

## Black scientists at Bell Labs

Ankita Anirban

In the 20th century, Bell Labs was a renowned industrial research lab in the US, known as the birthplace of the transistor and for the discovery of cosmic microwave background radiation. It was also home to a 40-year minority outreach programme that went on to create a generation of Black scientists. What can initiatives today learn from the success of this fellowship?

On a bright summer morning in 1977, a coach full of young Black men and women pulls up outside a long, low-rise, glass-fronted building in New Jersey. Amongst them is 20-year-old William Massey, a recent mathematics graduate from Princeton. Underwhelmed by job prospects in pure mathematics, he wants to try his hand at more applied research. And so he has come to Bell Labs to pursue a summer project on queuing theory supervised by John A. Morrison. During this summer, he would write his first research paper, prepare to enter a mathematics PhD programme at Stanford and meet James McKenna, a department chair from the Bell Labs Mathematical Science Research Center who would go on to become his long-term mentor. Today, Massey is the Edwin S. Wilsey Professor of Operations Research and Financial Engineering at Princeton University.

Massey is just one student of a generation of Black scientists who benefited from the Corporate Research Fellowship Programme (CRFP), an initiative to recruit, train and hire Black scientists to become the next generation of Bell Labs researchers. When Massey finished his PhD, he returned to Bell Labs – “there was no obligation to come back, but I wanted to work with McKenna,” he tells me. He stayed for 20 years, in turn mentoring new cohorts of CRFP fellows. “We weren’t trying just to turn one Black student into a scientist — we were trying to create a Black scientific community.”

Over 40 years from the early 1970s until the early 2010s, the CRFP funded 100s of Black PhD students<sup>1</sup>. Like Massey, many of them returned after their PhDs to take up research positions at Bell Labs, creating and sustaining a community of Black Bell Labs scientists. When the CRFP was set up in 1972, about 6% of PhDs in science and engineering were awarded to underrepresented ethnic or racial minorities<sup>2</sup> (defined as US citizens who are Black, Hispanic or Native American). In the past 50 years, there have been various attempts to increase diversity, equity and inclusion (DEI) in science and technology — including many recent commitments in the wake of the Black Lives Matter movement — yet this number was still only around 12% in 2020 (REF.<sup>3</sup>). More importantly, Black scientists continue to experience racism at universities and industries,

and DEI initiatives are often criticized as misplaced or tokenistic. Yet, all the CRFP fellows I spoke to only had words of praise for Bell Labs and the CRFP. What made it so successful? And could it happen again?

### Bell Labs Summer Research Program

Most CRFP fellows first arrived at Bell Labs as undergraduates to do a summer research project as part of the Bell Labs Summer Research Program. The idea of a summer internship was an emerging concept in the 1970s and the Bell Labs programme was targeted to recruit women and racial minorities into research. Each summer, about 150 students would arrive at Bell Labs, all housed together in dormitories at Rutgers University. Many CRFP fellows share fond memories of taking the bus to the lab together in the mornings and spending the evenings building friendships, often cooking meals together.

The summer internships gave undergraduates an opportunity to experience a research environment and interact closely with the top minds in the field. “The projects were well-defined problems and the students were treated like researchers,” explains Nadya Mason (now Rosalyn Sussman Yalow Professor in Physics at the University of Illinois and member of the National Academy of Science, CRFP 1996). At the end of the summer, students were given the opportunity to give seminars on their projects, attended by senior researchers from across the lab.

In the 1970s and 80s, Bell Labs was known as a highly competitive, but also collaborative and supportive, community with little hierarchy<sup>4</sup>. “Bell Labs was a very exciting place to be in at the time. The top experts were there and their doors were always open,” remembers Anthony Johnson (now Director of the Center for Advanced Studies in Photonics Research at University of Maryland Baltimore County, CRFP 1975), who after finishing his PhD in physics, turned down an interview at IBM to continue work at Bell Labs. The Summer Research Program opened up the legendary Bell Labs community to undergraduates interested in careers in science and engineering. For many students, the summer project led to their first publication and connected

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Left: Anthony Johnson working at Bell Labs for a summer project in 1974. Right: Bell Labs Murray Hill campus. Reproduced with permission from Anthony Johnson (left) and Alpha Stock/Alamy Stock Photo (right).

them to future PhD supervisors, who often became long-term professional mentors.

### Corporate Research Fellowship Program

The Bell Labs Summer Research Program served as a pipeline to feed into various graduate programmes that funded masters and PhD degrees, such as the CRFP for racial minorities, or the Graduate Research Program for Women. Once a student had been connected to a PhD supervisor and a research group, the CRFP would provide full PhD funding, including grants for textbooks and travel, meaning that students could focus on research without taking on teaching responsibilities or other jobs to make ends meet.

In addition to the institutional support and funding from Bell Labs, there was a real commitment from the staff to foster a new generation of Black researchers. Some of the recruitment for the programme was done through outreach to historically Black colleges and universities (HBCUs), but staff also reached out to Black students personally. William Wilson (now Director of the Center for Nanoscale Systems at Harvard University, CRFP 1982), was the only student of colour in his undergraduate cohort at St. Joseph's University. When he attended a conference for minorities in science, he saw Shirley Jackson (now President of the Rensselaer Polytechnic Institute) speak on a panel. When he spoke to her afterwards, she told him about the Bell Labs Summer Research Program and encouraged him to apply.

Summer research students were assigned mentors when they arrived, and those continuing onto PhDs through the CRFP received sustained mentorship throughout their PhD research, even while working at universities across the country. Many mentors, especially in the latter years, were the previous generation of Black CRFP fellows who had returned to work in the labs after their PhDs, but the majority of mentors were white. The mentorship scheme was strongly encouraged by the Bell Labs upper management, who provided incentives for staff to take part — promotions were contingent on participating in the mentorship programme. The personal connections formed through mentorship were invaluable to students entering the professional community both in academia and in industry. As Wilson put it, “doing a Bell Labs fellowship meant that you had

a mentor who would vouch for you, and everyone knew you were vetted”.

### A history of community building

At the turn of the 20th century, physics research in the US was mainly restricted to the upper classes working at universities, who were often financially independent. With the formation of industrial labs, such as General Electric in 1900, IBM in 1911 and subsequently Bell Labs in 1925, physics began to ‘professionalize’ — it became a way for the middle and working classes to make a living. The changing demographic and different industrial priorities led to a new way of approaching research.

A key difference in the industry approach was the focus on specific technological problems. Although researchers came from a range of scientific, technical and social backgrounds, they all had a shared goal. This created a culture of working closely with people who were different to each other and could provide new perspectives on a problem. Building a close-knit, interdisciplinary community based on a common goal also meant attracting the best people for the job — and if these people did not exist, then creating them. The research communities of condensed-matter physics and electrical engineering today largely owe their existence to 20th century industries.

Although Bell Labs could not escape the prevailing social attitudes regarding race and gender of the time, it was relatively progressive in hiring a diverse range of people. When James West, inventor of the electret microphone and one of the founders of the CRFP, arrived at Bell Labs for a summer project in the early 50s, he remembers researchers from Europe, India and Japan. He told me that he chose to work at Bell Labs as they already had a legacy of hiring Black researchers and he would not be the only one there — the first Black scientist to join Bell Labs was Walter Lincoln Hawkins in 1942<sup>5</sup>.

In 1970, there were about 20 Black researchers working at Bell Labs and a large number of Black technical and service staff, who formed the Association of Black Laboratory Employees (ABLE). West was a co-founder of ABLE and led a campaign to increase hiring Black researchers. Soon it became clear that there were not enough qualified Black scientists applying for positions at Bell Labs — so West and the other Black researchers decided to create them. Thus, in 1972, CRFP was born — to recruit students, train them and then hire them into the Bell Labs workforce.

### Legacy

By 1992, 10% of all US PhDs awarded to racial minorities in engineering went to Bell Labs fellows. Wilson remarked that “pretty much every Black scientist of the era had spent some time at Bell Labs”. Some universities had long-running connections with Bell Labs, and over the 30 year course of the programme, Stanford alone awarded PhDs to 40 CRFP fellows.

The last CRFP fellow to graduate with a PhD from Stanford was Mason in 2000. She chose Stanford over Harvard, where she would have been the first Black physics PhD to graduate, because of its legacy of Black students and its connections to Bell Labs. “Sometimes you

don't want to be the first to do something. Stanford is somewhere that a lot of former CRFP and Bell Labs people had gone ... and so my Bell Labs advisors had talked to people there and helped connect me to a group that would take me right away, working with a future Nobel laureate who did great research," explains Mason. In addition to the community at Bell Labs, the CRFP had contributed to creating communities at universities too.

Although Mason reflects fondly about her time at Bell Labs, when she graduated in 2001, she didn't return to Bell Labs for a research position, unlike many before her. Times had changed. In 1996, Bell Labs was split into AT&T Labs for AT&T and Bell Labs for Lucent Technologies. The CRFP programme was cloned for both companies but they would end up being discontinued a little more than ten years later. By the 2000s, the renowned Bell Labs community was no longer. Wilson, who left in 2001 after 15 years at Bell Labs, told me that "the Bell Labs culture was nearly gone at the end, and the lab was entirely just driven by managers". Focus shifted away from fundamental research and by 2008, there were just four scientists left<sup>6</sup>.

Massey describes the 1970s, 80s and 90s at Bell Labs as a "Black scientific renaissance", likening it to the Harlem Renaissance for Black artists in the 1920s. Those three decades created a generation of highly successful Black scientists who went on to become faculty at nearly 50 different universities across the US. No doubt these individuals have inspired and mentored Black students beyond the CRFP, but Massey rues the lack of institutional support today. "At Bell Labs, I could help a kid doing chemistry. Now, I can only support students within my department [operations research and financial engineering]. Although there are many of us trying to recreate the ethos of Bell Labs and the CRFP, we are isolated at various universities and no longer part of that community." Without the structure and support of Bell Labs, the impact of the programme is fading as the years pass.

### Lessons

Fellows of the CRFP attribute the success of the programme to the strong community that it created, both within Bell Labs and beyond. Building such a community required the personal commitment of a critical mass of individuals. Mason, who was at the lab in the 1990s recalls a lot of people of colour on the Bell Labs staff. "It wasn't just summer students who supported each other, we had a lot of internal role models within the lab as well. It showed that the effort was not tokenistic." The importance of this long-term community building

is echoed by Wilson. "For something like CRFP to work, you need a community across different levels so that there is dialogue across generations."

Bell Labs was in a unique position to foster a minority outreach programme like CRFP. There was an interest in and commitment to diversity coming from the top, an openness to creating new types of scientific communities and importantly, the money to do so. At the time, Bell Labs was a government-regulated monopoly — so while enjoying the benefits of the multidisciplinary industry approach, it was insulated from market pressures and able to focus on long-term planning.

Today, industrial labs continue to grapple with the question of racial representation in science and engineering, leading to the creation of initiatives like *Blacks at Microsoft* and the IBM-HBCU Quantum Centre<sup>7</sup>. The CRFP fellows I spoke to are sceptical that the success of the CRFP will be recreated in industry today. "The monopoly and strong government support enabled Bell Labs to think long-term — in the competitive market, that's hard to do," says Massey. He advocates for academic institutions to pick up the baton now. The Bell Labs culture was born out of a diverse group of people working towards a common goal in a well-funded setting. Massey would like to see increased collaboration and more targeted funding in academia. "We need more interdisciplinarity, we need to build stronger communities and we need the personal commitment from researchers to receive more institutional support. Most importantly we need to fund our students."

Ankita Anirban

*Nature Reviews Physics*.

e-mail: [ankita.anirban@nature.com](mailto:ankita.anirban@nature.com)

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