corresponding Nobel Prize (e.g. [18, p. 167] [9, p. 62]). Especially for public audiences, the Fields Medal is often called the Nobel Prize of Mathematics. Even the organizers of the 2014 ICM used the comparison on their official website.

The second story was the public controversy surrounding Stephen Smale's 1966 Fields Medal and his opposition to the Vietnam War. I became interested in Smale's tale while studying the published and private documents that circulated in the international mathematical community after World War II. Before 1966, with one exception, no source I encountered made what today is an almost reflexive comparison between the Fields Medal and the more famous Nobel Prize. After 1966, the comparison quickly became common. Looking closer, I found that the seemingly perennial speculation about the lack of a Nobel Prize in mathematics and its relation to the origins of

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the Fields Medal also dated to after 1966, at least when it came to what mathematicians and historians put in writing.

The reason for this sudden shift was the so-called Smale Affair. Here, I offer a full account of this finding, along with what I think it means for the history and discipline of mathematics. The stories mathematicians and historians tell about famous awards like the Fields Medal are not simply interesting trivia. They shape how the broader public views the discipline and how mathematicians see themselves. The true story of the Fields Medal and its link to the Nobel Prize, I contend, can challenge mathematicians and non-mathematicians alike to reconsider the relationship between the discipline and the societies that sustain it.

2   Myths and their Motivations

According to myth, there is no Nobel Prize in mathematics because of the personal antagonism between Alfred Nobel, who endowed the prizes on his death in 1896, and Swedish mathematician Gösta Mittag-Leffler. Perhaps, the story goes, Mittag-Leffler had an affair with Nobel's wife, or perhaps they were just rivals in the Royal Swedish Academy of Science. Then, the story often continues, Canadian mathematician John Charles Fields saw an opportunity to rectify Nobel's unfortunate and spiteful omission. And so, shortly after Fields's death in 1932, the international mathematics community created an award in his name that would serve as the Nobel Prize of mathematics.

Lars Gårding and Lars Hörmander tackled the first part of this myth in 1985 [7]. The speculation about Nobel's wife was easily refuted on existential grounds: Nobel was a confirmed bachelor. Regarding Swedish academic politics, Gårding and Hörmander could find no evidence that Nobel and Mittag-Leffler had much interaction in their lives, much less a history-altering antagonism. Instead, the authors conclude that there was no Nobel Prize in mathematics for the simple reason that mathematics just was not that important to Nobel. Neither, for that matter, was economics, whose prize was endowed separately in 1968 and first awarded in 1969.

The question of why there was no Nobel Prize in mathematics was motivated by an assumption, pointed out and refuted by Gårding and Hörmander, that mathematics was especially salient for Nobel. The myth that the Fields Medal was created as a substitute rests on the converse (and also mistaken)

assumption that the Nobel Prize was especially salient for mathematicians. In fact, while mathematicians took a general interest in the honors bestowed on their scientific colleagues they did not seem preoccupied with the lack of a Nobel Prize for themselves. If mathematicians harbored private questions these were rarely set to paper. It was only later, after a public controversy forced mathematicians to articulate what the Fields Medal was in terms that were meaningful to a much broader and more skeptical audience, that the comparison between the awards took hold.

Once established, however, the comparison came to matter for both mathematicians and their publics. It raised the stature of certain mathematicians and certain areas of mathematics by associating Fields Medals with a much better known award. Among mathematicians, the comparison sparked new conversations about the history of the Fields Medal and its relationship to the Nobel Prize. J. L. Synge, who had been instrumental in creating the Fields Medal itself, began to speculate anew about whether Fields could have been motivated by Nobel's omission, and his musings influenced an important early history of the medal (see [18]). Others asked the kinds of questions that led to Gårding and Hörmander's article. These conversations may have helped to spur the creation of new awards, like the Wolf and Abel Prizes, closer in spirit and compensation to the Nobel Prizes.

Myths form and take root for many reasons. In 1966, the myth tying the Fields Medal and Nobel Prize arose in response to an unpopular war and the grandstanding U.S. House of Representatives' Committee on Un-American Activities. Since then, the myth has shaped not just images of mathematics, but the discipline's funding, public role, and collective memory.

3   An Obscure and Confusing Distinction

Medals have long been a part of the formal trappings of powerful institutions and their imitators. Governments, militaries, and scientific societies alike have furnished them to mark the merit of their most distinguished subjects and members. It was in this tradition that Nobel endowed his eponymous prizes, and, independent of Nobel, it was this tradition that propelled the International Congresses of Mathematicians to establish the Fields Medal.

Fields's proposal for a medal came at a dark and difficult time for the international mathematics community. On the heels of the Great War, mathematicians were among the many scholarly communities to try to rebuild

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international alliances while excluding those from the former Central Powers whom many blamed for the conflict. While mathematicians did sometimes cooperate across borders in this period, the war's geopolitical aftermath helped national rivalries flare, and suspicion and score-settling were rarely far below the surface rhetoric of common enterprise. The fractious national bodies of mathematicians that adhered to the first International Mathematical Union (founded in 1920 and formally dissolved in 1936) had good reason to worry about a discipline in disarray (see [9, pp. 23-71], [12], [13]).

Scientific communities of many shapes and sizes had, from the late nineteenth century, espoused an ideal of scientific internationalism that tended by far to outstrip its realization in practice. These communities created and promoted prizes like Nobel's as a token of outward unity to complement the variety of inward-looking medals with which national scientific organizations proclaimed their distinctiveness. Fields was not the only one to propose a medal for mathematicians. Mittag-Leffler himself hoped to endow a gold medal for outstanding discoveries in mathematics, although instead of a monetary award the medal was to be accompanied by a set of his journal *Acta Mathematica*. The 1908 International Congress of Mathematicians presented the Medaglia Guccia in honor of the founder of the Circolo Matematico di Palermo to Francesco Severi, but later Congresses did not continue the award.[1] The Fields Medals were ultimately established at the closing session of the 1932 International Congress of Mathematicians in Zürich. The same session featured a resolution to study the prospects for international organization in view of an International Mathematical Union that was all but dead.

The first medals were awarded at the 1936 Congress in Oslo to Lars Ahlfors and Jesse Douglas, though the latter's fatigue kept him from the ceremony and the medal was accepted on his behalf by his MIT colleague Norbert Wiener. The Second World War delayed the next pair of medals until 1950, when they were presented in Cambridge, Massachusetts, to Laurent Schwartz and Atle Selberg. Neither recipient professed to have heard of the medal before having been notified by the selection committee of his achievement [14, p. 311] [15].

The October 24, 1950 edition of *L'Est Républicain*, a regional newspaper based in Nancy, France, where Schwartz taught at the time, touted the young

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[1]Full bibliographic information for Proceedings and for newspaper and magazine articles to which I refer in this essay can be found at `http://mbarany.com/Fields.html`.

mathematician's "médaille Field." The brief report contains earliest statement I have found in any published document or private letter comparing the medal to the Nobel Prize.[2] The article reads: "The Field [sic] gold medal is considered as having the importance of a Nobel prize," and it makes no claims about the medal's origins or founder. The so-called "collaborators of Bourbaki" in this period, including Schwartz and his Nancy colleague Jean Dieudonné to whom Schwartz later credited the article's orchestration, had a notorious sense of humor (see [4]). So it is entirely possible that the comparison in the article came tongue-in-cheek. In any case, *L'Est Républicain* was a small newspaper, scarcely read outside its region, much less abroad, and the claim seems to have rested there.

Indeed, for some it was the lack of any equivalent to a Nobel prize that made mathematics distinctive. Not long before Schwartz won his medal, his compatriot André Weil declared:

> Let others besiege the offices of the mighty in the hope of getting the expensive apparatus, without which no Nobel prize comes within reach. Pencil and paper is all the mathematician needs; he can even sometimes get along without these. Neither are there Nobel prizes to tempt him away from slowly maturing work, towards a brilliant but ephemeral result. [19]

The Secretary of the American Mathematical Society made no mention of Nobel in a detailed response to a 1951 query about the Fields Medal's background [8]. A Curriculum Vitae for Ahlfors from that period shows that the medal's purpose could not be assumed as common knowledge [1]. His entry for the Fields Medal explained that it was awarded at the International Congress of Mathematicians to those "distinguished by particularly remarkable works." Even in October, 1966, shortly after the events described below that would tie the prize and the medal together for many, a mathematician could propose that the Ford Foundation sponsor a Nobel Prize in Mathematics on the premise that no equivalent then existed [6].

At the same time, the Fields Medal itself was not widely known beyond the international mathematics community. It rarely received coverage in the mass media, or even in general scientific publications. Where it did appear, typically as a brief notice, the coverage betrayed the award's obscurity. The *Hattiesburg American* reported in 1936, for instance, that Douglas's medal

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[2]I am grateful to Laurent Rollet for locating a copy of the article.

was "for the best mathematical work of the year" and that Fields "was the first president of the congress [of mathematicians,...] elected in 1924." When the *New York Times* reported on the 1954 accolades of Jean-Pierre Serre and Kunihiko Kodaira, it joined the many periodicals to omit the 's' from Fields's name, and clarified for its readers that the medal "is one of the highest honors in mathematics." This orthographic confusion can be found even from members of the Fields Medal selection committee: 1950 committee member Marston Morse refered to the award in a 1951 article as "Field's medals and prizes" and again as "Field's prize and medal" [11, p. 35].

Nor could those closely tied to the Fields Medal jury as late as 1966 be assured of having a clear idea about the prize's rules and organization. Alonzo Church, who would give the official Fields laudation for Paul Cohen at the 1966 Congress, suggested to the Fields committee that the medal be shared by Cohen and Kurt Gödel for their respective contributions to a solution of the continuum problem before being informed that Gödel was ineligible at the time due to age [5].

In fact, the strict age limit of forty was only codified at the 1966 Congress, although an informal criterion of youth preceded it. Fields's remark that is often interpreted as favoring young medalists, that the prize should be "in recognition of work already done" but was "at the same time intended to be an encouragement for further achievement," is associated with no claim about the age or career status of the recipient. Rather, the stipulation that the award should be given "not alone because of the outstanding character of the achievement but also with a view to encouraging further development along these lines," was Fields's suggestion for how "to avoid invidious comparisons" from partisans dissecting candidates' existing work [18, pp. 173–174]. What started with a worry about rivalrous national factions became an excuse to narrow the pool of candidates, and eventually turned into a restrictive cut-off. It is yet another myth that Fields intended the medal only for the young.

4 Vietnam, Berkeley, Moscow

Mathematicians had no need of the Nobel Prize comparison for themselves. From its start in 1966, and even in its fleeting appearance in 1950, it was a way for mathematicians to explain and justify themselves to the general public. In the two decades following World War II, mathematicians in the United

States had been quite successful winning support from those who mattered most—which is to say those in the government, military, and other organizations who held the purse strings and amply funded their activities [2] [16]. These entities also supported mathematicians beyond the U.S. both directly and indirectly, and helped establish the dominant place of U.S. institutions in postwar international mathematics even as major non-U.S. sponsors eventually emerged. Thus, while the Smale Affair hinged largely on American politics, its implications reached far beyond U.S. borders.

The basic story of the Smale Affair has been told in detail (e.g. [3, chs. 6-8]), including by Smale himself [17], and was covered extensively in this very journal as it unfolded. My purpose in this section is to reexamine the story in order to pinpoint how, when, and why the Fields Medal became linked to the Nobel Prize.

As a member of the mathematics faculty at the University of California at Berkeley, Smale was active on the campus's Vietnam Day Committee, which had organized efforts to block troop transports and otherwise to protest the war. The worst of the loyalty oaths and blacklists that shook many in the academic community seemed to have passed, but Cold War politics continued to stir controversy and universities were centers for such provocation and confrontation.

On August 5, 1966, the *San Francisco Examiner* reported that Smale had been subpoenaed to appear before the House Un-American Activities Committee for his antiwar activism. The article insinuated that, rather than face the committee, Smale had fled to Moscow. The acting chairman of Smale's department, Leon Henkin, rushed to notify the media that Smale was on his way to Moscow not to avoid HUAC but rather to attend that summer's International Congress of Mathematicians.[3] In fact, on the same day Smale was intended to testify he was due to receive what would appear under an Associated Press byline in news outlets nationwide the next day as "the Field [sic] Medal, one of mathematics' highest awards." We know from the report in the *San Francisco Chronicle* (the *Examiner*'s main competitor) that Henkin suggested something further. Its article reported that "Dr. Smale will be given the Field [sic] Medal, the highest honor in mathematics and comparable to the Nobel Prize." The next day, the New York Times quoted a university announcement that called Smale's medal "mathematics' closest

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[3]Serge Lang, visiting Berkeley at the time, was also involved in communications with the press. See [17, p. 23].

award to the Nobel Prize."

Comparing an award to a Nobel Prize is a political claim. It is a way of saying that the weight of the disinterested judgment of the world's experts has found the award's recipient particularly meritorious. Nobel Prizes and their laureates have been, from relatively early in their history (but by no means uniformly from the start), covetously tallied by powerful nations and their elite centers of research. To win the equivalent of a Nobel Prize is to be wanted, valued, and respected in the widely recognized and purportedly neutral idiom of scientific fame. On its surface, Henkin's press statement was simply a matter of setting the record straight on behalf of a colleague facing insidious allegations. Deep down, whether intentionally or not, Henkin was defending his discipline.

For the most part, the comparison worked. When all four winners that year were announced, on the same day as the HUAC hearing, journalists praised the mathematical prestige of the Moscow Congress without supposing its medal to be suspiciously Soviet. Page 10 of the August 16 *Oakland Tribune* featured, in the left column, an account of the "uproar" that ensued when Smale's fellow Vietnam activists faced the House committee. On the right column it praised the "Two brilliant Bay Area mathematics professors [Smale and Cohen] whose work in the realm of pure math is dazzling in its originality," who that day claimed their medals. The second article made no mention of Smale's connection to the other story. Here, local interest extended Smale's spotlight as far as Cohen, but did not reach as far as Michael Atiyah or Alexander Grothendieck from across the Atlantic—a pattern shared across U.S. coverage of the medals that year. The next day, side-by-side, the *Tribune* again reported on the Vietnam Day Committee and included an AP dispatch from Moscow tying Smale's award to the raucous HUAC hearing.

Such was the intrigue of a Vietnam-protesting and HUAC-subpoenaed mathematician receiving a medal in Moscow that the *New York Times* secured its own special dispatch on the topic a week later. The article reported on an effort by U.S., French, and North Vietnamese mathematicians to circulate a resolution at the Moscow Congress condemning HUAC and the U.S. incursion in Vietnam. The same reporter followed his story five days later with a sensational account of Smale's "informal news conference" on the steps of Moscow University. There, Smale criticized the U.S. military's role in Vietnam (along with political repression in the Soviet Union) before being whisked away for a special sitting with the Soviet press.

The general scientific press proved most susceptible to the Nobel Prize comparison. *Science News* reported on Smale and Cohen (but not HUAC) and described the Fields Medal as "considered to be as prestigious as the Nobel Prize by mathematicians." An essay in *Science* on Smale and HUAC (but not Cohen) implied that the comparison had a still broader reach, with the Fields Medal "a prize frequently called the 'Nobel Prize' of mathematics." Such evasive journalistic formulations, by not crediting the comparison to particular sources, gave the impression that it was a long-standing and widely shared consensus. A recent suggestion, promulgated far and wide by the Associated Press and then churned through the scientific and general media, became a ready truism.

This identification resurfaced a year later for Smale's defenders after the U.S. National Science Foundation rejected his grant request for $150,000 over the next two years. The incidents of August 1966 had sparked the ire of some House of Representatives members, and Smale and his defenders were quick to suggest that the rejection was for his politics alone. Reporting on the new controversy, the *New York Times* described his medal of the prior year as "considered by some as 'the Nobel Prize of mathematics.' " This posture (and the accompanying uproar among other professors) proved effective, at least in part. The *Los Angeles Times* reported that the bulk of the grant would be approved after all, noting that Smale held "the equivalent of the Nobel Prize in mathematics." The same article attributed his broader recognition in the public eye to his twinned headlines the year before. Even an opponent who decried "this peacenik mathematician" who continued to "ride this gravy train" of government funding acknowledged in his *Newsday* column the Nobel-like prestige of Smale's award.

5 From Myth to Politics

Prizes are what people make of them. In important respects, such as its public stature, the Fields Medal has indeed become more like the Nobel Prize by virtue of the comparison. Born as a defensive analogy, insulating Smale from political criticism at a key juncture, the link has become common currency in the international scientific and mathematical communities and in some parts of the wider public.

So it is worth considering how common views of mathematics and its history might be different without the Fields-Nobel myth. What if, instead

of as an obvious correction to an erroneous oversight, one saw the Fields Medal as a troubled compromise among disagreeing national mathematical communities? What if, instead of assuming mathematics has always held pride of place among the international sciences, one stresses the struggles mathematicians have sometimes faced in winning legitimacy and prestige for their discipline?

The true origin story of the Fields Medal is a reminder of the messy underside of international mathematics and the muddied idealism of its interwar participants—mathematicians who spoke loftily of a free and open discipline but whose institutions often belied those same ideals. The international discipline that emerged in the postwar period continues to bear the marks of these conflicts and compromises, and the population of Fields medalists has reflected this.

Put bluntly, with few exceptions the Fields Medal (along with the Wolf and Abel prizes) has been an award for white European and American men. Their educations and careers, with few exceptions, traverse a small collection of elite institutions disproportionately located in the United States and France. Not coincidentally, these institutions were home to some of the most active and well-resourced shapers of international mathematics in the mid-twentieth century. The 2014 medalists represented a litany of 'firsts' for the award: each was the first medalist from her or his country of origin; Artur Avila was the first from his continent; Maryam Mirzakhani was the first of her gender. The selection committee, too, had its first female chair, also the first female president of the International Mathematical Union, Ingrid Daubechies.

Their stories show how the international mathematics community has changed in many ways but continues to inherit its interwar and early postwar legacies in others. The upper echelons of modern mathematics may in principle be open to anyone, but mathematicians live and work in societies and educational systems rife with sexism, racism, privilege, and inequality, often in forms that are hard to recognize. Exceptional talent seems a prerequisite for a Fields Medal, but so does being the right kind of person in the right place at the right time.

It does not diminish the impressive feats of individual past medalists to acknowledge that, as a group, they represent the products of societies and institutions in which mathematicians have not been mere bystanders. Mathematicians have been leading advocates for academic freedom and international peace, but also crucial participants in wars and in programs of

secrecy and control. Mathematical organizations have done important work to recognize bias and promote opportunities for aspiring mathematicians, but they have not been without blind spots and shortcomings.

Seeing the medal in this way, as a compromise rather than a culmination, can also help one to appreciate what has been left out of the compromise. To claim, as one prominent mathematician has, that "an ϵ-grid over the works of the Fields medalists covers a significant portion of the achievements of modern mathematics" [10, p. 4] is to espouse an impoverished view of who mathematicians are and what they do. No group numbering in the dozens, however distinguished, can possibly represent the range of so broad and variegated a discipline. Yet the synecdoche of medalists for the community of mathematicians from which they are drawn has grown with the award's Nobelian prestige in the last half century.

Presentations, discussions, and mythologies of medals offer special opportunities to promote and debate what mathematicians value. The Fields Medal is an important way of celebrating some of the best that mathematicians can offer. Perhaps a fuller view of its history can help mathematicians celebrate that they have more to offer the world than just profound new theorems. It may also help underscore that the history of mathematics is not without ambivalence, moral choices, and social responsibilities.

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