



Staff photo by Mark Czajkowski

Atle Selberg in his office at the Institute for Advanced Study. He once won the Fields medal — the mathematics equivalent of the Nobel Prize — for his work on the theory of prime numbers.

Discovery comes unexpectedly for the creative mind of Selberg

By Wendy Plump
Staff Writer

If creativity is a function of luck, then genius is the highest kind of intellectual accident.

Shrunk down to its simplest equation, this is Institute for Advanced Study mathematician Atle Selberg's theory on scientific creativity. Real scientific creativity. The kind that lets us see in the dark, lift wings of metal into the sky or shatter worlds by toying with particles of matter.

The wisdom that drives it, Dr. Selberg said, lies in knowing when to digress for the sake of some happy accident.

"I think in some sense much has to do with luck. If you are lucky many times, then you are a genius, of course. You may be lucky just a few times or some people may not really have any great luck at all. I don't know really what is the reason for this.

"I think perhaps what lies behind having luck is first of all if you have a background that is a bit different from what everybody

COMMUNITY OF IDEAS

Second of a series

Editor's note: Today, The Packet presents another in its series of profiles of thoughtful Princeton area residents whose life experiences we believe are worth sharing with our readers. During the interview, all of the questions posed by staff writer Wendy Plump were framed with a common thread: What can you pass along to us? What can you give to us that you have learned? The series continues today with scholar Atle Selberg of the Institute for Advanced Study. Next Tuesday, Sidney and Claire Rosen will be profiled.

else has so that you're not encumbered with precisely the same knowledge and are not thinking exactly the same way.

"It also helps if you can benefit by accidents, facts that you

come across quite accidentally and start thinking about and see there is something more," Dr. Selberg said. "I would say that most of the better things I have done all came about not because I set out from the beginning to do them. Something shifted the focus of my attention completely and I ended up doing something rather different.

"One has to be able to see opportunities and learn to utilize them. Real, original work, I think, comes about in this way."

Now 73, Dr. Selberg has been at the institute since 1947; with the exception of a single year as an associate professor at Syracuse University. He was a member of the institute faculty as some of the greatest men of science took up residence there — Albert Einstein and J. Robert Oppenheimer, Kurt Godel and Freeman Dyson.

To his own everlasting credit, Dr. Selberg was awarded the Fields medal — the mathematics equivalent of the Nobel Prize — in 1950 for his work on the theory

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prime numbers. His work was identified as having "the utmost portance and originality" by the athematical congress that awarded him the medal.

Growing up in Norway, Dr. Selberg had access to a substantial library of mathematical works kept by his father and rummaged through by most of his elder brothers. Ole Michael Ludwigsen Selberg had a doctor's degree in mathematics. Nevertheless, his influence on the young Atle was not strong as might be supposed.

"What has always mattered most to me," said Dr. Selberg, "has not been a personal influence much, but her what I got from reading books or articles."

Dr. Selberg opened his first year at the University of Oslo by reading in a paper on theoretical mathematics. The intellectual atmosphere in Norway at that time was generally richer for mainstream sciences like chemistry or botany than it was for mathematics.

Consequently, young mathematicians evolved largely on their own: like the Galapagos factor, because it yielded some mathematical contributions that might not have been about had they not been so isolated.

"There was no formation of any kind of school (of thought) and people largely did not develop on the influence of one specific teacher," Dr. Selberg explained. "Essentially all of them were self-taught."

"As a consequence we had in some sense a more varied selection of mathematicians than some of the larger small countries where what I could call schools under the

leadership of one teacher might tend to develop. And there might in some sense also have been some more originality in Norwegian mathematics for the same reason.

"That is something that has changed with the bigger breadth of academic life," Dr. Selberg added. "And there was probably something gained and something lost because of that."

When Germany invaded Norway in the spring of 1940, Dr. Selberg was in Oslo, studying. He left on the first day of the invasion to join his unit in the Norwegian Field Artillery. He did not serve as an officer; he had not yet been fully trained for such a post.

"I would have eventually ended up as an officer because I had been taken out for training. But that would have required several years of training in peacetime. So you might say my military service was interrupted by the war," Dr. Selberg said, smiling.

Twice during World War II, he landed in German war camps set up in Norway. His incarceration in both instances was short.

Most of the war years were spent either at the university, before it was closed down by the Germans, or studying in his hometown. A steady stream of academicians fleeing Germany came through the Scandinavian countries. Among them was Carl Ludwig Siegel, who delivered some lectures in Oslo.

It was this scholar who wrote to Dr. Selberg in the spring of 1947 from the Institute of Advanced Study, asking him to come to Princeton. Having received his doctorate from the University of Oslo and with few concrete plans for the future, the young mathematician accepted the invitation.

Dr. Selberg arrived at the institute in the fall of 1947, a few months before his bride, Hedi. She stayed behind in Sweden after the marriage to conclude some business before moving to the states.

These early years at the institute were among his best, Dr. Selberg said. He had a good social life and a growing young family. Moreover, they were his most successful years mathematically.

This was not an accident so much as the proper course for a young scientific mind.

"In the '50s when I was young, I was more active. Of course this is the nature of mathematics and theoretical physics. You do slow down with the years. You gain experience, you can still do things. But you do usually your best work at a younger age."

"Maybe (it is) that as you get older your mind is more encumbered by knowing too many things. I don't know. It is different in the scholarly world. Historians of course tend to reach their best years only rather late. But in mathematics or theoretical physics, the best work tends to be done at a rather young age. It's a fact of life."

J. Robert Oppenheimer arrived at the institute shortly after Dr. Selberg. His presence at the helm would force the institute into the public arena in a manner it had not seen before, and has not seen since.

Admiral Lewis Strauss, then chairman of the Atomic Energy Commission, wanted Oppenheimer stripped of his security clearance because of suspected Communist sympathies.

As the scrutiny into Oppenheimer's background intensified from the early '50s on, scientific work at the institute was often interrupted by the momentum of controversy.

There were governmental investigations at the institute. FBI agents. Wiretaps. There was even a reputed bugging device planted at Olden Manor, the director's home. And of course there were reporters dogging every development.

The institute became the setting for the dismantling of Oppenheimer's international influence. According to Dr. Selberg, the faculty was as divided in its loyalties as it was absorbed in the unfolding events.

"I felt that this type of bringing up all kinds of irrelevant, to my mind, things, these radical affiliations, were rather unjustified. So I felt these attacks on him were not appropriate," said Dr. Selberg.

"I must say that on the other hand, there were many qualities in Admiral Strauss that I appreciated also. He probably thought that he was doing something that was necessary in the sense that he was afraid of Oppenheimer's influence and powers of persuasion."

Some faculty members agreed

with Admiral Strauss that limiting Oppenheimer's influence in the development of the hydrogen bomb was a good idea. Others simply felt the investigation was mishandled. Still others, like Kurt Godel, followed the lead of Albert Einstein or another faculty luminaries.

Despite the internal disagreements, most faculty members ended up signing a statement in general support of Oppenheimer that was sent in June of 1954 to the New York Times.

The years at the institute since Oppenheimer have been unusually quiet, Dr. Selberg said. While there is always the opportunity to get more work done under this kind of atmosphere, he added he is unsure of its ultimate value.

"I don't know whether this means the institute is becoming too complacent with itself," Dr. Selberg said. "I've often thought that it may not be so good for a place if people are too happy with themselves and with their colleagues. This may indicate that their standards are slipping, perhaps."

For his own part, Dr. Selberg spends his days working out the details of mathematical concepts developed long ago. He writes papers, spends time with his wife, and works with a few students.

At home, he has an immense seashell collection — "More than I can keep out" — and maintains his interest in botany. As an adolescent, Dr. Selberg said, he collected more than 500 different species of Norwegian plants to fulfill a school requirement.

The interest in minutiae has lent a great deal to his own ability to discover.

"(Such interests) taught me to keep my eyes about me when I am outside. I can notice things by the wayside, anything that is different from the ordinary."

This principle, in turn, can be applied to almost any creative endeavor. "One has to be receptive and alert to notice when something is different," Dr. Selberg said. "One has to have a certain openness. You can't have a closed mind because then you will not notice anything but what you have decided to notice. I think one shouldn't be set in one's opinions."

"I shouldn't be too convinced about what so-called experts say, either," he added. "I should be very skeptical, particularly if they are making statements about problems that are still unsolved. This is important particularly for the younger."

An image springs to mind of the young Atle, working during the war years alone in his library, without the benefit of teacher, school or colleague. "They shouldn't be too taken in," Dr. Selberg concluded, "with what the authorities say."