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FACT SHEET – MARTIN J. REES

June 23, 1942: Martin John Rees born to Reg and Joan Rees, both teachers, in York, England. Though the family leads a peripatetic life while his father is in the Royal Air Force, they return home after the war ends to his father's roots in Shropshire, a mostly-rural area of England bordering Wales.

1948: His parents open a progressive boarding school in Bedstone, a village near the picturesque market town of Ludlow that remains their home for the next 18 years. Initially occupying a Victorian mansion, the school, Bedstone College, expands over the years and continues to flourish on extensive grounds near to the original school home. Attending Bedstone until age 13 provides him a solid, rural early education foundation that leaves him with an enthusiasm for nature and numbers.

1956 – 1960: Completes secondary education at Shrewsbury School, a large boarding school on a campus overlooking the river Severn on the outskirts of Shrewsbury, the largest town in Shropshire. Although it was hard to adjust to a traditional English "public school," he enjoyed its excellent opportunities for music and art, studying piano and participating in choral music. With the English school system requiring specialization in the last years of secondary school, he chooses mathematics and physics, less for any love of science than his reluctance to pursue languages, although he enjoys literature and history. The traditional, high-quality teaching at Shrewsbury ensures his admission to Cambridge University.

1960: Enters Trinity College at Cambridge University.

1963: Receives his B.A. in mathematics, First Class, from Cambridge. He later regrets his choice of subject, wishing he had gained a broader grounding in science and realizing he is not cut out to be a mathematician, preferring a more synoptic style of thinking. He seriously considers economics, but when he receives a research studentship in the Department of Applied Mathematics and Theoretical Physics, he embarks diffidently into studies of astrophysics and cosmology.

1964: After a year, his confidence has grown thanks in large part to a charismatic and inspiring advisor, Dennis Sciama, an unusually wide-ranging scientist. Sciama's other students include Templeton Prize laureates George Ellis and John Barrow, and other luminaries including Stephen Hawking, James Binney, and Brandon Carter.

His studies coincide with the explosion of new astrophysical knowledge revealed during the 1960s, an era that brought such breakthroughs as the first strong evidence for the "big bang," neutron stars, and black holes. The nascent subject allows even a beginning student such as himself to make significant contributions, with Cambridge and its strong academic links around the globe providing a fertile environment for advancement. Under Sciama's wing, his interest in the philosophical aspects of physics and cosmology also grows. With Sciama's encouragement to popularize the subject, he

gives his first BBC talks, as well as general lectures, while still a student. His ability to discuss the complexities of astrophysics in a popular forum will prove to presage a life-long talent.

1966: *Research Milestone:* With Sciama, "Cosmological Significance of the Relation between Redshift and Flux Density for Quasars" is published. The paper identifies strong evidence against the steady state theory of cosmology, at the time a widely embraced concept.

Research Milestone: Among his early and most enduring interests are radio sources and jets. His paper, "Appearance of Relativistically Expanding Radio Sources," presents indirect evidence that radio sources must involve ejection of material at close to the speed of light, a theory not directly verified until the 1970s onwards, with the advent of VLBI (very long baseline interferometry) techniques.

1967: Receives Ph.D. in theoretical astronomy from Cambridge, becomes a research fellow at Jesus College, Cambridge, and staff member at Cambridge's newly-established Institute of Theoretical Astronomy, under the direction of Fred Hoyle. During his five years on staff, leaves of absence allow him the freedom to make highly-beneficial, months-long visits to leading centers in the US.

1968-69: Receives short-term research fellowships at the California Institute of Technology (Caltech) and at the Institute for Advanced Study in Princeton, New Jersey.

1969: Appointed to Senior Research Fellowship at King's College, Cambridge.

Research Milestone: "The Collapse of the Universe: An Eschatological Study" becomes one of the first papers in the serious literature to address the long-term future of the universe. It is his first of many publications examining issues of destiny within the context of astrophysics.

1971: Serves as visiting associate professor at Caltech.

Research Milestone: Devotes his energies to studying massive black holes and quasars, a continuing interest. Written with D. Lynden-Bell, the paper "On Quasars, Dust and the Galactic Centre" offers the novel suggestion that there should be a black hole as massive as a few million suns in the center of our own galaxy, a prediction now firmly established.

1972: Named professor at Sussex University and serves as visiting professor at Harvard University.

1973: After only one year at Sussex, Rees returns to Cambridge as Professorial Fellow of King's College, and Plumian Professor of Astronomy and Experimental Philosophy at Cambridge, succeeding Fred Hoyle, arguably the most productive and imaginative English astrophysicist and cosmologist of his generation. Hoyle, whose path-breaking work included developing the concept that all the elements of the periodic table were synthesized in stars from pristine hydrogen, and co-originating the concept of "steady state" cosmology, famously disparaged the now-accepted belief that the universe began with a single, massive event by describing it as the "Big Bang," a term that stuck.

1976: Appointed Gresham Professor of Astronomy, Gresham College, London, the oldest science professorship in the world, founded in 1596. It provides for an annual series of public lectures on astronomy and related physical sciences.

1977: Serves as Director of the Institute of Astronomy at Cambridge, until 1982.

Research Milestone: The paper "Quasar theories" surveys evidence built up during the 1970s that active quasars involve flows onto and around massive black holes, and that formation of such holes is a natural expectation.

1979: Elected Fellow of the Royal Society, London (FRS).

Research Milestone: Writes "Anthropic principle and the Physical World" with B.J. Carr, an influential and still much-quoted survey addressing the various "large number coincidences" in astronomy and cosmology, relating them to fundamental constants and showing which are related by simple physics and which involve apparent "tuning" of parameters.

1981: *Research Milestone:* His early, groundbreaking speculations on the multiverse concept are published in the paper "Our Universe and others."

1982: Elected Foreign Associate of the (U.S.) National Academy of Sciences. Named visiting professor at the Institute for Advanced Study in Princeton (also in 1996 and 1997), renewing a connection begun during his postdoc stay in 1969 and continuing today through academic visits and as a member of the Institute's Board of Trustees.

1983: *Research Milestone:* "Formation of Population III stars and pregalactic evolution" (with A. Kashlinsky) published, detailing a specific model for formation of massive stars in subgalactic clusters. The universe became literally dark about half a million years after the big bang when primordial radiation shifted into the infrared, the so-called "dark age" of the universe's development. Building on an interest that began with a 1977 Yale conference, the paper attempts to explain how the first "Population III" objects (stars or superstars) formed and lit it up again.

Research Milestone: "How stable is our vacuum?" (with P. Hut) published, in which the authors argue that accelerator experiments pose no danger, a notion that received popular consideration many years later with the start-up of the super accelerator at CERN, because more extreme natural phenomena involving cosmic ray collisions have occurred repeatedly in the cosmos and the universe has survived.

1984: Appointed Regents Visiting Fellow of the Smithsonian Institution in Washington, D.C. Serves as joint coordinator of the program on galaxy formation at the Institute of Theoretical Physics in Santa Barbara, California. The program's research sets the foundations for the 'cold dark matter' (CDM) model for cosmic structure formation.

Research Milestone: "Formation of galaxies and large scale structure with cold dark matter," a key paper written with G. Blumenthal, S. Faber and J. Primack, codifies and prefigures future developments of the now-generally-accepted CDM model.

1986: Marries Caroline Humphrey, a professor of social anthropology at Cambridge, and founder of the Mongolia and Inner Asian Studies Unit. She is one of the first anthropologists from a western country allowed to do fieldwork in the USSR. Her focus continues in post-Soviet regions such as Siberia, and in Mongolia, India, Nepal and China. In 2006, she is appointed as the first Sigrid Rausing Professor of Collaborative Anthropology at Cambridge. A Fellow of the British Academy and of the American Philosophical Society, Humphrey recently was made Dame Caroline by Queen Elizabeth II.

1987: Serves again as Director of the Institute of Astronomy at Cambridge, until 1991. By this time the Institute has a wide-ranging program of observational and theoretical studies. His personal research covers black holes, "high energy" cosmic phenomena and cosmology.

1989: *The Stuff of the Universe* (co-written with John Gribbin) published (in the U.S. entitled *Cosmic Coincidences*).

1992: Named Official Fellow, King's College, Cambridge, and Royal Society Professor at Cambridge, a post he holds until 2003.

Knighted by Queen Elizabeth II.

Research Milestone: Publishes the first of many papers, many in collaboration with Peter Mészáros of Penn State University, on gamma ray bursts. Until the 1990s the distance of gamma ray bursts were unclear and the establishment of their cosmological distances evidenced that the bursts manifested the most extreme physics of any known cosmic objects, offering important links to his earlier work on radio jets and, more recently, Population III stars.

1993: Elected Foreign Member, American Philosophical Society.

1995: Named Astronomer Royal, a post established by Charles II in 1675. Originally the Astronomer Royal acted as Director of the Royal Observatory at Greenwich, but with that facility relegated to essentially a museum since observations are now done in distant sites with better climates, the title is now merely honorary.

Gravity's Fatal Attraction: Black Holes in the Universe (co-written with Mitchell Begelman) published. *New Perspectives in Astrophysical Cosmology* published.

1997: *Before the Beginning: Our Universe and Others* published.

1998: *Research Milestone:* "Quasars and galaxy formation," a pioneering and highly cited paper, discusses the feedback processes that might lead to a correlation (such as is observed) between the mass of a central black hole and the properties of its host galaxies.

1999: *Just Six Numbers: The Deep Forces that Shape the Universe* published.

2001: Named honorary professor at Imperial College, London, and at Leicester University. *Our Cosmic Habitat* published.

2002: Named Professor of Cosmology and Astrophysics at Cambridge, a post he holds until 2009.

2003: *Our Final Century* published (in the U.S. entitled *Our Final Hour*). His original title for the UK edition included a question mark; the U.S. title, he often notes, suggests the American penchant for instant gratification. The book gathers together reflections on his many lectures and general articles produced over the previous decade on themes relating to politics, environment, arms control, and other significant topics. Its main theme is that humanity is entering the first century in which one species, homo sapiens, controls the entire biosphere's future. Though he regards himself as a technological optimist, he has taken on the mantle of political pessimist, with his book giving human civilization no more than a fifty-fifty chance of surviving until 2100 without a setback as serious as a global nuclear war. Shortly after publication, Rees posts a prediction on www.longbets.org that bioterror or bioerror will lead to one million casualties in a single event before 2020.

2004: Installed as Master of Trinity College, Cambridge, a post established in 1546 and traditionally held by academics of the highest distinction. Presenter and advisor for the television series "What We Still Don't Know" on Britain's Channel 4, whose three segments – "Are We Alone?" "Why Are We Here?" and "Are We Real?" – emphasize the scope and limits of science and of human understanding. A book based on the series is scheduled for 2012.

2005: Appointed to the House of Lords as a non-party-political peer, sitting on the Cross Benches, with the title of Lord Rees of Ludlow (his hometown in the County of Shropshire). Serves as general editor for the *DK Illustrated Encyclopedia of the Universe*.

2005: Elected President of the Royal Society, a post of leadership within British science involving substantial interaction with academies around the world and one that offers publications and advice

on governmental policy questions. His final year of office in 2010 coincides with the 350th anniversary of the society's foundation. Celebrations include several hundred special events spread throughout the year highlighted by a convocation in the Royal Festival Hall attended by 2400 people, including Her Majesty the Queen and four other members of the royal family, as well as representatives of academies from around the world.

2007: Appointed to the Order of Merit, an honor in the gift of the Queen limited to 24 members.

2010: Delivers the Reith Lectures for the BBC Radio 4, a four-part series exploring the challenges facing science in the 21st century. An expanded version to be published in June 2011 as *From Here to Infinity: Scientific Horizons*.

Research Milestone: His work on gamma ray bursts, begun in the 1990s, continues apace with the paper "Population III gamma ray bursts" linking this phenomenon to the Population III stars formed after the "dark ages" about two hundred million years after the big bang.

2011: Martin Rees awarded the 2011 Templeton Prize.

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