40th ANNIVERSARY

THE Crafoord PRIZE

Crafoord *Days* 2022

25–27 APRIL IN LUND, SWEDEN

The Crafoord *Prize* in Mathematics and Astronomy 2020

Abstracts and Programmes

PHOTO: CLIFF MORE, INSTITUTE FOR ADVANCED STUDY

ENRICO BOMBIERI

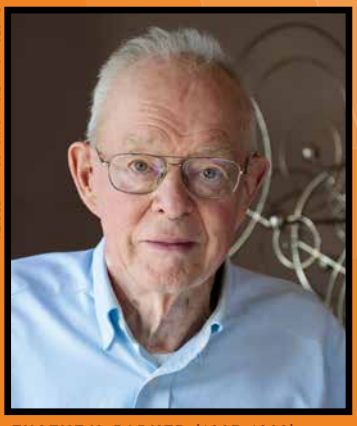

PHOTO: JOHN ZICH, CHICAGO UNIVERSITY

EUGENE N. PARKER (1927–1922)

Anna-Greta and Holger Crafoord Fund

THE FUND WAS ESTABLISHED in 1980 by a donation to the Royal Swedish Academy of Sciences from Anna-Greta and Holger Crafoord. The Crafoord Prize was awarded for the first time in 1982. The purpose of the fund is to promote basic scientific research worldwide in the following disciplines:

- Mathematics
- Astronomy
- Geosciences
- Biosciences (with particular emphasis on Ecology)
- Polyarthritis (e.g. rheumatoid arthritis)

Support to research takes the form of an international prize awarded annually to outstanding scientists and of research grants to individuals or institutions in Sweden. Both awards and grants are made according to the following order:

year 1: Mathematics and Astronomy
year 2: Geosciences
year 3: Biosciences (with particular emphasis on Ecology)
year 4: Mathematics and Astronomy
etc.

The Prize in Polyarthritis is awarded only when the Academy's Class for medical sciences has shown that scientific progress in this field has been such that an award is justified.

Part of the fund is reserved for appropriate research projects at the Academy's institutes. The Crafoord Prize presently amounts to 6 million Swedish krona.

The Crafoord Prize is awarded in partnership between the Royal Swedish Academy of Sciences and the Crafoord Foundation in Lund. The Academy is responsible for selecting the Crafoord Laureates.

ÅTTA45, JÄRFÄLLA 2022
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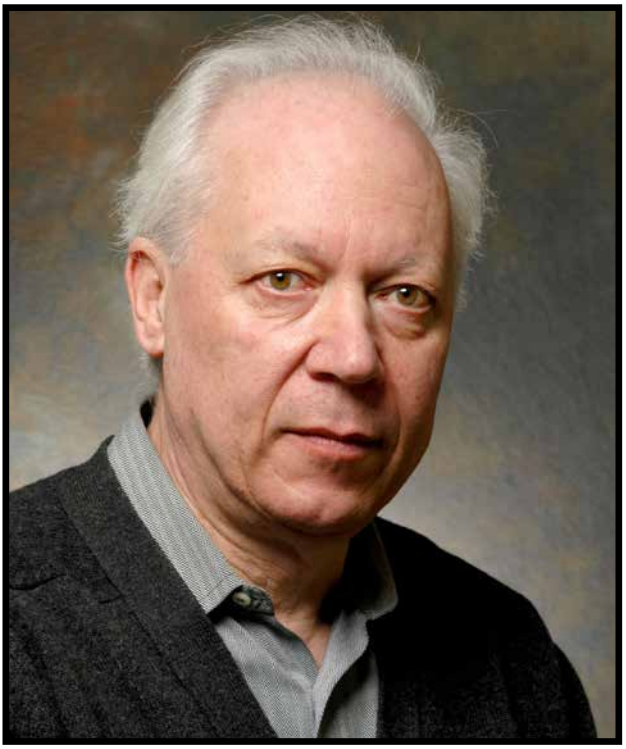
The Crafoord Laureate in Mathematics 2020

PHOTO: CLIFF MOKE, INSTITUTE FOR ADVANCED STUDY



ENRICO BOMBIERI
SCHOOL OF MATHEMATICS, INSTITUTE FOR ADVANCED STUDY, PRINCETON UNIVERSITY, USA

Enrico Bombieri, Institute for Advanced Study, Princeton, USA,
"for outstanding and influential contributions in all the major areas of mathematics, particularly number theory, analysis and algebraic geometry".

The Crafoord *Prize* in Mathematics

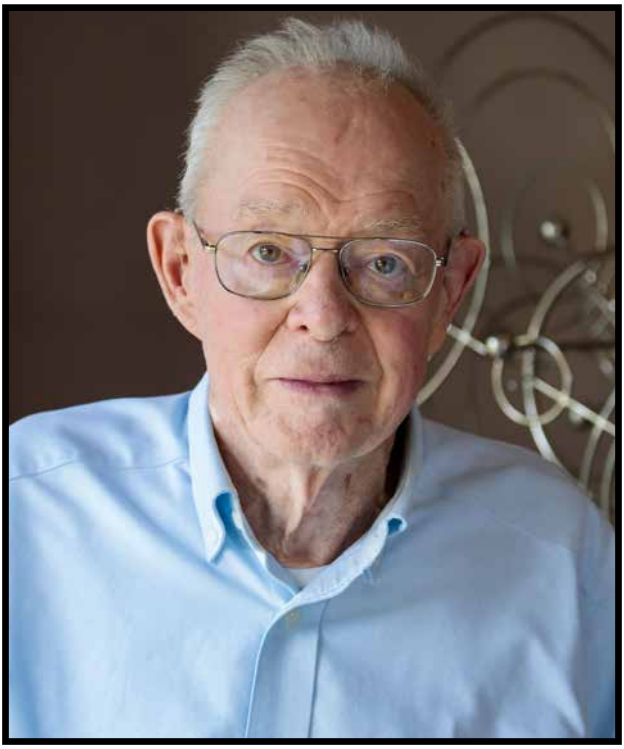
Passionate about number theory

Enrico Bombieri belongs to an increasingly rare group of mathematicians who can solve problems in almost all areas of mathematics. However, his greatest passion has always been number theory, which is the study of integers. He was just 16 years old when he published his first work in number theory and among other things, he is a leading expert on the Riemann hypothesis on the distribution of prime numbers.

Enrico Bombieri has made significant contributions in algebra, advanced geometry and complex analysis. He has also contributed to solving Bernstein's problem. This is a variation of Plateau's problem, about how to mathematically describe the shape of the soap film that forms when a wire frame is dipped into a soap solution.

The Crafoord Laureate in Astronomy 2020

PHOTO: JOHN ZICH, CHICAGO UNIVERSITY



EUGENE N. PARKER (1927–1922),
UNIVERSITY OF CHICAGO, USA

Eugene N. Parker, University of Chicago, USA,
"for pioneering and fundamental studies of the solar wind and magnetic fields from stellar to galactic scales".

The Crafoord *Prize* in Astronomy 2020

Fundamental discoveries about Space

The Parker Solar Probe is currently orbiting the sun. It was launched by NASA in 2018 and its first results were reported just before Christmas that year. This probe was the first to be named after a then-living person – Eugene N. Parker.

Eugene Parker is responsible for several fundamental discoveries about the gases that surround the sun and other stars. He has also developed the theory of how the solar wind arises and how magnetic fields arise and change in space. When he initially presented his theories, over fifty years ago, they were strongly challenged, but were later confirmed through observations from spacecrafts.

Eugene Parker was the first person to realise that the sun is not in equilibrium, as was previously thought. Quite the opposite, it releases mass; the charged gas of ions and electrons that makes up the sun's "atmosphere" is expanding as a solar wind that stretches throughout our planetary system. His ideas are also the foundation for all the forecasts about the space weather, which can disrupt satellites and cause power outages here on Earth.

ABSTRACTS IN MATHEMATICS

Crafoord *Days* 2022

Zeta functions, old and recent

CRAFOORD LAUREATE 2020 **ENRICO BOMBIERI**, SCHOOL OF MATHEMATICS, INSTITUTE FOR ADVANCED STUDY, PRINCETON, USA

The modern theory started with Euler in the 18th century, where he introduced the sum of all positive integers raised to an arbitrary fixed power, which today is called the zeta function. He noted that this sum can also be expressed as an infinite product, which gives the means to study the infinitude of primes by studying a single object, namely the zeta function.

This study continues to be extremely active today, with new methods and connections with other areas of mathematics.

References

Karl Prachar, PRIMZAHLVERTEILUNG, Springer-Verlag/Goettingen-Heidelberg Bd. XCI.

E.C. Titchmarsh, The theory of the Riemann zeta function, Oxford University Press, 1951.

Zeta functions applied to Arithmetic Diophantine Geometry

MARC HINDRY, UNIVERSITÉ PARIS CITÉ, FRANCE

Euler first studied special values at integers (including negative integers) of the zeta function. Later Dirichlet and Riemann used analytic properties of zeta functions and their factors L-functions to prove asymptotic statements on the distribution of prime numbers. These two important trends are combined in the proof of the classical Brauer-Siegel theorem, which gives an asymptotic relation between the three most important quantities associated to a number field - its discrimininant, class number and regulator of units; indeed its proof combines a formula for the special value at s=1 of the Dedekind zeta function with analytic estimates for this special value.
I will explain the basic steps towards the Brauer-Siegel theorem and how various analogues and generalisations can bring interesting results – many conjectural, but some unconditional – in the study of the arithmetic of algebraic varieties defined over a global field or a finite field. The two main examples so far are applications to the Mordell-Weil group of abelian varieties over a global field and to the study of surfaces over finite fields.

The sieve, the large sieve, and a lot of prime numbers

HENRYK IWANIEC, RUTGERS SCHOOL OF ARTS AND SCIENCES, USA

Analytic Number Theory reveals properties of sequences of integers by means of harmonic analysis. The modern sieve methods, especially their large sieve extensions, are used to solve problems in the distribution of prime numbers. The results of Enrico Bombieri are fundamental for a conceptual understanding of these methods and their limitations. I will explain the "Parity Barrier" of the linear sieve along the lines of the Bombieri "Asymptotic Sieve". Moreover, I will discuss how Bombieri and Davenport developed an abstract setting of the large sieve. Bombieri played these cards with great finesse in order to pass the Riemann Hypothesis to control the zeros of Dirichlet's L-functions off the critical line for applications to the distribution of prime numbers over arithmetic progressions. I will also venture into some more recent territories of harmonic analysis in number theory (automorphic forms) which have been opened after early works of Bombieri and others.

Primes in arithmetic progressions and sieves

JAMES MAYNARD, UNIVERSITY OF OXFORD, UK

One of the fundamental results proved by Enrico Bombieri is the Bombieri-Vinogradov theorem on primes in arithmetic progressions, which shows that a version of the Riemann Hypothesis is true 'on average'. This result has profound implications for results in sieve methods, and has been a crucial component for recent work on gaps between primes. Moreover, stronger versions of the Bombieri-Vinogradov Theorem (particularly results of Bombieri-Friedlander-Iwaniec) give results on primes in arithmetic progressions beyond the range of the Riemann Hypothesis, which are fundamental for certain arithmetic applications.

I'll survey these connections between the Riemann Hypothesis, primes in arithmetic progressions and sieve methods, demonstrating Bombieri's influential work and showing how it plays a role in more recent results, including some of the speaker.

Atypical intersections, point-counting, and the Andr\'e-Oort conjecture

JONATHAN PILA, UNIVERSITY OF OXFORD, UK

The Andr\'e-Oort conjecture in diophantine geometry sits within a larger framework of conjectures due to Zilber, Bombieri-Masser-Zannier, and Pink (in differing forms and settings). The full statement is widely open, but there are many partial results using a variety of methods. I will describe the proof of the Andr\'e-Oort conjecture via point-counting on definable sets in o-minimal structures, which has its roots in earlier joint work of mine with Bombieri.

ABSTRACTS IN ASTRONOMY

Crafoord *Days* 2022

Coronal Heating by Topological Dissipation of Magnetic Energy

CRAFOORD LAUREATE 2020 **EUGENE N. PARKER**, UNIVERSITY OF CHICAGO, USA

The fully ionized corona radiating in X-ray at its million-degree temperature is an excellent electrical fluid-conductor, trapping energy in its ~10-Gauss magnetic field extending from the heavy fluid at the white-light solar surface beneath the coronal base. The field dynamically dominates the tenuous corona but is constrained by high electrical conductivity to evolve with each elementary tube of magnetic flux containing the same mass of fluid. Preserving field topology under this so-called "frozen-in" condition, the relaxation of a 3D field to attain equilibrium irrepressibly results in spontaneous formation of thin sheets of electric current separating flux tubes, the sheets so intense as to dissipate at the otherwise negligibly weak coronal resistivity. Thus, a highly conducting fluid by its embedded magnetic field is naturally also resistively dissipative and self-heating, a fundamental hydromagnetic property discovered in 1972. Intermittent, ubiquitous, small-scale resistive events liberate magnetic energy to heat the corona, the energy fed into the corona by the action of the turbulent, heavy solar surface. This process is at the root of stellar and galactic coronae today observed as a universal astrophysical phenomenon. The Lecture will focus on explaining the irrepressible formation of current sheets as a basic physical process.

Magnetic fields in nearby galaxies and the Milky Way

RAINER BECK, MAX-PLANCK-INSTITUT FÜR RADIOASTRONOMIE, BONN, GERMANY

The strength and structure of magnetic fields in the interstellar medium of star-forming galaxies can be best studied by observations of radio synchrotron emission, its linear polarization, and its Faraday rotation. Supernova explosions generate turbulent gas motions and turbulent magnetic fields. The fields in spiral arms of typically 10-30 MicroGauss (1-3 nT) strength are dynamically important.

Magnetic fields with a well-ordered spiral structure exist in all nearby spiral galaxies observed so far and even in a few dwarf galaxies. The strongest ordered fields are found between the optical spiral arms, often forming "magnetic arms". Faraday rotation measures (RMs) of the polarization angles reveal large-scale patterns that are signatures of the alpha-Omega dynamo, a process proposed by Eugene N. Parker in 1971. The Andromeda nebula, our neighbour galaxy, is the prototype of a dynamo-generated field extending across more than 30 kiloparsecs. The field structure is a superposition of an axisymmetric spiral field plus a weaker bisymmetric spiral field, the two lowest azimuthal modes of the dynamo. Several other galaxies show evidence also for higher modes. On smaller scales of a few kiloparsecs, RMs often show periodic fluctuations, indicative of "Parker loops" (Parker 1965).

Galaxies observed edge-on host magnetic halos of several kiloparsecs extent and X-shaped patterns. This requires outflows of gas and magnetic fields (galactic winds) with speeds of several 100 km/s. RM data reveal large-scale fields that are symmetric with respect to the plane (even parity), but are more complex than the quadrupolar field predicted by dynamo models. In a few galaxies "giant magnetic ropes" with several kiloparsec size emerge from the disk into the halo.

Our Milky Way hosts magnetic fields of similar strength as in spiral galaxies, while the global field structure in the disk and halo is not yet well known. Several field reversals on kiloparsec scales are indicated in the distribution of RMs of pulsars, whereas in external galaxies similar reversals are rarely observed.

Exploring the Heliospheric Boundary and Beyond: From Voyager to Interstellar Probe

PONTUS C. BRANDT, THE JOHNS HOPKINS UNIVERSITY APPLIED PHYSICS LABORATORY, USA

During its evolution the solar system has completed twenty revolutions around the galactic core. Its vast, protective magnetic bubble – the Heliosphere – has plowed through dramatically different interstellar environments and witnessed supernovae along its evolutionary path shaping the habitable system we live in today. For the past 60 000 years, our heliosphere has been immersed in the Local Interstellar Cloud, but is now about to enter a completely new environment of interstellar space that, again, will change the entire heliospheric interaction and shielding of interstellar matter. In 1961, the pioneering work of Prof. Parker laid the theoretical groundwork of a star's interaction with its Very Local Interstellar Medium (VLISM) that still remains a foundation in the scientific debate. Today, the heliospheric interaction with the VLISM continues to be one of the most outstanding problems of space physics. Only Voyager 1 and 2 have crossed the heliospheric boundary into the VLISM and will remain operational until around 2030. Throughout their historic journey, these two spacecrafts have made remarkable discoveries that make it clear that this ultimate frontier of space exploration represents a new regime of space physics. Complex interactions with interstellar neutrals appear to be decisive to the physics of the heliospheric boundary, and Voyager still observes a solar-like magnetic field despite having crossed into the VLISM almost a decade ago. Many more mysteries have been uncovered by Voyager, with many still eluding full explanations. Momentum is building across the world behind an Interstellar Probe mission that would be launched on a fast trajectory through the heliosphere to explore its boundary with dedicated instrumentation. Traveling far beyond the Voyager mission, Interstellar Probe would directly sample the properties of the VLISM to ultimately understand the global interaction with the heliosphere and the evolution along its galactic journey.

The Challenge of Exploring Our Sun: the 60-Year Odyssey to Parker Solar Probe

NICOLA FOX, SCIENCE MISSION DIRECTORATE, NASA HEADQUARTERS, WASHINGTON, USA

Parker Solar Probe is humankind's first mission to venture to the Sun and unlock the mysteries of the corona. Launched in 2018, and designed by Johns Hopkins University Applied Physics Laboratory, for NASA, this mission is the culmination of a 60-year quest to build a spacecraft and instruments capable of exploring the searing temperatures and radiation of the corona, and investigate the processes that drive the solar wind. While a mission to the Sun has been a science priority since 1958 when Dr. Eugene Parker predicted the existence of the solar wind, it was not a possibility until recently due to the extreme radiation environment close to the Sun. Parker Solar Probe and its instruments will come within 3.8 million miles (6.16 million kilometers) to the Sun, more than seven times closer than any spacecraft has come before. Data from Parker Solar Probe instruments has revealed previously unobserved processes in the near-solar region; highlights of new scientific findings based on the mission's solar flybys to date, or perihelia, will be presented at the Crafoord Symposium honoring Dr. Eugene Parker.

Stellar Magnetic Fields

MOIRA JARDINE, SCHOOL OF PHYSICS & ASTRONOMY, ST ANDREWS, UK

We are now in an era when our ability to map the surface magnetic fields of other stars has allowed us to place the magnetic activity of the Sun in a larger context. In this talk I will explore how the strength and structure of the Sun's magnetic field might have changed since it formed. Over this time the solar wind has removed angular momentum from the Sun, reducing its spin rate and causing its magnetic activity to decrease. This in turn would have lead to changes in the space weather experienced by the evolving planets in our solar system. I will discuss our current understanding of this process, in light of the wealth of exoplanet architectures that have been discovered. Age is not the only factor, however, that determines the magnetic activity of a star. Stellar mass, which determines a star's internal structure, is equally important. In particular, the depth of a star's convective zone and the existence of a radiative core appear to be crucial in governing the form of a star's dynamo-generated magnetic field. I will show how measuring the helicity density of stellar magnetic fields may shed some light on the nature of magnetic field generation.

Which theoretical approach to better explain the Solar Wind expansion: Fluid or Kinetic?

MILAN MAKSIMOVIC, CNRS & LESIA, PARIS OBSERVATORY, FRANCE

The Knudsen number Kn, which is the ratio between the Coulomb collision mean free path and a typical hydrostatic scale height of a medium, is often used as an indicator of the level of collisionality in a space plasma. When computing this number for the Sun, one obtains Kn~10^{-13} in the cromosphere and reaches Kn~1 in the corona and solar wind. Therefore the corona and solar wind are plasmas which are neither highly collisional with Kn << 1 nor fully collisionless Kn >> 1. The physics one has to use in order to model this region is somehow between two well defined theoretical approaches, the fluid theory on one hand and the Vlasov approximation on the other.

During this talk I will present the major results obtained by these two approaches and will show that in the end they are reconcilable through the role of the interplanetary thermoelectric field which is naturally established in the solar wind and which is now being observed in the data from the NASA Parker Solar Probe.

Cosmic Rays in Galaxies: From Microscales to Macroscales

ELLEN ZWEIBEL, UNIVERSITY OF WISCONSIN-MADISON, USA

Cosmic rays are the relativistic particle component of the tenuous interstellar medium that pervades the Milky Way and similar galaxies. They comprise mostly protons, carry about as much energy as the thermal gas despite being insignificant by number, and are confined to the galaxy by the embedded interstellar magnetic field. Eugene Parker was among the first to recognize that the interplay between cosmic rays, thermal gas, and magnetic fields results in a rich range of dynamical and thermodynamic interactions, largely mediated by plasma instabilities at the kinetic scale, that profoundly affect the structure of the interstellar medium. I will describe recent developments in theory and computation that demonstrate the self regulation of stellar energetics, magnetic fields, and cosmic rays, how this self regulation impacts the evolution of galaxies and the surrounding circumgalactic medium over cosmic time, and how kinetic scale processes can be probed by astronomical observations.

PROGRAMME

Crafoord *Days* 2022

Overview programme Crafoord *Days* 2022

Monday 25 April | LUX, HELGONAVÄGEN 3, LUND — 09:30

THE CRAFOORD PRIZE LECTURE IN **MATHEMATICS**
Held by the Crafoord Laureate **Enrico Bombieri**.

THE CRAFOORD PRIZE LECTURE IN **ASTRONOMY**
Held by **Nicola Fox,** on behalf of the late Crafoord Laureate **Eugene N. Parker**.

THE CRAFOORD PRIZE LECTURE IN **POLYARTHRITIS**
Held by the Crafoord Laureate **Daniel L. Kastner**.

THE CRAFOORD PRIZE LECTURE IN **GEOSCIENCES**
Held by the Crafoord Laureate **Andrew H. Knoll**.

Registration at www.kva.se

Tuesday 26 April

09:35 CRAFOORD PRIZE SYMPOSIUM IN **MATHEMATICS**
Number Theory
Lectures by the Crafoord Laureate **Enrico Bombieri** and invited speakers.
THE FACULTY OF ENGINEERING, LTH, ANNEXET, MA5, SÖLVEGATAN 20, LUND

09:00 CRAFOORD PRIZE SYMPOSIUM IN **ASTRONOMY**
Solar wind and magnetic fields in space
Lectures by **Boon Chye Low,** on behalf of the late Crafoord Laureate **Eugene N. Parker** and invited speakers.
THE FACULTY OF ENGINEERING, LTH, ANNEXET, MA7, SÖLVEGATAN 20, LUND

09:00 CRAFOORD PRIZE SYMPOSIUM IN **POLYARTHRITIS**
Autoinflammatory diseases
Lectures by the Crafoord Laureate **Daniel L. Kastner** and invited speakers.
KULTUREN IN LUND, TEGNÉRSPLATSEN 6, LUND

09:30 CRAFOORD PRIZE SYMPOSIUM IN **GEOSCIENCES**
The evolution of life on Earth through deep time
Lectures by the Crafoord Laureate **Andrew H. Knoll** and invited speakers.
LUX, HELGONAVÄGEN 3, LUND

Wednesday 27 April | LUND UNIVERSITY ASSEMBLY HALL, UNIVERSITY MAIN BUILDING, PARADISGATAN 2, LUND — 16:15

THE CRAFOORD PRIZE AWARD CEREMONY
In the presence of **HRH Crown Princess Victoria**.

By invitation only.

Detailed programme

The Crafoord *Prize* Lectures in Mathematics, Astronomy, Polyarthritis and Geosciences

LUX,
HELGONAVÄGEN 3,
LUND

Monday 25 April

Seating is limited. For registration and further information visit:
www.kva.se/en/crafoordprizelectures2022

09:30	Presentation of the Crafoord *Prize*	Nils Dencker, Chair of the Crafoord Prize Committee in Mathematics
09:35	Introduction of the Crafoord Laureate in Mathematics 2020	Per Salberger, Member of the Royal Swedish Academy of Sciences
09:45	*The zeta function: a mystery 283 years old*	CRAFOORD LAUREATE Enrico Bombieri, School of Mathematics, Institute for Advanced Study, Princeton University, USA
10:20	Questions from the audience	CHAIR: Per Salberger, Member of the Royal Swedish Academy of Sciences
10:30	COFFEE BREAK	
10:50	Introduction of the Crafoord Laureate in Astronomy 2020	Dainis Dravins, Member of the Royal Swedish Academy of Sciences
11:00	*The Challenge of Exploring Our Sun: the 60-Year Odyssey to Parker Solar Probe*	Nicola Fox, Science Mission Directorate, NASA Headquarters, Washington, USA, on behalf of the late CRAFOORD LAUREATE Eugene N. Parker, University of Chicago, USA
11:35	Questions from the audience	CHAIR: Dainis Dravins, Member of the Royal Swedish Academy of Sciences
11:45	LUNCH	(Included for registered participants)
12:45	Introduction of the Crafoord Laureate in Polyarthritis 2021	Rikard Holmdahl, Member of the Crafoord Prize Committee in Polyarthritis
12:55	*Cutting the Gordian Knots of Inflammation with the Shears of Genomics*	CRAFOORD LAUREATE Daniel L. Kastner, National Human Genome Research Institute, Bethesda, USA
13:30	Questions from the audience	CHAIR: Rikard Holmdahl, Member of the Crafoord Prize Committee in Polyarthritis
13:40	COFFEE BREAK	
14:00	Introduction of the Crafoord Laureate in Geosciences 2022	Daniel Conley, Member of the Crafoord Prize Committee in Geosciences
14:10	*The Deep History of Life*	CRAFOORD LAUREATE Andrew H. Knoll, Harvard University, Cambridge, USA
14:45	Questions from the audience	CHAIR: Daniel Conley, Member of the Crafoord Prize Committee in Geosciences
14:55	End of the Crafoord *Prize* Lectures	

Detailed programme

THE CRAFOORD SYMPOSIUM IN MATHEMATICS 2022

Number Theory

THE FACULTY OF ENGINEERING,
LTH, ANNEXET, MA5,
SÖLVEGATAN 20, LUND

Tuesday 26 April

Seating is limited. For registration and further information visit: www.kva.se/en/crafoordmathematics2022

09:35	Opening address	Dan Larhammar, President of The Royal Swedish Academy of Sciences
09:40	Presentation of the Crafoord Laureate	Per Salberger, Member of the Royal Swedish Academy of Sciences
09:45	*Zeta functions, old and recent* [1]	CRAFOORD LAUREATE Enrico Bombieri, School of Mathematics, Institute for Advanced Study, Princeton, USA
10:35	COFFEE BREAK	
11:00	*Primes in arithmetic progressions and sieves* [2]	James Maynard, University of Oxford, UK
12:00	LUNCH	(Included for registered participants)
13:00	*Zeta functions applied to Arithmetic Diophantine Geometry* [3]	Marc Hindry, Université Paris Cité, France
14:00	*Atypical intersections, point-counting, and the Andr\'e-Oort conjecture* [4]	Jonathan Pila, University of Oxford, UK
15:00	COFFEE BREAK	
15:30	*The sieve, the large sieve, and a lot of prime numbers* [5]	Henryk Iwaniec, Rutgers School of Arts and Sciences, USA
16:30	END OF SYMPOSIUM	

CHAIRS:
Pär Kurlberg, KTH Royal Institute of Technology, Sweden [1, 2, 5]
Fabien Pazuki, University of Copenhagen, Denmark [3, 4]

Detailed programme

THE CRAFOORD SYMPOSIUM IN ASTRONOMY 2022

Solar wind and magnetic fields in space

THE FACULTY OF ENGINEERING,
LTH, ANNEXET, MA7,
SÖLVEGATAN 20, LUND

Tuesday 26 April

Seating is limited. For registration and further information visit: www.kva.se/en/crafoordastronomy2022

	MORNING SESSION	CHAIR: **Axel Brandenburg**, Member of the Royal Swedish Academy of Sciences
09:00	Opening address	**Dan Larhammar**, President of the Royal Swedish Academy of Sciences
09:05	Introduction of the Crafoord Laureate	**Jan-Erik Wahlund**, Member of the Crafoord Prize Committee in Astronomy
09:10	*Coronal Heating by Topological Dissipation of Magnetic Energy*	**Boon Chye Low**, National Centre for Atmospheric Research, USA, on behalf of the late CRAFOORD LAUREATE **Eugene N. Parker**, University of Chicago, USA
10:00	COFFEE BREAK	(Included for registered participants)
10:30	*Which theoretical approach to better explain the Solar Wind expansion: Fluid or Kinetic?*	**Milan Maksimovic**, CNRS & LESIA, Paris Observatory, France
11:10	*Stellar magnetic fields*	**Moira Jardine**, School of Physics & Astronomy, St Andrews, UK
11:50	LUNCH	(Included for registered participants)
	AFTERNOON SESSION	CHAIR: **Jan-Erik Wahlund**, Member of the Crafoord Prize Committee in Astronomy
13:00	*The Challenge of Exploring Our Sun: the 60-Year Odyssey to Parker Solar Probe*	**Nicola Fox**, Science Mission Directorate, NASA Headquarters, Washington USA
13:40	*Magnetic fields in nearby galaxies and the Milky Way*	**Rainer Beck**, Max-Planck-Institut für Radioastronomie, Bonn, Germany
14:20	COFFEE BREAK	
14:50	*Cosmic Rays in Galaxies: From Microscales to Macroscales*	**Ellen Zweibel**, University of Wisconsin-Madison, USA
15:30	*Exploring the Heliospheric Boundary and Beyond: From Voyager to Interstellar Probe*	**Pontus C. Brandt**, The Johns Hopkins University Applied Physics Laboratory, USA
16.10	Speakers view of the future of the field	All speakers, 5 minutes each
16.45	Closing remarks	**Jan-Erik Wahlund**, Member of the Crafoord Prize Committee in Astronomy
16.50	END OF SYMPOSIUM	

Anna-Greta and Holger Crafoord

Holger Crafoord (1908–1982) was prominent in Swedish industry and commerce. He began his career with AB Åkerlund & Rausing and devoted a larger part of his working life to this company. In 1964, Holger Crafoord founded Gambro AB in Lund, Sweden, where the technique of manufacturing the artificial kidney was developed. This remarkable dialyser soon became world famous. Since then, a series of medical instruments has been introduced on the world market by Gambro.

HOLGER AND ANNA-GRETA CRAFOORD

In 1980, Holger Crafoord founded the Crafoord Foundation, which annually contributes greatly to the Anna-Greta and Holger Crafoord Fund.

Holger Crafoord became an honorary doctor of economics in 1972 and in 1976 an honorary doctor of medicine at Lund Univeristy.

Anna-Greta Crafoord (1914–1994) took, as Holger Crafoord's wife, part in the development of Gambro AB. Through generous donations and a strong commitment in the society around her, she contributed to the scientific and cultural life. In 1986 she founded the Anna-Greta Crafoord foundation for rheumatological research and in 1987 Anna-Greta Crafoord became an honorary doctor of medicine at Lund Univeristy.

Over the years, the Crafoords have furthered both science and culture in many ways and it is noteworthy that research in the natural sciences has received an important measure of support from the Anna-Greta and Holger Crafoord Fund.

THE ROYAL SWEDISH ACADEMY OF SCIENCES was founded in 1739 and is an independent non-governmental organisation, whose overall objective is to promote the sciences and strengthen their influence in society. The Academy has a particular responsibility for natural science and mathematics, but its work strives to increase interaction between different disciplines. The activities of the Royal Swedish Academy of Sciences primarily focus on:

- being a voice of science in society and influencing research policy (policy for science)
- providing a scientific basis for public debate and decision-making (science for policy)
- recognizing outstanding contributions to research
- being a meeting place for science, within and across subject boundaries
- providing support for young researchers
- stimulating interest in mathematics and natural science in school
- disseminating knowledge to the public
- mediating international scientific contacts
- preserving scientific heritage

THE ACADEMY has around 460 Swedish and 175 foreign members who are active in classes, committees and working groups. They initiate enquiries, consultation documents, conferences and seminars. The Academy has General Meetings eight times a year. Open lectures are held in association with these (read more at www.kva.se/kalendarium). They can also be watched via www.kva.se/video.

THE ACADEMY´S institutes offer unique research environments in ecological economics, botany, the history of science and mathematics.

Every year, the Academy awards a number of prizes and rewards. The best known are the Nobel Prizes in Physics and Chemistry and the Sveriges Riksbank Prize in Economic Science in Memory of Alfred Nobel (the Prize in Economic Sciences). Other major prizes are the Crafoord Prize, Sjöberg Prize, Göran Gustafsson Prizes, Söderberg Prize and the Tobias Prize. The Göran Gustafsson Prizes are awarded to outstanding young researchers and are a combination of a personal prize and research funding. Since 2012, the Academy of Sciences has been one of the academies involved in implementing the Wallenberg Academy Fellows career programme, which provides long-term funding to the most promising young researchers. As well as a comprehensive range of scholarships, the Academy is also involved in appointments to research posts in a number of programmes funded by external foundations.

Through its working groups and committees, the Academy also works to promote sustainable, science-based societal development in the area of energy and the environment, among others. Issues relating to education and conditions for teachers are another major interest. The Academy regularly organises lectures and workshops on various scientific topics for teachers and students. In the 1990s, the Academy and the Royal Swedish Academy of Engineering Sciences founded one of Sweden's biggest school development programmes, NTA – Naturvetenskap och teknik för alla (Science and Technology for all).

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