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GUIDE

to the 2008 Nobel Laureates
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Welcome to this short Guide to the 2008 Nobel Laureates from Nobelprize.org, the official website of the Nobel Foundation. The Guide aims to provide a handy digest of the 2008 Nobel Prizes and to offer a little insight into the work and people who have been the subject of this year’s awards. For each Nobel Prize category, you will find a ‘Speed read’ summary of the Prize-awarded work, together with a timeline noting some of the important milestones that led to each Prize. We also include a succinct profile of each Laureate, entitled ‘In his/her own words’ and based on our telephone interviews conducted immediately following the announcements, which reveal some of the motivations and remarkable stories behind their individual achievements.

The Nobel Prize, which was first awarded in 1901, rewards achievements in the five fields of physics, chemistry, physiology or medicine, literature and peace, as stipulated by Alfred Nobel in his will. In 1968, Sveriges Riksbank established The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel, and this is awarded on the same day as the Nobel Prizes. This year’s announcements have seen another twelve new Laureates added to the illustrious list, taking the grand total to 809 since the Nobel Prize’s inception. The addition of one new female Nobel Laureate in Physiology or Medicine, Françoise Barré-Sinoussi, now elevates the total number of women awarded a Nobel Prize to just 35.

Once again the scope of awarded discoveries takes us on a journey of extremes, from international trade and the source of global epidemics, to the miniature world of glowing jellyfish proteins and particle physics. Consistent with the global theme, a cross-cultural author and an international peacemaker have been awarded Nobel Prizes for their life-long achievements.

We hope that The Guide provides a taste of this year’s Nobel Prizes. To explore these and other Nobel Prizes and Laureates in greater detail, please visit Nobelprize.org to access our full range of freely available content, including audio and video interviews, official documentation from the Prize-awarding committees, articles, educational games and much, much more.
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The Nobel Prize in Physics 2008

“for the discovery of the mechanism of spontaneous broken symmetry in subatomic physics”

Yoichiro Nambu
1/2 of the prize
Birth: 1921
Birthplace: Japan
Nationality: US citizen
Current position: Harry Pratt Judson Distinguished Service Professor Emeritus, Enrico Fermi Institute, University of Chicago, Illinois, USA

Makoto Kobayashi
1/4 of the prize
Birth: 1944
Birthplace: Japan
Nationality: Japanese citizen
Current position: Professor Emeritus, High Energy Accelerator Research Organization (KEK), Tsukuba, Japan

Toshihide Maskawa
1/4 of the prize
Birth: 1940
Birthplace: Japan
Nationality: Japanese citizen
Current position: Professor Emeritus, Yukawa Institute for Theoretical Physics (YITP), Kyoto University, Japan

“for the discovery of the origin of the broken symmetry which predicts the existence of at least three families of quarks in nature”
luckily for us, the Universe is not symmetrical, at least at the subatomic level. If it was, the newly formed matter at the Universe’s birth would have been annihilated by an equal and opposite amount of antimatter, and nothingness would have resulted. Instead, a small imbalance, or asymmetry, in the amount of matter and antimatter created led to a slight excess of matter, from which we are all eventually formed. Such so-called ‘broken symmetry’ is one key to our existence.

Understanding symmetry, or the lack of it, is an ongoing task, and the 2008 Nobel Prize in Physics rewarded two discoveries concerning symmetry violation in the field of particle physics. In the 1960s Yoichiro Nambu, who had been working on asymmetries underlying superconductivity, was the first to model how broken symmetry can occur spontaneously at the subatomic level. The mathematical descriptions he formulated helped refine the standard model of particle physics, the current working theory that best explains much, but not all, of the way that fundamental particles and the forces that govern their behaviour interact to create the known Universe.

In the early 1970s, Kobayashi and Maskawa formulated a model that explained certain symmetry violations that had recently surprised observers in particle physics experiments. Their model suggested that the collection of subatomic particles known at

Timeline: Milestones for the 2008 Nobel Laureate in Physics, Yoichiro Nambu.
the time was insufficient to explain the observed behaviours, and predicted the existence of as yet undiscovered elementary particles. It did not, however, specify precisely what form these particles should take. Kobayashi and Maskawa hypothesized the existence of a third family of quarks, which are some of the building blocks from which all matter and antimatter are formed. They then had to wait almost three decades for the experimental results that would fully verify their hypothesis. The existence of all three families was finally confirmed when the last member was observed in the mid 1990s.

Symmetry breaking in particle physics continues to be the focus of intense speculation and investigation. One of the most infamous examples of symmetry breaking, the particle or set of particles known as the Higgs boson, thought to be responsible for breaking the symmetry between electromagnetism and the so-called weak nuclear force, could help solve one of the greatest outstanding questions in physics – how particles acquire mass. Whether or not this mysterious particle exists will be the main subject of scrutiny at the Large Hadron Collider, the giant particle accelerator soon to go into operation outside Geneva, Switzerland.

Timeline: Milestones for the 2008 Nobel Laureates in Physics, Makoto Kobayashi and Toshihide Maskawa.
By his own admission the concept that Yoichiro Nambu devised in the early 1960s — that of spontaneous broken symmetry in particle physics — is “a bit difficult to explain” in simple terms. But while lecturing the day before he had been awarded the Nobel Prize in Physics, Nambu chanced upon an elegant analogy to describe how such broken symmetry can occur spontaneously.

“I saw a roomful of people all looking towards me and I thought that’s strange, why do they look only in one direction?” But if one person in that crowd turns their head and looks in the opposite direction then of course people nearby will turn around to see what that person is looking at. “So there is a kind of wave propagating from that person. And that is the wave associated with broken symmetry.”

Having begun his career as a theoretical physicist in Japan during the Second World War, Nambu is no stranger to looking for explanations in the midst of turmoil. Nambu describes being “lucky enough” to get a research position at the University of Tokyo after the war, though he was working under conditions that are a world away from the conditions enjoyed by most physicists nowadays. “I spent two, three years sleeping in my office, shared with maybe eight or so people. Everyday I had to go shopping, and sleep on my desk.” But the bleak conditions did provide one huge advantage, says Nambu: “I kept thinking about physics.”

By good fortune, a student of Sin-Itiro Tomonaga, who would receive the Nobel Prize in Physics in 1965, happened to be working at the neighbouring desk. By discovering what Tomonaga was doing Nambu eventually joined his group, and thanks to Tomonaga’s recommendation Nambu was able to get a job first in Japan and then at Robert Oppenheimer’s Institute at Princeton University. The few years he originally planned to spend in America would become a lifetime. “I was not able to do good research to my satisfaction while I was in Princeton, so I wanted to stay for a few more years in America before going back to Japan.” Fortunately Nambu was able to get a postdoctoral position at the world-renowned Physics Department at the University of Chicago. “I jumped at the opportunity! I came here and I have stayed here ever since.”

All of which illustrates the virtues of being in the right place at the right time, and Nambu feels grateful to have been a theoretical physicist at the time he began his research. “I was very fortunate. Particle physics was created in the early 1930s. Ernest Lawrence invented the cyclotron on one hand, and [Hideki] Yukawa in Japan invented particle physics, the theoretical side, and they went along side by side.”

When asked whether young physicists should follow his example and only eat and think about physics, Nambu laughs. “Yes! That’s a very good thing! My whole career was formed by the three years I was in Tokyo.”
In his own words: **Makoto Kobayashi**

When recalling the groundbreaking theory he developed with Toshihide Maskawa that has been rewarded with the 2008 Nobel Prize in Physics, Makoto Kobayashi reveals a refreshing degree of honesty. “We were confident about the first part because it’s quite logical. But the second point was quite uncertain at that time.”

“Our work consisted of two parts”, Kobayashi goes on to explain. The first part of the theory, that the number of subatomic particles thought at the time to make up all matter were not enough to explain a long-standing mystery in particle physics called broken symmetry, “is a quite logical consequence of the argument”, says Kobayashi. However, the second, trickier part of the theory involved forecasting what these extra, new particles actually are. And as Kobayashi admits “there are many possibilities logically”. Only two families of a particular subatomic particle known as quarks were known at the time, and Kobayashi and Maskawa predicted that there had to be one more. “At first we were not confident about this six quarks scheme, but gradually we came to believe that this actually is the case.”

“Gradually” might seem like an understatement. After all, Kobayashi was 28 years old when he devised his theory, and it would take almost 30 years to discover the new types of quarks in particle accelerators. Yet this illustrates that sometimes theoretical physics leads experiment, and at other times experiments produce results that theoretical physics must explain. Kobayashi feels very fortunate to have started out as a theoretical physicist at the time he did, “particularly in the 1970s”, a time he describes as being a “liberation in particle physics”, because “at that time we had many chances to do many things.”

Now the situation is different, says Kobayashi. “This is actually quite a new phase ... we are waiting for some kind of new physics. Theoreticians predict, propose many theories, and we just wait for experimental proof of those models.” Kobayashi particularly hopes that the new particle accelerator called the Large Hadron Collider (LHC) at CERN in Geneva, Switzerland, will help fill in missing information in the so-called Standard Model of particle physics, the best theory that physicists currently have to explain how fundamental particles and forces interact to create the known Universe. “We need to add something on top of this Standard Model. That is what we expect at the LHC experiment.”

“This is actually quite a new phase... we are waiting for some kind of new physics”

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This article is based on a telephone interview with Makoto Kobayashi following the announcement of the 2008 Nobel Prize in Physics. To listen to the interview in full, visit http://nobelprize.org/nobel_prizes/physics/laureates/2008/kobayashi-interview.html
In his own words: Toshihide Maskawa

“For a theorist, the most exciting period is waking early one morning to discover a truth that you could not have imagined.” Toshihide Maskawa describes the intellectual thrill of being a theoretical physicist, perhaps matched only by witnessing one’s theories eventually being proved true. In 1972 he and Makoto Kobayashi formulated their model for broken symmetry, which predicted the existence of a third family of elementary particles called quarks, but did Maskawa ever have any doubts that experiments decades later would prove their bold theory to be correct? “In any research thesis there is always an element of supposition,” he candidly states before revealing, “to be honest, I didn’t imagine that the top quark would ever be as heavy as it is.”

For anyone trying to understand the concept of broken symmetry Maskawa offers the following analogy: “There is a saying that if you put the grass that a cow likes in a circle around the cow, then whatever grass the cow eats, as far as the cow is concerned, will be the same. However if the cow sooner or later chooses a certain direction in which to eat the grass, then we have a state of broken symmetry.”

Maskawa provides more food for thought when discussing whether there was anything particular about the Japanese educational system that helped him and his fellow Nobel Laureates develop as theoretical physicists. “The period in which I was raised as a researcher was at a time after a brutal and reckless war and before the calmer period of the 1960s was first coming into view,” he says. “What was often said was that as there are no natural resources in Japan, we must survive on the strength of science and technology.” It was within this testing environment that Maskawa says he gained his yearning and an affinity for science.

All young and eager scientists require nurturing, and Maskawa was no exception. He cites his professor at university, Shoichi Sakada, as the person who provided especially useful direction on his path to becoming a physicist. He describes Sakada as “a pioneer in Quark Theory”, and Maskawa recalls how he and his colleagues were encouraged to collectively gather and discuss research. “It was there that I studied how to think and in what form things should be accomplished,” says Maskawa.

And now that the student is himself a mentor, what advice would he offer young people thinking of entering theoretical physics today? “My advice to young people is to be ambitious and to have sincerity toward our natural world.”

“To be honest, I didn’t imagine that the top quark would ever be as heavy as it is”
The Nobel Prize in Chemistry 2008

“for the discovery and development of the green fluorescent protein, GFP”

Osamu Shimomura
1/3 of the prize
Born: 1928
Birthplace: Japan
Nationality: Japanese citizen
Current position: Professor Emeritus, Marine Biological Laboratory (MBL), Woods Hole, Massachusetts, USA, and Boston University Medical School, Massachusetts, USA

Martin Chalfie
1/3 of the prize
Born: 1947
Birthplace: United States
Nationality: US citizen
Current position: William R. Kenan Jr Professor of Biological Sciences, Columbia University, New York, New York, USA

Roger Y. Tsien
1/3 of the prize
Born: 1952
Birthplace: United States
Nationality: US citizen
Current position: Professor, University of California, San Diego, La Jolla, California, USA
The story begins with Osamu Shimomura’s research into the phenomenon of bioluminescence, in which chemical reactions within living organisms give off light. While studying a glowing jellyfish in the early 1960s he isolated a bioluminescent protein that gave off blue light. But the jellyfish glowed green. Further studies revealed that the protein’s blue light was absorbed by a second jellyfish protein, later called green fluorescent protein (GFP), which in turn re-emitted green light. The ability of GFP to process blue light to green (its fluorescence) was found to be integral to its structure, occurring without the need for any accompanying factors.

In 1988, Martin Chalfie heard about GFP for the first time, and realised that its ability for independent fluorescence could perhaps make it an ideal cellular beacon for the model organisms he studied. Using molecular biological techniques, Chalfie succeeded in introducing the gene for GFP into the DNA of the small, almost transparent worm Caenorhabditis elegans. GFP was produced by the cells, giving off...
its green glow without the need for the addition of any extra components, and without any indication of causing damage to the worms. Subsequent work showed that it was possible to fuse the gene for GFP to genes for other proteins, opening-up a world of possibilities for tracking the localisation of specific proteins in living organisms.

The opportunities offered by GFP were immediately obvious to many, as was the desirability of extending the range of available tags. Roger Tsien first studied precisely how GFP’s structure produces the observed green fluorescence, and then used this knowledge to tweak the structure to produce molecules that emit light at slightly different wavelengths, which gave tags of different colours. In time, his group added further fluorescent molecules from other natural sources to the tag collection, which continues to expand. Complex biological networks can now be labelled in an array of different colours, allowing visualisation of a multitude of processes previously hidden from view.
In his own words: Osamu Shimomura

“To get success, everybody has to overcome any difficulty on the way.” Osamu Shimomura can speak from experience. As a teenager living 12 kilometres away from Nagasaki, he felt the blast of the atomic bomb explosion in August 1945. “I was soaked by black rain. So, I was contaminated by the radioactivity, a lot of strong radioactivity. But fortunately still I’m alive.”

“I don’t do my research for application or any benefit. I just do my research to understand why jellyfish luminesce”

The thousands of scientists worldwide who have benefited from the fruits of Shimomura’s labours will no doubt share his sentiment. Thanks to his discovery of green fluorescent protein (GFP) in jellyfish they have one of the most important tools at their disposal for visualizing life at the microscopic level; although Shimomura is quick to point out that there was only ever a single purpose behind his studies. “I don’t do my research for application or any benefit. I just do my research to understand why jellyfish luminesce, and why that protein fluoresces.”

Discovering GFP in jellyfish took considerable effort. “What we needed to do to study that protein is we have to get large amounts of that protein. So, we collected huge numbers of jellyfish by going to Friday Harbor, Washington, every summer.” Just how many jellyfish did he need to collect? “Our schedule was 50,000 per summer, in one or two months.” These remarkable expeditions took place every summer for 19 years, collecting a staggering 850,000 jellyfish in total. “That’s classical biochemistry, not genetics or something like that,” says Shimomura.

Shimomura says that GFP is one of many, still undiscovered, molecules in nature that emit light, but he fears that the demands of carrying out such labour intensive and uncertain research will deter young scientists from looking for them. “They prefer easier research. And they prefer research subjects that you can see the results; that you are sure to get the results.” So, what advice would Shimomura give to young people who are interested in entering science? “Study whatever they are interested in, and don’t give up on the way until they finish the subject. Good subjects have a lot of difficulty. If one gives up, on the way; that’s it, that’s finished.”

By way of illustrating his philosophy on never finishing until the job is done, Shimomura continues to work in a laboratory set up in the basement of his house, despite officially retiring in 2001. Recently he has been working on writing papers, and also helping other people, but he resigns himself to the inevitable change that will result from being awarded the Nobel Prize. “I think it’s hopeless to work out of the laboratory for the next several months, I guess.”
In his own words: Martin Chalfie

For many scientists, the phone call from a Nobel Prize Awarding Institution informing them that they have been awarded the Nobel Prize must rank as one of the most important moments of their lives. Martin Chalfie will remember the moment somewhat differently. A recent change of ring tone on his home phone meant he slept through the call from Stockholm, thinking it was for someone else. Chalfie laughs when recalling how he received the happy news. “I woke up, and I realised that they must have given the Prize in Chemistry, so I simply said, ‘Okay, who’s the schnook that got the Prize this time?’ And so I opened up my laptop, and I got to the Nobel Prize site and I found out I was the schnook!”

Looking back at the moment 20 years ago when he first heard about green fluorescent protein (GFP) in a seminar, Chalfie recalls his instant realisation that GFP could be used as a cellular beacon in his studies in the nematode worm, known as Caenorhabditis elegans. “One of the great things about working on C. elegans was the fact that it was transparent, and so when I first heard that seminar describing GFP, and realised, ‘I work on this transparent animal, this is going to be terrific! I’ll be able to see the cells within the living animal’.”

The story from initial thought to seeing cells glow in C. elegans involved an extraordinary chain of events over the following two years. Chalfie contacted a researcher called Douglas Prasher who was studying GFP, and they agreed that once Prasher had cloned the gene that encodes GFP they would see if they could make it glow in C. elegans. “One of the great things about working on C. elegans was the fact that it was transparent, and so when I first heard that seminar describing GFP, and realised, ‘I work on this transparent animal, this is going to be terrific! I’ll be able to see the cells within the living animal’.”

Given the unlikely chain of events, and the manner in which he discovered the news about his Nobel Prize, Chalfie can be forgiven for wondering if he is still sleeping. “I'll try to wake up tomorrow and say that it wasn’t a dream!”

“I work on this transparent animal, this is going to be terrific! I’ll be able to see the cells within the living animal”
In his own words: Roger Tsien

Like many Nobel Laureates, Roger Tsien says his love of science began at an early age, carrying out chemistry experiments at home, accompanied with “a mixture of fear in my parents and a little bit of encouragement”. By the relatively early age of 9 or 10, he knew he wanted to be a scientist. “I think I did go through the usual small-child phase of imagining being a fireman and so on, but yeah, I think being a scientist was more of a possibility for me than probably for most kids.”

As an adult chemist, Tsien has been instrumental in making the green fluorescent protein a more effective beacon for visualising processes inside cells. By understanding what made GFP glow and by tweaking the structure he could create molecules that emit light at slightly different wavelengths, producing tags of different colours. From the tens of thousands of papers that have been published using the probes he has developed, Tsien finds it difficult to single out any of the applications that he likes the most. One of the “showiest applications”, he says, is the trick of painting neurons in a whole kaleidoscope of colours – known as the brainbow.

A love of pretty colours can be said to have been the driving force in Tsien’s research career. “I have to say I myself do not find pipetting colourless droplets of liquid from one plastic tube to another awfully inspiring,” says Tsien. “At least without having to worry about whether the work would be successful in 5 or 10 or 20 years, I could get some direct aesthetic pleasure out of the experiments as I went along.”

When asked to comment on the observation that this Nobel Prize in Chemistry is being awarded for work that is basically involved in cell biology, Tsien notes that it’s an area that has been categorised as being chemical biology, biochemistry, or as Tsien sometimes calls it, molecular engineering, “at least our approach to it, because we try to build molecules to solve problems.”

Does Tsien worry about these academic labels? “I try not to,” he replies, but adds that it becomes dangerous “when students let themselves get pigeon-holed, or let their thought processes get pigeon-holed, and they say ‘Oh, I could never do that, that’s chemistry. I don’t know any chemistry.’” It’s surprising how often biologists develop an attitude about chemistry or chemists an attitude about biology, says Tsien, which unfortunately creates an “instinctual fear that, ‘Oh, that’s a subject I can’t do, and nobody should expect me to know how to do, and so I will just not pay any attention to questions that lead me in that direction.’” If there is one thing that Tsien has illustrated over the years, it’s the importance of being illuminated by any direction the subject that you are interested in takes you.

“We try to build molecules to solve problems”
The Nobel Prize in Physiology or Medicine 2008

“for his discovery of human papilloma viruses causing cervical cancer”

Harald zur Hausen
1/2 of the prize

Born: 1936  
Birthplace: Germany  
Nationality: German citizen  
Current position:  
Professor Emeritus and former Chairman and Scientific Director, German Cancer Research Centre, Heidelberg, Germany

Françoise Barré-Sinoussi
1/4 of the prize

Born: 1947  
Birthplace: France  
Nationality: French citizen  
Current position:  
Professor and Director, Regulation of Retroviral Infections Unit, Virology Department, Institut Pasteur, Paris, France

Luc Montagnier
1/4 of the prize

Born: 1932  
Birthplace: France  
Nationality: French citizen  
Current position:  
Professor Emeritus and Director, World Foundation for AIDS Research and Prevention, Paris, France

“for their discovery of human immunodeficiency virus”
Looking back over the two discoveries rewarded with the 2008 Nobel Prize in Physiology or Medicine reveals two different timelines for discovery research. One, Harald zur Hausen’s realisation that subtypes of a virus that produces harmless warts can also lead to cervical cancer, took a decade of work to prove, initially against a backdrop of considerable scepticism. The other, Françoise Barré-Sinoussi and Luc Montagnier’s identification of the virus associated with AIDS, occurred within just a few months amid a flurry of global research activity directed towards finding the cause of the then-new epidemic.

Harald zur Hausen’s suggestion that human papilloma virus (HPV) infection might lie behind cervical cancer flew in the face of general opinion in the early 1970s, which held that another commonly present virus, herpes simplex virus, might be the cause. Realising that there were a multitude of different HPV subtypes, and hypothesising that unknown subtypes might cause the cancer, zur Hausen’s group began a painstaking search for such novel viruses. By the early 1980s they found novel viruses in genital warts. Their subsequent identification of two novel HPV subtypes in cervical cancers formed the essential piece of evidence linking HPV infection to the onset of the disease.

Françoise Barré-Sinoussi and Luc Montagnier’s discovery of the virus that later came to be known as human immunodeficiency virus (HIV) occurred within just a few months amid a flurry of global research activity directed towards finding the cause of the then-new epidemic.

Timeline: Milestones for the 2008 Nobel Laureate in Physiology or Medicine, Harald zur Hausen.
just two years after the first reports of cases of what we now know as AIDS. An infective agent was suspected by many to cause the disease, and Barré-Sinoussi and Montagnier decided to test whether it might be a so-called retrovirus. Retroviruses are relatively uncommon among the viruses that infect humans and rely on the host’s cellular machinery to replicate their RNA. The gamble proved correct; their studies revealed retroviral activity in cells taken from a patient’s lymph nodes, and demonstrated that viral particles from these cells could infect and kill white blood cells. Within the year, Barré-Sinoussi and Montagnier had isolated HIV from several patient groups. Soon afterwards several research groups provided convincing evidence that showed HIV to be the cause of AIDS.

Identifying the viral culprits behind two human diseases that impact greatly on global health provided crucial insights into the workings of each virus, which, in turn, led to the development of much-needed treatments. zur Hausen’s discoveries enabled the development of vaccines that provide protection from the two HPV subtypes found in the majority of cervical cancer cases. Barré-Sinoussi and Montagnier’s discoveries led to a greater understanding of HIV and the way it interacts with humans, allowing the development of diagnostic tools and a range of antiviral drugs aimed at controlling HIV, and with it providing hope that the disease could eventually become treatable.
In his own words: Harald zur Hausen

“I’m of course totally surprised. And it’s of course a great pleasure for me.” Sitting in his office at the German Cancer Research Center, the news that Harald zur Hausen had received the 2008 Nobel Prize in Physiology or Medicine had yet to fully sink in. Perhaps surprise is an apt response; for years, few considered zur Hausen’s proposal, that cervical cancer was caused by the same virus that caused skin warts, worthy of serious discussion, let alone a Nobel Prize.

When zur Hausen first suggested publicly that human papilloma virus, or HPV, caused cervical cancer at a meeting in Key Biscayne, Florida, in 1974, it flew in the face of the prevailing view that the culprit was herpes simplex virus. “It was not very welcome,” recalls zur Hausen. “My statements were not well received, and I felt as a lonely voice in that meeting.”

When asked what gave him the dedication to persevere for years and eventually prove the link between HPV and cervical cancer, zur Hausen responds that it was the combination of a personal conviction that there must be an infectious agent involved in this cancer, together with the fact that so many questions remained unanswered about papilloma viruses. “I was not from the beginning mainly interested in papilloma virus, I was mainly interested in infectious agents in human cancer. Papilloma viruses came up as the most likely candidate from my viewpoint.”

The key breakthrough in finding that two subtypes of human papilloma virus, called HPV16 and 18, are found in most cervical cancer cases wasn’t automatically followed by the successful development of vaccines, mainly because companies were unconvinced that this was a worthwhile investment. As zur Hausen recalls, one German company showed some interest, but it pulled the plug on the project after carrying out some damning market analysis. “According to this market analysis there would be no market for such a vaccine. And then they stopped the funding.”

Now the opposite appears to be the case; results from trials on cervical cancer vaccines within the last decade have been enormously promising. zur Hausen sees this as clear evidence that vaccination programmes should be widened; however, he cautions that “The major disadvantage at this stage is that it is too expensive for those parts of the world which most badly need the vaccine; namely, the developing world.”

zur Hausen believes that scientists will discover more links between viruses and cancer, and he is keen to promote greater interest in this line of research. “I hope, indeed, that this Nobel Prize will of course create more awareness of the role of infectious agents in human cancer”.

Having spent decades in pursuit of his goal, it is perhaps appropriate that he hadn’t rushed into making any plans for celebrating his Nobel Prize. “It was so surprising I really have to sleep about it for one night or so before I make any decisions.”
In her own words:
Françoise Barré-Sinoussi

Visiting the Pasteur Institute in Cambodia, Françoise Barré-Sinoussi says she was unaware that she had been awarded the Nobel Prize in Physiology or Medicine until a French radio journalist called her for an interview. "I didn't know about the news. It was a big surprise."

Barré-Sinoussi feels that Cambodia is an appropriate place to receive the happy news. "I've been working with developing countries since the mid-1980s and it's really working with those countries that gives me another view, or another way, of orienting my research after the discovery of the HIV virus. It's important to really know what's going on in those countries strongly affected by these kinds of disease."

"We said, okay, look, we have all the reagents, we have the technique, and so let's try"

Recalling the discovery of the virus that later came to be known as human immunodeficiency virus, or HIV, Barré-Sinoussi remembers several waves of excitement as evidence slowly accumulated that she and her research colleagues had discovered a novel virus. "First it was the isolation of the virus from a patient that was with symptoms associated with AIDS. The second excitement was when we realised that it's not a known virus. Then we had electron microscopy pictures showing that the morphology was different, and so on." So, it was, as Barré-Sinoussi describes, a "progressive excitement".

Looking for a retrovirus in the first place seems an inspired choice with the benefit of hindsight, though Barré-Sinoussi admits this was initially "because most of the other types of virus families were already being explored". There were also "several lines of arguments" telling Barré-Sinoussi to look at retroviruses. "Since we were working on mammalian retroviruses at Pasteur at that time, we said, okay, look, we have all the reagents, we have the technique, and so let's try."

The educated guess paid off, and when asked what message she hopes her Nobel Prize will deliver, Barré-Sinoussi hopes that it highlights the fact that the success in discovering HIV is really the success of a global team of scientists, each bringing their different expertise to the task. "It's also important, especially when working on infectious disease, to have a world network of clinicians, virologists and microbiologists, working in the hospitals and basic sciences. This was really essential for me in the discovery of the AIDS virus. And I think it's essential also for tomorrow for discovering new, emerging, or re-emerging agents responsible for infectious disease."

"I've been working with developing countries since the mid-1980s. It's important to really know what's going on in those countries strongly affected by these kinds of disease."

This article is based on a telephone interview with Françoise Barré-Sinoussi following the announcement of the 2008 Nobel Prize in Physiology or Medicine. To listen to the interview in full, visit http://nobelprize.org/nobel_prizes/medicine/laureates/2008/barre-sinoussi-interview.html
In his own words: Luc Montagnier

“Even after 20 years we are still fighting this virus very strongly, and the AIDS epidemic is still spreading in Africa”

is to make most of these people, infected people, never sick, for life.”

Looking back on the moment that he and his colleagues first saw evidence of active HIV in cells taken from a patient’s lymph nodes, and that the virus from these cells could infect and kill white blood cells, Montagnier says he initially had little idea of the scale of the epidemic that he would be confronted with decades later. “But, when I realised that the virus could be the cause of AIDS and was present not only in gay men in France and the United States, and haemophiliacs, but also in African nations, I realised it could be big.”

In fact, Montagnier reveals that at the time of his discovery of HIV he was actually working on a possible viral cause of breast cancer, which he says makes sharing the Nobel Prize with Harald zur Hausen for his discovery of the viruses that cause cervical cancer a happy coincidence. “I’m still interested in cancer viruses so I appreciate that the Nobel Committee also has awarded the Prize to Harald zur Hausen who has worked for a long time on this.”

Luc Montagnier says the battle against AIDS in Africa is far from resolved.

This article is based on a telephone interview with Luc Montagnier following the announcement of the 2008 Nobel Prize in Physiology or Medicine. To listen to the interview in full, visit http://nobelprize.org/nobel_prizes/medicine/laureates/2008/montagnier-interview.html
The Nobel Prize in Literature 2008

“author of new departures, poetic adventure and sensual ecstasy, explorer of a humanity beyond and below the reigning civilization”

Jean-Marie Gustave Le Clézio

Born: 1940
Birthplace: France
Nationality: French and Mauritian citizen
Jean-Marie Gustave Le Clézio has said that the French language is the only place where he feels a sense of belonging. He is someone who has always lived on the edge, and in-between, and is hard to identify with a single locality. Itinerant from childhood, he has continued to travel, and now divides his time between New Mexico, on the frontier between North and South America, Nice, on the very edge of France, and Mauritius, a small island where the confrontation of land and sea is inescapable. Coming from a line of emigrants and immigrants, his family is dispersed all over the world.

Perhaps unsurprisingly, given his background, he has always been interested in thresholds. For instance, his novels explore the transformation from childhood into adulthood (Cœur brûlé et autres romances), voyages that result in the confrontation of cultures (Désert), and the points where past, present and future collide (Ourania). “Writing for me is like travelling”, says Le Clézio, who shows us that we are all emigrants, that we all face futures that are both liberating and terrifying.

Le Clézio’s talent was recognised from the beginning; his first published novel (Le procès-verbal) written when he was 23, received the Renaudot prize. The early novels are highly experimental in style and intellectually challenging. They present a bleak picture of modern western urban existence, as one of alienation, aggression and enslavement to materiality (Les géants). Then, in the late 1970s, Le Clézio’s style and thinking underwent a radical change, partly as a result of his experience of living with the Emberas Indians in the Panamanian forest between 1970 and 1974. Le Clézio is an expert on early Amerindian mythology and culture and produced the first ever translation of Indian mythology into a western language in Les prophéties du Chilam Balam. His experience in Panama developed his thinking about the limits of western rationalism and its dangerous devaluation of emotions and spirituality, and also of the natural world. His novels became more focused on story and character as the means to analyse the limits of western culture. More recently, as part of his exploration of the interaction between past, present and future, he has turned to his own family history and made it the subject of his novels.
In his own words: 
Jean-Marie Gustave Le Clézio

"Writing for me is like travelling. It’s getting out of myself and living another life, maybe a better life."

Travelling and writing are intertwined in the life of Jean-Marie Gustave Le Clézio, or J.M.G. Le Clézio as he calls himself in his books. “I enjoy very much being in a foreign country, in a new country, new place. And I enjoy also beginning a new book. It’s like being someone else.”

Having grown up in many countries, and with his time now spent in New Mexico, Nice and Mauritius, Le Clézio identifies with different cultures. Yet he still maintains a special bond with his country of birth, France; though he is bilingual, Le Clézio still writes in his first language. “When I was a child I grew up speaking French. My first contact with literature was in French, and that’s the reason why I write in French.”

“Writing for me is like travelling. It’s getting out of myself and living another life, maybe a better life”

Le Clézio’s healthy appetite for writing stems from the sheer enjoyment of putting pen to paper.
“One of my greatest pleasures in life is to sit at a table, wherever it is. I don’t have any office, I can write everywhere. So, I put a piece of paper on the table and then I travel.”

His desire to travel and to write has allowed Le Clézio to document many places, cultures and possibilities. For example, he has spent time among the Amerindians, whose culture he finds particularly appealing and one that he believes Europeans can learn a lot from. “It’s a culture so different from the European culture, and on the other hand it didn’t have the chance of expressing itself. It’s a culture which has been in some ways broken by the modern world, and especially by the conquests from Europe. So, I feel there is a strong message here for the Europeans to encounter this culture which is so different from the European culture.”

Le Clézio describes his role as writer as follows: “A writer is not a prophet, not a philosopher; he’s just someone who is witness to what is around him. And so writing is the best way to testify, to be a witness.”

For those unfamiliar with his works, Le Clézio has no specific recommendations, suggesting instead that interested readers should be guided by their own feelings. “Reading is a free practice. I think the readers are free to begin by the books where they want to. They don’t have to be led in their reading.” In other words, readers embarking on a journey through the countries and cultures described in his works are required to do some travelling of their own.

“A writer is not a prophet, not a philosopher; he’s just someone who is witness to what is around him”

This article is based on a telephone interview with Jean-Marie Gustave Le Clézio following the announcement of the 2008 Nobel Prize in Literature. To listen to the interview in full, visit http://nobelprize.org/nobel_prizes/literature/laureates/2008/clezio-interview.html
The Nobel Peace Prize 2008

“for his important efforts, on several continents and over more than three decades, to resolve international conflicts”

Martti Ahtisaari

Born: 1937
Birthplace: Finland
Nationality: Finnish citizen
Current position: Chairman of the Board, Crisis Management Initiative
Martti Ahtisaari, former diplomat and politician, is an international trouble-shooter. Over the past two decades he has worked under a variety of mandates to attempt to bring a peaceful end to conflicts in Africa, Asia, Europe and the Middle East. Few people have gained such a broad understanding of the intricacies of managing conflict resolution.

Ahtisaari insists that all conflicts are essentially solvable, and believes that it is the duty of the international community to intervene to prevent injustice. His approach is founded on the idea that one should never avoid the hard questions for the sake of reaching a swift but shallow agreement. His experiences have led him to formulate a number of principles underlying successful crisis resolution, including the need for rapid reaction, the importance of consistency of approach in different locations, the value of reconciliation and the necessity of an all-inclusive approach to negotiations that brings all concerned parties into discussions from the outset.

Ahtisaari's mediation has helped diffuse seemingly intractable conflicts across the globe. He was instrumental in helping to bring about Namibia’s eventual independence from South Africa after long years of war. His brokering of a peace agreement between the Indonesian government and the separatist Free Aceh Movement led to the 2005 Aceh Peace Accord, after almost 30 years of conflict. In the former Yugoslavia, Ahtisaari first helped to mediate an end to the war in Kosovo in the late 1990s, and more recently, as United Nations Special Envoy, he sought to find a solution to the problem caused by the majority Albanian population’s desire for independence from Serbia. In this case, however, the internationally monitored independence he proposed for Kosovo was not adopted, and the prolonged international deadlock led to Kosovo’s unilateral declaration of independence in early 2008.

In 2000, upon retiring from the Finnish Presidency, Ahtisaari founded the Crisis Management Initiative (CMI), an independent, Helsinki-based, non-profit organisation. CMI aims to work alongside the international community to promote innovative approaches to conflict resolution, through a combination of “analysis, action and advocacy”. It has already assisted in the Aceh negotiations, and is involved in ongoing efforts to bring about sustainable peace in Iraq.
For Martti Ahtisaari, receiving the 2008 Nobel Peace Prize provided an opportunity to hear once again from familiar faces. “All my friends have been calling me, which is of course extremely nice,” says Ahtisaari, “My assistants do nothing nowadays except to try to answer the phones.” As a former diplomat, politician and President of the Republic of Finland, who has helped bring a peaceful end to conflicts in several continents, Ahtisaari must have a long line of friendly well-wishers.

His success over the past two decades stems from his conviction that no situation is beyond resolution. “Every conflict can be solved. I think it’s a disgrace for the international community that we have allowed so many conflicts to become frozen, and we are not making a serious effort to solve them.”

According to Ahtisaari the key to solving conflicts lies in getting all parties around the table; not only those directly involved but also all other countries that can have an influence on a possible solution. The Kosovo conflict perfectly illustrates this, says Ahtisaari. “We had a contact group that included Russian Federation, United States, United Kingdom and Northern Ireland, France, Germany and Italy. It was absolutely vital in keeping the process together.”

For a negotiator like Ahtisaari, one principle is extremely important. “I insist that I will have a free hand to pick my colleagues. Because, very often, the organisations tend to send people that are not perhaps the most suited in that.” In Kosovo, Namibia, and Aceh, Ahtisaari chose his own people for the task. “They have to be able to work together. They have to be professionals. They have to master their speciality area, so that you can trust them.”

Hence the need for organisations like the Crisis Management Initiative (CMI), which Ahtisaari founded after retiring from the Finnish Presidency. CMI works alongside the international community to promote innovative approaches to conflict resolution. Because it is a non-profit organisation Ahtisaari says it has the advantage of being able to adopt a more flexible approach than governments. “And of course, the mere fact that I’m Former Head of State and Former Under-Secretary in the UN system, it means that I can get in touch with anybody in the world, in theory.”

One thing Ahtisaari emphasises with respect to CMI is rapid reaction, in other words the ability to respond effectively and without delay to any requests from parties at critical moments in conflicts and crisis situations. Adopting the rapid reaction approach, though, requires sizeable finances. “You need to carry out very careful pre-feasibility and feasibility studies before you enter any crisis situation.” Ahtisaari hopes his Peace Prize will help the CMI to secure funding more easily. “Far too much of my time goes for knocking on the doors of the donors. We can do much more than we have done so far.”

Martti Ahtisaari has helped bring a peaceful end to conflicts affecting countries in several continents.
The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2008

“for his analysis of trade patterns and location of economic activity”

Paul Krugman

Born: 1953
Birthplace: United States
Nationality: US citizen
Current position: Professor of Economics and International Affairs, Princeton University, New Jersey, USA
In a remarkably succinct, ten-page article published in 1979, Paul Krugman proposed a new trade model that changed the way economists view the international exchange of goods. At the heart of the model lay two concepts that reflected the general twentieth century trend towards having more: the increased production of goods, leading to economies of scale, and increased diversity of products, leading to greater choice for consumers. Krugman’s model better reflected the new pattern of international trade that had developed in a world where less certainly wasn’t more.

His model sought to explain the situation in which countries that are similar benefit by producing and trading in similar goods. Thus, cars are manufactured in France, Germany and Italy, with each country benefiting from the economies of scale delivered by mass production, and the citizens of each country benefiting from the increased choice that arises from having a global motor industry. Previous trade models had emphasised the importance of the differences between countries, with international trade being based on the production of different materials in each country to fulfil unmet needs in others. Krugman’s development of a rigorous framework for describing the real world situation formed the basis for an explosion of subsequent analysis.

The 1979 paper in the *Journal of International Economics* also sowed the seeds of an analysis of the forces driving increased urbanization. In his core-periphery model, which he developed properly in a 1991 publication, Krugman describes the opposing pressures that act on populations: those that serve to pull them into the core (urban) centres and those that work to push them out into the peripheral (agricultural) areas. For example, one such factor is the cost of transport, and the generally decreasing transport costs seen in the twentieth century have served to pull production, and populations, into urban centres. Once again, Krugman’s formulation of a robust model provided the apparatus that allowed a thorough exploration of the factors driving the global distribution of production facilities, and of the urbanisation that is such a prevalent feature of the modern world.
In his own words: **Paul Krugman**

Paul Krugman had been anticipating an interesting day on the morning that he received the phone call from the Economics Prize Committee. Krugman was in Washington DC for a meeting associated with the World Bank and International Monetary Fund; a meeting occurring hours after emergency packages had been announced in Europe aimed at preventing banks from collapsing in the economic downturn. “I thought that was going to be the exciting thing today, but it didn’t quite turn out quite as planned.”

As a journalist, columnist and blogger for *The New York Times*, Krugman has become one of the best known popularisers of economic ideas, but the 2008 Prize in Economics acknowledges his models on economic theory that, as he says, showed “why countries might trade even if they have the same climate, and the same resources, and the same technology.”

Krugman developed his models to explain why jobs and businesses are becoming increasingly concentrated in certain places such as cities. “The reason why 80 million people live in a fairly narrow corridor along the East Coast of the United States is not that there’s something especially favourable about the geography, but it’s simply the agglomeration force. Essentially each of those 80 million people is there because the other 80 million people are also there.”

According to Krugman the value of creating these mathematical models is that “once you have the clear statement of how the pieces fit together you can apply it to numbers, you can use it to try to assess the welfare impact of different trade policies.” In other words, people could now think more clearly about international trade, says Krugman. “It required the math to get to the plain English.”

When asked how easy he found the move into journalism, Krugman says he believes the task of boiling down an intellectual problem to its essence through economic models and the task of explaining a complex problem in simple language are related. “I always felt that what I do when I try to explain, say, the financial crisis in 800 words, and what I do when I try to model the financial crisis in a half-dozen equations, are very much the same kind of effort.”

To some extent the consequence of trying to explain things clearly has led Krugman to recently adopt a more political stance on issues in his newspaper columns. He was an early critic of the Bush administration because his economics background led him to conclude that they were being dishonest about budget arithmetic. “I’ve gone somewhat beyond my role as an economist in the column but, hey, economists are people too, and are citizens too, and have political opinions.”

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This article is based on a telephone interview with Paul Krugman following the announcement of the 2008 Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel. To listen to the interview in full, visit http://nobelprize.org/nobel_prizes/economics/laurates/2008/krugman-interview.html