

CONTENTS

1. Opening Remarks 1
Emilio Panarella

SECTION I

2. Edward Teller's Scientific Legacy 3
Stephen B. Libby
3. IAEA Support for Fusion Energy Research 5
R.E.H. Clark, G. Mank, A.L. Nichols, and A. Malaquias
4. Fusion Research as a Scientific Undertaking: Relationship to Other Fields of Science
and Technology 7
Bruno Coppi

Magnetic Confinement

5. Enhancement of the Thermonuclear Component of the Neutron Yield in Pinch Plasma
Focus. Experiments in Devices with Energy from 100 kJ to Less than 1 J 9
Leopoldo Soto, Patricio Silva, José Moreno, Marcelo Zambra,
Gustavo Sylvester, and Cristian Pavez
6. Advances Towards pB11 Fusion with the Dense Plasma Focus 11
Eric J. Lerner and Robert E. Terry
7. Plasma Formation in Spherical Tokamaks Without a Central Transformer Solenoid 23
F. Alladio, P. Costa, A. Mancuso, P. Micozzi, A. Sykes, G. Cunningham,
M. Gryaznevich, J. Hicks, M. Hood, G. McArdle, and Y. Dnestrovskij
8. About the Next Step in the Development of a Tokamak Fusion Reactor 25
E. Mazzucato

Magnetic Confinement and Other

9. Future Issues in the RFP Research 33
Piero Martin
10. Small Scale Fusion: The Pulsed High Density FRC Experiment 35
John Slough
11. Plasma and Ion Beam Injection into an FRC 37
M. Anderson, M. Binderbauer, V. Bystritskii, E. Garate, N. Rostoker, Y. Song,
A. Van Drie, and I. Isakov

| | |
|--|----|
| 12. Progress on the PEG Program | 39 |
| M. Binderbauer, N. Rostoker, H. Monkhorst, V. Bystritskii, E. Garate, O. Gornostaeva, W. Heidbrink, Y. Song, A. Van Drie, F. Wessel, S. Dettrick, D. Hendrix, Y. Mok, A. Qerushi, M. Anderson, S. Armstrong, M. Morehouse, G. Strashnoy, and K. Walters | |
| 13. Plasma Electric Generator Space Propulsion System..... | 41 |
| A. Cheung, F. Liu, A. Qerushi, N. Rostoker, F.J. Wessel, and M.W. Binderbauer | |
| 14. Supersonically Rotating Plasmas for Magnetic Fusion: The Maryland Centrifugal Experiment..... | 43 |
| R. Ellis, A. Hassam, S. Messer, A. Case, A. DeSilva, R. Elton, J. Ghosh, H. Griem, R. Lunsford, and C. Teodorescu | |

SECTION II

| | |
|--|----|
| 15. Commissioning the National Ignition Facility..... | 45 |
| E.I. Moses, R.E. Bonanno, C.A. Haynam, B.J. MacGowan, R.L. Kauffman, R.W. Patterson, Jr., and B.M. Van Wonterghem | |

Inertial Confinement and Other

| | |
|---|----|
| 16. Commissioning Status of the Mercury Laser, a Scalable Option for Inertial Fusion Energy | 53 |
| C. Bibeau, A.J. Bayramian, J.P. Armstrong, R.J. Beach, R.W. Campbell, C.A. Ebbers, B.L. Freitas, A.S. Ladran, J.A. Menapace, E.I. Moses, S.A. Payne, N.L. Peterson, K.I. Schaffers, C.J. Stolz, S. Telford, J.B. Tassano, and E.J. Utterback | |
| 17. The Institute for Fusion Studies in Southern Italy: Progress Report on the Design and Construction of the First Fusion Prototype Reactor | 55 |
| Emilio Panarella | |
| 18. Taming of Electromagnetic Instabilities in Fast Ignition Scenarios For ICF and REB Stopping | 59 |
| Claude Deutsch, Antoine Bret, Marie-Christine Firpo, and Konstantin Starikov | |
| 19. Localization and Fusion Modeling in Plasma Physics. Part I: Math Framework for Non-Equilibrium Hierarchies..... | 61 |
| Antonina N. Fedorova and Michael G. Zeitlin | |
| 20. Localization and Fusion Modeling in Plasma Physics. Part II: Vlasov-like Systems. Important Reductions..... | 87 |
| Antonina N. Fedorova and Michael G. Zeitlin | |

Magnetic Confinement and Other

| | |
|--|-----|
| 21. Progress In Mirror Plasma Activities..... | 101 |
| T. Cho, J. Kohagura, M. Hirata, T. Numakura, H. Higaki, H. Hojo, M. Ichimura, K. Ishii, K. Md. Islam, A. Itakura, I. Katanuma, Y. Nakashima, T. Saito, Y. Tatematsu, M. Yoshikawa, O. Watanabe, N. Yokoyama, Y. Tomii, Y. Miyake, S. Kiminami, K. Shimizu, A. Kojima, T. Kobayashi, Y. Yamaguchi, Y. Miyata, Y. Kubota, H. Saimaru, Y. Higashizono, A. Mase, Y. Yasaka, Y. Tomita, K. Sakamoto, M. Yoshida, V.P. Pastukhov, T. Imai, S. Miyoshi, and GAMMA 10 Group | |

| | |
|--|-----|
| 22. Axisymmetric Tandem Mirrors: Status of Kinetic-Stabilizer Studies | 115 |
| R.F. Post | |
| 23. Demonstration of Steady Inductive Helicity Injection | 117 |
| T.R. Jarboe, P.E. Sieck, W.T. Hamp, B.A. Nelson, R.G. O’Neill, A.J. Redd, and R.J. Smith | |
| 24. Stopping Power for Arbitrary Angle Between Nuclear Alpha Particle Velocity and Magnetic Field | 121 |
| Carlo Cereceda, Michel de Peretti, and Claude Deutsch | |
| 25. Staged Z-Pinch for Fusion | 129 |
| H.U. Rahman, P. Ney, F.J. Wessel, and N. Rostoker | |
| 26. Nonlocal Transport of Heat by Electromagnetic Waves in Magnetically Confined Plasmas | 131 |
| A.B. Kukushkin and K.V. Cherepanov | |
| 27. Desirable Fusion Reactor Qualities For Commercial Electrical Generation Applications | 143 |
| V.R. Page | |

SECTION III

| | |
|---|-----|
| 28. Direct-Drive Inertial Fusion Research at the University of Rochester’s Laboratory for Laser Energetics: A Review | 155 |
| R.L. McCrory, D.D. Meyerhofer, S.J. Loucks, S. Skupsky, R. Betti, T.R. Boehly, M.J. Bonino, R.S. Craxton, T.J.B. Collins, J.A. Delettrez, D.H. Edgell, R. Epstein, V.Yu. Glebov, V.N. Goncharov, D.R. Harding, R.L. Keck, J.H. Kelly, T.J. Kessler, J.P. Knauer, L.D. Lund, D. Jacobs-Perkins, J.R. Marciante, J.A. Marozas, F.J. Marshall, A.V. Maximov, P.W. McKenty, S.F.B. Morse, J. Myatt, S.G. Noyes, P.B. Radha, A. Rigatti, T.C. Sangster, W. Seka, V.A. Smalyuk, J.M. Soures, C. Stoeckl, K.A. Thorp, L.J. Waxer, M.D. Wittman, B. Yaakobi, J.D. Zuegel, K.A. Fletcher, C. Freeman, S. Padalino, J.A. Frenje, C.K. Li, R.D. Petrasso, and F.H. Séguin | |

Inertial Confinement and Other

| | |
|---|-----|
| 29. Inertial Confinement Fusion At Los Alamos | 177 |
| E.L. Lindman, M.M. Balkey, C.W. Barnes, J. Bartos, S.H. Batha, R.R. Berggren, B. Bezzerides, P.A. Bradley, P. Brooks, B. Cameron, J.A. Cobble, R.F. Coker, J. Cooley, R.E. Chrien, C.R. Christensen, R. Day, N.D. Delamater, E.S. Dodd, M.R. Douglas, D.F. DuBois, J. Edwards, J. Elliott, N. Elliott, J.C. Fernandez, J.R. Fincke, S.R. Goldman, V. Gomez, M.A. Gunderson, D. Hatch, A. Hauer, D.A. Haynes, B.M. Hegelich, N.M. Hoffman, R.L. Holmes, G.C. Idzorek, R.P. Johnson, P.A. Keiter, J.M. Kindel, K.A. Klare, J.L. Kline, G.A. Kyrala, N.E. Lanier, R. Morse, G.R. Magelssen, R. Manzanares, R.J. Mason, D.S. Montgomery, M.S. Murillo, A. Nobile, D.L. Paisley, P. Papin, A.L. Peratt, R. Perea, D.L. Peterson, R.R. Peterson, T. Pierce, G.D. Pollak, P. Ramaprabhu, B. Randolph, G. Rivera, H.A. Rose, D. Sandoval, D. Schmidt, M. Schmitt, J.M. Scott, R. Sebring, R. Snow, M.S. Sorem, W. Steckle, D.C. Swift, T.E. Tierney, D.L. Tubbs, A. Valdez, W.S. Varnum, E. Vold, R.G. Watt, B.H. Wilde, D.C. Wilson, B.P. Wood, J.B. Workman, and L. Yin | |

30. Evidences for and the Models of Self-Similar Skeletal Structures in Fusion Devices, Severe Weather Phenomena and Space..... 195
A.B. Kukushkin and V.A. Rantsev-Kartinov
31. Compression of Field Reversed Configurations for Magnetized Target Fusion.....213
J.H. Degnan, A. Brown, T. Cavazos, S.K. Coffey, M. Domonkos, M. Frese, S. Frese, D. Gale, C. Gilman, T.C. Grabowski, B. Guffey, T.P. Intrator, R. Kirkpatrick, G.F. Kiuttu, F.M. Lehr, J.V. Parker, R.E. Peterkin, Jr., N.F. Roderick, E.L. Ruden, R.E. Siemon, W. Sommars, Y.F. Thio, W. Tucker, P.J. Turchi, G.A. Wurden, and S. Zhang

Magnetic Confinement and Other

32. Field-Reversed Configuration Plasma for Magnetized Target Fusion at Los Alamos National Laboratory223
S.Y. Zhang, T.P. Intrator, G.A. Wurden, W.J. Wagonaar, R. Renneke, C. Grabowski, E.L. Ruden, and J.H. Degnan
33. The MAGO System: Current Status229
S.F. Garanin, V.I. Mamyshev, and V.B. Yakubov
34. Physical Schemes of Experimental Devices with Disk EMG for Feasibility Study of Thermonuclear Ignition in MAGO System233
A.M. Buyko, S.F. Garanin, G.G. Ivanova, V.M. Kalashnikov, V.I. Mamyshev, and V.B. Yakubov
35. New Conserved Quantities Around a Magnetic Surfaces for Plasma Equilibrium with Non-Linear Convective Terms and Low Vorticity: A Review235
Julio Puerta, Enrique Castro, and Pablo Martín

SECTION IV

36. Celebration of Fusion Day249
Roger Raman
37. Prospects For Magneto-Inertial Fusion Using the Atlas Facility at the Nevada Test Site.....253
Richard E. Siemon

Magnetic Confinement and Other

38. Laser-Magnetized Plasma Interaction — Toward a Few Hundreds eV Solid Density Plasma in the Laboratory255
Y. Sentoku, A.J. Kemp, M. Bakeman, R. Presura, and T.E. Cowan
39. Recent Compact Torus Injection Experiments on the STOR-M Tokamak257
D. Liu, C. Xiao, A. Singh, S. Livingstone, and A. Hirose
40. Fuelling Requirements for Advanced Tokamak Operation.....259
R. Raman
41. Neoclassical Collision Transport in Tokamaks for Elliptic Plasmas with Triangularity: A Review265
Pablo Martín and Enrique Castro

| | |
|--|-----|
| 42. New Regime in TCABR Tokamak: Runaway Electron Avalanche in Cold Recombinative Plasma | 277 |
| Yu.K. Kuznetsov, R.M.O. Galvão, and I.C. Nascimento | |

Inertial Confinement and Other

| | |
|---|-----|
| 43. Current Status of Fast Ignition Research Using a Long Pulse Laser for Implosion and a PW Laser For Heating..... | 279 |
| K.A. Tanaka, R. Kodama, Y. Kitagawa, K. Kondo, K. Mima, H. Azechi, Z. Chen, S. Fujioka, T. Johzaki, A.L. Lei, T. Matsuoka, N. Miyanaga, K. Nagai, H. Nagatomo, H. Nishimura, T. Norimatsu, P. Norreys, K. Shigemori, H. Shiraga, M. Tanpo, Y. Tohyama, T. Yabuuchi, J. Zheng, R. Freeman, S.P. Hatchett, M. Key, D. Meyerhofer, R. Snavely, R. Stephens, and C. Stoeckl | |
| 44. Single Event Laser Fusion Schemes Using ns-MJ or PW-ps Laser Pulses | 287 |
| George H. Miley, H. Hora, F. Osman, and X.Z. Li | |
| 45. Progress in US Fast Ignition Research | 289 |
| M.H. Key, F. Amiranoff, D. Batani, S.D. Baton, T. Cowan, N. Fisch, R.R. Freeman, L. Gremillet, T. Hall, S.P. Hatchett, J.M. Hill, J.A. King, R. Kodama, J.A. Koch, M. Koenig, B.F. Lasinski, B. Langdon, A.J. MacKinnon, E. Martinolli, P.A. Norreys, P. Parks, E. Perelli-Cippo, M. Rosenbluth, C. Rousseaux, J.J. Santon, R.A. Snavely, R. Stephens, M. Tabak, K. Tanaka, and R. Town | |
| 46. Study of Dipole-Assisted Inertial Electrostatic Confinement..... | 293 |
| George H. Miley, Prajakti J. Shrestha, Hiromu Momota, Robert E. Thomas, and Yoshikazu Takeyama | |
| 47. Rational Paradigm of Plasma Physics | 303 |
| V.I. Erofeev | |
| 48. New Glance at Statistical Mechanics and Some Other Components of Theoretical Physics | 311 |
| V.I. Erofeev | |
| 49. Low Energy Nuclear Reactions in Reproduced Experiments and Explained as Picometer-Megasecond Reactions | 317 |
| H. Hora, G.H. Miley, X.Z. Li, J.C. Kelly, and F. Osman | |
| 50. From Cold Fusion to Condensed Matter Nuclear Science — A Chinese View on the Summary of CMNS | 319 |
| X.Z. Li | |

SECTION V

| | |
|---|-----|
| 51. Inertial Fusion Energy Research Progress in China | 327 |
| X.T. He, W.Y. Zhang, and Chun-Fu Ye | |

Inertial Confinement and Other

| | |
|--|-----|
| 52. Compression of Fusion Targets by a Spherically Focused Shock Wave in a Liquid..... | 329 |
| Michel Laberge | |

| | |
|--|-----|
| 53. Laser-Plasma Experiment and PIC–Simulation to Study Dynamics and Energetics of ICF-Plasma in a VISTA-Type Rocket with Dipole Magnetic Field..... | 339 |
| Yu.P. Zakharov, H. Nakashima, A.V. Melekhov, and K.V. Vchivkov | |
| 54. Thermonuclear Fusion, NPT, and CTBT | 343 |
| V.N. Mokhov | |

Inertial Confinement and Other

| | |
|--|-----|
| 55. Progress Toward Fusion Energy with Direct-Drive Krypton Fluoride Laser Drivers.. | 345 |
| Andrew N. Mostovych, Stephen P. Obenschain, and John D. Sethian | |

SECTION VI

| | |
|-----------------------------|-----|
| 56. Concluding Remarks..... | 347 |
| Emilio Panarella | |

SECTION VII

| | |
|--|-----|
| 57. Report of the Review Panel of Scientists and Engineers..... | 349 |
| Edward C. Creutz, Ronald C. Kirkpatrick, Irvin R. Lindemuth, Richard F. Post, Norman Rostoker, and Hans J. Schneider-Muntau | |
| 58. Biographies of the Members of the Panel of Scientists and Engineers | 363 |
| Participants..... | 367 |
| Index..... | 375 |