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## Curriculum Vitae Professor Dr Karl Waldemar Ziegler

**Name:** Karl Waldemar Ziegler  
**Life Dates:** 26 November 1898 to 11 August 1973

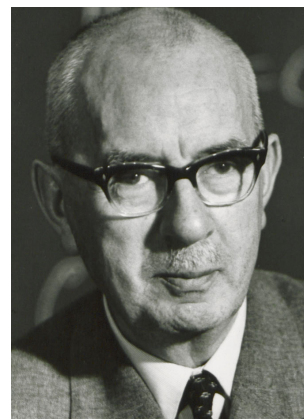


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Karl Ziegler was a German Chemist. He studied trivalent carbon and four-membered rings, as well as organo-alkali compounds, which eventually led him to research organometallic compounds. The Wohl-Ziegler bromination, a method used in preparative chemistry that enables the selective allylic bromination of olefins, is named after him. He also managed to synthesise various organic compounds, such as cantharidin (a poisonous substance secreted by the Spanish fly) and ascaridole. The Ziegler-Natta catalyst used in producing synthetic materials that also bears his name became the basis for the mass production of synthetic materials. For their discoveries in the field of chemistry and technology of high polymers, Karl Ziegler and Italian chemist Giulio Natta were jointly awarded the Nobel Prize in Chemistry in 1963.

### Academic and Professional Career

In the summer semester of 1916, Karl Ziegler enrolled at the University of Marburg to study chemistry. His mandatory military service interrupted his studies in the spring of 1918. After being discharged from the military, he returned to university in the spring of 1919. He started out working on organic chemistry and wrote his dissertation on the topic of "Semibenzenes and Related Compounds" ("Semi-Benzole und verwandte Verbindungen"), for which he was awarded his doctorate with distinction at the end of the summer semester of 1920. He then went on to become an assistant at the chemical institute at the University of Marburg. Until 1924, he worked for the department for organic chemistry, where he was mainly involved in teaching. Later, he also taught at the department of inorganic chemistry, as well as in the subjects of medicine and natural sciences. By the end of 1923, he earned his qualification to become a professor (Habilitation) in Marburg with his

work entitled “Researching trivalent carbon: On tetraarylallyl-type radicals and their derivatives” („Zur Kenntnis des dreiwertigen Kohlenstoffs: Über Tetraarylallylradikale und ihre Abkömmlinge“).

From 1925 to 1926, Ziegler worked at the Institute of Physical and Theoretical Chemistry at Goethe University Frankfurt. In 1926, he became an assistant at the of Chemistry at Heidelberg University, where he earned another habilitation and was appointed Associate Professor in 1928. In 1936, he worked as a visiting lecturer at the University of Chicago in the United States. In October of the same year, he joined Martin Luther University Halle-Wittenberg as interim professor for chemistry, where he was appointed professor ordinarius in chemistry in March 1938. Ziegler eventually left Halle in 1945.

In 1943 he was offered the position of head of the Kaiser Wilhelm Institute for Coal Research (later renamed Max Planck Institute) in Mülheim an der Ruhr. At first, Ziegler had doubts about his transfer to Mülheim, and only accepted the offer once he had been guaranteed to work in the field of chemistry of carbon compounds. The institute in Mülheim was especially reorganised to accommodate Ziegler’s research interest. In 1946, Karl Ziegler co-founded the German Chemical Society and in 1949, he was appointed Adjunct Professor at the RWTH Aachen University. In the same year, he became president of the German Chemical Society, a position he held until 1951. In 1952, he was visiting lecturer at the University of Wisconsin-Madison and the University of Illinois Urbana-Champaign in the United States. He also served as President of the German Society of Mineralogy and Coal Chemistry from 1954 to 1957. Between 1955 and 1957, he served as head of the Chemistry, Physics and Technology Section of the Max Planck Society.

In 1953, Ziegler registered a patent for the production of high molecular weight polyethylene at standard temperature and pressure using organometallic mixed catalysts. This invention boosted the industrial production of synthetic materials. In 1963, Ziegler and the Italian Giulio Natta received the Nobel Prize in Chemistry for this achievement.

In 1969, Ziegler retired from his position as head of the Max-Planck-Institut für Kohlenforschung in Mülheim an der Ruhr. Until 1971, he still held his position as president of the North Rhine-Westphalian Academy of Sciences, Humanities and the Arts in Düsseldorf.

### **1963 Nobel Prize in Chemistry**

Ziegler’s basic research at the Mülheim institute for coal research soon found practical applications and gave way to new technical processes, such as the organometallic mixed catalysts made of aluminium and titanium compounds that became known as Ziegler catalysts. Ziegler catalysts were invented in 1953 and enabled the polymerisation of ethylene into polyethylene at standard pressure, a reaction which had previously required high pressure and a temperature of 200 degrees Celsius. Once Ziegler had been awarded a patent for this process, the production of synthetic materials continued to develop rapidly. For their discoveries in the field of chemistry and technology of high polymers, Karl Ziegler and Italian chemist Giulio Natta were awarded the Nobel Prize in Chemistry in 1963.

Thanks to its wear behaviour, polyethylene is nowadays used at an enormous scale. The patent as well as the licence fees for Ziegler's work generated considerable additional income for the Mühlheim institute.

On his 70th birthday, Ziegler donated 40 Million Deutsche Mark from licence fees to a research fund. The city of Mühlheim inherited his collection of paintings that he had established in 1958.

### **Honours and Awarded Memberships**

Karl Ziegler received numerous awards for his scientific achievements, such as the Liebig Medal of the German Chemical Society (1935), the Carl Duisburg Plaque (1953), the Lavoisier Medal of the Société Chimique de France (1955), the Werner von Siemens Ring (1961), the Nobel Prize in Chemistry (1963), the Swinburne Medal of The Plastics Institute, London (1964), the Great Cross of Merit of the Federal Republic of Germany (1964), the Order Pour le Mérite (1969), as well as the Wilhelm Exner Medal of the Austrian Trade Association (1971). Furthermore, he was inaugurated as Honorary Chief of the Ponca Indians, U.S.A (1959) and bestowed honorary citizenship of the city of Mühlheim an der Ruhr (1963).

Ziegler was a member of several academies and scientific committees, such as the Bavarian Academy of Sciences and Humanities in Munich, the Göttingen Academy of Sciences and Humanities, German National Academy of Sciences Leopoldina in Düsseldorf, the Chemical Society of Japan (1958) and the New York Academy of Sciences (1966). He was also an Honorary Senator of the Max Planck Society (1968), Foreign Member der Royal Society, London (1971), as well as Foreign Honorary Fellow of the Royal Society of Edinburgh (1972).

A number of universities awarded him Honorary Doctorates, among them the Gottfried Wilhelm Leibniz University Hannover (1951), the Universities of Giessen and Heidelberg (1958), as well as the Technical University of Darmstadt (1968).

### **About Karl Waldemar Ziegler**

Karl Ziegler was born on 26 November 1898 as the second son of the pastor Karl August Ziegler in Helsa near Kassel. He attended primary and secondary school in Kassel, and then transferred to the secondary school in Marburg, from which he graduated.

In 1922, he married Maria Kurtz from Marburg. The couple had two children: daughter Marianne and son Erhart. His daughter Marianne Witte, a medical doctor, became an honorary citizen of the city of Halle (Saale) in 2003, having supported the cemetery Stadtgottesackers' restoration by donating millions of euros from her father's inheritance.

Karl Ziegler died on 11 August 1973 in Mühlheim an der Ruhr.