



livelihoods

today and tomorrow

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‘Special’

Stephen Hawking

An emaciated man in a wheelchair who couldn't move his body and used his cheek muscles to activate a synthetic voice to share his ideas with the world would hardly fit the popular conception of a man who changed the way we look at the Cosmos, but change he did! Both through his sheer brilliance and his amazing grit and determination in the face of challenges! The world of science has been left in a gaping "Black Hole" with the passing away of Stephen Hawking at the age of 76. Not only was he considered one of the greatest theoretical physicists after Einstein, but he was also the most famous disabled person suffering from a motor neurone disease. In this regard, all of us at livelihoods are going to celebrate his life and pay our respects to the genius through this article on him.



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Introduction: Stephen William Hawking, the iconic British theoretical physicist, cosmologist and author, died on 14 March 2018 at his home in Cambridge at the age of 76. His remarkable works in the fields of cosmology, his efforts especially in helping us unravel the mysteries behind myriad subjects such as black holes, Big Bang, general relativity, quantum physics, time, universe, theory of everything etc., are extraordinary. For a man who was diagnosed with a terminal illness at the age of 21 and was told he would live only around 2 or 3 years, he certainly did make the extra years count through his outstanding work.

Early life: Hawking was born on 8 January 1942 at Oxford, England in a well-educated family. Hawking's father and mother studied at University of Oxford. Academically, Hawking had no special aptitude in school initially. In fact, he couldn't read properly even by the age of 8! In school, he was bored by normal course work but was very creative in his thinking, creating games, crackers and computers along with his friends. His teachers could guess that he was something different. What changed his direction towards maths was being taught by a Mathematics teacher who inspired him and made him love the subject.

Therefore, he hoped to study mathematics, but as his father wanted him to study in Oxford, where mathematics wasn't available, he chose to study physics instead. At first, he found his time at Oxford to be boring; he realised he didn't need to study as much as his peers, as the coursework was too easy for him. But slowly he found he excelled at extracurricular activities such as rowing for the college Boat Club and started gelling with college mates and became popular due to his wit and liveliness. However, because he didn't put in an effort to study more, he found that the exams weren't that easy after all. His marks were hovering between a first class and second class degree which made him really worried because the Cosmology course at Cambridge that he had his eye on took only students who got first class. But during the viva, the examiners recognized his brilliance and gave him first class.

Achievements: Hawking joined Trinity Hall, Cambridge and was supervised by Dennis Sciama, the famous cosmologist. But the course work was pretty challenging even for Hawking, but he thrived under the challenge. Soon after, he met Jane Wilde (his future wife and mother of his 3 children) and began dating her. Life was looking good for Hawking until he started developing some symptoms and got diagnosed with amyotrophic lateral sclerosis (ALS or "Lou Gehrig's disease"), a degenerative disease. Not only was he told that he had not long to live, but also that he will slowly lose all neuromuscular control over his entire body. This led to Hawking losing interest in studies and life

<u>Awards received by Hawking</u>
Adams Prize (1966)
Eddington Medal(1975)
Maxwell Medal and Prize (1976)
Heineman Prize(1976)
Hughes Medal (1976)
Albert Einstein Award(1978)
RAS Gold Medal(1985)
Dirac Medal (1987)
Wolf Prize (1988)
Prince of Asturias Award (1989)
Andrew Gemant Award (1998)
Naylor Prize and Lectureship (1999)
Lilienfeld Prize (1999)
Albert Medal (1999)
Copley Medal (2006)
Presidential Medal of Freedom (2009)
Breakthrough Prize in Fundamental Physics (2012)
BBVA Foundation Frontiers of Knowledge Award (2015)
Source: Wikipedia

and becoming depressed. After a while, Hawking realised that he had so much left to do before he died and decided he didn't want to waste his precious time. Moreover, his health condition didn't deteriorate as fast as was predicted; though there was loss of control on muscles, he was out of danger for the moment. He and his girlfriend Jane decided to get engaged. So with his mentor's support and his fiancée's motivation, who stuck by him through his struggle both physically and emotionally, he got back to his PhD studies. Hawking once



mentioned, "Getting engaged lifted my spirits and I realised, if we were going to get married, I had to do a job and finish my PhD. I began to work hard and I enjoyed it." During that time he came across Roger Penrose's theorem regarding space-time singularity in black holes and decided to write his thesis on singularities in the universe. He got married in 1965 and got his PhD an year later. He became a Research Fellow and soon a Professorial Fellow at Gonville and Caius College, Cambridge. He joined as faculty in Institute of Astronomy in Cambridge in 1968. He continued working on singularities with Penrose and by 1970 published a paper with proof that Universe must have started as a singularity. In 1973, Hawking started working in the Department of Applied Mathematics and Theoretical Physics. His particular interest in black holes kept him busy and by 1974 he proposed that black holes weren't totally black but emitted radiation known as Hawking radiation and he also came up with the formula for their entropy (a measure of disorder). It was a Theory that shook the scientific world and led to a lot of debates (it wasn't until much later after further research that the scientific world would agree he was right). He was of the opinion that to know what happened during the Big Bang and to understand other mysteries it was necessary to come up with a single "Theory of Everything" through combining General Relativity and Quantum theory.

Immediately after his breakthrough with black hole radiation, he became a member of Fellow of the Royal Society. In 1979, he became the Lucasian Professor of Mathematics (a post he would retire from in 2009) at Cambridge, a prestigious post that was held by the likes of Isaac Newton.

His research and work was on a wide variety of subjects such as string theory, quantum gravity and cosmology, cosmic inflation, "large N" cosmology, the density matrix of the universe, unification theory of physics, wormholes, no-boundary theory etc.

Disability versus determination: Looking at his achievements and contributions, one cannot gauge the intensity of his affliction, not that he would want anyone to notice it too much. He once stated that, "I would like to be thought of as a scientist who just happens to be disabled, rather than as a disabled scientist." But disability and the battles associated with it, especially of such a distinguished person, need

"Remember to look up at the stars and not down at your feet," Hawking said. "Try to make sense of what you see and about what makes the universe exist. Be curious."

to be put out there to raise awareness about them and for promoting better facilities for the disabled and for further research. After the initial diagnosis of his disease in 1963, Hawking started walking with the support of crutches, with speech slightly slurred, and continued his research with renewed vigour. He has often stated that before being diagnosed ALS he was bored with life, but the fact that he may not live long drove him to study hard

and work harder. His wife Jane Hawking supported him thoroughly by managing home life and kids, and also helping him out.

By 1969, he had trouble walking but he resisted using a wheelchair to go about until the last moment.

Due to his health, it was really getting tough for him to do his daily chores without assistance, his wife assisted in doing basic chores, but he refused extra help; but only after much coaxing did he let his students help him and Jane out. His refusal to take nursing services meant that his wife had to take care of him, home and children. His speech was difficult to understand for everyone except for his close friends, colleagues and family, but that didn't stop him from working on his passion. He kept travelling and teaching at different universities the world over.

But by 1979 his health continued deteriorating and slowly he lost total control of his legs and hands and he began needing nursing services. The use of electric wheelchair, which he operated it by using fingers to manoeuvre the joystick to move, made him a bit independent in roaming around the campus and home. He continued attending lectures in various countries and debating on his favourite subjects. Unfortunately, he lost his voice in 1985 when after a trip to CERN Geneva, he caught pneumonia and had to be put on life support. On his wife's insistence on not withdrawing life support, the doctors performed an emergency tracheotomy, through which a tube was placed in his windpipe for him to breathe. Through he made a recovery, the loss of voice was a blow to him. So much of his ideas needed to be shared, but how? At first, he started using a rough system of blinking to select the letters written on a placard. But fortunately, technology came to his aid soon. A California-based technology company helped him through their software that turns the letters he touches through his fingers on a pad into voice. He now could type at 15 words per minute. This improved his life a lot and he felt that he was able to communicate better than before he lost his voice. A mobile computer was attached to his chair so that he could "talk" everywhere he went. From 1997, Intel had been helping him out with the computers. But by 2009 his fingers became too weak to click, so a cheek sensor was developed by his student through which he could type, but even using that sensor became tough due to lessened muscular movement and became very slow, so much so that he could type a small sentence in 20 minutes. Imagine a mind that could make theories about objects light years away from earth, having to communicate at one word per minute. Upon hearing of his plight, the people at Intel immediately started working on helping him out. They developed a predictive software that was programmed with his earlier works so that it could correctly and rapidly predict what he wanted to type with his cheek faster. In his last few years he wasn't able to drive his wheelchair any longer. But his drive to work hard never wavered!

He was considered one of the most inspirational disabled people in this century and has been a role model for many people to overcome their hurdles, whatever they might be. His participation and speech at the 2012 London Paralympics was one among the highlights of the games and gives us a glimpse of the man.

"The Paralympic Games is also about transforming our perception of the world. We are all different. There is no such thing as a standard or run-of-the-mill human being, but we share the same human spirit. What is important is that we have the ability to create. This creativity can take many forms, from physical achievement to theoretical physics. However difficult life may seem, there is always something you can do and succeed at."

Personal life and personality: Stephen Hawking has been married and divorced twice. His first wife Jane and he divorced in 1990 following problems. The burden of being a great physicist with a motor neurone disease and the added strain of celebrity status became too much for Jane and him to handle. They had been married for 25 years before they divorced, but even until his death they had been friends. He married a nurse of his, Elain Mason, in 1995 but they divorced in 2005.

Hawking has been called determined and obstinate by his close family members and friends due to his unwillingness to accept defeat. He had a great sense of humour and loved stubbing on people's toes literally with his notoriously rash wheelchair driving abilities and figuratively by getting into debates with colleagues. In true British spirit, he loved betting, but unlike the masses he preferred betting on scientific matters with his colleagues the world over. Many of which he lost! He loved travelling and this quote sums up his love for it, "The downside of my celebrity is that I cannot go anywhere in the world without being recognized. It is not enough for me to wear dark sunglasses and a wig. The wheelchair gives me away." Hawking had been a lifelong socialist. He allegedly declined knighthood in the 90s to protest against the government's cost cutting on scientific research funding. He was a strong supporter of NHS in Britain saying he couldn't have survived without free health coverage and vehemently opposed privatization of the scheme.

Celebrity status: Though he was considered one of the greatest minds on the planet and there were no dearth of awards, the fact was, he didn't have enough money to fund his children's college education or afford his increasing nursing care. So he decided on writing a book on the concepts of space time and physics and to earn some money. Though he wasn't new to writing books (he had written many scientific books with his colleagues), this time he wanted to write a book which even a layman could understand. His book, A Brief History of Time, released in 1988 and went on to become a best seller. By that time, people around the world had heard about his work and also about his unique personality. The idea of a man who couldn't move and talk but could unravel the mysteries of the universe caught the frenzy of the world. He became an inspiration for many. Whenever he had time left over from his works, he continued writing popular science books.

Hawking has garnered a cult status and has been the subject of many documentaries. A Hollywood film was made on Hawking in 2014 called "The Theory of Everything" (a reference to his unification theory), which won Eddie Redmayne an Oscar for portraying him. Hawking has also made appearances in popular shows and movies as himself in Big Bang Theory, Star Trek, The Simpsons. He has been to Antarctica and had wished to travel to space one day. He has been on a zero gravity flight in 2007.

His views on life, universe and everything: Hawking was a man with strong views on a wide variety of issues and didn't mind expressing them out loud.

On the need to colonise other planets- "It will be difficult enough to avoid disaster in the next hundred years, let alone the next thousand or million...Our only chance of long-term survival is not to remain inward-looking on planet Earth, but to spread out into space."

On extra-terrestrials - "If aliens visit us, the outcome would be much as when Columbus landed in America, which didn't turn out well for the Native Americans." On Artificial Intelligence and need for wealth redistribution- "If machines produce everything we need, the outcome will depend on how things are distributed. Everyone can enjoy a life of luxurious leisure if the machine-produced wealth is shared, or most people can end up miserably poor if the machine-owners successfully lobby against wealth redistribution. So far, the trend seems to be toward the second

Popular Science Books

1. **A Brief History of Time (1988)**
2. **Black Holes and Baby Universes and Other Essays (1994)**
3. **The Nature of Space and Time (1996)**
4. **The Universe in a Nutshell (2001)**
5. **The Future of Space-time (2002)**
6. **On the Shoulders of Giants (2002)**
7. **The Theory of Everything (2002)**
8. **God Created Integers: The Mathematical Breakthroughs that Changed History (2005)**
9. **The Grand Design (2010)**
10. **The Dreams That Stuff Is Made Of (2011)**
11. **The Origin of (Almost) Everything (2016)**

Hawking co-authored many children's book with his daughter, Lucy Hawking.

option, with technology driving ever-increasing inequality." On God- "I believe the universe is governed by the laws of science. The laws may have been decreed by God, but God does not intervene to break the laws."

Conclusion: Stephen Hawking was man a born to be a genius; coincidentally, Hawking was born on the 300th death anniversary of Galileo Galilei and passed away on the 139th birth anniversary of Albert Einstein. Hawking has not only managed to make a mark in the field of theoretical physics, but has also managed to put disability and its issues on the radar of media and common people. On one side are his achievements and discoveries about the universe, and on the other hand are his will power and strength in overcoming of difficulties in life with motor neurone disease.

He had mentioned that his disability enabled him to ponder on the meaning of life and try to answer a lot of the questions about the cosmos. Hawking had always preferred the attention to be on his work rather than on his disability. Stephen Hawking's story doesn't need disability to be thought of as remarkable! Doing so might be construed as the world trying to undermine his extraordinary work, but being able to produce this work along with fighting for day to day survival with ALS or motor neurone disease, certainly succeeds in providing us much-needed perspective about a great man.

His work, life and positive outlook can be understood by the following quote of his -

"The message of this lecture is that black holes ain't as black as they are painted. They are not the eternal prisons they were once thought.

"Things can get out of a black hole both on the outside and possibly to another universe. So if you feel you are in a black hole, don't give up – there's a way out."

He continued to work until he breathed his last and presented various theories on various subjects including the multiverse theory etc. Who knows, he may get a Nobel Prize yet! ❖