The Role of Neutrinos,
Strings, Gravity, and
Variable Cosmological
Constant in Elementary
Particle Physics

The Role of Neutrinos, Strings, Gravity, and Variable Cosmological Constant in Elementary Particle Physics

Edited by

Behram N. Kursunoglu

*Global Foundation, Inc.
Coral Gables, Florida*

Stephan L. Mintz

*Florida International University
Miami, Florida*

and

Arnold Perlmutter

*University of Miami
Coral Gables, Florida*

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PREFACE

The 29th International Conference was held as the first one of the millennium at its Fort Lauderdale venue. These conferences began, with High Energy Physics being the main topic, by introducing gradually cosmology into its programs. These proceedings of the 2000 conference reflect the variety of topics and ideas discussed. Our future conferences will be designed somewhat akin to the early Coral Gables Conferences where we shall seek some convergence of ideas. For this reason various committees have been formed from among the participating physicists. The committees and their memberships are listed in these proceedings. We further decided for the first time to include some graduate student participants in our future meetings for which also a committee has already been established. The topics will demonstrate a more *activist structure* of the Coral Gables Conferences, for example the *duality of the gravitational forces* and expansion of the universe will be discussed from this point of view since it conveys a convergence to the ideas of quintessence versus the ordinary theory, which are considered as the cause of the expansion of the universe.

We further wish to announce that the future conferences will assume a collective organization where several committees as listed in these proceedings will have their input into the conference. We have now introduced new topics and ideas, which referred especially to the attractive and repulsive nature of the gravitational force. These proceedings of the conference contain a variety of topics and ideas. The meeting for 2001 next December will represent these anticipated changes and hopefully will follow the established early tradition of these series of conferences.

The Chairman and Trustees of the Global Foundation, Inc. wish to gratefully acknowledge Lady Blanka Rosenstiel, Founder and President of the American Institute of Polish Culture, Chopin Foundation and Honorary Consul of the Republic of Poland in Miami, and to Dr. and Mrs. Edward Bacinich of Palm Beach, Florida for their continued generous annual support.

Behram N. Kursunoglu
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Coral Gables, Florida
February 2001

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The Global Foundation, Inc., which was established in 1977, utilizes the world's most important resource... people. The Foundation consists of distinguished men and women of science and learning, and of outstanding achievers and entrepreneurs from industry, governments, and international organizations, along with promising and enthusiastic young people. These people convene to form a unique and distinguished interdisciplinary entity to address global issues requiring global solutions and to work on the frontier problems of science.

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Nova Science Publishers, Inc., New York, 1992

Unified Symmetry in the Small and in the Large

Edited by: Behram N. Kursunoglu, and Arnold Perlmutter

Nova Science Publishers, Inc., New York, 1993

Unified Symmetry in the Small and in the Large - 1

Edited by: Behram N. Kursunoglu, Stephen Mintz, and Arnold Perlmutter

Plenum Press, 1994

Unified Symmetry in the Small and in the Large - 2

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Confluence of Cosmology, Massive Neutrinos, Elementary Particles & Gravitation

Edited by: Behram N. Kursunoglu, Stephan Mink, and Arnold Perlmutter
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Global Warming and Energy Policy

Edited by: Behram N. Kursunoglu, Stephan Mink, and Arnold Perlmutter
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The Role of Neutrinos, Strings, Gravity, and Variable Cosmological Constant in Elementary Particle Physics

Edited by: Behram N. Kursunoglu, Stephan Mintz, and Arnold Perlmutter
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*A Nonprofit Organization for Global Issues Requiring Global Solutions,
and for problems on the Frontiers of Science*

Center for Theoretical Studies

MILLENNIUM'S FIRST
INTERNATIONAL CONFERENCE
ON
ORBIS SCIENTIAE 2000

**THE ROLE OF ATTRACTIVE AND REPULSIVE
GRAVITATIONAL FORCES IN COSMIC
ACCELERATION OF PARTICLES**

The Origin of the Cosmic Gamma Ray Bursts

*(29th Conference on High Energy Physics
and Cosmology Since 1964)*

**December 14 - 17, 2000
Lago Mar Resort
Fort Lauderdale , Florida**

*This conference is supported in part by
Alpha Omega Research Foundation and
Lady Blanka Rosenstiel*

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P.O. Box 249055
Coral Gables, Florida 33124-9055
Phone: (305) 669-9411
Fax: (305) 669-9464
E-mail: kursun@globalfoundationinc.org
<http://www.globalfoundationinc.org>

Conference Hotel:
Lago Mar Resort

1700 South Ocean Lane
Fort Lauderdale, Florida 33316
Ph: 1-800-255-5246
Fax: (954) 524-6627
Deadline: October 15, 2000
Group rate: \$125.00/night

Précis

This year's conference will take off with some new ideas giving special prominence to the role of very large, both attractive and repulsive, gravitational forces in cosmic regions of the universe. There exist charged particle accelerations in the presence of tremendous gravitational power of supermassive black hole, which can accelerate for example the electrons to acquire energies far above the capability of any accelerator we can build on the earth. These particles will emit high-energy gamma rays and will emerge in various directions depending on the black hole's location. It thus appears that very high gravitational fields can explicitly act as the source of an electromagnetic field.

This précis is based on the prediction by unified field theory with quintessential matter (infinite number of positive and negative magnetic charges of different magnitudes) permeating the universe, which could alternate between gravitational attraction and repulsion modes.

NASA in collaboration with the department of energy is proposing to study such gamma rays in a project called GLAST (the gamma ray large area space telescope). Already there are preparations to deploy this particular telescope by 2005. The participants of this research project include physicists from various universities. If the attractive and repulsive gravity is the main accelerating mechanism then they will find not only directional arrival of gamma rays but also indirectly the presence of these gamma rays will demonstrate that gravity can be a source of electromagnetism. We already know that electromagnetism, as described in Einstein's general theory of relativity, is a source of gravity. Thus have we come to experimental verification of a unified field theory of gravity and electromagnetism at high energy?

The Conference will further include the topics of superstring theory based unification, gravitational waves, current understanding of dark matter, proton spin, neutrino cosmology and quantum gravity.

Dedication

The trustees of the Global Foundation and members of the 29th Orbis Scientiae 2000, dedicate this conference to Dr. Fred Zachariasen of CALTECH. The late Professor Zachariasen was a loyal and active member of this series of conferences on the frontiers of physics since 1964. He also served as a member of the Conferences' International Advisory Committee. We shall all miss Fred. We extend our deepest condolences to his wife Nancy Zachariasen, his two daughters Kerry and Judy, his two grandchildren and all the other members of his family.

--NOTES--

1. Each presentation is allotted a maximum of 25 minutes and an additional 5 minutes for questions and answers.
2. Moderators are requested not to exceed the time allotted for their sessions.

Moderator: Presides over a session. Delivers a paper in own session, if desired, or makes general opening remarks.

Dissertator: Presents a paper and submits it for publication in the conference proceedings at the conclusion of the conference.

Annotator: Comments on the dissertator's presentation or asks questions about it upon invitation by the moderator.

CONFERENCE PROCEEDINGS

1. Instructions to the authors from the publisher for preparing typescripts for the conference proceedings will be sent to you via e-mail.
2. Papers must be received at the Global Foundation by February 15, 2001.

An edited Conference Proceedings will be submitted to the Publisher by March 14, 2001.

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ORBIS SCIENTIAE 2000 PROGRAM OUTLINE

Thursday, December 14, 2000

Lakeview Room

8:00 AM - 12:00 PM

Registration

9:00 AM—11:30 AM

International Advisory Committee Meeting,
Director's Room

12:00 PM

Committee Members Lunch, Director's Room

1:30 PM SESSION I:

Cosmological Constant is Not Really a Constant

Moderator:

Behram N. Kursunoglu, Global Foundation, Inc.

Dissertators:

Edward Teller, Lawrence Livermore Laboratory

Behram N. Kursunoglu

“The Quartet of Attractive and Repulsive Gravity Forces”

Paul Frampton, University of North Carolina

“Quintessence and Cosmic Microwave Background”

Annotators:

Thomas W. Kephart, Vanderbilt University

Session Organizer:

Behram N. Kursunoglu

3:00 PM Coffee Break

3:30 PM SESSION II:

Beyond the Standard Model

Moderator:

Don Colladay, University of South Florida

Dissertators:

Alan Kostelecky, Indiana University

“Violation of Spacetime Symmetries”

Pierre Sikivie, University of Florida

“Dark Matter, Axions and Caustics”

Tom Weiler, Vanderbilt University

“Neutrino Oscillations from Broken Lorentz Invariance”

Annotator:

Behram N. Kursunoglu, Global Foundation, Inc.

Session Organizer:

Alan Kostelecky

5:00 PM SESSION III:

Neutrino Cosmology

Moderator:

George Fuller, UCSD

Dissertators:

George Fuller

“Neutrino Oscillations in Big Bang Cosmology”

David Cline, UCLA

“Measurement of Neutrino Mass with SN II”

Randell Mills, CEO of Black Light Power, Princeton, NJ

“The Grand Unified Theory of Classical Quantum Mechanics”

Annotator: **Stephan L. Mintz**, Florida International University

Session Organizer: **David Cline**

6:30 PM **Orbis Scientiae adjourns for the day**

Friday, December 15, 2000

8:30 AM SESSION IV: **The Role of Neutrinos in Super String Theory Based Unification**

Moderator: **Stephan L. Mintz**, Florida International University

Dissertators: **A.J. Meyer**, International Scientifics Projects, Inc.
“On CPT Asymmetry as Predicted by the Super Sp Model”

Osher Doctorow, Culver City, CA
“Light Speed Energy Dependence”

Gabor Domokos & Susan Kovesi-Domokos, Johns Hopkins
"A Neutrino Component of Ultra High Energy Cosmic Rays?"

Ali R. Fazely, Southern University, Baton Rouge, LA
“Probing the Nature of Neutrinos at Pion Factories”

Annotators: **Freydoon Mansouri**, University of Cincinnati

Session Organizer: **Stephan L. Mintz**

10:00 AM Coffee Break

10:30 AM SESSION V: **Recent Progress on Old and New Ideas I**

Moderator: **Paul Frampton**, University of North Carolina

Dissertators: **Stephan L. Mintz**, Florida International University
“Neutrino Reactions in Nuclei at Higher Energies”

Thomas W. Kephart, Vanderbilt University
“AdS/ CFT Phenomenology”

Thomas L. Curtright, University of Miami

“Duality and Time”

Annotator: **Alan Kostelecky**, Indiana University

Session Organizer: **Paul Frampton**

12:00 Noon: Lunch Break

1:30 PM SESSION VI: **New Directions In Gravitational Research**

Moderator: **Arnold Perlmutter**, University of Miami

Dissertators: **Philip Mannheim**, University of Connecticut
“Attractive and Repulsive Gravity—Cosmic Acceleration
as the Solution to the Cosmological Constant Problem”

Richard P. Woodard, University of Florida
“Back-reaction is for real”

Bhaskar Dutta, Texas A&M University
“Phenomenology and Horava-Witten M Theory”

Annotator: **Don Lichtenberg**, Indiana University

Session Organizer: **Arnold Perlmutter**

3:00 PM Coffee Break

3:30 PM SESSION VII: **Proton Spin**

Moderator: **Alan Krisch**, University of Michigan

Dissertator: **Alan Krisch**
“New Experiment on Very Violent Collisions of Spinning
Protons”

D.W. Sivers, Michigan-Portland University
“Single Spin Asymmetry; A Probe of Hadron Structure”

Annotator: **Arnold Perlmutter**, University of Miami

Session Organizer: **Alan Krisch**

5:00 PM **Orbis Scientiae adjourns for the day**

6:30 PM WELCOMING COCKTAILS, FOUNTAINVIEW LOBBY

Courtesy of Lago Mar Resort

7:30 PM CONFERENCE BANQUET, FOUNTAINVIEW LOBBY
Courtesy of Edward and Maria Bacinich

Saturday, December 16, 2000

8:30 AM SESSION VIII: **Nature's Highest Energy Particle Accelerators**

Moderator: **Elliott Bloom**, SLAC/Stanford University

Dissertators: **Elliott Bloom**
"Nature's highest energy accelerators"

Steve Ritz, Goddard Space Flight Center
"Exploring the extreme universe with GLAST"

Stirling Colgate, LANL
"The Free Energy of the Universe and the Acceleration of
Ultra High-Energy Cosmic Rays"

Annotators: **Grzegorz Madejski**, SLAC, Stanford University

Session Organizer: **Elliott Bloom**

10:00 AM Coffee Break

10:30 AM SESSION IX: **Gamma Ray Bursts**

Moderator: **Brenda L. Dingus**, University of Wisconsin

Dissertators: **Brenda L. Dingus**
"Highest Energy Gamma Ray from Gamma Ray Bursts"

Donald Q. Lamb, University of Chicago
"Implications of Gamma-Ray Bursts on the Early Universe"

Grant Mathews, Notre Dame University
"Models of the Engines of Gamma-Ray Bursts"

Annotator: **David Cline**, UCLA
"Primordial Black Holes and Short Gamma-Ray Bursts"

Session Organizer: **Brenda L. Dingus**

12:00 Noon: **Orbis Scientiae adjourns for the day**

Sunday, December 17, 2000

9:00 AM SESSION X: **Recent Progress on Old and New Ideas II**

Moderator: **Don Lichtenberg**, Indiana University

Dissertators: **Don Lichtenberg**, Indiana University
“Comments on Supersymmetry, extra dimensions,
and the accelerating universe”

Freydoon Mansouri, University of Cincinnati
“Twisted Affine Kac-Moody Algebras and the
Black Hole Entropy”

Uwe Trittmann, Ohio State University
“Testing the Maldacena conjecture with SDLCQ”

Annotator: **Stephen Pinsky**, Ohio State University

Session Organizer: **Don Lichtenberg**

10:30 AM Coffee Break

11:00 AM SESSION XI: **The Latest Developments In High Energy
Physics and Cosmology**

Moderator: **Sydney Meshkov**, CALTECH

Dissertators: **Carsten Hast**, SLAC / Stanford University
“CP-Violation In B-Decays : Status and Prospects with
BABAR”

Steve Pinsky, Ohio State University
“Quarks in Super symmetric discrete light-cone
quantization (SDLCQ)”

Keith Dienes, University of Arizona
“The Role of Extra Dimensions”

Annotator: **Alan Krisch**, University of Michigan

Session Organizer: **Sydney Meshkov**

12:30 PM **Orbis Scientiae 2000 adjourns**

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