

Frontiers of Fundamental Physics

***Edited by
Michele Barone
and
Franco Selleri***

94
49

Frontiers of Fundamental Physics

Edited by

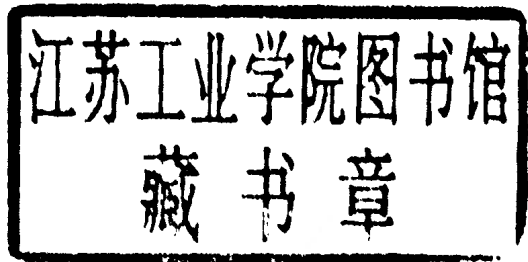
Michele Barone

*Nuclear Research Centre
Demokritos, Greece*

and

Franco Selleri

*Università di Bari
Bari, Italy*



Plenum Press • New York and London

Library of Congress Cataloging-in-Publication Data

Frontiers of fundamental physics / edited by Michele Barone and Franco Selleri.

p. cm.

"Proceedings of an international conference on Frontiers of fundamental physics, held September 27-30, 1993, in Olympia, Greece"--T.p. verso.

Includes bibliographical references and index.

ISBN 0-306-44825-4

1. Physics. 2. Astrophysics. 3. Geophysics. I. Barone, Michele. II. Selleri, Franco.

QC21.2.F76 1994

500.2--dc20

94-38843

CIP

Proceedings of an International Conference on Frontiers of Fundamental Physics,
held September 27-30, 1993, in Olympia, Greece

ISBN 0-306-44825-4

© 1994 Plenum Press, New York
A Division of Plenum Publishing Corporation
233 Spring Street, New York, N. Y. 10013

All rights reserved

No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording, or otherwise, without written permission from the Publisher

Printed in the United States of America

Frontiers of Fundamental Physics

Preface

The Olympia conference **Frontiers of Fundamental Physics** was a gathering of about hundred scientists who carry on their research in conceptually important areas of physical science (they do "fundamental physics"). Most of them were physicists, but also historians and philosophers of science were well represented. An important fraction of the participants could be considered "heretical" because they disagreed with the validity of one or several fundamental assumptions of modern physics. Common to all participants was an excellent scientific level coupled with a remarkable intellectual honesty: we are proud to present to the readers this certainly unique book.

Alternative ways of considering fundamental matters should of course be vitally important for the progress of science, unless one wanted to admit that physics at the end of the XXth century has already obtained the final truth, a very unlikely possibility even if one accepted the doubtful idea of the existence of a "final" truth. The merits of the Olympia conference should therefore not be judged a priori in a positive or in a negative way depending on one's refusal or acceptance, respectively, of basic principles of contemporary science, but considered after reading the actual new proposals and evidences there presented. They seem very important to us.

The confrontation between different lines of research has accompanied science from its birth. Galileo's scientific ideas were heretical, not only with respect to the dominant religious and political powers of his times, but with respect to the academic establishments of the universities as well: Well known is the example of the astronomy professor who refused to look in the telescope, but many were the centers where the heliocentric ideas were rejected. The great results obtained by Kepler, Newton, and many others, slowly transformed Galileo's heresy into the orthodoxy of modern physical science.

Atomism had existed as an idea cultivated by few isolated people for about 2300 years when, at the end of the XIXth century, Ludwig Boltzmann presented his conception of an objectively existing atomic structure of matter. Almost all scientists surrounding him seemed to reject atomism, and the bitter struggle that went around this question probably contributed to the dramatic ending of his life (1906). In the same years, however, Albert Einstein and Jean Perrin obtained an atomistic description of Brownian motion and shortly afterwards atomism was fully accepted in physics, owing also to the discoveries made by Ernst Rutherford and Niels Bohr. In this way the isolated ideas of Boltzmann became the new orthodoxy.

The geophysicist Alfred Wegener was much laughed at for his 1912 proposal that the continents had shifted relatively thousands of km, that the Atlantic Ocean had opened as the Americas split from Africa and Europe, and that all the continents had once been united as a single supercontinent, Pangaea. Only after the confirmations found by Warren Carey in 1954 Wegener's discovery started to be accepted in the scientific community. Today there are so many independent proofs that continents have been united in the past that it seems impossible to doubt it. Here the new frontier has become the conjecture that the Earth radius has considerably increased in the past.

In spite of these well known examples science is of course not reducible to an endless confrontation between opposite ideas, since it deals with the material reality surrounding us and uses powerful methods that allow sometimes the scientists to understand true properties of the real world. Therefore part of the orthodoxy can also be considered as valid knowledge. Such are for example the following statements: the Sun is just a star; the Milky Way is our galaxy seen from inside; in outer space there are hundreds of millions of other galaxies; there is a molecular and atomic structure of matter, and a nuclear structure of atoms; there exist subatomic entities called electron, proton, pion, etc. Many other examples of valid knowledge could easily be given. It is a fact however that today's physics seems to contain more than just valid knowledge.

In books dealing with astrophysics and cosmology one often finds statements like: "the astronomer Edwin Hubble established beyond all reasonable doubt that the Universe is expanding", but Hubble himself wrote in several different occasions statements like the following one of 1939: "... the results do not establish the expansion as the only possible interpretation of redshifts". Moreover quasars are the objects with the largest observed redshifts, and should therefore be considered at the margins of the visible universe, but many independent pieces of observational evidence indicate that some of them are actually associated with nearby galaxies and that their redshifts cannot therefore be due to recessional motion. A recent amazing discovery is the so called "redshift quantization" phenomenon for spiral galaxies, and this is so difficult to explain within the standard cosmology that most people prefer to forget about it - a predictable reaction of modern scientific thinking confronted with radically new evidence. Important astrophysicists and cosmologists (Hannes Alfvén, Halton Arp, Geoffrey Burbidge, Fred Hoyle, Jayant Narlikar, ...) have repeatedly argued that the observed redshifts of quasars and galaxies could well have an explanation radically different from the standard one based on *big bang*. In spite of all this the dominant view remains the idea that the only possible explanation of galaxy and quasar redshifts is based on the universal expansion

In relativity most people believe that the "luminiferous ether" of the XIXth century has been ruled out by Michelson-type experiments and by the development of the theory of special relativity. The situation is very different however, since

Poincaré and Lorentz were both defenders of the existence of ether, and Einstein himself after 1916 radically modified his previously negative attitude. For example in 1924 he wrote: "According to special relativity, the ether remains still absolute because its influence on the inertia of bodies ... is independent of every kind of physical influence." The minority group of people working today in the foundations of special relativity seems to be almost completely ether-oriented, and there are many proposing a reformulation of the theory along the lines dear to Lorentz: Simon Prokhovnik and the late John Bell are two examples. It has also become clear how such a reformulation should be carried out, after the 1977 realization that the conventional nature of the clock synchronization procedures opens the door to theories which are different from, but physically equivalent to special relativity.

Also general relativity has problems of fundamental nature, in particular those connected with the right-hand side of Einstein's field equations, where only the matter stress-energy tensor, but not the field stress-energy tensor, contributes to space-time curvature. This goes against the very fundamental conclusion of special relativity that all forms of energy are completely equivalent, and gives rise to a curious conservation law of rest mass, but not of energy-momentum. A very large number of theoretical physicists seem to be happy with calculations performed strictly within the standard formulation, in spite of the fact that it has been shown that Einstein's field equations do not lead to interactive N-body solutions, if $N > 1$. General relativity can be considered as a test-particle theory, and as such it explains the three classical tests, but in other respects seems sometimes not to be quite satisfactory. More about this can be found in these proceedings.

In our century the interplay between science and ideology has become more important than ever and the historians of physics have produced detailed reconstructions of the true scientific/cultural processes leading to the development of what we call "modern physics". From this work evidence has emerged for the existence of common cultural roots with philosophers such as S. Kierkegaard, M. Heidegger, A. Schopenhauer, and W. James. It is therefore not surprising that these philosophers developed ideas similar to some now prevailing in modern physics, in particular concerning the negative attitude toward the possibility of a correct understanding of the objective reality. In fact in quantum physics the standard teaching (after 1927) is that one cannot understand the atomic world in "classical" terms, that is by employing causal space-time descriptions. People active in the foundations of quantum physics believe instead that no good reason for such a pessimistic conclusion has ever been presented, and recall that Einstein, Planck, Schrödinger and de Broglie could not accept it. A group of participants in Olympia try accordingly to find new space-time models of elementary particles and/or to develop new mathematical tools useful for this task.

Bell's theorem states that any theory of the physical world based on the rather natural point of view of local realism must disagree at the empirical level with the

predictions of quantum mechanics by as much as 42%. Experiments performed in the seventies and early eighties have produced results compatible with the existing quantum theory, but Bell's theorem has actually not been checked due to the introduction in the reasoning of arbitrary (but unavoidable, given the efficiency of the used apparatus) additional assumptions. In this way a confusion has been produced between Bell's original inequality and the much stronger inequality violated in those experiments, forgetting that the latter owes the very possibility of being violated by the quantum theoretical predictions to the mentioned additional assumptions. In spite of the fact that Bell's theorem could allow in principle to decide who was right in the Einstein/Bohr debate, we still do not know the answer thirty years after the formulation of the theorem.

The confrontation between different points of view goes on, but a strange mutation seems to reduce its effects, since new ideas in fundamental physics find invariably difficulties in being accepted by the majority, no matter how well formulated and important they could be. While the ruling of the majorities is a fundamental feature of every democracy, it certainly does not apply to science where the great steps forward have always been made by isolated individuals. This dogmatic hardening risks today to make the scientific majorities impenetrable to a critical understanding of the foundations of contemporary scientific theories.

The existence of such attitudes within modern science has been observed by many physicists and also by the best epistemologists of our century. Thomas Kuhn, for example, wrote about the education of young physicists: "Of course, it is a narrow and rigid education, probably more so than any other except perhaps in orthodox theology." Karl Popper was worried about the poor standards of scientific confrontations and stated: "A very serious situation has arisen. The general anti-rationalist atmosphere which has become a major menace of our time, and which to combat is the duty of every thinker who cares for the traditions of our civilization, has led to a most serious deterioration of the standards of scientific discussion. ... But the greatest among contemporary physicists never adopted any such attitude. This holds for Einstein and Schrödinger, and also for Bohr. They never gloried in their formalism, but always remained seekers, only too conscious of the vastness of their ignorance." The understanding of the vastness of our ignorance was generally present in Olympia, but in all fairness we must add that one could also get glimpses of what our science could become in the future: in all cases these were very exciting moments.

The choice of Olympia for holding the conference was not casual: this is the place where the Olympic games of ancient times were held for something like 1,200 years. Wars were stopped when the games started and activities included reading of poems, and discussions about science and philosophy. Olympia is not only one of the most beautiful and interesting spots of the world, but also a positive symbol of the modern civilization.

The generous efforts of many people have made our conference possible. First of all we wish to thank Attanassios Kanellopoulos for his encouragement and for many useful suggestions. The elected member of the Parliament Crigno Kanellopoulos-Barone has generously helped us in establishing fundamental contacts in Olympia and elsewhere. The constant help of Georges Kanellopoulos has been of tremendous importance for the success of the meeting: we thank him warmly. We are also very grateful to the physics students Rossella Colmayer, Francesco Minerva and Gabriella Pugliese, who formed an efficient and charming secretariat.

Our thanks go also to the International Olympic Committee, and to its president Prof. X. Yzezezez, for allowing us to use, free of charge, the wonderful structures of the Olympic Academy where the conference was held. Mr. A. Bababab, representative of the Greek government, brought us welcome greetings and encouragement, and Prof. R. Rapetti, president of the Istituto Italiano di Cultura in Athens, stressed the European nature of the conference. The words of Mr. X. Kosmopoulos, mayor of Olympia, made the participants feel at home in his marvellous town.

Last but not least our gratefulness goes to the generous sponsors: the Greek Ministry of Culture, the General Secretary of Research and Technology of the Greek Ministry of Industry, the Università di Bari and, independently, the Physics Department of the Università di Bari, the National Tourist Organization of Greece, the Commercial Bank of Greece, the Ionian Bank of Greece, the Ellenic Industrial Development Bank S.A., and Glaxo A.E.B.E. Without their concrete help the Olympia conference would not have taken place.

M. Barone and F. Selleri

Contents

ASTROPHYSICS : ANOMALOUS-REDSHIFTS

Empirical Evidence on the Creation of Galaxies and Quasars	1
<i>Halton Arp</i>	
Periodicity in Extragalactic Redshifts	13
<i>William M. Napier</i>	
Quasar Spectra: Black Holes or Nonstandard Models ?	27
<i>Jack W. Sulentic</i>	
Configurations and Redshifts of Galaxies	37
<i>Mirosław Zabierowski</i>	
Isominkowskian Representation of Cosmological Redshifts and the Internal Red-Blue-Shifts of Quasars	41
<i>Ruggero M. Santilli</i>	
The Relativistic Electron Pair Theory of Matter and its Implications for Cosmology	59
<i>Ernest J. Sternglass</i>	
Are Quasars Manifesting a de Sitter Redshift?	67
<i>John B. Miller and Thomas E. Miller</i>	

What, if Anything, Is the Anthropic Cosmological Principle Telling Us? <i>Silvio Bergia</i>	73
Large Anomalous Redshifts and Zero-Point Radiation <i>Peter F. Browne</i>	83
Theoretical Basis for a Non-Expanding and Euclidean Universe <i>Thomas B. Andrews</i>	89
Light Propagation in an Expanding Universe <i>Alexandros Paparodopoulos</i>	99
Fornax - The Companion of the Milky Way and the Question of Its Standard Motion <i>Mirosław Zabierowski</i>	105
Cosmological Redshifts and the Law of Corresponding States <i>Victor Clube</i>	107

RELATIVITY: ENERGY AND ETHER

Did the Apple Fall? <i>Hüseyin Yilmaz</i>	115
Investigations with Lasers, Atomic Clocks and Computer Calculations of Curved Spacetime and of the Differences between the Gravitation Theories of Yilmaz and of Einstein <i>Carrol O. Alley</i>	125
Gravity Is the Simplest Thing ! <i>David F. Roscoe</i>	139
Fourdimensional Elasticity: Is It General Relativity ? <i>Angelo Tartaglia</i>	147
Universality of the Lie-Isotopic Symmetries for Deformed Minkowskian Metrics <i>Ascar K. Aringazin and K.M. Aringazin</i>	153

Hertz's Special Relativity and Physical Reality	163
<i>Constantin I. Mocanu</i>	
From Relativistic Paradoxes to Absolute Space and Time Physics	171
<i>Horst E. Wilhelm</i>	
Theories Equivalent to Special Relativity	181
<i>Franco Selleri</i>	
The Physical Meaning of Albert Einstein's Relativistic Ether Concept	193
<i>Ludwik Kostro</i>	
The Limiting Nature of Light-Velocity as the Causal Factor Underlying Relativity	203
<i>Trevor Morris</i>	
The Ether Revisited	209
<i>Adolphe Martin and C. Roy Keys</i>	
What Is and What Is Not Essential in Lorentz's Relativity	217
<i>Jan Czerniawski</i>	
Vacuum Substratum in Electrodynamics and Quantum Mechanics - Theory and Experiment	223
<i>Horst E. Wilhelm</i>	
The Influence of Idealism In 20th Century Science	233
<i>Heather McCouat and Simon Prokhovnik</i>	

GEOFYSICS: EXPANDING EARTH

Creeds of Physics	241
<i>S. Warren Carey</i>	
Earth Complexity vs. Plate Tectonic Simplicity	257
<i>Giancarlo Scalera</i>	
An Evolutionary Earth Expansion Hypothesis	275
<i>Stavros T. Tassos</i>	

Global Models of the Expanding Earth	281
<i>Klaus Vogel</i>	
An Orogenic Model Consistent with Earth Expansion	287
<i>Carol Strutinski</i>	
Earth Expansion Requires Increase in Mass	295
<i>John K. Davidson</i>	
Principles of Plate Movements on the Expanding Earth	301
<i>Jan Koziar</i>	
The Origin of Granite and Continental Masses in an Expanding Earth	309
<i>Lorence G. Collins</i>	
The Primordially Hydridic Character of Our Planet and Proving It by Deep Drilling	315
<i>C. Warren Hunt</i>	
Possible Relation between Earth Expansion and Dark Matter	321
<i>Stanislaw Ciechanowicz and Jan Koziar</i>	
Earth Expansion and the Prediction of Earthquakes and Volcanicism	327
<i>Martin Kokus</i>	
Tension-Gravitational Model of Island Arcs	335
<i>Jan Koziar and Leszek Jamrozik</i>	

FIELDS, PARTICLES : SPACE-TIME STRUCTURES

Electromagnetic Interactions and Particle Physics	339
<i>Asim O. Barut</i>	
Isotopic and Genotopic Relativistic Theory	347
<i>Asterios Jannussis and Anna Sotiropoulou</i>	
A Look at Frontiers of High Energy Physics: From the GeV(10^9 eV) to PeV(10^{15} eV) and Beyond	359
<i>Michele Barone</i>	

An Approach to Finite-Size Particles with Spin	369
<i>Bronislaw Sredniatwa</i>	
A New High Energy Scale?	377
<i>Vladimir Kadyshevsky</i>	
On the Space-Time Structure of the Electron	383
<i>Martin Rivas</i>	
Physics without Physical Constants	387
<i>Edward Kapuscik</i>	
The Relation between Information, Time and Space Inferred from Universal Phenomena in Solid-State Physics	393
<i>Gerhard Dorda</i>	
Quantum-Like Behaviour of Charged Particles in a Magnetic Field and Observation of Discrete Forbidden States in the Classical Mechanical Domain	401
<i>Ram K. Varma</i>	
Unipolar Induction and Weber's Electrodynamics	409
<i>André K.T. Assis and Dario S. Thober</i>	
Impact of Maxwell's Equation of Displacement Current on Electromagnetic Laws and Comparison of the Maxwellian Waves with Our Model of Dipolic Particles	415
<i>Lefteris A. Kaliambos</i>	
Direct Calculation of H and the Complete Self Energy of the Electron from Fluid Models	423
<i>William M. Honig</i>	
Interbasis "Sphere-Cylinder" Expansions for the Oscillator in the Three Dimensional Space of Constant Positive Curvature	429
<i>George S. Pogosyan, A.N. Sissakian and S.I. Vinitzky</i>	
Pancharatnam's Topological Phase in Relation to the Dynamical Phase in Polarization Optics	437
<i>Susanne Klein, Wolfgang Dultz and Heidrun Schmitzer</i>	

On the Connection between Classical and Quantum Mechanics	443
<i>Andrzej Horzela</i>	
Discrete Time Realizations of Quantum Mechanics and Their Possible Experimental Tests	449
<i>Carl Wolf</i>	
Heraclitus' Vision - Schrödinger's Version	459
<i>Pitter Gräff</i>	
<u>QUANTUM PHYSICS : DUALITY AND LOCALITY</u>	
Is It Possible to Believe in both Orthodox Quantum Theory and History?	465
<i>Euan J. Squires</i>	
A New Logic for Quantum Mechanics?	475
<i>Eftichios Bitsakis</i>	
Dangerous Effects of the Incomprehensibility in Microphysics	485
<i>Jenner Barretto Bastos Filho</i>	
Classical Interpretation of Quantum Mechanics	493
<i>Vladimir K. Ignatovich</i>	
Rabi Oscillations Described by de Broglie Probabilities	503
<i>Mirjana Bozic and Dusan Arsenovic</i>	
A Test of the Complementarity Principle in Single-Photon States of Light	511
<i>Yutaka Mizobuchi and Yoshiyuki Othaké</i>	
Experiments with Entangled Two-Photon States from Type-II Parametric Down Conversion: Evidence for Wave-Particle Unity	519
<i>Carroll O. Alley, T.E. Kiess, A.V. Sergienko and Y.H. Shih</i>	
Note on Wave-Particle Unity	
<i>H. Yilmaz</i>	
Correlation Functions and Einstein Locality	529
<i>Augusto Garuccio and Liberato De Caro</i>	

Optical Tests of Bell's Inequalities. Closing the Poor Correlation Loophole	537
<i>Susana F. Huelga, Miguel Ferrero and Emilio Santos</i>	
Atomic Cascade Experiments with Two-Channel Polarizers and Quantum Mechanical Nonlocality	545
<i>Mohammad Ardehali</i>	
New Tests on Locality and Empty Waves	555
<i>Ramon Risco-Delgado</i>	
Wave-Particle Duality	561
<i>Marius Borneas</i>	
Quantum Correlations from a Logical Point of View	565
<i>Nikos A. Tambakis</i>	
Local Realism and the Crucial Experiment	571
<i>Yoav Ben-Dov</i>	
The Space of Local Hidden Variables Can Limit Non-Locality And What Next?	575
<i>Milan Vinduska</i>	
How the Quantum of Action Cannot Be a Metric one	583
<i>Constantin Antonopoulos</i>	
The Ghostly Solution of the QuantumParadoxes and Its Experimental Verification	591
<i>Raoul Nakhmanson</i>	
Index	597

EMPIRICAL EVIDENCE ON THE CREATION OF GALAXIES AND QUASARS

Halton Arp

Max-Planck-Institut für Astrophysik
Garching bei München, Germany

Simply the arrangement on the sky of extragalactic objects has long shown that the youngest, smallest quasars and compact galaxies have been created recently in the vicinity of older progenitor galaxies. Now high energy observations in X-rays and γ -rays confirm these connections and require the creation of matter as an ongoing process marked by an initially high intrinsic redshift.

The nearest superclusters of galaxies show creation along lines in space originating from the central, ejecting galaxy. String theory may be pertinent. The existence of preferred values of redshift (periodicity) rule out, again, an expanding universe. They also imply quantum mechanical effects at the $m = 0$ creation points of particulate matter. No theory has been advanced, however, which numerically predicts the quantization values.

Introduction

The Big Bang theory of the universe precludes any scientific observation of creation because the event is so remote in time and space. But even if we could observe this singular event at a distance of 15 billion light years this age zero universe would supposedly surround us in every direction. That leads to the rather bizarre conclusion that we are, at this moment, "inside" a point that is so small it is dimensionless (the point from which the universe is supposed to have suddenly expanded).

Perhaps the conclusion is illogical enough to send us back to what we should have been doing all along – looking at the actual observations. If we do, we find that they all point to the incorrectness of one key assumption in the current theory. That assumption is that extragalactic redshifts measure velocities of expansion. If redshifts are not due to recessional velocities the expansion of the universe and Big