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The Life of George Gamow



George Gamow [Georgi Antonovich Gamow, "Geo" to his friends] was a great physicist, he was one of the men who "created" the theory of Big bang. George Gamow was born in 1904 the 4th of mars in Odessa, Russia. His father was a secondary schoolteacher. In early school-years Gamow became very fascinated by astronomy, on Gamow's thirteenth birthday his father gave him a telescope, in which he patiently studied the stars. Quite early Gamow decided to become a scientist.

From 1922 - 1923 he studied at Novorossia University, in his hometown. During the years of 1923-1929 he studied optics and cosmology at the University of Leningrad. In 1926 he attended summer-school in Göttingen in Germany. And trough his research he was able to solve and show the answers to ten mysterious phenomenon of natural radioactivity. [E.g. he developed his quantum-theory of radioactivity, the first successful explanation of the behaviour of radioactive elements, some of which decay in seconds, while other decay over thousands of years.] He also experimented on the induced transformation of light elements by Lord Rutherford.

In 1928 he received his Ph. D degree from the University of Leningrad. Later in 1929 he went to Copenhagen. When George told Niels Bohr about his studies, Niels became very interested in his work. Niels offered him a scholarship from the Royal Danish Academy to study one year at the Institute of Theoretical Physics. Where George proposed a hypothesis that the atomic nuclei can be treated as little droplets of "nuclear fluid". These discoveries led to today's theory of fusion and fission.

Gamow's fame as a physicist began with his theory that explained the radioactive alpha particle decay of atomic nuclei.

1929-1930 -Rockefeller Fellow, Cambridge University.

Then he co-operated with F. Noutermans and R. Atkinson, in attempts to apply his formula for calculating the rate of induced nuclear transformation (thermonuclear reaction) in the interior of the stars. This formula is today being successfully used to design Hydrogen-bombs, and in studies of the possibility of controlled thermonuclear reactions, fusion. He also visited Lord Rutherford, and his research-group at the Cavendish Laboratories in Cambridge.

At the year of 1931 Gamow was recalled to the Sovjet Union to become Master of Research at the Academy of Science in Leningrad. The same year he got married to Luybov Vokhminzeva [divorced in 1956]. In 1935 Gamow's son was born and he was called Rustem Igor.

In 1933 Gamow got permission from the Sovjet-government to attend the Solvay Congress in Brussels. By mistake the Sovjet-government allowed Luybov to go along as Gamow's secretary, and they saw their chance to escape to the west. Gamow and his wife had trouble getting visum in Solvay, so instead of staying there, they visited Institute de Pierre Curie 1933-34. At the same time Gamow was visiting professor at the University of London. When Gamow still was in Europe he got an invitation to lecture at the University of Michigan in 1934. So instead of going back to the Sovjet Union or staying in Europe Gamow and his wife travelled to America. Finally he was offered the Chair of Physics at George Washington University, and he taught there from 1934 to 1956.

During the second world war Gamow was concerned with the Manhattan project, developing an atomic-bomb. Gamow among other physicists contributed with the research at Los Alamos, which finally led to the production of the Hydrogen-bomb.

Gamow's contribution to the astronomy-research is mainly concerning the origin of the Universe and the stars evolution. Gamow used Hans Bethe's model of stars as startingpoint for his own research. Bethe's model of the stars was formulated so that heat and radiation is generated in the cores of stars (thermonuclear reactions), and postulated that a star heats up -rather than cools down as i "fuel" is consumed. Gamow also developed the theory for the internal structure of red giants (large stars). Gamow's most famous contribution to astronomy stated with his research and theories supporting Abbé Georges Lemaître's "big bang -theory".

The Big bang -theory meant that the Universe was created trough a "explosion" a very long time ago, and that the galaxies was a result of it finally he meant that the Universe is expanding. The "war" between the men behind the Steady state -theory and the Big bang -theory was obvious. The Steady state -theory was created by Hermann Bondi, Thomas Gold and Fred Hoyle. Its idea mostly consisted by the thought that the always had been there, and that everything had been and is created by the same kind of special matter. According to this theory no such thing as a "big bang" ever occurred. A quite amusing part in this little "war" between the two theories was that when Fred Hoyle performed in radio, with the intention to outrage "the awful theory of the creation of the Universe", he called it "the Big bang -theory", because in Hoyle's meaning it sounded stupid and silly. Ever since, people have thought that it was the best name ever mentioned to describe what the theory meant, so it became known as the Big bang -theory. [Although it's said that Gamow himself wasn't too font of the name.]

During Gamow's years of being a successful physicist he was also well known as an author. He wrote a number of popular-scientific books. Gamow created his own character, Mr Tompkins, quite an odd man, who Gamow used to explain his theories with. Gamow explained complex and difficult theories in a simple way, only using maths when it's really essential. His works such as "Tompkins in Wonderland," which explained the general theory of relativity, enjoyed many people.

A poem written by George and his wife, describing mainly Fred Hoyle's aversion to accept the facts, published in Mr Tompkins in wonderland.

*"Your years of tiol"
Said Ryle to Hoyle
"Are wasted years, believe me
The steady state
is out of date
unless my eyes deceive me*

*My telescope
has dashed your hope;
Your tenest are refuted
Let me be terse:
Our Universe
Grows daily more diluted!"*

*Said Hoyle, "You quote
Lemaître, I note
And Gamow, well, forgett them!
That errant gang
And their Big bang
Why aid them and able them?*

*You see, my friend
It has no end
And there was no beginning
As Bondi, Gold
and I will hold
Until your hair is thinning!"*

*"Not so!" cried Ryle
With rising bile
And straining at the tether;
"Far galaxies
Are, as one sees,
More tightly packed together!"*

*"You make me boil!"
Exploded Hoyle,
His statement rearranging
"New matter is born
Each night and morn.
The picture is unchanging!"*

*"Come off it, Hoyle!
I aim to foil
you yet"
"And in a while"
Continued Ryle
"I'll bring you to your senses!"*

In Washington Gamow collaborated with Edward Teller with the theory of beta-decay, a nuclear process, in which an electron is emitted. Together they formulated the so-called "Gamow -Teller selection rule for beta-emission".

Gamow used his knowledge of nuclear-reactions to interpret stellar evolution, collaborating with Teller on a theory of the internal structure of red giants, in 1942. From his work on stellar evolution, Gamow postulated that the Sun's energy results from thermonuclear process.

Together with Mario Schoenberg he developed the theory of the so-called Urca process.

In 1948 Gamow and his colleague Ralph Alpher wrote a text about the Big bang -theory and how matter would have come to existence. [Gamow proposed that the matter of the Universe originally existed in a primordial state called the "Ylem," and that Helium and perhaps other elements were formed from the Ylem shortly after the big bang had started the Universe's expansion.] Gamow had a great sense of humour so he invited his friend Hans Bethe to join the list of authors. The text was then called Alpher -Bethe -Gamow Theory (or alpha -beta - gamma theory).

Gamow released a theory titled "Space - the Big Ball of Fire." Gamow's theory proposed that space initially expanded through extreme heat and pressure, then cooled down. At the time, such a theory was unprecedented. But in 1965 2.7K black radiation was discovered, which proved that the Universe started and expanded after a massive explosion that caused extreme heat and pressure.

1954 -Visiting Professor, University of California, Berkeley

DNA

In his last years Gamow researched and experimented in biology. Gamow solved the mysteries of the DNA-coding system. In 1954 he proposed an important theory concerning the

organisation of genetic information in the living cell. His theory showed what the DNA-structure looked like. Gamow was the first to suggest that its nucleotide groups were coded information for the construction of proteins.

He envisioned the relationship between DNA structure and protein synthesis as a numerical cryptanalytic problem. Gamow surmised that the goal for scientists was to learn how a long sequence of 4 nucleotides determines the assignment of long protein sequences composed of 20 amino acids. Gamow published a short piece in the October 1953 issue of Nature that proposed a solution called the "diamond code", an overlapping triplet code based on a combinatorial scheme in which 4 nucleotides arranged 3-at-a-time would specify 20 amino acids. Somewhat like a language, this highly restrictive code was primarily hypothetical, based on then-current knowledge of the behavior of nucleic acids and proteins.

Gamow's coding scheme generated a great deal of enthusiasm among other scientists. To foster communication and camaraderie, Gamow founded the RNA Tie Club, a group of 20 hand-picked scientists corresponding to the 20 amino acids who would circulate notes and manuscripts on the coding problem and (not inconsequentially) consume wine, beer, and whiskey at periodic meetings. Each member of the club was given the moniker of an amino acid, and all were presented with a diagrammed tie and tiepin made to Gamow's specification. Although geographically dispersed, the Tie Club brought physical scientists and biologists together to work on one of the most challenging and important problems in modern science.

By mid-1954, Gamow had accepted that his diamond code was not accurate, yet he and others continued to deliberate over the various codes presented by disparate researchers. In truth, the notion of a "code" as the key to information transfer was not articulated publicly until late 1954, when Gamow, Martynas Ycas, and Alexander Rich published an article that defined the code idiom for the first time since Watson and Crick casually mentioned it in a 1953 article. /

Gamow was in 1956 awarded Kalinga Prize by UNESCO for popularisation of science.

In 1958 Gamow married Barbara Perkins, his publisher from Viking press.

In 1956 Gamow became professor at the University of Colorado, he stayed there until his death in 1968 the 19th of August. It's said that before he died he said "Finally my liver is presenting the bill.", summing up a life of carefree drinking, eating, good humour, sports and an unusual friendly egoism. His attitude to physics was larger than life, and he was known for finding the right scientific topics for research and introducing conceptual simplicity to them.

1965 -Overseas Fellow, Churchill College, Cambridge University

The George Gamow Memorial Lectures were initiated by the Department of Physics and Mrs. Barbara Gamow after the death of her husband. The lecture series is now maintained by a request to the Regents of the University of Colorado from the Will of Mrs. Barbara Gamow, who died in December 1975.

The George Gamow Tower of the University's Duane Physical Laboratories building was named in his honour.

