HANS-BETHE SYMPOSIUM (SYHB)

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ÜBERSICHT DER HAUPTVORTRÄGE UND FACHSITZUNGEN

(Hörsaal HV)

Hauptvorträge

SYHB 1.2	Mo	14:15	(HV)	**Quantum Electrodynamics and Nuclear Astrophysics**, E.E. Salpeter
SYHB 1.3	Mo	14:50	(HV)	**Hans Bethe and the Nuclear Age**, K. Gottfried
SYHB 1.4	Mo	15:25	(HV)	**Theory of the Passage of Energetic Charged Particles through Matter: An Early Application of Quantum Mechanics**, E. Merzbacher
SYHB 2.1	Mo	16:30	(HV)	**Bethe's Legacy in Nuclear Physics: From Nuclear Structure to Nuclear Matter**, W. Henning
SYHB 2.2	Mo	17:05	(HV)	**Hans Bethe's Role in Solid State Physics**, H. Thomas
SYHB 2.3	Mo	17:40	(HV)	**The Implication of Bethe's Equation to Radiation Biology and Therapy**, G. Kraft

Fachsitzungen

SYHB 1	**Hans-Bethe Symposium I**	Mo 14:00–15:55	HV	SYHB 1.1–1.4
SYHB 2	**Hans-Bethe Symposium II**	Mo 16:30–18:10	HV	SYHB 2.1–2.3

Fachsitzungen

– Hauptvorträge –

SYHB 1 Hans-Bethe Symposium I

Zeit: Montag 14:00–15:55 Raum: HV

SYHB 1.1 Mo 14:00 HV

Introduction — •R.M. Dreizler — S. Lyson Professor Emeritus, J.W. Goethe Universität, Frankfurt

Hauptvortrag SYHB 1.2 Mo 14:15 HV

Quantum Electrodynamics and Nuclear Astrophysics — •E.E. Salpeter — J.G. White Professor Emeritus, Cornell University, Ithaca

Up to 1947 quantum electrodynamics was cumbersome beset by singularities and by the Lamb shift crisis. Hans Bethe's simple formulation of renormalization theory gave a good solution to the Lamb shift problem.I will give personal reminiscences on the importance of his 1947 paper. After Feynman's version of relativistic QED Hans and I formulated a fully relativistic equation for bound state problems. The application to states with a very large binding energy proved to be difficult,but we managed to use the Bethe-Salpeter equation for relativistic corrections to atomic energy levels.

Hans's two papers in 1938/39 on thermonuclear hydrogen burning reactions showed how the sun and other main sequence stars obtain energy for their luminosity.I will give some history leading up to these papers and of the follow up in the 1950s and 60s on energy production in more evolved stars, involving nuclear reactions of heavier elements .

Hauptvortrag SYHB 1.3 Mo 14:50 HV

Hans Bethe and the Nuclear Age — •K. Gottfried — Cornell University, Ithaca

The lecture will describe the central role played by Bethe in the development of the world's first nuclear fission weapons during World War II; his participation in the invention of the hydrogen bomb; his role as a high-level adviser to the government of the United States; his arms control initiatives; and his outspoken critiques of the policies of the United States regarding nuclear weapons and ballistic missile defense.

Hauptvortrag SYHB 1.4 Mo 15:25 HV

Theory of the Passage of Energetic Charged Particles through Matter: An Early Application of Quantum Mechanics — •E. Merzbacher — Kenan Professor Emeritus, University of North Carolina, Chapel Hill

With his doctoral training complete in 1928, Hans Bethe was poised to apply the new quantum mechanics to atoms, solids, nuclei and particles. I will focus on Bethe's influential and enduring theoretical study of atomic collisions, initially formulated in his 1930 article in Annalen der Physik, and reviewed in his 1933 review in the Handbuch der Physik. I will attempt to place this paper in its historical context, summarizing earlier work on atomic cross sections and stopping power, and briefly describing the impact Bethe's theories have had on our understanding of the interaction of charged particle beams with target atoms.

SYHB 2 Hans-Bethe Symposium II

Zeit: Montag 16:30–18:10 Raum: HV

Hauptvortrag SYHB 2.1 Mo 16:30 HV

Bethe's Legacy in Nuclear Physics: From Nuclear Structure to Nuclear Matter — •W. Henning — GSI, Wixhausen and J.W. Goethe Universität, Frankfurt

For more than seven decades Hans Bethe has made fundamental contributions to the understanding of matter that is governed by the strong - the nuclear - interaction. His seminal work in nuclear structure and nuclear matter work ranges from the understanding of the nuclear force, of few nucleon systems and their dissociation properties - and thus their relevance for nuclear reactions and nuclear astrophysics - to important aspects of many-body theory and to the properties of extended nuclear matter as, for example, found in supernovae and neutron stars. Some of the questions are still at the forefront of today's nuclear physics research, in particular when pushing nuclei and strong interaction systems to the extremes, such as in isospin and for nuclei far off stability, for highly compressed and excited nuclear matter, and for phase transitions involving new forms of matter.

Hauptvortrag SYHB 2.2 Mo 17:05 HV

Hans Bethe's Role in Solid State Physics — •H. Thomas — Universität, Basel

Hans Bethe started his scientific career with the theory of the newly discovered electron diffraction by crystals and with work on the electron theory of metals, but soon other areas attracted his interest. Nonetheless, his contributions to solid-state physics have had a lasting influence on this field. In particular, the famous "Bethe ansatz"used for calculating the eigenstates of the one-dimensional ferromagnet, including bound states of two or more spin waves, has proved to be a powerful tool for a large variety of problems and is very much alive today. Further, the "Bethe approximation"in the theory of order-disorder transitions, as well as the "Bethe lattice"for which it becomes the exact solution, have been and are being applied to a multitude of problems in statistical physics. And last but not least, the "Elektronentheorie der Metalle"by Arnold Sommerfeld and Hans Bethe in the Handbuch für Physik has been a source of wisdom for generations of solid-state physicists.

Hauptvortrag SYHB 2.3 Mo 17:40 HV

The Implication of Bethe's Equation to Radiation Biology and Therapy — •G. Kraft — GSI, Wixhausen und Technische Universität, Darmstadt

Bethe's theory of the passage of fast particles through matter explains the increase of particle interaction with decreasing velocity. This effect is the basis for a larger energy deposition at the end of macroscopic particle beams as used in tumor therapy.

The increase in interaction density in each particle track is in addition the reason for an enhanced production of local DNA damage yielding clusters of lesions. At a certain ionisation density the magnitude of clustered lesions exceeds the cellular repair capacity and yields cell death.

In carbon tumor therapy both effects, the high dose and the enhanced relative biological effectiveness in the tumor produce outstanding clinical results. In particle biology, heavy ions can be used to study the kinetics of DNA repair processes.