

TABLE OF CONTENTS

Dedication	vi
Preface	xiii

VOLUME I

NATIONAL ACADEMY OF SCIENCES PLENARY: PRELUDE TO THE FIRST CHAIN REACTION—1932 TO 1942

Chairman: *Edoardo Amaldi*
(*Univ of Rome-Italy*)

Fiftieth Anniversary of Nuclear Fission, <i>Emilio Segrè (LBL)</i>	2
The Prelude to Fission, Italy, <i>Edoardo Amaldi (Univ of Rome-Italy)</i>	10
50 Years with Nuclear Fission, April 25–28, 1989. A Prelude to Fission: France, <i>Pavle Savić (Serbian Academy of Sciences and Arts-Yugoslavia)</i>	20
How Fission Was Discovered, <i>Siegfried Flügge (Univ of Freiburg-FRG)</i>	26
The Early French Program, <i>Bertrand Goldschmidt (CEA Paris-France)</i>	30
Early Work in Copenhagen and England, <i>Rudolf Peierls (Nuclear Physics Laboratory-England)</i>	35
The First Nuclear Chain Reaction, <i>Walter H. Zinn (GNEC-retired)</i>	38

NATIONAL ACADEMY OF SCIENCES PLENARY: EARLY FISSION RESEARCH—NUCLEAR STRUCTURE AND SPONTANEOUS FISSION

Chairman: *Glenn T. Seaborg (LBL)*

Fission in 1939: The Puzzle and the Promise, <i>John A. Wheeler (Princeton Univ/Univ of Texas-Austin)</i>	45
-----------------------------------------------------------------------------------------------------------------	----

Soviet Research into Nuclear Fission Before 1942, <i>Georgy N. Flerov (Joint Inst for Nuclear Research-USSR)</i>	53
------------------------------------------------------------------------------------------------------------------------	----

The Early Japanese Program, <i>P. K. Kuroda (EPA/Univ of Nevada)</i>	60
----------------------------------------------------------------------------	----

Personal Reminiscences of the Kaiser Wilhelm Institute, Berlin, 1937/38 and of the Nuclear Project in Canada, 1944/56, <i>Leslie G. Cook (ERE)</i>	69
----------------------------------------------------------------------------------------------------------------------------------------------------------	----

Nuclear Shell Structure and Fission, <i>V. Strutinsky (INR-USSR)</i>	73
----------------------------------------------------------------------------	----

Spontaneous Fission of the Heaviest Elements, <i>Darlene C. Hoffman (LBL)</i>	83
-------------------------------------------------------------------------------------	----

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY PLENARY: 50 YEARS OF FISSION, SCIENCE, AND TECHNOLOGY

Chairman: *John A. Wheeler (Princeton Univ/
Univ of Texas-Austin)*

Nuclear Fission and the Transuranium Elements, <i>Glenn T. Seaborg (LBL)</i>	95
------------------------------------------------------------------------------------	----

Fission Technology: Retrospect and Prospect, <i>Alvin M. Weinberg (IEA)</i>	103
-----------------------------------------------------------------------------------	-----

REACTORS I

Chairman: *John J. Taylor (EPRI)*

Advanced Reactors: A Retrospective, <i>Chauncey Starr (EPRI)</i>	111
------------------------------------------------------------------------	-----

The BWR and the Start of the Nuclear Power Era, <i>Bertram Wolfe (GE Nuclear Energy)</i>	119
------------------------------------------------------------------------------------------------	-----

PWR History & Evaluation, <i>John W. Simpson (Energy Consultant)</i>	123
----------------------------------------------------------------------------	-----

History and Evolution of the Breeder Reactor, <i>Rémy Carle (EdF-France)</i>	130
------------------------------------------------------------------------------------	-----

FISSION SCIENCE I

Chairman: *W. Swiatecki (LBL)*

Theoretical Nuclear Fission: The Evolution of the First Fifty Years, <i>James J. Griffin (Univ of Maryland)</i> . . .	137
Dynamics of Fission, <i>J. Rayford Nix (LANL)</i>	147
Fission Barriers and Half-Lives, <i>P. Möller, J. R. Nix (LANL), W. J. Swiatecki (LBL)</i>	153
Fission Isomers, <i>R. Vandebosch (Univ of Washington)</i>	161
Subthreshold Fission and Barrier Effects, <i>H. Weigmann (Central Bureau for Nuclear Measurements-Belgium)</i> . .	168
Cluster Radioactivity and Nuclear Fission, <i>P. B. Price (Univ of California-Berkeley)</i>	177

NUCLEAR FISSION—ITS VARIOUS ASPECTS

Chairman: *Glenn T. Seaborg (LBL)*

Some Early Work for Reactors in the United States, <i>E. Creutz (Consultant)</i>	187
From Lawrence to Lasers to Light Bulbs A Brief History of Commercial Enrichment and the People Who Made It Happen, <i>Michael J. Connor (Nuclear Resources International, Inc.)</i>	190
Fission Neutron Radiation and Military Radiobiology Research, <i>J. P. Jacobus, P. J. Mattson, G. H. Zeman (Armed Forces Radiobiology Research Inst)</i>	192
The First Steps in the Atomic Problem in the USSR, <i>I. N. Golovin (I. V. Kurchatov Inst of Atomic Energy-USSR)</i>	198

SAFEGUARDS AND SPACE APPLICATIONS

Chairman: *Alvin M. Weinberg (IEA)*

Nuclear Fission and Nuclear Safeguards: Common Technologies and Challenges, <i>G. Robert Keepin (LANL)</i>	207
Space Reactors, A Prospective for the Future, <i>Earl Wahlquist (DOE), Susan S. Voss (LANL)</i>	227

REACTORS AND SAFEGUARDS

Chairman: *Neil M. Howard (Bechtel-Gaithersburg)*

Evolution of the Hanford Graphite Reactor Technology, <i>Hans Toffer (Westinghouse Hanford Company)</i> . .	237
-------------------------------------------------------------------------------------------------------------	-----

The Evolution of Self-Stabilization in Nuclear Power Development, <i>John J. Taylor (EPRI), Edwin E. Kintner (GPU Nuclear Corp)</i>	244
PRISM, A Safe, Economic, and Testable Liquid Metal Reactor Power Plant for the Future, <i>R. C. Berglund, F. E. Tippets (GE Nuclear Energy)</i>	251
Basic Study on Utilization of Thorium-Based Nuclear Fuel, <i>Zhang Jiahua, Bao Borong, Xia Yuanxian (Shanghai Inst of Nuclear Research-PRC)</i>	258
Progress Toward a Generic Methodology for the Closed-Loop Digital Control of Nuclear Reactor Power, <i>John A. Bernard (MIT)</i>	262
Fission Neutron Spectra for ²⁴⁰ Pu, ²³⁸ Pu, and ²⁴² Pu, <i>R. L. Walsh (ANSTO-Australia), D. G. Madland (LANL), G. Chircu (Univ of South Wales-Australia)</i> . .	274

THEORY AND EXPERIMENTS IN SUPPORT OF THEORY

Chairmen: *Charles D. Bowman (LANL)*
D. Seeliger (Technical Univ of Dresden-GDR)

Classical Model for α -Particle Emission During Nuclear Fission, <i>N. Carjan, B. Leroux (CEN Bordeaux-France), K. Weingärtner, J. Theobald (Inst für Kernphysik-FRG)</i>	285
Pre-Equilibrium Fission: A New Decay Channel for Composite Systems Formed in Heavy Ion Fusion Reactions, <i>V. S. Ramamurthy, S. S. Kapoor (BARC-India)</i>	292
Low-Energy Ternary Fission, <i>P. Heeg, M. Mutterer, J. Pannicke, P. Schall, J. P. Theobald, K. Weingärtner (Inst für Kernphysik-FRG)</i>	299
Nuclear Shapes from Spectroscopic Studies of Fission Fragments, <i>I. Ahmad, H. Emling, R. Holzmann, R. V. F. Janssens, T. L. Khoo (ANL-East), W. R. Phillips (Univ of Manchester-England), M. W. Drigert (Univ of Notre Dame)</i>	306
Cold Fragmentation Properties: A Crucial Test for the Fission Dynamics, <i>J. Trochon, G. Simon (CEA Bruyeres le Châtel-France), C. Signarbieux (CEA/CEN Saclay-France)</i>	313
Experimental Evidence of the Third Minimum in the Fission Barrier, <i>D. Paya, J. Blons (CEA/CEN Saclay-France)</i>	319

GENERAL RESEARCH AND INSTRUMENTATION

Chairman: *Glenn F. Knoll (Univ of Michigan)*

25 Years of Actinide Research at the European Institute for Transuranium Elements, <i>J. van Geel, H. E. Schmidt, J. Fuger (Inst for Transuranium Elements-FRG)</i>	327
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----

Fission Reactor Pumped Lasers: History and Prospects, <i>George H. Miley (Univ of Illinois), Russell DeYoung (NASA Langley Research Center), David McArthur (SNL), Mark Prelas (Univ of Missouri-Columbia)</i> ...	333	U235 Fission Cross Section Measurements—A View 25 Years On, <i>P. H. White (AWE-England)</i>	436
Analysis of Fission Products from Russia's First Atomic Bomb Test, <i>Lloyd R. Zumwalt (North Carolina State Univ)</i>	343	Neutron Induced Fission Cross Sections for ²³² Th, ^{235,238} U, ²³⁷ Np, and ²³⁹ Pu, <i>P. W. Lisowski, J. L. Ullmann, S. J. Balestrini (LANL), N. W. Hill (ORNL), A. D. Carlson, O. A. Wasson (NIST)</i>	443
An Instrument for Determining Spontaneous-Fission Properties of Millisecond Isotopes, <i>R. J. Dougan, P. A. Baisden, E. K. Hulet (LLNL)</i>	351	Composite Delayed Neutron Energy Spectra of Fissionable Isotopes, <i>G. Couchell, P. Bennett, E. Jacobs, D. Pullen, W. Schier, M. Villani (Univ of Lowell), R. Tanczyn (Rutgers Univ), M. Haghghi (GPU Nuclear Corp), Q. Sharfuddin (General Physics Corp)</i>	449
Technique for Fission Measurements of Highly Active and Weak Cross Section Actinides, <i>R. C. Block, R. E. Slovacek (RPI), Y. Nakagome (Kyoto Univ-Japan), R. W. Hoff (LLNL)</i>	354	Independent Yield Pattern in Thermal Neutron-Induced Fission of ²³⁵ U, <i>G. Rudstam, B. Ekström, E. Lund (Studsvik Neutron Research Laboratory-Sweden)</i> ...	457
Measurements of $\bar{\nu}(m^*)$ by Fragment Double-Velocity Double-Energy Method, <i>Y. Nakagome, I. Kimura (Kyoto Univ-Japan), I. Kanno (JAERI-Japan)</i>	360	Ground State Spontaneous Fission Half-Lives from Thorium to Fermium, <i>Norman E. Holden (BNL)</i> ...	465
Subthreshold and Near-Subthreshold Fission Physics Measurements at the Oak Ridge Electron Linear Accelerator Facility, <i>R. B. Perez, G. de Saussure, F. C. Difilippo, L. W. Weston, J. A. Harvey (ORNL)</i>	368	The Production of a New Evaluation of Fission Products, <i>R. W. Mills (Birmingham Univ-England), M. F. James (UKAEA, Winfrith-England), D. R. Weaver (Birmingham Univ-England)</i>	471

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY PLENARY: NUCLEAR REACTORS, SECURE ENERGY FOR THE FUTURE

Chairmen: *John A. Wheeler (Princeton Univ/Univ of Texas-Austin)*
Bertrand Goldschmidt (CEA Paris-France)

The Future of Nuclear Reactors, <i>Edward Teller (LLNL/Hoover Inst on War, Revolution and Peace)</i> ..	379
Development Prospects for Advanced Reactors, <i>L. V. Konstantinov, P. Dastidar, J. Kupitz, D. Guthrie (IAEA-Austria)</i>	382
Euratom, <i>Jules Gueron (Euratom-France)</i>	393

FISSION DATA

Chairmen: *Michael S. Moore (LANL)*
Lee Stewart (LANL-retired)

Fission Measurements, <i>A. Michaudon (Inst Laue-Langevin-France)</i>	399
The Relationship Between Integral Experimental Data and Nuclear Fission Parameters, <i>W. P. Poenitz (ANL-West)</i>	408
Fission Theory: Its Relevance to the Nuclear Cross Section Data Base, <i>J. E. Lynn (ANL-East)</i>	418
Theory of Neutron Emission in Fission, <i>David G. Madland (LANL)</i>	429