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Olivier Voinnet

Career Profiles

Finding His Voice in Gene Silencing

Olivier Voinnet's first years as an undergraduate student didn't bode especially well for his scientific future. He was kicked out of his preparatory course for entry into the French *Grandes Écoles* after ranking near the bottom of his class for two "disastrous" years, as he puts it. As he saw it, biology classes in the French *Classes Préparatoires* were mostly about outdated knowledge that students were expected to learn and repeat back "like a parrot," Voinnet says. "I was not made for this sort of thing."

"Many of us were very surprised that the work that he did didn't earn a share of the Nobel Prize." --Timothy Hunt.

After flunking out of the *Classes Préparatoires*, Voinnet joined a university and made a complete U-turn. The exposure to fresh, living science provoked an immediate and enduring passion. At almost the same time, he stumbled across what would later become his research field: the first observations of gene silencing, which had started to trickle through via transgenic plant experiments. During those early days, in the 1990s, many scientists dismissed the phenomenon as an experimental artifact. But, attracted to the quirkiness of the topic, Voinnet bet his career on it. It "was a bit crazy, but that's what I liked about it," he says. The risk paid off: Voinnet witnessed all of the field's early discoveries at close range and contributed to some of them.

Listening to intuition

When Voinnet joined the **Pierre and Marie Curie University (http://english.upmc.fr/UK/info/00)** in Paris in 1992 for a master's degree program, biologists had just started to report puzzling observations in which foreign genes inserted in plants were actually shut down. In a now-famous report, petunias turned white when given extra copies of coloring genes. Voinnet saw a connection that few others saw: He was aware of reports in other organisms "where it was somehow clear"--to him, intuitively--"that there was something more about silencing than just a system that was activated by transgenes," he says.

Determined to investigate, Voinnet specialized in plant molecular biology and, because gene silencing had also been reported in plants made resistant to viruses, plant pathology. By the time he obtained his master's degree, new research suggested "that there was a system in the plant ... able to recognize foreign nucleic acids and deal with them ... in a sequence-specific manner," Voinnet says. Intuitively assuming a connection with a plant defense system, Voinnet went to the nearby **Institut Jacques Monod (http://ijm2.ijm.jussieu.fr/ijm/)** in Paris to work on plant viruses with Anne-Lise Haenni for a year.

During that time, he also earned an engineering diploma from the prestigious Grande École **Institut National Agronomique de Paris Grignon (http://www.inapg.inra.fr/)** (now AgroParisTech)--he was admitted thanks to his good marks at university despite having earlier flunked out of the *Classes Préparatoires*. Voinnet then set off for the United Kingdom in 1996 to do a Ph.D. with David Baulcombe at the **Sainsbury Laboratory (http://www.tsl.ac.uk/)** in Norwich. Baulcombe "was among the few, at least in Europe, who was entertaining the idea that one ... biological role [of silencing] was in fact an antiviral defense mechanism," Voinnet says. Baulcombe staffed his lab mainly with postdocs, but he accepted Voinnet. "It was clear that he had unusual insight for a young student--he asked the right questions including many that I could not answer," Baulcombe writes in an e-mail to *Science* Careers.

In the Baulcombe lab, Voinnet analyzed the in vivo dynamics of gene silencing using transgenic plants, recombinant viruses, and fluorescence microscopy. But this part of the project became "almost insignificant" when he discovered a sequence-specific silencing signal spreading through a plant, Voinnet says. "From then [on], we established basically the notion that ... in natural contexts, the silencing signal ... should somehow immunize naïve cells so that they get ready against virus infections."

Voinnet set out to investigate the other part of the story--the virus's response--which led to his discovery of a large variety of viral proteins able to impair the plant's silencing mechanism. By using some of these gene-silencing suppressors, Voinnet was able to demonstrate the existence of at least two species of small RNA that are involved in distinct silencing pathways. This work was done in collaboration with Andrew Hamilton, a postdoc in the lab.

By the time Voinnet obtained his Ph.D., he had published 13 papers, half of them in top journals. He had also "established the existence of a systemic signal of silencing and the notion that most if not all plant viruses produce suppressors of silencing," Baulcombe writes. "This work has really changed plant virology, had a broad impact in plant biology, and influence[d] thinking more generally about silencing."

Synergistic dynamics

Voinnet attributes his success partly to the productive, synergistic dynamic of the Baulcombe lab. "It was a unique period probably where we were stimulating each other and sharing data," so that one discovery led to the next, Voinnet says. But Voinnet, Baulcombe writes, also showed "hard work and [the] ability to focus on the important scientific issues to the exclusion of everything else, including the real world."

"David [Baulcombe]'s group developed a number of very interesting gene silencing systems at the time and Olivier was very good at seeing connections between these and designing elegant experiments to test them," Hamilton, today a lecturer at the **University of Glasgow (http://www.gla.ac.uk/)** in the United Kingdom, writes in an e-mail.

Voinnet has one big weakness, his colleagues say. "He was well known for filling a bench/desk/glasshouse space with debris from one experiment and then moving on to another ... clear area for the next. When he left we isolate[d] new species of fungus from some of the stuff that he left behind," Baulcombe jokes. Still, "I think his skill as an experimentalist was one of his greatest strengths," Hamilton says.

Setting out on his own

Immediately after graduating, Voinnet obtained a **Dorothy Hodgkin Fellowship (http://royalsociety.org/funding.asp?id=1122)** from the British Royal Society. He stayed in the Baulcombe lab for about a year, the time it took to obtain a permanent position from the **French National Center for Scientific Research (http://www.cnrs.fr/index.php)** (CNRS) to work at the **Institut de Biologie Molculaire des Plantes (http://ibmp.u-strasbg.fr/index.php?id=48&L=1)** in Strasbourg and a CNRS **ATIP (http://www.cnrs.fr/infoslabos/atip/vivant.htm)** grant so he could start an independent lab rather than join an existing one.

Voinnet returned to France at the end of 2002, and he's won many accolades since. That year, he was a **winner (http://www.sciencemag.org/cgi/reprint/298/5598/1568.pdf)** of the Amersham Biosciences and *Science* Prize in an essay competition. In 2004, he obtained a **Young Investigator award (http://www.embo.org/programmes/yip.html)** from the **European Molecular Biology Organization (http://www.embo.org/)** (EMBO). He received a **Starting Independent Researcher Grant (http://erc.europa.eu/index.cfm?fuseaction=page.display&topicID=65)** last year from the **European Research Council (http://erc.europa.eu/)** . And this year, he won the **EMBO Gold Medal (http://www.embo.org/aboutembo/embo-gold-medal.html)** for what EMBO Council Chair Timothy Hunt of the Cancer Research UK London Research Institute calls "a particularly distinguished piece of work. ... It wasn't straightforward thinking, it was putting one foot in front of the other, overturning stones, ... the best definition of scientific research," Hunt says. "Many of us were very surprised that the work that he did didn't earn a share of the Nobel Prize" allocated to gene-silencing discoveries in 2006, Hunt adds.

Today, Voinnet's group counts 29 people. It takes a full page on his CV to sketch out how all the projects in his lab relate to each other. "It is rare for someone to establish such a diverse and imaginative research programme so quickly after graduating," Baulcombe writes. "The really cool thing about having such a lab," Voinnet says, "is that hardly ever do you [have a day without] an interesting result."

One thing Voinnet learned from Baulcombe and now emulates in his own group is to allow young researchers "a level of freedom to explore their own field and also to prepare their future," Voinnet says. "You're not there just to make papers. You're there also to bring the next generation on the way to be as good, if not much better, than you." That role is especially important in a field as young as gene silencing, he says. "There should be no dogma in our field," Voinnet believes. "You will need young, fresh ideas to grasp everything that needs to be discovered."

Gene silencing remains a quirky field that requires "a particular state of mind," Voinnet says. "I have probably found the field that fits exactly the way I am. I take my work very seriously, but I also like to be a bit happy and crazy and do other things with my people and then make them feel also that ... there is more to the science we do than just publishing papers."

Elisabeth Pain is contributing editor for South Europe.

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