

## Abstract

All materials in the universe, from nebula to atom, are strongly connected to the motion of rotation. The matter has a self-spinning characteristics which is called "spin" and seems to concern with stability of its existence and motion. The main subject of our collaboration is to make clear the origin of the nucleon spin which is an essential property of the elementary particles and nuclei. I will explain about this fundamental property "spin" of the nucleon and how to align the spin for high energy experiment and for application to other fields, before coming to the talk on the history of the early stage of the Bonn-Nagoya collaboration.



## Curriculum Vitae

### Naoaki Horikawa

Birth: January 3, 1940 in Ena-shi, Gifu-ken, Japan

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Subject: Physics/Elementary Particles

#### Education:

1962 – 1964 Graduate Course at the Faculty of Science, Nagoya University  
1967 Finishing of the Doctor Course at the Faculty of Science, Nagoya University  
1970 Doctor of Science (Nagoya University)

#### Positions:

1967 – 1968 Postdoc of JSPS (Japan Society for the Promotion of Science)  
1968 – 1973 Research Associate at the Faculty of Science, Nagoya University  
1973 – 1995 Associate Professor at the Faculty of Science, Nagoya University  
1995 Professor of CIRSE (Center for Integrated Research in Science and Engineering)  
2003 Retirement from Nagoya University  
2003 – Present Professor at the College of Engineering, Chubu University

#### Research stays abroad:

1977 – 1979 Invited Professor of the Bonn University by the Alexander von Humboldt foundation (2 years)

## Abstract

The purpose of elementary particle physics is to find the fundamental structure of matter and the laws that govern these objects. With the construction of large microscopes (particle accelerators) the world at the smallest scale down to 0,000.000.000.000.000.001 meter can be explored. Atoms are no longer thought to be elementary; the quarks have taken their place. Furthermore, various forces previously thought to be unrelated could be unified.

Besides the gravity, which dominates our everyday life, three additional forces or interactions are applicable to the microcosmos. They are the electromagnetic interaction, the weak interaction and the strong interaction, which are described by the Standard Model. The Standard Model has a very strong theoretical standing, because it is the only mathematical description, which takes into account both Einstein's theory of relativity and quantum mechanics. The Standard Model describes quarks, leptons and force-carrying particles. Quarks build, for instance, the protons and neutrons of the atomic nucleus. Electrons that form the outer casing for atoms are leptons and, as far as is known, are not constructed from any smaller constituents. The atoms join up to form molecules, the molecules build up structures and in this way the whole universe can finally be described.

Our German-Japanese cooperation is focused on experiments with spin polarized solid targets, to make contribution to the understanding of the strong interaction. Since the beginning of the 1970ies these studies have been performed at various accelerator facilities in Japan (INS-Tokyo; KEK-Tsukuba) and Germany (Bonn University; Mainz University). Since about 15 years the partner are active at CERN experiments in an international collaboration.

Presently there are successes with highly polarized materials in the field of medicine (Magnetic Resonance Imaging).

## Curriculum Vitae

### Werner Meyer

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Subject: Physics / Elementary Particles



### Education:

1967 – 1973 Study of physics at the “Friedrich-Wilhelm Universität Bonn”  
1973 – 1977 PhD study at the “Friedrich-Wilhelm Universität Bonn”, Germany, (supervisor: Prof. K.H. Althoff)  
1994 Habilitation at the “Friedrich-Wilhelm Universität Bonn”

### Positions:

1976 – 1995 Scientist at the “Physikalisches Institut der Friedrich-Wilhelm Universität Bonn”  
1995 Call to “Ruhr-Universität Bochum”, Germany  
1995 Call to “Johannes-Gutenberg-Universität Mainz”, Germany  
1995 C3-Professor at the “Ruhr-Universität Bochum”

### Research stays abroad:

1981 CERN (Switzerland – 4months)  
1986 Fellowship of the Japanese Society for the Promotion of Physics at Nagoya University (3 month)  
1991 – 1992 Stanford Linear Accelerator Center (USA – 15 months)  
1999 JSPS-Fellowship at the Nagoya University (2 months)  
2004 Thomas Jefferson National Accelerator-Facility (USA – 1 month)  
1999 JSPS-Fellowship at the Nagoya University (2 months)  
2004 Thomas Jefferson National Accelerator-Facility (USA – 2 months)  
2004 CERN (Switzerland – 1 month)