THE NOBEL PRIZE

“Find a good problem and challenge it. Be open for criticism, listen to what other people have to say but stand tall and be true to yourself.”

DAN SHECHTMAN
NOBEL LAUREATE
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Bruce Beutler.

Jules Hoffman.

A monk and a gambler

The doors of the Thavenius saloon at the Grand Hotel in Stockholm open and two researchers come in. Not in lab coats or scruffy jeans and T-shirts, but in suits; one of them with a discrete pin picturing Alfred Nobel on his jacket. Bruce Beutler and Jules Hoffman have been awarded half of the Nobel Prize in Physiology or Medicine and have come to Stockholm to join the festivities of the Nobel week.

BY NATALIE VON DER LEHR
PHOTO PIERRE MARTIN

IT ALL STARTED WITH THEIR FATHERS' INTEREST IN SCIENCE AND NATURE

"My father was a researcher and often took me to his lab. I was very comfortable in that environment and conducted my first scientific experiment when I was in my teens. Then I just kept on going, first I went to medical school and then on to conduct biomedical research," says Bruce Beutler. He goes on to explain that he has always been intrigued by the endotoxin receptor, which triggers the immune system. "That interest has gotten me where I am today," he says, leans back and smiles.

Jules Hoffman also worked as a student with his father, who was an entomologist, and he became fascinated by insects. "Do not forget that they comprise 80 percent of all species, destroy one third of crops annually and put one third of the human population at risk by transmitting diseases," he says, emphasizing the importance of the creatures that many might find a strange choice for studying the immune system.

ON TO SOMETHING BIG

Both Laureates claim that their research was entirely curiosity driven. Jules Hoffman was intrigued by the fact that insects are resistant to most microbial infections and wanted to identify a weak spot in order to find a way to defeat them. Bruce Beutler had noticed a particular mutant mouse strain that could not

recognize the endotoxin LPS and wanted to identify the responsible genetic region. In the early days neither of them had any idea that they were about to discover the principle behind innate immunity. “We just worked our way through the system. When we got to the signaling cascade we started to think that we were on to something,” says Jules Hoffman.

Bruce Beutler gives an account of the endless sequencing experiments in the late 80s and 90s when the technology was still in its infancy. “We ran everything manually, from casting gels to reading and comparing the sequences. When we were done with about 90 percent of the region we got really scared – this is the kind of project where human error is common.” On top of the feeling of having missed the needle in the haystack the funding for the project was also running out. Nevertheless Bruce Beutler and his colleagues felt the pressure to continue and finally found what they were looking for.

THE POWER OF EVOLUTION

Beutler and Hoffman were surprised when they noticed that they had basically identified the same mechanism, but in quite different species, namely in the fruit fly Drosophila Melanogaster and in the mouse. “We really did not expect these so completely different organisms to be so alike. I guess we were ignorant to the power of evolution,” says Hoffman and laughs. Since almost all genes in mice have an orthologue in humans they quickly understood that the same mechanism must also exist in man.

MOLECULAR METHODS PAST AND PRESENT

Bruce Beutler’s approach to sequence the region of interest took five years, from 1993 to 1998. Sequencing methodology has undergone rapid development and nowadays he could get the same results within a week at most. If the precise region to look at is know, results could even be available within a couple of hours. “As we are speaking one million base pairs are sequenced in my laboratory per second,” he says proudly, referring to his newly build lab at UT Southwestern in Dallas. Hoffman also points to the development of molecular methods during the last 50 years. “The techniques now are so powerful. There is almost no question that you cannot attack methodologically. The key to success is instead to have a good idea, ask a good question and have the courage to tackle it. Then you need the right funding of course,” he says and almost immediately adds that despite the common complaint of the scientific community, there has never been more money for science than now. “But more people are in the system and not everybody will succeed.” Bruce Beutler nods and shapes a triangle with his hands. “The academic system is a pyramid and not everybody will make it to the top. Things are tough, the reaction should be to work harder and not complain about it.”

A MONK AND A GAMBLER

Long hours, bad pay and months without reasonable or – even worse - contradictory results. What made the Laureates stay in research?

“I think that conducting science is very much like entering a monastery. You have to believe, be ready to accept difficult times and work hard. It is a lot about believing, working and maybe even praying,” says Jules Hoffman.

Bruce Beutler uses another analogy. “I would rather think of

researchers as gamblers. You just get addicted to it and cannot give up. After having made certain investments you just have to continue, whatever impossible thing it is that you have set out to do."

BIG GROUPS LEAD TO BIG ACHIEVEMENTS

Intellectual brilliance and hard work are not enough. These need to be placed in an environment where they can perform to best effect. Both Laureates believe that their big research group has been one of the key factors in succeeding. "We have been up to fifty people working together on one central goal simultaneously – to find out what makes the insect resistant. Everybody has contributed with their specific competence. None of them could have made it on their own," explains Jules Hoffman.

Bruce Beutler was inspired by the group dynamics of the Hoffman lab and built up a similar team. His new lab was inspired by his long experience and over time he has also adjusted to the new requirements. The fast development within sequencing technology imposes demands for computational competence, for example. Beutler is currently building up a centre for the genetics of host defense, extending his group instead of cutting down. Hoffman describes his plans as a little less ambitious, but nevertheless aims at interaction and association of groups that have the same scientific interest but different approaches. "I will put some energy into helping the next generation," he says, looking modest.

LIFE AFTER THE NOBEL PRIZE

Although having received several scientific prizes during the last few years neither of the two Laureates saw the Nobel Prize coming. "Of course, in hindsight one could say that I should have suspected this," says Bruce Beutler. Jules Hoffman emphasizes that the Nobel Prize rewards the work of a whole laboratory – over the years some 200 people have contributed. "I would really like to diffuse the prize back to the field. That is one of the reasons I want to make an effort to help the next generation." Bruce Beutler picks up on Hoffman's notion that while the Nobel Prize does not change you, it changes the way people look at you and gives a different weight to what you say. "Getting the Prize was never the goal. You should go into science to explore and discover something and because you feel understanding nature to be deeply rewarding, not to get the Nobel Prize."

NOBEL LAUREATES IN PHYSIOLOGY OR MEDICINE 2011:

Bruce A Beutler
Born 1957 in Chicago, USA
MD University of Chicago 1981
Recently rejoined the University of Texas Southwestern Medical Center as a professor in its Center for Genetics of Host Defense

Jules A Hoffman
Born in Echternach, Luxembourg, 1941
PhD from the University of Strasbourg, France
Director of the Institute for Molecular Cell Biology in Strasbourg
President of the French National Academy of Sciences

After his return from Stockholm he was awarded with the French Gold Medal for Research

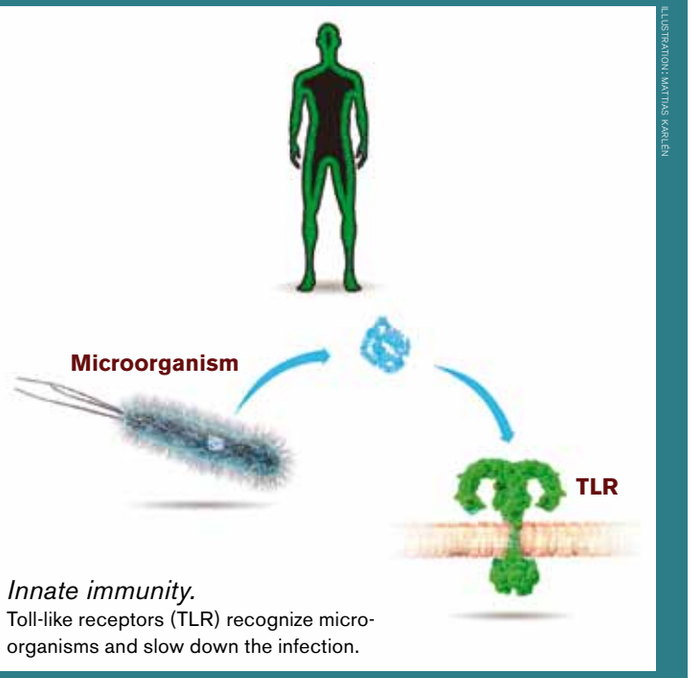
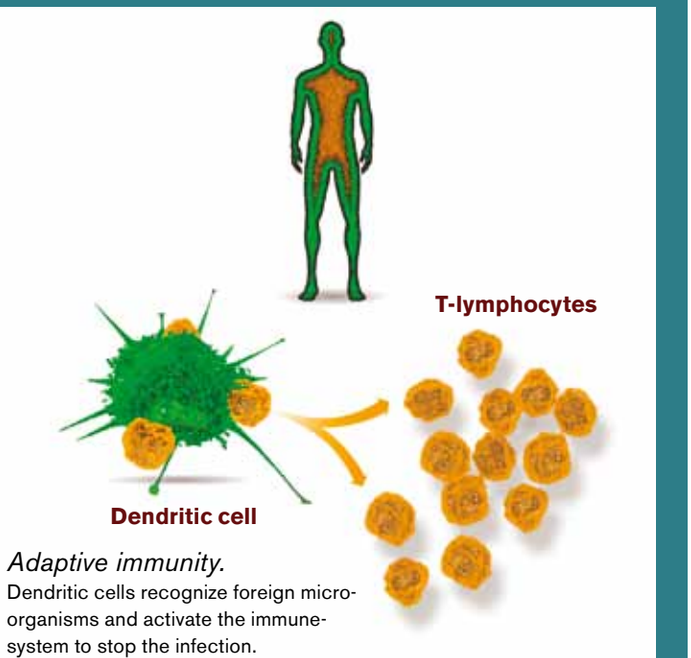


ILLUSTRATION: MATTIAS KARLÉN

Innate immunity.
Toll-like receptors (TLR) recognize microorganisms and slow down the infection.



Adaptive immunity.
Dendritic cells recognize foreign microorganisms and activate the immune-system to stop the infection.

The 2011 Nobel Prize in Physiology or Medicine was divided, one half jointly awarded to Bruce Beutler and Jules Hoffmann for their discoveries concerning the activation of innate immunity, and the other half to Ralph Steinman for his discovery of dendritic cells and their role in adaptive immunity.

These discoveries have revealed how the innate and adaptive phases of the immune response are activated and thereby have provided novel insights into these mechanisms. Their work has opened up new avenues for the development of prevention and therapies against infections, cancer, and inflammatory diseases.

Source: The Nobel Assembly at Karolinska Institute

BY NATALIE VON DER LEHR

Dedicating his life to dendritic cells

After the announcement of the Nobel Committee that Ralph Steinman had been awarded the other half of the Nobel Prize in Physiology or Medicine for his discovery of dendritic cells nobody could get hold of him to announce the news or get an interview. Hours later the tragic news of his death three days earlier made headlines around the world.

"I am sure he would have hung on for a little while if he had known," says his daughter Alexis Steinman. This was on the third day of the Nobel week for the Steinman family and they had now become accustomed to giving interviews about Ralph Steinman. Alexis leant back in her chair, smiled and talked about her father as if he might walk right through the door the very next moment.

"We all still feel his presence; that he is still with us. It means a lot that he got to keep the prize although the rules normally do not allow posthumous prizes. It's a legacy to him and his work and we will do our best to take good care of it," she says.

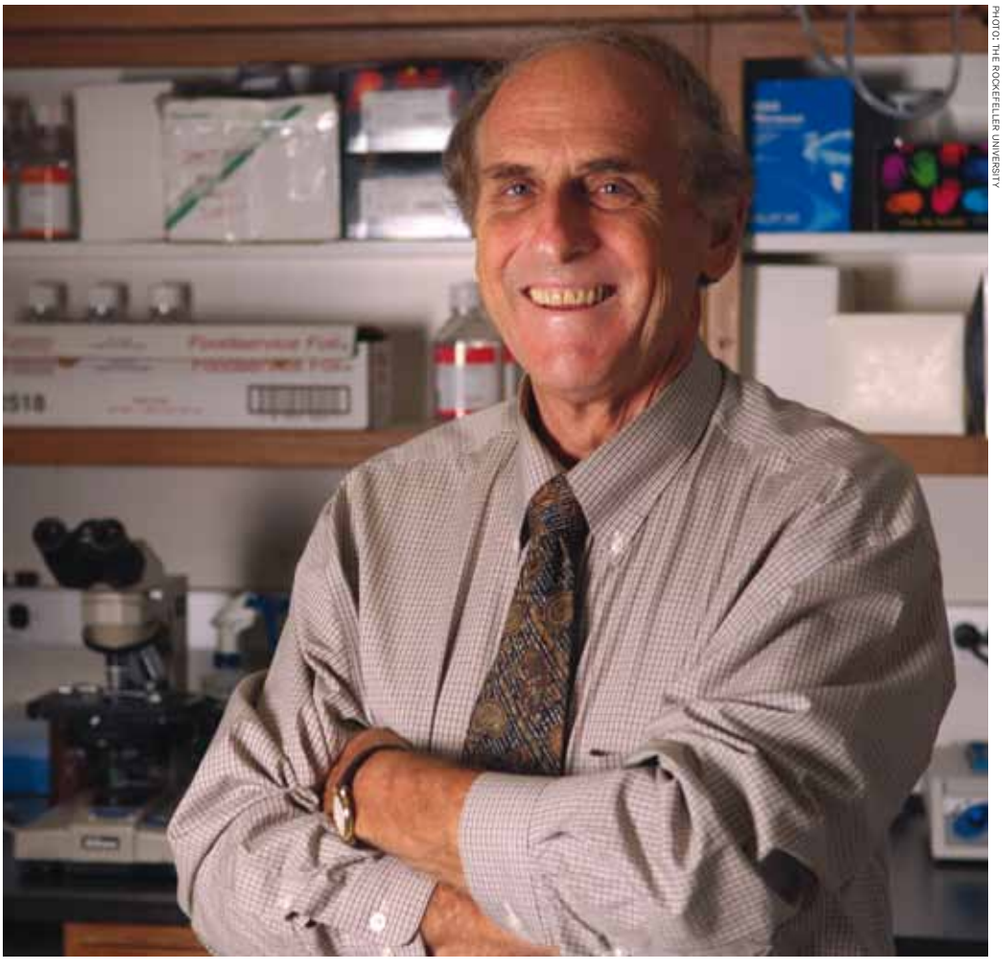


PHOTO: THE ROCKEFELLER UNIVERSITY

SCIENCE AND FAMILY

Ralph Steinman was known as one of the leading scientists within the field of immunology. Alexis also describes him as a dedicated father who managed to combine research and family.

"He just did it simultaneously. If we went to the beach he would take a pile of scientific journals with him, read them and then throw them aside, go for a swim and get his nose stuck back in an article again right after that," Alexis explains. In his house the study where he did a considerable amount of work was right in the middle of everything – living room and toys for

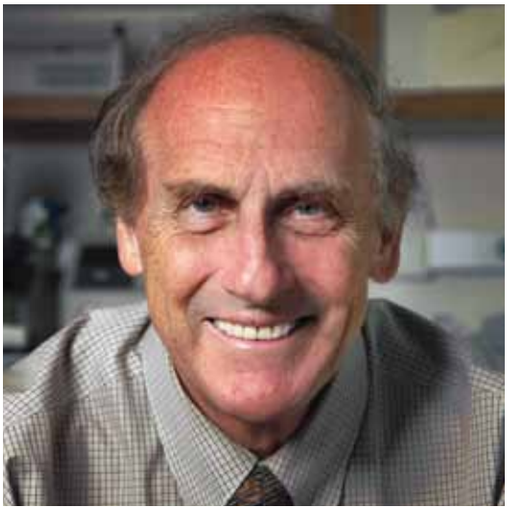


PHOTO: THE ROCKEFELLER UNIVERSITY

the grandchildren, who were one of his joys in the later part of his life. Apart from his biological family Ralph Steinman also embraced colleagues and friends with the same warmth. "He would invite foreign students to our house on Thanksgiving, which is a typical family holiday. He just took care of everybody, as if they were family," Alexis Steinman remembers.

CLAUDIACYTES

When Ralph Steinman for the first time noticed these previously unknown cells he thought that they looked very much like his wife – an elegant body with long legs. He named them Claudiacytes, after her, before they were given their official name, dendritic cells.

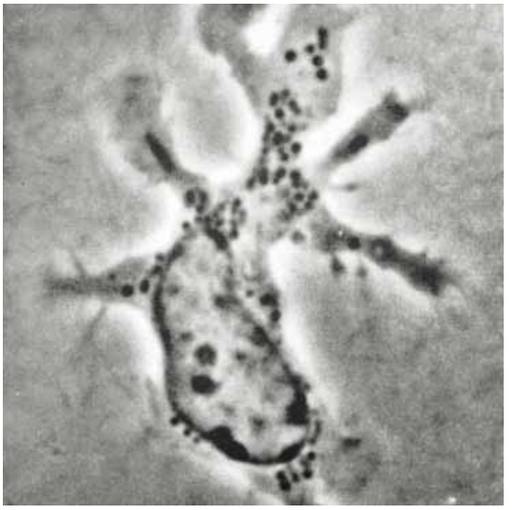
"My mum meant so much to my dad. He was just infatuated with her and could not believe his luck that she chose him. They were married for 40 years and always had fun together – just recently they took classes in ballroom dancing. She was an enormous support to him," Alexis Steinman states.

Naturally it is Ralph Steinman's wife, Claudia, who will accept the Prize. "She is very nervous but it is the only right thing to do," says her daughter Alexis.

DESIGNING HIS OWN TREATMENT

Four and a half years ago Ralph Steinman was diagnosed with pancreatic cancer. Usually patients do not survive much longer than half a year, but Ralph Steinman took a very rational approach and decided to tailor his own treatment with dendritic cells.

"When he told us that not only had he been diagnosed with cancer but that he would also treat it himself we never even questioned it. We knew if there was one person who knew what he was doing it would be him," says Alexis. She adds that Ralph Steinman was very frustrated with the classical way of treating cancer – radiation therapy and chemotherapy, which often has debilitating side effects – and he always believed that there must be a better way. He asked his close coworker and friend Sarah Schlesinger to help him design and administer his very own cancer vaccine. "From that moment, his disease turned into a scientific experiment," said Sarah Schlesinger in an interview with Swedish Television. She pointed out that not only did he live for four and half years after the diagnosis but that those were four and a half good years. "There were no tests available to show that his method was working, but he felt that it did," confirms Alexis Steinman.



Electron microscope image of a dendritic cell made by Ralph Steinman in 1973.

PASSING ON THE KNOWLEDGE

For Ralph Steinman, part of being a passionate scientist was to pass on his knowledge to the next generation. His adepts are spread all over the world and carry on the research that he founded. In that spirit the Steinman family will also use the Nobel Prize to pass on the legacy by setting up a foundation for young scientists. "We already have a small family foundation, for example to help graduate students to travel to conferences and such. Now we have the possibility to extend this foundation and will do so to carry on my father's legacy," says Alexis Steinman. She and the rest of the Steinman family are very fond of the fact that the Nobel week is used to raise awareness of the importance of science. "We thought it was just about collecting a prize but it is so much more. My father would have really liked that!" Alexis Steinman concludes.

PHOTO: PERE MARTIN

Alexis Steinman.

RALPH M STEINMAN

Born in 1943 in Montreal, Canada
Studied Biology and Chemistry at McGill University
Received his MD 1968 after studying medicine at Harvard Medical School in Boston, USA
Affiliated with the Rockefeller University in New York since 1970

Wife and three children

Ralph Steinman passed away three days before the announcement of the Nobel Prize.

“First I was really happy – then I was really sad”

Being a scholar of one of the adepts of the late Ralph Steinman, Anna Smed Sörensen was one of the many scientists to first feel delighted and then bereaved when the Nobel Prize in Medicine or Physiology was announced. Just as Ralph Steinman, Anna has dedicated her academic career so far to dendritic cells and now, with the Nobel Prize as an injection of energy into the field, she sees no reason to change that.

BY NATALIE VON DER LEHR

In her dissertation, which she defended 2004, she studied the influence of HIV on dendritic cells. Often when dendritic cells are infected with different viruses they are less capable of presenting antigens and are therefore less able to trigger the immune system. The aim of Anna Smed Sörensen's work has been to elucidate that mechanism and thereby find better methods of treatment.

"What we are doing is really basic research. We want to understand how viruses affect dendritic cells and then design a method to block that action," says Anna Smed Sörensen. But the step to the clinic does not have to be so far away. "The approach of combining basic research and the rational design of vaccines or drugs has worked well for other diseases. The drugs that block HIV are just one example of drugs that were developed in that way," she emphasizes.

HUMANS RATHER THAN MICE

Rather than working with mice Anna Smed Sörensen works with human dendritic cells, which is often a challenge as the cells are very rare. She is now planning a collaborative study with colleagues in Umeå using clinical material from patients with influenza virus infections. In the case of influenza virus infection, lung material can be obtained by bronchoscopy. Another alternative is to study cells in bronchoalveolar lavage fluid that is collected after rinsing the lungs. "It is a challenge to collect and work with human material. At the same time it can be difficult to transpose the findings that we make in mouse models. The results that we obtain from human material are more relevant and the next step to the clinic becomes a lot shorter," says Anna Smed Sörensen.

A GOOD RESEARCH ENVIRONMENT

After defending her thesis Anna spent five years in the United States as a postdoctoral fellow. She has worked with Ira Mellman, first at Yale University, then at the company Genentech in California. "Not only did I change coasts but I also switched research environments from academia to industry," she says, illustrating the unexpected events in the life of a scientist. For the past one and a half years she has been back at the Karolinska Institute, setting up a research group of her own with funding from Vinnova (a Swedish organization funding research and innovation for sustainable growth) and SIDA (the Swedish International Development Cooperation Agency). "The scientific environment is very stimulating, there is a lot of expertise here, good equipment and people who have the competence to run it as well," she says, referring to the newly built SciLife lab.

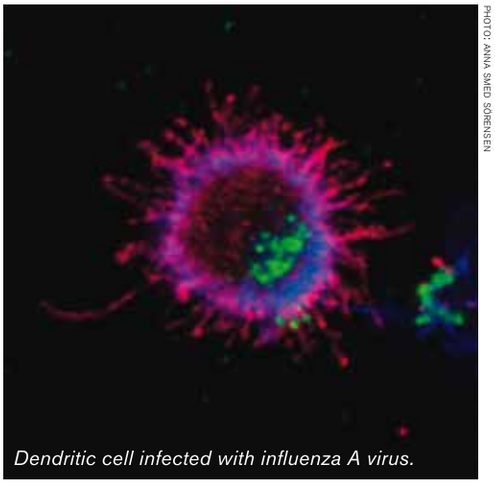


PHOTO: ANNA SMED SÖRENSEN

Dendritic cell infected with influenza A virus.

AN ENERGY BOOST FOR THE RESEARCH FIELD

The Nobel Prize draws attention to the research field of immunology in general and to dendritic cells in particular. Anna Smed Sörensen is thrilled about that kind of injection of energy to the research area. Apart from conducting research she also teaches undergraduates and has noticed that a subject gains in importance once it has been awarded a Nobel Prize. "It just becomes easier to explain why it is so important," she says enthusiastically. The founder of the field, Ralph Steinman, was known for his enthusiasm and for his ability to inspire other researchers, especially young people. Anna Smed Sörensen met Ralph Steinman on several occasions, the last time being as late as last March when he visited the Karolinska Institute. "He looked at the labs and we discussed science, just as always," she recounts. Her happy smile disappears when she recounts her feelings after the announcement of the Nobel Prize on the third of October. "First I was really happy and then I was really sad. Ralph Steinman deserved the Prize so much, it is a shame that he missed it by so little," she says and continues her account of her role model and inspiration. "When I met him the first time I was astonished by his knowledge, not only when it came to dendritic cells but also in general. Ralph had this amazing ability to make students and young researchers feel like a part of the scientific community, a quality that is anything but obvious amongst the rock stars of science. I hope that I will be able to develop the same ability to listen and to focus both on the person and the scientific problem in front of me," Anna Smed Sörensen concludes.

BY NATALIE VON DER LEHR

Dendritic cells as vaccines against cancer

Ralph Steinman was diagnosed with pancreatic cancer four and a half years ago and his life was extended using a combination of surgery, standard chemotherapy and experimental dendritic-cell based immunotherapy of his own design. Two Nordic companies are currently developing similar cancer vaccines.

Dendritic cells (DCs) can be derived from immature white blood cells and are the single most important substance in all immune responses since they activate systems that help the body to eliminate harmful foreign material. DCs process antigens and present them to T-cells, whose job it is to attack cells that have been invaded by harmful agents. Cancer cells have a mechanism to "hide" from the body's own immune system and can therefore continue to grow.

FINE TUNING DENDRITIC CELLS

The use of dendritic cells for anti-cancer immunotherapy became possible only after the development of methods to establish dendritic cell cultures from monocytes isolated from blood. By the addition of certain cytokines these monocytes are transformed first into immature and then into active, mature dendritic cells. Antigens of the patient's own tumor, or universal antigens, can be loaded to the cell between the immature and mature stage, thereby giving rise to a patient-specific vaccine that will recognize the tumor and activate the immune system to destroy it. This method was used by Ralph Steinman and is also the underlying principle of the American company Dendreon,

PHOTO: IMMUNICUM

Jamal El-Mosleh.

which is developing commercially available cancer vaccines against prostate cancer. The Danish company Dandrit is currently developing second generation dendritic-cell based immunotherapy by loading the DCs with their own master-antigen.

"Our technology brings down the cost to 30,000 USD per year and patient," explains CEO Eric Leire. "We just draw out 200 ml of blood from the patient and that is enough for five vaccines that are administered by a nurse; it is just like a tetanus shot," he says, illustrating the difference to Dendreon's method, which relies on the use of leukapheresis and administration by intravenous infusion.

UNIVERSAL DONORS

The Swedish company Immunicum is taking a slightly different approach by not using the patient's own blood cells but white blood cells from any healthy donor. "When people donate blood the red and white blood cells are often separated from one another and it is mostly the red blood cells that are given during blood transfusions. The white blood cells are often left over and there we have a great resource for the basis of our vaccine," explains Jamal El-Mosleh, CEO of Immunicum. The advantage is that one universal vaccine can be designed for many patients and treatment can then be started immediately. "It can be tricky to find a good patient-own antigen or even a universal antigen to load the cells with. Therefore we administer our vaccine directly into the tumor where it is automatically loaded with the tumor-specific antigen. Using this strategy we

are able to mass produce our vaccines and still keep the advantages that a tailor-made vaccine offers. Our allogeneic DCs are probably a further trigger for the immune system since they are recognized as foreign," says Jamal El-Mosleh.

PROMISING CLINICAL TRIALS

Both companies have entered clinical trials. Dandrit is currently carrying out an international randomized Phase IIb clinical trial with 174 advanced colorectal cancer patients and has already completed successfully two Phase IIa trials in Denmark and in Singapore. Immunicum has recently gotten approval to carry out a phase I/II study on renal cancer in twelve patients in Sweden. "One good thing about this therapy is that it does not compete with existing treatments. It is a complement to traditional surgery, radiation and/or chemotherapy and therefore it will not be difficult to establish it on the market," says Eric Leire. Dendritic cells, administered intradermally to the lymph nodes (Dandrit) or directly into the solid tumor (Immunicum), seem to combat the cancer cells and target metastases of the tumor.

SPURRED BY THE PRIZE

Just as many other scientists within the research field of dendritic cells, both Jamal El-Mosleh and Eric Leire are spurred by the fact that Ralph Steinman's discovery was rewarded with the Nobel Prize. "It is amazing that he could live for so long with that type of cancer. That really encourages us to believe that we are on the right track," concludes Eric Leire.

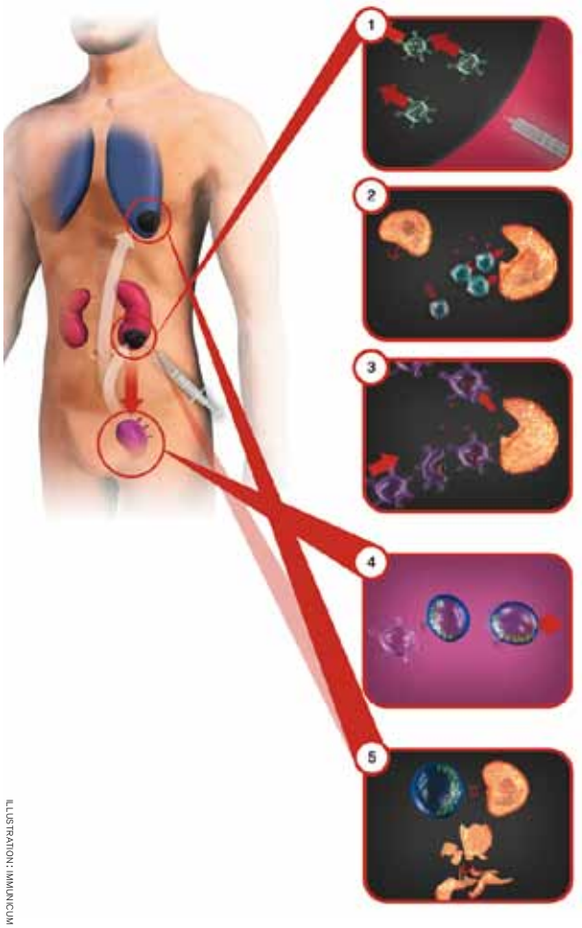


ILLUSTRATION: IMMUNICUM

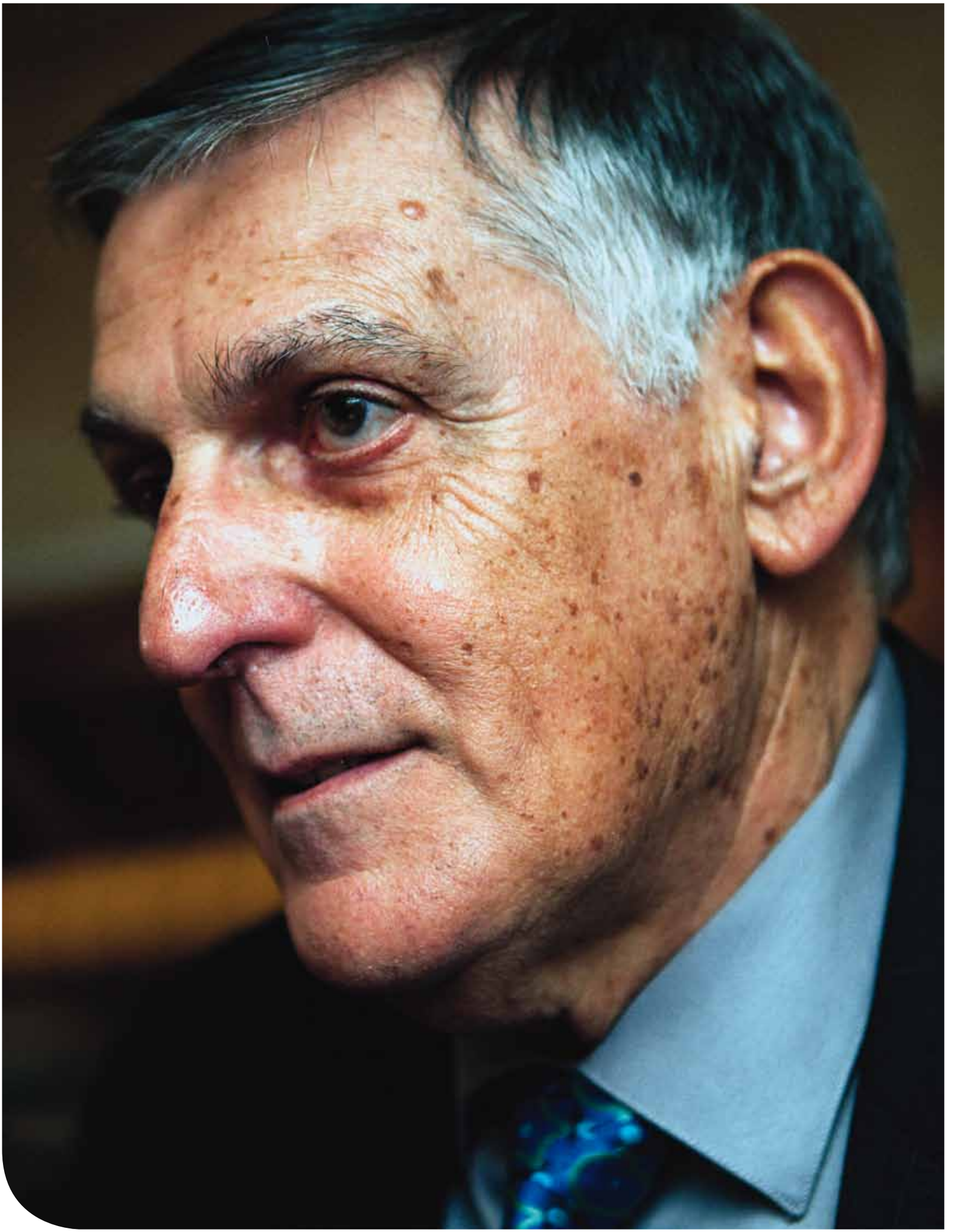
1. Dendritic cells from healthy blood donors are injected into the tumor

2. NK-cells are recruited to the tumor and cause cell death, which in turn leads to a release of tumor antigens

3. The patient's own dendritic cells pick up the tumor antigens and migrate to the lymph nodes

4. The dendritic cells present the tumor antigens to T-cells which are transformed into tumor-specific cytotoxic T-lymphocytes (CTL).

5. CTLs search for and attack tumor cells in the body



BY NATALIE VON DER LEHR
PHOTO PIERRE MARTIN

“After a while I started to like that fight between me and Linus Pauling”

When Dan Shechtman saw the first signs of quasicrystals nobody believed him. He had to endure being called a quasiresearcher, was asked to leave his research group and to check up on the basic facts.

The main reason for those reactions from his scientific peers was, according to Dan Shechtman, that crystallography was a well-defined subject where not much had happened in 70 years. “From 1912 to 1982 all observed crystals were ordered and periodic. That became the definition, people thought of crystallography as a mature science with nothing new left to happen. People just sorted new crystals into different drawers – but mine did not fit into any,” Dan Shechtman explains. He adds that the new definition of a crystal is very modest and is open for the possibility of new discoveries. “The science of crystallography is very tough. To achieve this soft definition is quite an achievement,” he says, acknowledging his contribution to the re-definition with a happy smile.

CONTINUED TO BELIEVE IN HIMSELF

So why did nobody see these structures before him? “A good electron microscope is the first requirement in order to see quasicrystals. The second important parameter is knowing what you are doing and the third is believing what you are seeing,” summarizes Dan Shechtman. Other people have indeed seen quasicrystals but could not sort them into one of the existing drawers and discarded them. Dan Shechtman on the other hand believed in what he saw and even when his discovery was questioned he continued to believe. “I am the worst critic of my own science. I checked it over and over again and knew I was right,” he says. He also adds that the criticism he got was not that bad. “All in all it was an unpleasant one and a half year period but then I managed to publish my results and got an enormous response from other scientists who started to remember those structures that they could not fit into one of the given drawers earlier,” he says. One critic however remained, Linus Pauling, twice recipient of the Nobel Prize. “He is the one behind the famous quote that there is no such thing as quasicrystals, only quasiscientists. At the beginning our fight was unpleasant but after a while I started to like it. It was Danny Shechtman against Linus Pauling, fighting another, up here,” he says and lifts his hands to form a line above his head.

A FEW INTERSECTIONS IN LIFE ARE CRUCIAL

Dan Shechtman got interested in research when he was ten years old. “I read the novel ‘The Mystery Island’ by Jules Verne. The characters in the book are stranded on an island and through the brains of one person they create civilization. I got very influenced by that book and decided to become an engineer,” he says. When he finished his degree in medical engineering in 1966 at the Technion University in Israel there were no jobs because of the recession. “So I did my Masters and fell in love with science. I did find a job after my Masters but called the evening before I was supposed to start and told them that I just had to go for my PhD,” he says. This was, according to himself, one of the crucial decisions of his life. “As I see it there are only a few intersections in life where you really make a choice. Once you have made a decision you follow a straight line with intrinsic ups and downs – the road does not have to be paved but it is there,” he says and emphasizes that out of hundred applications for a postdoc he got two offers. “But that did not matter, I got the offer I wanted, didn’t I?”

HIGH EXPECTATIONS

Apart from having high expectations of himself he demands the same from his students and his children. “When my children were young I told them that their basic education starts in primary school and finishes with a university degree, preferably with a PhD,” he explains, adding that one out of his four children has obtained a PhD so far, two more are on their way and that he has high hopes for the fourth one. “A good education and a good understanding of the world are the most important things in life,” he adds.

He encourages his students and young scientists in general to adopt risky projects with a high potential. “Find a good problem and challenge it. When you get unexpected results you should ask yourself whether you are an expert and check your results over and over again. Be open for criticism, listen to what other people have to say but stand tall and be true to yourself.”

DAN SHECHTMAN

Born 1941 in Tel Aviv, Israel
PhD 1972 from Technion – Israel Institute of Technology, Haifa, Israel
Distinguished Professor, The Philip Tobias Chair, Technion – Israel Institute of Technology, Haifa, Israel

The Nobel Prize in Chemistry 2011 was awarded to Dan Shechtman for his discovery of quasicrystals. He was the first scientist to describe crystals with a five-fold symmetry, something that was thought to be impossible.

Raising the next generation

The Nordic countries are well known for the high quality of their research. Young scientists today are however struggling and find it difficult to follow a rather undefined career path. Several initiatives are now promoting young scientists in order to maintain Nordic success levels.

BY NATALIE VON DER LEHR

One of these is The Young Academy of Sweden (Sveriges unga akademi), initiated by the Royal Swedish Academy of Sciences (RSAS). "There is a clear need for a forum for young scientists and no such thing existed in Sweden," says Anna Sjöström Douagi, Director of the Young Academy. In order to get started fast some of the top young researchers in the country were invited to join the academy. Eligibility criteria were high quality of research, a willingness to interact across different research fields and a genuine interest for the promotion of science. 35 of 86 applicants were invited to an interview; in the end 22 candidates were selected to form the first academy for young scientists in Sweden. "The role of the RSAS has been mostly the same as that of a midwife. Now that we have been born we have to make it on our own," says Anna Sjöström Douagi jokingly.

TOP RESEARCHERS WORKING FOR EVERYBODY'S INTEREST

Comparisons with a club of the elite are not far removed, bearing in mind that only the most successful young researchers are members of the Young Academy. Anna Sjöström Douagi emphasizes that the academy is dealing with problems that all young researchers encounter – one example being the undefined career path and the insecurity that is common in the academic world. "We are looking for more structure. Once young people chose the academic career path they should know what is expected of them and they should be evaluated on the way – naturally not everybody can become a top researcher within their field but those who embark on the journey should have good conditions in place to help them get there," says Anna Sjöström Douagi.

DEMANDS ON POLITICIANS

The young scientists meet on a regular basis and discuss science and related issues. "Once they are all in one room the atmosphere is bubbling, with a lot of interesting and rewarding discussions going on, both about science and related issues. The advantage with young scientists is that they still feel that anything is possible and it is amazing to experience that spirit," says Anna Sjöström Douagi. At a recent meeting the Young Academy completed a proposal for the forthcoming Research and Innovation Policy Bill 2012. It included fostering academic mobility, long term supply of knowledge and investing in individual creative researchers.

LARGEST INITIATIVE EVER

In the spirit of supporting individual young researchers, the Knut and Alice Wallenberg Foundation decided to set up a unique career program for young researchers called the Wallenberg Academy Fellows. The program, which is the Foundation's largest initiative ever, will provide funding of 1.2 billion SEK to 125 young researchers over a period of five years.

"We have to invest in science of good quality. The future depends on the young researchers," says Göran Sandberg, executive director of the Knut and Alice Wallenberg Foundation, when he explains the background of the initiative.

He expresses his concern that too few young Swedish researchers establish themselves within the international elite. Groundbreaking science is done when researchers are willing to take risks and take on projects with an uncertain outcome. Given the shortsighted funding that a lot of young scientists experience, those kinds of projects are anything but a given choice.

UNIVERSITIES NOMINATE THEIR CANDIDATES

The universities are given the opportunity to nominate a certain number of

PHOTO: MARKUS MARCETIC

Anna Sjöström Douagi.

Stefan Claesson, Royal Academy of Sciences and Helene Andersson-Svahn, chairman Young Academy of Sweden.

"Especially within the research areas with experimental activities the fellows will have to apply for additional funding. Our hope is that the research of the fellows will be of such a high standard that it will not be a problem for them to attract more funding."

candidates. In so doing the universities also guarantee to provide at least half of the salary. Criteria for the young scientists are their scientific achievements, independence and ability to be creative and to break new scientific ground. 40% of the fellows will be recruited externally.

"We wanted to avoid too much internal recruitment, but at the same time there should be an opportunity to promote those promising young scientists that are already working at the same university. I really hope that the universities will use their opportunities to both recruit international talent and to bring home talented Swedish researchers who are currently gaining more competence and insights abroad," explains Göran Sandberg.

FOCUSING ON THE INDIVIDUAL

Nominations must include a CV, publication list and project proposal, just like many other applications for funding.

"But it will be very important to be able to justify the research program and what you are about to do. We will accept wild and crazy projects as long as the candidates can justify why they want to do them. We really want to promote the qualities of the individual rather than strategically chosen projects," says Göran Sandberg.

Young scientists who feel that they have what it takes to become a Wallenberg Academy Fellow are welcome to themselves approach the university they would like to carry out their research at. The Foundation is planning to advertise in the scientific journals Nature and Science to attract the best researchers internationally.

FIVE MORE YEARS

After the initial funding of five years the fellows are welcome to apply for another five year extension. Approximately one third of the fellows will be granted this extension, giving them a total period of ten years. The funding is supposed to cover costs for employing staff and experimental costs.

"Especially within the research areas with experimental activities the fellows will have to apply for additional funding. Our hope is that the research of the fellows will be of such a high standard that it will not be a problem for them to attract more funding," says Göran Sandberg.

THE FUTURE

Young researchers will grow older and will then not qualify for certain types of funding. Göran Sandberg hopes that the researchers who have been part of the program will have gained so much competence that they will do well in general competition with others. Additionally, membership of the Young Academy is only possible for five years. "We want to keep the academy young and will work with constant renewal," says Anna Sjöström Douagi, adding that there might something like an alumni-network for the "retired" members of the Young Academy. Both Göran Sandberg and Anna Sjöstrom Douagi are convinced about the potential of the young scientists and hope to see some of them receiving a prize handed to them by his Majesty the King one day. "I made sure that our chairman, Helene Andersson Svahn, was invited to the Nobel Prize banquet. That is always a start," concludes Anna Sjöström Douagi.

YOUNG ACADEMY OF SWEDEN

22 members from different disciplines, including science and humanities.
Currently the academy is looking for six new members.

The aim of the academy is to

- Create a forum where young scientists can engage in a scientific dialogue across research fields and get ideas for new hypotheses.
- Encourage young scientists to use their scientific expertise to improve the perception of science by the public.
- Make it possible to cooperate and improve Swedish research politics.
- Create a national forum for the leading scientists of the future.
- Create a forum where young scientists can establish networks with other young academics and scientists globally.

Torsten Wiesel, Nobel Laureate 1981, patron of the Young Academy of Sweden.

WALLENBERG ACADEMY FELLOWS

The program has been initiated in close collaboration with Swedish university vice-chancellors, The Royal Academy of Engineering Sciences (IVA), the Royal Swedish Academy of Agriculture and Forestry (KSLA), the Royal Swedish Academy of Sciences (RSAS), the Royal Swedish Academy of Letters, History and Antiques (KVHAA) and the Swedish Academy. The universities are to nominate researchers who will be evaluated by the academies, whereupon the Foundation will make the final selection, and the universities will assume long-term responsibility for the selected researchers' work.

Young Scientists walk a yellow brick road

I just started my second year as a postdoc at the National Institutes of Health (NIH) in Bethesda, a suburb a few miles north of Washington DC. I'm a young scientist, I guess. I'm a junior scientist for sure. Even though I'm over 30, I'm still in the early stages of my scientific career. Scientists don't really retire like normal people. They just keep going. I hope I have at least another 50 years of pipetting left in these hands. My goal, and the goal of most junior scientists, is to land a faculty position at a decent university and eventually to become a professor. This is difficult and competitive, especially in times of financial crisis and budget cuts. Reaching this goal takes ambition and dedication. It's a long yellow brick road to walk and the goal is far and fleeting, like Emerald city.

In many countries, universities use a tenure track system to recruit and nurture young scientists during the early stages of their careers. The university hires them and they get a certain time frame to prove themselves. They are on the track and if they meet the expectations, they get to stay and they obtain a faculty position - tenure. If they don't meet the expectations, they have to leave. A few years ago, I attended a meeting at the Karolinska Institute about the future of research training in Sweden. Most of the biomedical research in Sweden is funded, not by the government, but by private foundations and through NIH grants. Universities have little money to spend on research and hiring people is expensive. Hence, finding a faculty position at a university in Sweden for young scientists just starting out is essentially impossible. This has prompted PhDs like me to go abroad to do postdocs. The term refers to the stage you are at after obtaining your PhD. This is when you establish yourself as an independent scientist. You no longer have a supervisor per see, but a mentor. Your mentor guides you on the road towards independence, but as a postdoc you are responsible for your project and you fail or succeed with your experiments.

So building a successful research career is like going on a long and sometimes wearisome journey. The postdoc phase of this journey is usually the most stressful. This is when you have to prove yourself and show that your stand out from the rest. Usually this phase coincides and clashes with the time when most people start thinking about starting a family. My mentor once had a boss that told her "If you want to do science, forget about having a family and friends." What she really meant was that you have to compromise, because you can't have it all. This works out well if you don't want to have a successful career, or if you don't want kids or just don't have any friends. That excludes most of us. This definitely excludes me. This boss is absolutely right, though. I've asked most of my postdoc friends and they all agree. These are the rules and this is the downside to being a young scientist. The road lies before me but I should not walk any further if I'm not willing to makes sacrifices along the way.

The point of the meeting I attended was for members of academia to discuss the tenure track system and how that would work in Sweden. Currently, when you return home from your postdoc period or periods, you have to fight other PhDs for the highly coveted research assistant positions. As a research assistant you are awarded external grants to start up your own research at a university. These positions are supposed to bridge the gap between being a scientist in training and becoming an independent researcher. The tenure track would open up the job market for young scientist and make it possible for them to come home from their postdoc period and actually find a job. This is a question of resource allocation, of course, more money needs to be spent on biomedical research, which is largely a political issue, but it is also a matter for the research community to discuss for it requires some serious changes in attitude and tradition. Like, maybe I shouldn't still be in the lab pipetting at the age of 82…

This is not a call for sympathy, but I do believe something needs to be done about the organization of the research training in Sweden. I want a job when I return home. I realize that having a successful career in any field is hard and requires a lot of dedication and sacrifice. I'm no martyr. Actually, I love what I do so I'm thankful. So many people go to work every day hating their jobs, letting the hatred turn them bitter. Bitterness is like a thin layer of filth that covers everything and makes it looks dirty. As long as I'm not bitter I know that I have not sacrificed too much. And that is key for a young scientist to make it to Emerald city, to never become bitter and never blame the science for missed opportunities and sacrifices. Also to make friends with your lab colleagues, because they are likely to be the only people see. Everything else will work out.

Anna Sundborger, PhD

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