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Nobel for antibiotics tool

Trio win chemistry prize for work that has led to cures for diseases

ASSOCIATED PRESS

STOCKHOLM—Americans Venkatraman Ramakrishnan and Thomas Steitz and Israeli Ada Yonath on Wednesday won the 2009 Nobel Prize in chemistry for the atom-by-atom mapping of protein-making factories within cells.

The Royal Swedish Academy of Sciences said their work on ribosomes has been fundamental to the scientific understanding of life and has helped researchers develop antibiotic cures for various diseases.

This year's three laureates all generated three-dimensional models that show how different antibiotics bind to ribosomes. "These models are now used by scientists in order to develop new antibiotics, directly assisting the saving of lives and decreasing humanity's suffering," the academy said.

The researchers used a method called X-ray crystallography to pinpoint the positions of the hundreds of thousands of atoms that make up the ribosome. "This knowledge can be put to a practical and immediate use; many of today's antibiotics cure various diseases by blocking the function of bacterial ribosomes," the Nobel citation said. "Without functional ribosomes, bacteria cannot survive. This is why ribosomes are such an important target for new antibiotics."

The scientists' work builds on Charles Darwin's theory of evolu-



Chemistry Nobel Prize winners, from left: Venkatraman Ramakrishnan, Thomas Steitz and Ada Yonath.

tion and, more directly, on the work done by James Watson, Francis Crick and Maurice Wilkins, who won the 1962 Nobel Prize in medicine for mapping DNA's double helix, the citation said.

In 2006, Roger D. Kornberg won the Nobel Prize in chemistry for X-ray structures that showed how information is copied to messenger RNA molecules, which carry information from DNA to the ribosomes.

"Now, one of the last pieces of the puzzles has been added—understanding how proteins are made," said Prof. Gunnar von Heijne of the Swedish Academy of Sciences the

chairman of the Nobel committee for chemistry.

The Indian-born Mr. Ramakrishnan, 57 years old, is the senior scientist and group leader at the Structural Studies Division of the MRC Laboratory of Molecular Biology in Cambridge, England. Mr. Steitz, a 69-year-old born in Milwaukee, is a professor of molecular biophysics and biochemistry at Yale University and attached to the Howard Hughes Medical Institute, both in New Haven, Conn. Ms. Yonath, 70, is a professor of structural biology at the Weizmann Institute of Science in Rehovot, Israel.

Americans, Israeli win chemistry Nobel

Identification of ribosome map ushered in new antibiotics era

Los Angeles
LOS ANGELES TIMES

Two Americans and an Israeli who used X-ray crystallography to map the precise structure of the ribosome, a cell's crucial protein-making factory, won the 2009 Nobel Prize in chemistry on Wednesday.

Their independent work, published in 2000, provides fundamental information about the workings of cellular machinery at the atomic level and is already being exploited by pharmaceutical companies working to make new, more effective antibiotics.

The \$1.4 million prize will be shared equally by Thomas Steitz of Yale University, Venkatraman Ramakrishnan of the MRC Laboratory of Molecular Biology in Cambridge, England, who was born in India but is now a U.S. citizen, and Ada Yonath of the Weizmann Institute of Science in Rehovot, Israel.

Yonath is the only one of this year's nine science winners who is not an American citizen, either native or naturalized. She is the first woman to win the chemistry Nobel since Dorothy Crowfoot Hodgkin of Britain received the 1964 prize, and who was also honored for her contributions to X-ray crystallography. Yonath is also the first Israeli woman to win a Nobel.

"It's true that a woman hasn't won since 1964," she told Israeli radio. "But I don't know what that means. Does it mean that I'm the best woman since then? I don't think gender played a role here."

X-ray crystallography is a time-consuming and tedious science that requires excruciating patience and care to produce crystals of cellular proteins and then sophisticated mathematics to analyze the X-ray patterns that arise when an X-ray beam is focused on such crystals. This is a diffi-



Venkatraman Ramakrishnan



Thomas Steitz



Ada Yonath

large, amorphous molecule to form precise crystals was something that had never been attempted before.

Undaunted, Yonath began trying to grow crystals in the early 1970s, working with a bacterium that can grow under harsh environmental conditions on the assumption that its ribosomes would be more stable and thus more resistant to degradation during the process of inducing crystals to form.

After 20 years of work, it became apparent that she could finally produce such crystals, and other researchers such as Steitz and Ramakrishnan joined the race to complete the work.

The X-ray images produced directly from a crystal are insufficient to reveal its structure. They lack crucial mathematical information that researchers call phase angles. This information is typically obtained by seeding the crystals with heavy metal atoms, such as mercury. But ribosomes are so large that obtaining the phase angles was exceedingly difficult.

Steitz's contribution was to determine how the ribosomes were oriented within the crystal. That, combined with the information from heavy metals, finally made it possible to determine phase angles and, in 1998, Steitz published the first crude crystal structure of the ribosome's large subunit.

With that advance, it was then necessary only to improve the crystals and obtain more data to increase the sharpness of the image, allowing researchers to locate every individual atom within the assemblage.

In 2000, Steitz published the refined structure of the large subunit and Yonath and Ramakrishnan independently published the structure of the small subunits.

Many antibiotics work by blocking the activity of ribosomes in bacteria without affecting those in human cells, but bacteria have grown resistant to most of them. Using the new ribosome images, pharmaceutical companies have been able to determine how the antibiotics actually function and to design new molecules that will circumvent resistance.

cult process with small proteins from cells, and many researchers thought it would be impossible with the ribosome, which is one of the largest proteins in living organisms.

The ribosome translates the cell's genetic information into the proteins that actually make the cell function. It has a large and a small subunit, each of which contains thousands of the nucleotides that comprise RNA and thousands of the amino acids that comprise proteins. Getting such a

Weizmann Institute turns into Hollywood premiere as Yonath nobly meets the press

REPORTER'S NOTEBOOK

• By YA'AKOV LAPPIN

The leap from the sterile, quiet laboratory to the messy, frantic world of the news media is difficult for anyone to take, especially for a 70-year-old scientist who has spent years trying to understand what the Weizmann Institute calls "one of the most complicated machines of the biological system."

It is little wonder, therefore, that Professor Ada Yonath had to rub her eyes repeatedly as she tried to make her way past reporters and cameramen sending bright flashes her way at a hastily-arranged press conference at the Weizmann Institute in Rehovot, a few hours after being notified that she had won the Nobel Prize in Chemistry.

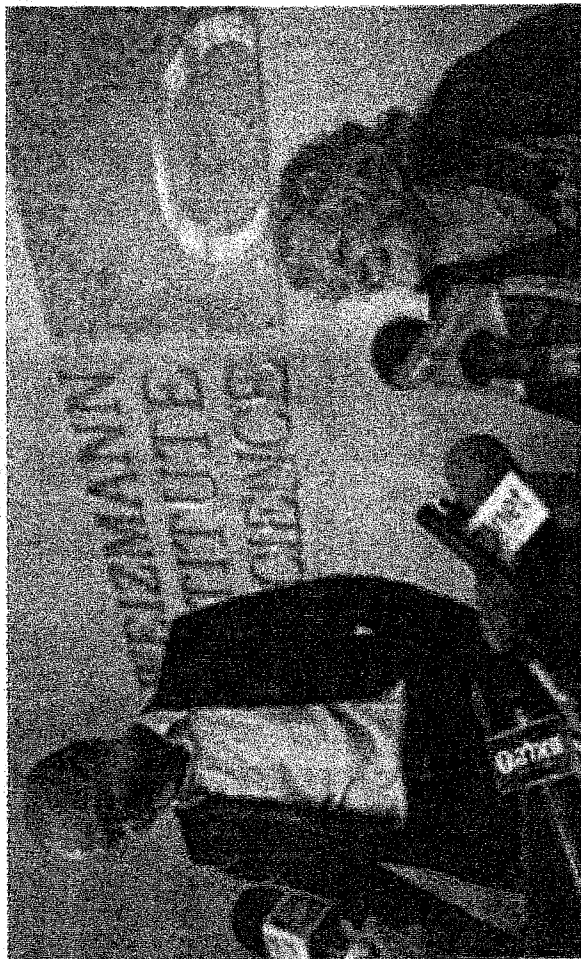
Yonath, who through dogged determination and scientific brilliance worked her way up from a Jerusalem working class

media spotlight to share the credit with her colleagues, and offer encouragement to aspiring Israeli scientists facing budget cuts and dwindling university resources.

Yonath gently chided a reporter who suggested that no quality new scientists were appearing in Israel, reminding all those present that curiosity was the fundamental key to scientific progress.

As the cameras clicked and the reporters battled one another for questions, the Weizmann Institute looked more like a star-studded Hollywood premiere than one of the country's leading scientific research centers.

But Yonath gave the impression that the newly found media spotlight would not throw her off balance, vowing to return to work shortly to continue to add to humanity's understanding of how cells translate genetic code to instructions for miniature cellular factories, via the chemical Rubizon.



NOBEL PRIZE-WINNER for chemistry Prof. Ada Yonath speaks to the media yesterday along with Weizmann Institute Vice President Prof. Israel Bar-Joseph at a press conference at the school, after Yonath was informed she had won the award. (Dan Bailey/AP)

neighborhood to the pinnacle of the world scientific community, struggled for words at first - but only at first. After conceding that she composed, and seized the

PHOTO BY DAN BAILEY/AP

SCIENCE

Ribosome blueprints nab Nobel in chemistry

BY MALCOLM RITTER NEW YORK

Two Americans and an Israeli won a Nobel Prize in chemistry yesterday for creating detailed blueprints of the protein-making machinery within cells, research that's being used to develop new antibiotics.

Venkatraman Ramakrishnan, Thomas Steitz and Ada Yonath will split the \$1.4-million (U.S.) award for their atom-by-atom description of ribosomes.

Dr. Yonath, 70, is only the fourth woman to win the Nobel chemistry prize and the first since 1964.

Ribosomes are key to life. They use instructions from genes to make thousands of different proteins that control what happens in the body. Many antibiotics kill bacteria by attacking their ribosomes, and the detailed descriptions by the new Nobelists are being used to develop new drugs.

The three scientists worked independently and published their results virtually simultaneously in 2000.

"I didn't feel it was a personal competition, but it was a bit of a race," said Dr. Steitz, 69, a professor at Yale. "We were all taking separate approaches."

Dr. Yonath told Israeli Radio she didn't think her gender played a role in her Nobel win.

"It's true that a woman hasn't won since 1964. But I don't know what that means - does it mean that I'm the best woman since then? I don't think that gender played a role here," she said.

The ninth Israeli to win a Nobel, she works at the Weizmann Institute of Science in Rehovot, Israel.

Dr. Ramakrishnan, 57, is at the MRC Laboratory of Molecular Biology in Cambridge, England, where he went after working in the United States.

He said he wasn't convinced when a caller from the Royal Swedish Academy of Sciences in Stockholm told him he'd won a Nobel.

"I thought it was an elaborate joke. I have friends who play practical jokes," Dr. Ramakrishnan said by telephone from his lab in Cambridge. "I complimented him on his Swedish accent."

The academy called Dr. Yonath a "strong-willed pioneer" for starting on the quest in the 1970s, when most people thought it would be impossible. Dr. Steitz, like Dr. Ramakrishnan, entered the field later.

"It seemed to us a bit like trying to climb Mount Everest," Dr. Steitz said. "We knew it was doable in principle, but we didn't know actually whether we were going to be able to get there, and we didn't know exactly the route through which we should travel."

» The Associated Press

'Happy and shocked' Ada Yonath wins Nobel Prize in Chemistry

Weizmann Institute professor is first woman to become chemistry laureate since 1964 • Life's work has led to the current struggle against antibiotic-resistant bacteria • Ninth Israeli Nobel winner expresses concern that inadequate investment in science will hurt future prize chances, but praises new generation of scientists

• By JUDY SIEGEL
and YAAKOV LAPPIN

Prof. Ada Yonath of the Weizmann Institute of Science – whose highly abstruse field and targets were regarded with skepticism by colleagues and who was treated like “the village fool” for years – has been awarded the 2009 Nobel Prize in Chemistry for her four decades of research on protein “factories” in cells.

Her dedicated work has led to the current struggle against antibiotic-resistant bacteria and many other applications. Yonath is the world's first woman to become a chemistry laureate since 1964, and only the fourth in history. Her prize will be Israel's ninth Nobel and its second in chemistry, and the Rehovot Institute's first. The ceremony will be held in Stockholm on December 10.

A boost for women scientists, Page 2

Continuing a message expressed numerous times by Prof. Aaron Ciechanover after he won the 2004 Nobel in Chemistry with his mentor, Prof. Avram Hershko, Yonath warned on Wednesday that inadequate government funding available for aspiring Israeli scientists would make it far



PROF. ADA YONATH, 70, with her daughter Hagit, a physician, and granddaughter Noa at the Weizmann Institute in Rehovot shortly after winning the 2009 Nobel Prize in Chemistry. (Inset) Ribosomes are protein-making ‘factories’ within cells. (AP and Weizmann Institute)

more difficult for younger researchers to earn Nobel Prizes in the future. “Those who win the prize now do so because of what has happened before, not because of what is happening now,” she said.

However, she added that the world would soon be hearing about a promising new generation of Israeli scientists.

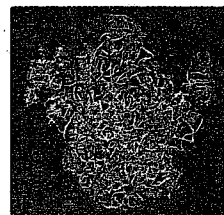
The Royal Swedish Academy of Science announced two

other winners to share the prize – American scientists Venkatesan Ramakrishnan and Thomas Steitz, for their work on mapping ribosomes at the atomic level. The three will share the \$1.4 million (10 million Swedish kroner) in prize money. All three chemistry laureates generated three-dimensional models that show how different antibiotics bind to ribosomes, but Yonath's work

was the pioneering “mother” of the field. All three have used a method called X-ray crystallography to map the position for each and every one of the hundreds of thousands of atoms that make up ribosomes, the academy stated.

Appearing shell-shocked, with her famous mane of curly grey hair looking slightly wild,

See NOBEL PRIZE, Page 9



Ada Yonath, *curriculum vitae* A compound career

Education:

1959-1962 B.Sc. Chemistry, Hebrew University, Jerusalem
 1962-1964 M.Sc. Biochemistry, Hebrew University, Jerusalem
 1964-1968 Ph.D. X-ray crystallography, Weizmann Institute (WI)
 1969 Post Doctoral Fellow, Mellon Inst. Pittsburgh, Pa., USA
 1970 Post Doctoral Fellow, Dept. of Chemistry, MIT, Cambridge, MA, USA



Professional Experience:

1989- Director, the Kimmelman Center for Biomolecular Assemblies, WI
 1988- Professor, Dept. of Structural Biology, WI
 1988-2004 Director, the Mazer Center for Structural Biology, WI
 1986-2004 Head, Max-Planck Research Unit, Hamburg, Germany
 1992-1994 Chairperson, Dept. of Structural Biology, WI
 1989-1990 Chairperson, Dept. of Structural Chemistry, WI
 1984-1988 Associate Prof., Dept. of Structural Chemistry, WI
 1974-1983 Senior Scientist, Dept. of Structural Chemistry, WI
 1979-1983 Visiting Prof., Max-Planck Inst. for Mol. Genetics, Berlin, Germany
 1978 summer Visiting Prof., Universidad Austral de Chile, Valdivia, Chile
 1977-1978 Visiting Scientist, Biophysics, University of Chicago, IL, USA
 1974 Visiting Scientist, Dental School, University of Alabama, USA
 1971-1977 Consultant, The Open University, Israel
 1971-1978 Lecturer, Tel-Aviv & Ben-Gurion Universities
 1970-1974 Scientist, Dept. of Chemistry, WI
 Member of the USA National Academy of Sciences Member of the Israeli Academy of Sciences and Humanities
 Member of the European Academy of Sciences and Art Member of the European Molecular Biology Organization (EMBO)
 Member of the American Academy of Art and Sciences
 Member of the International Academy of Astronautics (IAA)

Honors and Awards:

2008 - Albert Einstein World Award of science, Princeton University, NJ, USA
 2008 - Honorary Doctorate, Oxford University, England
 2008 - The UNESCO-L'Oréal Award for European Woman in Life science, Paris
 2008 - The George E. Palade Gold Medal, Wayne State U. Medical School, Detroit, USA
 2008 - The Linus Pauling Gold Medal - Stanford, USA
 2007 - The American Chemical Society Luncheon in honor of the Wolf Prize, Boston, USA
 2007 - The Wolf Prize, Jerusalem, Israel
 2007 - The Paul Ehrlich-Ludwig Darmstaedter Medal, Germany
 2006 - The Israel Prime Minister EMET award
 2006 - The Rothschild Prize for Life Sciences
 2005 - Louisa Gross Horwitz Prize of Columbia University, NYC
 2005 - The Fritz Lipmann Lectureship, the German Biochemical

2004 - The Massry Foundation International Award and Medal for Ribosome Research
 2004 - The Paul Karrer Gold Medal, Zurich, Switzerland
 2003 - The Arifinsen Prize of the Protein Society, Boston, USA
 2003 - Medal of distinction, Israeli Chemical Society
 2003 - Honorary doctorate, Tel-Aviv Uni, Israel
 2002 - Honorary doctorate, Ben-Gurion Uni., Israel
 2002 - Harvey Prize for Natural Sciences, the Technion, Israel
 2002 - The Israel Prize for Chemical Research
 2002 - The FA. Cotton Medal, the USA Chemical Society, USA
 2001 - Honorary Member of the Israeli Crystallographic Society
 2000 - National Institutes of Health (NIH) Certificate of Distinction, USA
 2000 - The Kilby International Award, USA
 2000 - The First European Crystallography Prize, Nancy, France
 1990 - Kolthof Award for outstanding research in Chemistry, Haifa, Israel
 1989 - Holder of Martin A. Kimmel Professorial Chair, Weizmann Inst.
 1974 - Somach Sachs Award for Outstanding Work in Biochemistry
 1967 - Miphal Hapais Prize for Outstanding Graduate Studies

Recent Plenary and special lectures:

2009 - DeLuca Lecture UCSD, La Jolla, Ca, USA
 2009 - Plenary in Frontiers in Chemistry Symposium, Scripps Research Institute, La Jolla, Ca, USA
 2008 - Palade Distinguished Lecture, Wayne State University, Detroit, Mi, USA
 2008 - World Award of Science Lecture, Princeton University, NJ, USA
 2008 - The Connell Lecture, Toronto University Medical School, Canada
 2008 - Plenary Lecture at the "Women Shaping Science", Vilnius, Lithuania
 2008 - The "Honors" lecture, New York University Medical School, USA
 2008 - The XXXVII Annual Linus Pauling Lecture, Stanford, USA
 2008 - The George E. Palade Distinguished Lecture Wayne State U. Med School, Detroit, USA
 2007 - The World Women, Culture and Peace Forum, Gwangju, S. Korea
 2007 - The American Chemical Society Womanhood Lecture, Boston, USA
 2007 - "Nothing is Impossible" symposium, Technion, Plenary lecture
 2007 - Mini symposium in honor of Wolf Winners, Weizmann Institute
 2007 - The Dorothy Crowfoot-Hodgkin Symposium keynote speaker, Zurich, Switzerland
 2006 - The Keynote lecture in ESOR 11 Symposium, Warsaw, Poland
 2006 - The Otto Loewy Lecture of the David Herzog Fund, Medical University, Graz, Austria
 2005 - The Fritz Lipmann Lecture, Berlin
 2005 - The Datta Lectureship Award, IUBMB, Budapest Hungary
 2005 - "Inside the RNA World" COST-symposium, Paris, France
 2005 - The ICWES1 women in Science and Engineering meeting, Seoul
 2004 - The NYU colloquium in Life Sciences
 2004 - The Steenbock Lecture, Wisconsin, USA
 2004 - The Nobelsymposium on Molecular Mechanisms of Biological Processes, Sweden
 2004 - The FEBS Young Scientist Forum - Warsaw, Poland
 2004 - The Israeli Microbiology Society Meeting, Haifa, Israel
 2004 - The ESRF-Israel Collaboration Conference, Jerusalem, Israel
 2003 - Student Forum Lecture, MPI, Martinsried, Germany

2009 Chemistry Nobel Honors Work on Ribosomes

By Robert F. Service
ScienceNOW Daily News
7 October 2009



Just as architects usually get more glory than carpenters, DNA is more famous than the molecular machine that converts genetic blueprints into proteins. But the ribosome is in the limelight today with the announcement of this year's Nobel Prize in chemistry.

The prize was awarded to three scientists who revealed the atomic structure and inner workings of the ribosome: Ada Yonath of the Weizmann Institute of Science in Rehovot, Israel; Thomas Steitz of Yale University; and Venkatraman Ramakrishnan of the Medical Research Council Laboratory of Molecular Biology in Cambridge, United Kingdom. All three used a technique known as x-ray crystallography to pinpoint the position of thousands of atoms in the cellular machine known as the ribosome, and all will share one-third of the \$1.4 million prize.

Cellular mechanics.

Venkatraman Ramakrishnan, Thomas Steitz, and Ada Yonath have won this year's chemistry Nobel for their work on ribosomes.

CREDIT: RAMAKRISHNAN: MRC CAMBRIDGE; STEITZ: MICHAEL MARSLAND/YALE UNIVERSITY; YONATH: REUTERS/WEIZMANN INSTITUTE OF SCIENCE REHOVOT, ISRAEL

"It's a fantastic accomplishment and one that everyone in the field has known for some time is worthy of such recognition," says Wayne Hendrickson, an x-ray crystallographer at Columbia University. Hendrickson adds that this year's prize also completes the Nobel Committee's recognition for the discoverers of biology's central dogma, which describes how genetic information in DNA is copied into RNA, which is then translated into proteins. In 1962, James Watson, Francis Crick, and Maurice Wilkins were awarded the Nobel for their atomic model of DNA. In 2006, Roger Kornberg won for his x-ray structures of RNA polymerase, which translates DNA into RNA. Today's prize for work on the ribosome completes that, Hendrickson says.

Ribosomes exist in all cells in all living organisms. Although central, they are anything but simple. Dozens of different proteins and strands of RNA form a complicated machine divided into two principal components. The smaller component, known as the 30S subunit, works mainly to decode the genetic code in messenger RNA. The larger 50S subunit then takes this information and uses it to stitch together the proper sequence of amino acids that make up the final protein. Early on, researchers struggled to map the atomic structure of even one of these subunits. Producing an x-ray structure requires first creating crystals of

millions of copies of a ribosome aligned in near perfect order. If that ordering is precise enough, researchers can then fire a beam of x-rays at the crystal. The pattern in which those x-rays then deflect off the crystal can then be used to map out the arrangement of atoms in the molecule.

In 1980, Yonath managed to generate the first low-quality crystals of a ribosome. By 1990, she had upped the quality of her crystals, but she still struggled to a good structure. Steitz, along with his longtime Yale colleague Peter Moore, jumped into the fray in 1995, following Yonath's recipe for making ribosomal crystals. By 1998, they used additional insights gleaned from electron microscopy studies to help them acquire a low-resolution 9 Angstrom structure of the ribosome. In August, 2000 Steitz's group then published a higher 2.4 Angstrom resolution structure of the large subunit (*Science*, 11 August 2000, p. 905). Meanwhile, Yonath's and Ramakrishnan's groups published slightly lower resolution structures of the smaller subunit the following month. Since then, the three groups, plus other teams, have used those structures and others to understand in atomic detail how ribosomes translate genetic information into proteins.

The three groups have also begun to push practical applications of their work. All three, for example, have reported crystal structures that show how different antibiotics bind to the ribosome. And several companies are now using these structures in an effort to design new antibiotics against worrisome infections, such as methicillin-resistant *Staphylococcus aureus* and tuberculosis.

But Steitz, for one, says he never thought initially that anything more than a fundamental insight into the molecular workings of biology would come of the work. "It seemed a bit like trying to climb Mount Everest," Steitz says. "We knew it was doable. But we didn't know how to get there. When we got there in 2000, it was exhilarating. In fact, it was the most exhilarating moment I've had in science."

- *Correction:*

The original version of the story stated that Roger Kornberg won a 2006 Nobel Prize for his work on DNA polymerase, which translates DNA into RNA. That translation is carried out by RNA polymerase. Kornberg was awarded his Nobel prize for his crystallography work on RNA polymerase. Thanks to several readers for pointing out our error.

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October 7 2009

Women set Nobel Prize record

By Amber Bellaire
Globe and Mail Update

German writer Herta Mueller's win for literature brings total of women laureates to four this year, a historic first.

It's proving to be a banner year for women and the Nobel Prize, marking the first time four women have been named Nobel laureates in the same year.

Today's announcement of Herta Mueller, a little-known Romanian-born author, as winner of the 2009 Nobel Prize in literature set the record. The Nobel Peace Prize is set to be announced tomorrow, leaving the door open for a possible fifth female win.

Earlier this week, U.S.-based researchers Elizabeth Blackburn and Carol Greider were among the medicine winners and the chemistry prize included Israel's Ada Yonath.

Dr. Yonath won the 2009 Nobel Prize in chemistry Tuesday morning for mapping ribosomes, the protein-producing factories within cells, at the atomic level. "These models are now used by scientists in order to develop new antibiotics, directly assisting the saving of lives and decreasing humanity's suffering," the academy said in its announcement. Dr. Yonath shared the prize with American colleagues Venkatraman Ramakrishnan and Thomas Steitz.



The prize includes a 10-million kronor (\$1.4-million U.S.) prize and will be handed out Dec. 10 in the Swedish capital

Dr. Blackburn and Dr. Greider were co-recipients of the Nobel Prize in medicine, announced Monday morning at the Nobel assembly in Stockholm, Sweden. The two women shared the award with another American, Jack W. Szostak.



The three doctors were accredited for the discovery of how chromosomes are protected by telomeres and the enzyme telomerase. A statement from the Nobel Foundation said that their discovery added a new dimension to our understanding of the cell, shed light on disease mechanisms, and stimulated the development of potential new therapies, "including therapies for cancer."



Only 39 Nobel Prizes have ever been handed out to women, and that includes this year's four female winners and both of Marie Curie's awards.

Five of the most acclaimed female Nobel Prize winners are listed below.

Marie Curie *physics (1903) and chemistry (1911)*



Curie and husband Pierre Curie were awarded half of the 1903 Nobel Prize in physics for their research with the spontaneous radiation discovered by Henri Becquerel, who won the other half of the prize.

In 1911 she received a second Nobel Prize, this time in chemistry, in recognition of her work in radioactivity.

In 1935, Curie's daughter, Irène Joliot-Curie, and son-in-law, Frédéric Joliot-Curie, jointly received Nobel prizes in chemistry for their discovery of artificial radioactivity

To this day, Marie Curie is the only woman to have ever won two Nobel prizes. The French Curie family has more Nobel wins than any other family.

Toni Morrison, *literature (1993)*



A professor, writer and editor, Morrison, now 78, was recognized for her many contributions to the literary community. The American has written six monumental novels, including *The Bluest Eye*, *Song of Solomon* and *Beloved*, a Pulitzer Prize winner in 1988.

"Toni Morrison is a literary artist of the first rank. She delves into the language itself, a language she wants to liberate from the fetters of race. And she addresses us with the lustre of poetry," the Nobel Foundation announced upon her win in 1993.

Doris Lessing, *literature (2007)*



The Nobel Foundation awarded Lessing with the prestigious Nobel Prize in literature, stating that "with skepticism, fire and visionary power," she "has subjected a divided civilization to scrutiny." Aged 89-years-old, the Briton is most famous for *The Grass is Singing*, a novel about racial politics, and *The Golden Notebook*, a novel that interweaves fiction and reality, cleverly exploring serious themes like Stalinism and the Cold War, in an enjoyable manner.

Aung San Suu Kyi, *peace (1991)*



Suu Kyi was determined to end the socialist, military rule of government in Myanmar (also known as Burma). In 1990, the government-held free elections in the country, and Suu Kyi, leader of the opposition democratic party, won by a landslide. Upon discovery of these results, however, the military junta refused to give up power. It wasn't long after when Suu Kyi was placed under house arrest. A believer in Mahatma Gandhi's philosophy of non-violent protesting, Suu Kyi remains in her house this very day. "Suu Kyi's struggle is one of the most extraordinary examples of civil courage in Asia in recent decades," the Nobel Foundation announced at the time she was awarded. World leaders such as U.S. president Barack Obama and French president Nicolas Sarkozy have demanded her release, but it has not yet happened.

Shirin Ebadl, *peace (2003)*



The first Iranian person, let alone woman, to win the Nobel Peace Prize, is a 62-year-old lawyer and human rights activist. The Nobel Foundation described Ebadi as a Muslim woman who has stood up time and time again as a courageous activist for the human rights of women and children. The academy said Ebadi "never heeded the threats to her own safety," adding that "no society deserves to be labelled civilized unless the rights of women and children are respected."

The Nobel Prize in economics has never been won by a woman. The opportunity to be the first is still available.

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Yonath. Ribosome research Photo: Tal Shahr

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Israeli woman wins 2009 chemistry Nobel

Ada Yonath is one of three winners of prestigious Swedish award for achievements in chemistry. 'The study was difficult to the point of impossible,' Yonath says. 'When I was told I was a leading candidate I thought it was a practical joke.' President Peres calls to congratulate her, says 'we are so proud of you'
Daniel Edelson

Israeli scientist Ada Yonath, 70, was awarded the Nobel Prize for chemistry for showing how ribosomes function, work that has important implications for antibiotics, the prize committee said on Wednesday.

Yonath shares the prize amounting to 10 million Swedish crowns (\$1.4 million) with Americans Venkatraman Ramakrishnan and Thomas Steitz.

"As ribosomes are crucial to life, they are also a major target for new antibiotics," the Nobel Committee for Chemistry at the Royal Swedish Academy of Sciences said in a statement.

Yonath told a press conference at the Weizmann Institute of Science on Wednesday afternoon that she had been given the feeling that she had no chance of winning the prestigious prize.

"From the moment I reached the first, initial finding I said this was a project deserving a Nobel, but people told me I wouldn't get there, that it was impossible. In other words, they gave me the feeling that this really is a cardinal and important problem, but that there is no chance."



Nobel winners Venkatraman Ramakrishnan, Thomas Steitz and Ada Yonath (Photo: Reuters)

A renowned scientist, Yonath serves as the director of the Helen and Milton A. Kimmelman Center for Biomolecular Structure and Assembly at the Weizmann Institute of Science.

She was a co-recipient of the 2006 Wolf Prize in Chemistry, along George Feher, and in 2008, became the first Israeli to win a lifetime's achievement award from L'Oréal and UNESCO for her vital work identifying how bacteria become resistant to antibiotics.

Now she has become the first Israeli woman to win a Nobel Prize.

Yonath said Wednesday she was hardly expecting the great honor. "People who think they made such a huge contribution sit and wait for the award and get angry when they don't get it. I'm not like that."

Referring to her ground-breaking study she said, "The topic was such that if a breakthrough could really be achieved, it would have Nobel-winning potential. It was considered difficult to the point of impossible."



Prof. Yonath celebrates with her daughter and granddaughter (Photo: AP)

She further added, "People were skeptical and I myself wasn't sure we would make it – but indeed we did."

The professor doesn't intend on slowing down from now on and said there are many more challenges to tackle. "Many points remain unanswered, there are a lot of open questions," she said.

'No one more deserving than Ada'

Following the announcement, President Shimon Peres called Yonath and congratulated her on the win. "We are so proud of you, it's hard to describe just how much. You are extremely deserving of the Nobel and the award is an achievement to the entire country, we are all excited together with you," Peres said.

Prime Minister Benjamin Netanyahu also congratulated the winner and said, "I, as all other Israelis, am extremely proud of you. The Nobel Prize is the true Olympics of mankind."

Foreign Minister Avigdor Lieberman congratulated also Yonath for winning the 2009 Nobel Prize in chemistry. "Her win helps present Israel's real image as one of the world's leading countries of science and technology. Prof. Yonath joins an honorable list of Israelis who have won the most important international recognition.

"The State of Israel, which is a small country, has a very respectable representation among Nobel Prize recipients, and this aspiration must continue to stand before the eyes of the leadership and citizens as one," Lieberman added.

Opposition Chairwoman Tzipi Livni stressed the feminine side. "I was excited, and I am proud that it's a woman winning the prestigious prize. I know that when women reach achievements, particularly such an achievement, it gives strength to other women to dare and succeed.

"In addition, I view your win as a very important one because it strengthens Israel's image beyond the conflict, Israel as a country which nurtures science and manages to illustrate through women like you its contribution to science and humanity," Livni told Yonath.

Dr. Anat Bashan, Yonath's research partner commented as well and said, "There is no doubt that if anyone deserves a Nobel prize it's Ada – she's an amazing scientist and an incredible human being."

This was the third of this year's Nobel prizes, following awards for medicine or physiology on Monday and for physics on Tuesday.

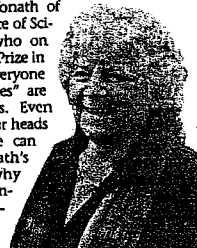
Prizes for the sciences and for peace were established in the will of 19th century dynamite tycoon Alfred Nobel and have been handed out since 1901. Sweden's central bank began awarding a prize for economics in 1969.

Roni Sofer, Ronen Medzini, Roi Mandel and Reuters contributed to this report

FRIDAY, OCTOBER 9, 2009

The girl from Geula

Thanks to Prof. Ada Yonath of the Weizmann Institute of Science in Rehovot – who on Wednesday won the Nobel Prize in Chemistry – just about everyone now knows that “ribosomes” are protein factories for cells. Even those of us who can’t get our heads around the Periodic Table can appreciate that Yonath’s research helps explain why antibiotics work, and contributes to solving the problem of antibiotic-resistant bacteria.



Science at this level of sophistication is where the brilliance and perseverance of the individual theorist needs the backing of an institution and its benefactors.

Not even Galileo, Muhammad ibn Musa al-Khwarizmi and Albert Einstein could have achieved their respective advances in astronomy, mathematics and physics without a support network. The same holds true for our Nobel laureates in the sciences and economics – Aaron Ciechanover, Avram Hershko, Daniel Kahneman and Robert Aumann – as well as, now, Ada Yonath.

It detracts not a whit from the accomplishments of our winners that their prizes were shared with others. This year, for example, two Americans working independently, Venkatraman Ramakrishnan and Thomas A. Steitz, share the chemistry prize, Yonath’s trailblazing work notwithstanding.

YONATH has a special place in our hearts, of course. She is Jerusalem-born, and as unpretentious as she is luminous. Her father, who ran a grocery store in the capital’s Geula neighborhood, died when she was only 10, leaving her mother as the family’s sole breadwinner. After IDF service, Yonath attended the Hebrew University of Jerusalem and then went on to study at Weizmann.

Over the years, she told *The Jerusalem Post*, there were those who considered her line of basic research a fool’s errand. But with Weizmann’s backing, her hard work came to be widely recognized when she was awarded the Israel Prize in 2002.

Israelis have reason to *kvell* over Yonath’s achievement – and in the eight other Nobels the country has garnered over its mere 60 years. But let’s not be swept away by hubris. Jewish tradition teaches that excessive pride is akin to idolatry.

The prizes for science and economics reflect the nation’s priorities 30 and 40 years ago. So we are coasting on those investments in our human resources, and on the indispensable financial support of Diaspora Jewry. Yonath would be the first to acknowledge that her work is more dependent on the generosity of New Yorker Helen Kimmelman than on the taxpayers of Israel.

We’d like to think there really is such a thing as “Jewish genius,” but if so, it still needs to be tempered by good judgment. Rather than gloating, we Israelis owe a thank you to the Kimmelmans and other major overseas benefactors, who keep Israel’s higher education research institutions afloat.

IT’S NOT that we spend less of our GDP on education than other developed countries; it’s that we appear inept in spending it wisely. Science and Technology Minister Daniel Hershkowitz could not bring himself to support the cabinet’s budget plan. Regrettably, the government is committed to cutting rather than growing the education budget. Meanwhile, teaching has become a low-prestige vocation dominated by underpaid women.

Education Minister Gideon Sa’ar recently told the Knesset: “We are very close to the bottom. International [rankings] show that Jordan’s school children have passed us, and we are a little ahead of Syria and Tunisia, although more recent statistics might show that they have also surpassed us.”

Rather than behaving triumphantly, Israelis ought to be asking themselves: Why has education become less of a national priority?

Let’s pray this country continues to be blessed with a nucleus of very high-IQ students. Yet the good of society requires greater investment in the vast pool of average students.

Israelis can learn from the experience of Muslim and Arab civilization, which once kept the beacon of knowledge glowing only to see it dim because of an inability to come to terms with modernity. Looking around Israel today, we can see some of the same obduracy permeating Jewish society.

Large numbers of Israeli children are not even receiving a basic secular education. Which means that the chance of a girl born in Geula this year one day going on to university – much less to a Nobel Prize – is remote indeed.

ADA YONATH.
Genius needs nurturing

NATIONAL POST


Thursday, October 8, 2009

Trio shares chemistry Nobel and US\$1.42-million for work on Ribosome

Presented by



Reuters

 Venkatraman Ramakrishnan, Thomas Steitz and Ada Yonath won the Nobel Prize for Chemistry yesterday for work on the ribosome, a cellular machine that makes proteins, the stuff of life. The three, who will share the US\$1.42-million prize, worked independently of each other yet all published crucial studies in 2000. For Prof. Yonath, 70, just the fourth woman to win the Nobel Chemistry Prize, and the first Israeli woman to clinch a Nobel, the distinction marked just how far she has come since her childhood in a poor family in Jerusalem. The professor of structural biology and biomolecular structure and assembly at the Weizmann Institute of Science in Rehovot, Israel, said her first reaction was "overwhelming happiness."

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Back to Trio share Nobel prize for chemistry

Trio share Nobel prize for chemistry

October 08, 2009

NEW YORK—Two Americans and an Israeli won a Nobel Prize in chemistry Wednesday for creating detailed blueprints of the protein-making machinery within cells, research that's being used to develop new antibiotics.

Venkatraman Ramakrishnan, Thomas Steitz and Israeli Ada Yonath will split the \$1.5 million (Canadian) award for their atom-by-atom description of ribosomes.

Yonath, 70, is only the fourth woman to win the Nobel chemistry prize and the first since 1964.

Ribosomes are key to life. They use instructions from genes to make thousands of different proteins that control what happens in the body. Many antibiotics kill bacteria by attacking ribosomes, and the detailed descriptions by the Nobelists are being used to develop new drugs.

The scientists worked independently and published their results simultaneously in 2000.

"I didn't feel it was a personal competition but it was a bit of a race," said Steitz, 69, a professor at Yale. "We were all taking separate approaches."

Yonath told Israel Radio she didn't think her gender played a role in her Nobel win. Yonath works at the Weizmann Institute of Science in Rehovot, Israel. Ramakrishnan, 57, works at the MRC Laboratory of Molecular Biology in Cambridge, England.

Associated Press

THE GAZETTE • montrealgazette.com • THURSDAY, OCTOBER 8, 2009

Nobel for cell research

LOS ANGELES - Three scientists who used X-ray crystallography to map the precise structure of the ribosome, the cell's crucial protein-making factory, won the 2009 Nobel Prize in chemistry yesterday. Two are from the U.S. and one is from Israel.

Their independent work, published in 2000, provides fundamental information about the workings of cellular machinery at the atomic level and is already being exploited by pharmaceutical companies working to make more effective antibiotics.

The \$1.4-million prize will be shared equally by Thomas Steitz of Yale University; Venkatraman Ramakrishnan of the MRC Laboratory of Molecular Biology in Cambridge, England, who was

born in India but is now a U.S. citizen; and Ada Yonath of the Weizmann Institute of Science in Rehovot, Israel.

Yonath is the only one of this year's nine science winners who is not a U.S. citizen.

She is the first woman to win the chemistry Nobel since Dorothy Crowfoot Hodgkin of Britain received the 1964 prize. Yonath is also the first Israeli woman to win a Nobel.

"It's true that a woman hasn't won since 1964," she told Israeli radio. "But I don't know what that means. Does it mean that I'm the best woman since then? I don't think gender played a role here." Her radio chat had to be cut short because of a call from Israeli President Shimon Peres.

LOS ANGELES TIMES



Aaron Ciechanover

A Nobel for negligence?

The award of the 2009 Nobel Prize for Chemistry to Prof. Ada Yonath fills us with pride, especially amid data showing that Israel has more Nobel Prizes per capita than anywhere else in the world, according to Prof. Dan Ben-David ("Academic vision and nightmare," October 9). But Ben-David also harshly criticizes the downward slide in higher education, and the impression is that this country's leaders are getting a prize for their negligence.

Numbers can be misleading or irrelevant. About a quarter of all Nobel laureates are Jewish. This is a marvelous achievement; since Jews account for less than one quarter of one percent of the world's population, they have 100 times more than their proportionate share. However, the contribution by Israeli recipients is more than five times smaller than that of other Jews, taking into account that half the world's Jews live in Israel.

Many explanations have been offered for the Jewish people's amazing accomplishments as reflected in the lists of Nobel laureates. Was it the Diaspora, with its persecution, wanderings, fear and hiding that made Jews take up knowledge-based occupations that can be carried from place to place, like medicine, science, law, commerce and rabbinical studies? Did they not make scholarship a specifically Jewish trait?

But the creation of the Jewish state and the realization of a 2,000-year-old dream has led to a change in direction. The existence of firm ground, the sense of security, and perhaps arrogance, have eroded the foundations of scholarship. Gradually, with the passing of the state's founders, they have devalued education and scholarship.

The new leadership, and in its wake the nation, has failed to recognize the



Ada Yonath at a press conference last week. The day we hear a leader say his hero is a writer or scientist and not a movie star, we will know that redemption is beginning.

Getty Images

enormous contribution that education and research, as well as educators and researchers, have made to Israel's success as an economic power and the hub of Jewish culture. These leaders have

yet to develop a stance on the position of these values on the nation's and society's value scale.

Instead of resting securely in the national pantheon these values still depend

on the goodwill of the government of the day, subject to every change in the way the wind is blowing and liable to run at any time into intentional campaigns of delegitimization.

The results have not been long in coming: the school students' declining results, the brain drain and the shortage of means for buying new research equipment. In much more difficult times for the state we saw David Ben-Gurion's glowing face when he dedicated the new building for the Technion's chemistry faculty. Today, not even a deputy minister from a marginal party would deign to attend such a ceremony.

We need leaders for whom education and scholarship are real values, not merely pretexts for congratulatory speeches honoring the winners of prestigious prizes, whom they had never heard of until a moment before. The day we hear a leader say his hero is a writer or scientist and not a movie star, we will know that redemption is beginning. We want to go back to the days when "We had a state with narrow roads and broad universities, not one with broad roads and narrow universities," in the words of journalist Sever Plocker. A "poor state with a great vision," as Ben-Gurion put it. That's why the numbers are irrelevant; the values that lead to them are what is important.

It's not a question of money, but of a shift in values, mainly in leadership. Relatively small amounts are involved, much smaller than those that have gone up in smoke in coalition agreements that benefited the few with vested interests and have left a whole nation behind, in other areas as well, such as health and social welfare.

The writer won the Nobel Prize for Chemistry in 2004.

MERCURY (Durban)
Thursday, 8 October 2009, p. 8

Nobel-winning chemistry work 'saving lives'

STOCKHOLM: Two Americans and an Israeli scientist won the 2009 Nobel Prize in chemistry yesterday for atom-by-atom mapping of the protein-making factories within cells.

The Royal Swedish Academy of Sciences said Venkatraman Ramakrishnan's, Thomas Steitz's and Israeli Ada Yonath's work on ribosomes had been fundamental to the scientific understanding of life and had helped researchers develop antibiotics.

Yonath, 70, is the fourth woman to win the Nobel chemistry prize and the first since 1964, when Dorothy Crowfoot Hodgkin of Britain received the award.

"I'm really happy," Yonath said. "I thought it was wonderful when the discovery came. It was a series of discoveries... We still don't know everything, but we progressed a lot."

This year's three laureates, who will share the \$1.4 million (R11m) award, generated three-

dimensional models that show how different antibiotics bind to ribosomes.

"These models are now used by scientists in order to develop new antibiotics, directly assisting the saving of lives and decreasing humanity's suffering," the academy said.

They used a method called X-ray crystallography to pinpoint the positions of the hundreds of thousands of atoms that make up the ribosome.

"This knowledge can be put

to a practical and immediate use; many of today's antibiotics cure diseases by blocking the function of bacterial ribosomes," the citation said. "Without functional ribosomes, bacteria cannot survive. This is why ribosomes are important for new antibiotics."

Their work builds on Charles Darwin's theory of evolution and, more directly, on the work done by James Watson, Francis Crick and Maurice Wilkins, who won the 1962

Nobel Prize in medicine for mapping DNA's double helix.

Steitz, a 69-year-old born in Milwaukee, is a professor of molecular biophysics and biochemistry at Yale University and is attached to the Howard Hughes Medical Institute, both in New Haven, Connecticut.

Yonath is a professor of structural biology at the Weizmann Institute of Science in Rehovot, Israel, and the ninth Israeli to win a Nobel prize. - Sapa-AP

Female Nobel Prize winner 'surprised'

SAPA-DPA AND SAPA-AP
Tel Aviv

THE ISRAELI joint winner of this year's Nobel Prize for chemistry says she is "surprised" to be among the winners.

"I was pretty surprised, because I wasn't expecting it," Professor Ada Yonath said yesterday.

Yonath, a researcher in the structural biology field, shares the 2009 Nobel chemistry award with US nationals Venkatraman Ramakrishnan and Thomas A Steitz.

They won the award for their studies of the ribosome, a part of the cell that synthesises protein and translates genetic code in the production of protein.

Yonath, the first Israeli woman to win a Nobel Prize, is the director of the Centre for Biomolecular Structure and Assembly of the Weizmann Institute of Science, south of Tel Aviv.

The Royal Swedish Academy of Sciences said Ramakrishnan, Steitz and Yonath's work on ribosomes had been fundamental to the scientific understanding of life and had helped researchers develop antibiotics.

Yonath, 70, is the fourth woman to win the Nobel chemistry prize and the first since 1964, when Dorothy Crowfoot Hodgkin of Britain received the award.

This year's three laureates, who will share the 10 million kronor (R10.5m) award, generated three-dimensional models that show how different antibiotics bind to ribosomes.

"These models are now used by scientists to develop new antibiotics, directly assisting the saving of lives and decreasing humanity's suffering," the academy said in its announcement yesterday.

They used a method called X-ray crystallography to pinpoint the positions of thousands of atoms that make up the ribosome.

"This knowledge can be put to a practical and immediate use; many of today's antibiotics cure various diseases by blocking the function of bacterial ribosomes," the citation said. "Without functional ribosomes, bacteria cannot survive. This is why ribosomes are such an important target for new antibiotics."

Their work builds on Charles Darwin's theory of evolution and, more directly, on the work done by James Watson, Francis Crick and Maurice Wilkins, who won the 1962 Nobel Prize in medicine for mapping DNA's double helix, the citation said.

In 2006, Roger D



HONOURED: Nobel Prize winners Ada Yonath, Thomas Steitz and Venkatraman Ramakrishnan.

Kornberg won the Nobel Prize in chemistry for X-ray structures that showed how information is copied to messenger RNA molecules, which carry information from DNA to the ribosomes.

"Now, one of the last pieces of the puzzles has been added - understanding how proteins are made," said Professor Gunnar von Heijne of the Swedish Academy of Sciences, the chairman of the Nobel Committee for Chemistry.

"This discovery is important not only for science as such, but also gives us tools to develop new antibiotics."

Yonath is a professor of structural biology at the Weizmann Institute of Science, and the ninth Israeli to win a Nobel prize. She told Israel Radio she didn't think her gender played a role in the decision.

"It's true that a woman hasn't won since 1964. But I don't know what that means - does it mean that I'm the best woman since then?"

"I don't think that gender played a role here," she said.

Indian-born Ramakrishnan, 57, is the senior scientist and group leader at the structural studies division of the MRC Laboratory of Molecular Biology in Cambridge, England.

He said he wasn't convinced when he got the call from the academy. "I thought it was a joke. I have friends who play practical jokes," Ramakrishnan said via telephone from his lab in Cambridge.

Steitz, a 69-year-old born in Milwaukee, is a professor of molecular biophysics and biochemistry at Yale University and is attached to the Howard Hughes Medical Institute, both in New Haven, Connecticut.

On Monday, three American scientists shared the Nobel Prize in medicine for discovering a key mechanism in the genetic operations of cells, an insight that has inspired new lines of research into cancer.

The physics prize on Tuesday was split between a Hong Kong-based scientist who helped develop the fibre-optic cable and two Canadian and American researchers who invented the "eye" in digital cameras - technology that has revolutionised communications and science.

The literature and peace prize winners were to be announced later this week and the economics announcement is set for Monday.