

# Eighty Years On

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I first came to the Institute fifty-five years ago in 1955, having just acquired a wife and a Ph.D. Early memories last longest and I have vivid recollections of my first impressions. The sedate and almost rural calm of Princeton stood up to a comparison with my alma mater of Cambridge. I conveyed my enthusiasm to the director, Robert Oppenheimer, the sophisticated cosmopolitan, who politely demurred, hinting at the derivative nature of Princeton architecture.

I spent one and a half years on that first visit which, through the friends and future collaborators I made, laid the foundations for my entire subsequent career. In the aftermath of World War II, the Institute was a unique intellectual center where scholars from different countries and of different vintages were in haste to make up for lost time. It is perhaps a subjective illusion that one's own youth is a unique golden age with a concentration of talent, but the myth can turn into reality.

Over the years, I have been a constant recurring visitor, as a member on sabbatical leave, as a short-term visitor, and as a faculty member. The Institute has always been home away from home, and we have both just celebrated our eightieth birthdays. My lengthy and varied connections

with the Institute enable me to reflect on what it represents, the role it plays in the world, and how it affects both individuals and ideas.

It was a key objective from the start that the Institute should be a place for permanent faculty to carry out pure research on a long-term basis without the distraction of teaching or administrative duties. At a time when universities were mainly devoted to the education of their students, professorial duties could be heavy and often inimical to research. The Institute would be a refuge for serious scholars, carefully selected from the most creative of their time, who were to advance knowledge and move forward in the vanguard of the academic profession.

Younger visitors, who would sit at the feet of the great thinkers on the faculty, and perhaps work alongside as assistants, were to provide a second layer. The precise details evolved over time so that, by the time I arrived, the visitor program, particularly in mathematics, had become a major enterprise. Young postdocs taking their first tentative steps in the academic world formed the base of the visitor program. In that mobile postwar era, they came from all over the world and helped to establish the Institute as a

thoroughly international center. But a second layer of visitors were there in mid-career, taking sabbatical leave from their universities, and they formed a natural link between the green Ph.D.s and the senior permanent faculty.

In this way, the Institute found its natural role as a post-graduate center without the masses of undergraduates that dominate a university. As times have changed, the gap between universities and research institutes has narrowed. Many universities are now heavily oriented toward research and may even contain their own institutes. The IAS can claim to have pioneered a role that the universities have followed.

Having been at the Institute at various stages of my career and in different capacities, I can assess the benefits that scholars derive from their stays. As a postdoc, part of a large cohort of young and enthusiastic mathematicians, I benefited more from my contemporaries than from the more remote senior faculty. Among the young, there was a heady mixture of new ideas, energy, and camaraderie. Friendships were formed and collaborations established that would last a lifetime and survive geographical dispersion.

Later, as a faculty member (albeit only a decade later), I saw my role as going beyond my personal research. Running seminars and discoursing with the young was my contribution. Now, when returning to the Institute, I feel like Rip Van Winkle, a curiosity from a bygone age, there to remind the present generation of their history.

From its inception, the Institute has played a major role in mathematical physics, beginning with the early appointments of Albert Einstein, John von Neumann, and Hermann

Weyl, all refugees from Nazi Germany. Abraham Flexner, the first director, and his key adviser Oswald Veblen ensured that the fledgling establishment got off to a brilliant start. This was the era of great strides in physics, heavily backed by beautiful mathematics, an ideal mix for a new institution.

In recent years, a number of books about the early years of the IAS have appeared, shedding a fascinating light on the process by which it was formed. Its success depended on several fortuitous factors. First, the availability, courtesy of Adolf Hitler, of Europe's leading thinkers. Second, the financial crash that severely constrained the competitive power of universities, but which the Bambergers escaped. Finally, there was the entrepreneurial skill and vision of Flexner and Veblen, who took full advantage of the opportunities and challenges.

Einstein and Weyl both died the year I arrived in Princeton, and von Neumann succumbed to cancer shortly after. The great men who had overseen the synergy of mathematics and physics in the earlier decade were gone. The two subjects drifted apart. Physics pursued new models with shaky mathematical foundations, while mathematicians developed exciting ideas that centered on the pure mathematics of topology and algebraic geometry. So as a young postdoc in the School of Mathematics I had no contact with the physicists. The breakup of the mathematicians and physicists who were the founding faculty seemed inevitable and irreversible.

The situation remained the same during my time as a faculty member, but ironically, from my point of view, things changed rapidly after my return to Oxford in 1973.

The past thirty-five years have seen the interface between geometry and physics blossom in a remarkable way and the IAS has been at the center of this renaissance, led by Edward Witten and his colleagues. I have kept in touch with these exciting new developments, and I am sure that Hermann Weyl is cheering us on from the next world. In this area, the Institute has returned to its roots.

When the Institute was first envisaged, the Bambergers' intention was to locate it near their estate outside Newark. But Flexner argued that Princeton, with its large university library, was much more suitable. As we know, he eventually won the argument, and it is now difficult to imagine any other location. The university library is of course a convenient resource, particularly for scholars in the humanities, but it is of less importance for mathematicians and physicists, especially in the age of the Internet. However, the proximity of the university was of immense benefit to me, and no doubt to many other mathematicians for quite different reasons. During my first visit, I regularly attended the advanced graduate courses there and, along with other Institute members, interacted at all levels with

the university's faculty and graduate students. The mathematical community essentially doubled in size.

Although the Institute never had formal graduate students of its own, over the years many faculty members supervised students from the university, an arrangement that has worked to the benefit of both sides. Having able and eager young students around can be a great stimulus to their elders. Without this safety valve it might have been difficult to hold on indefinitely to all the professors.

The IAS has undoubtedly found a clear role for itself as a graduate center of exceptional quality. It is not a university, it has no students, it does not cover all fields, especially in experimental sciences, and it remains focused. Its success can best be gauged by the flowering of similar institutes all over the world. It is the role model par excellence and as such has influenced the world of advanced scholarship and research. It has diversified in a modest way by including new disciplines that fit its particular format, and it has expanded gradually, particularly in terms of its buildings. I think Oppenheimer might have approved of the new architecture.