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Editorial

The scientific and editorial mission left to us by Madame Ing. Carmen Capel Boute with the CIFA News has allowed to maintain open the contacts with the American, Russian and European Schools in the filed of studies and research on environmental and climatic factors effect on biologic systems.

The meetings in Rome, in Kiev, Crimea, in Moscow, Milan and Bruxelles talk of the common scientific spirit that overcomes the distances and various difficulties that interfere with the development of the scientific and cultural cooperation. These activities normally rely on the common solid base found on the rigorous and scientific method and contemporarily on the conscience of the inherently innovative and pioneering character of the scientific activities that never is afraid of the news and of the unknowns but on the contrary is always researching and facing it with Galilean and Socratic spirit.

Strongly linked to the traditions, it is possible to read on the CIFA News pages a lot of new concepts, new experiments, new acronyms that offer the show the attractive of the unknowns that strongly couple with the academic and industrial matrix with whom interact continuously by means of the validation of the scientific national and international institutions and of the industrial production to which they make reference for research and Development Programs.

This seems the case of the cold fusion for which people is awaiting for huge amount of energy and this is the case of the radioactive waste management and that of the old “querelle” on the bioelectromagnetims that need more rigorous and less ideological approach full of politics that does not meet the scientific dialectic and methods.

In this number of the CIFA News there are presented papers on traditional topics such as that of Faraone on the influences of the cosmic factors on the CSD that appear linked to the neutrons counting that do not appear really neuter. Peculiarly, this theme has been revisited by the Moscow physicist Boris Kukesky with his new neutron dose meter that really deserves further theoretical and experimental studies. So this number of the CIFA News reprints a comment of the New York Times of the Cold Fusion that shows how nowadays the topic is focused to the attention of big press and of the worldwide multinational and transnational industries as it is also underlined by the implication of primary national industrial groups such as Pirelli, Moratti and so on in Italy plus Mitsubishi in Japan, the America Navy Labs in the States and so on.

According to what it is reported by a Russian lecture by Mudretskaya and Nedospasiv dated on 1995 and published by Fusions Technology on 1997, by now there are a lot of large research groups involved in the fusion research. This paper show also a very interesting and original theoretical approach that we suggest to consider and carefully analyze even only for comparison purposes.

Furthermore, in this issue of CIFA News a number of papers given at “Coherence 2004” Congress hold in Rome at the “Sapienza University” are reported: Actually, these papers appear very interesting due to fact that afford the complexity of the condensed matter as is seen by researchers belonging to the Preparata school such as Luca Gamberale e Renata Mele that are nowadays working for Pirelli Lab’s and afford these problems by using coherent quantum electrodynamics theories among others the superconductivity, the cold fusion and so on.

A peculiar mention is due to modern science daughter the gravitation that as told by Pizzella, after Newton has never had so large developments a part from the history of the Space shuttle. “Gravitation” is a very difficult filed proposed to the scientific community even because of the electromagnetic waves and forces that influence country people due to the action of the moon that continues to be monitored on empirical base.

It should be a good point do not leave the evaluation of the interaction between environment and biological systems to the country men wisdom, but to insert them into the current scientific evaluations.

CIFA News will continue to deal with these topics inside the PRIN research program about the interaction between environment and biological systems and inside the INTAS program for which work will be done for developing common research programs among European and Russian (that really are European), Ukraine and so on colleagues. On these topics CIFA News will publish again by developing a new Edition in cooperation with the “Ricerca Aerospaziale” Journal by starting in the next autumn on behalf of CSB and CIFA News. However CIFA News will remain a network “news letter” published in appendix to the above mentioned “Ricerca Aerospaziale” Journal. We will be very pleased to receive further papers and other kind of cooperation for the global development of the two journal for giving new energy and interest to the space research form which we do expect new technological fall down.

In the end of day, our thinking goes to the soul of our friend and colleague Alexander Konradov that is recently dead due to an vascular attack. We missing him but we will continue the work that we started together for science and humanity improvement.

Bye Alexander!

Vincenzo Valenzi

Editoriale

La missione scientifico/editoriale assegnataci da Madame Ing. Carmen Capel Boute con il CIFA NEWS ha consentito di mantenere aperti i contatti tra la Scuola Russa e la Scuola europea/americana nel campo dello studio dei fattori dell'ambiente e della loro influenza sui sistemi biologici. I nostri incontri in Crimea, Kiev, Mosca ed a Roma, Bruxelles e Milano ci parlano di uno spirito scientifico comune che va oltre le distanze e le difficoltà varie che si frappongono allo sviluppo della cooperazione scientifica e culturale che vede una base comune solida fondata sul rigore ed il metodo scientifico e nel contempo sulla coscienza del carattere intrinsecamente innovatore e pionieristico tipico dell'attività scientifica, che non può temere il nuovo e l'ignoto, ma che lo cerca e l'affronta con lo spirito socratico e galileiano.

Ancorati fortemente alla tradizione, si può osservare nelle pagine del CIFA l'evoluzione di nuovi concetti, di nuovi esperimenti, di nuovi acronimi che offrono l'ebbrezza dell'ignoto (si veda per tutti l'articolo di Rita Pizzi e altri), ma che si innestano fortemente con la matrice accademica ed industriale con cui interagiscono continuamente tramite la validazione delle istituzioni scientifiche nazionali ed internazionali e della produzione industriale a cui si fa riferimento per i programmi di Ricerca & Sviluppo .

È sintomatico il caso della fusione fredda, attesa al varco dello sviluppo di quantità di energia importanti e del trattamento delle scorie radioattive, come anche il caso delle querelle sul bioelettromagnetismo che necessita di un approccio rigoroso e meno ideologico da manifesti politici che poco si addicono alla dialettica scientifica.

In questo numero del CIFA NEWS accanto ai temi tradizionali (vedasi l'articolo di Lushnov) tra cui ulteriori approfondimenti degli studi di Piero Faraone sull'influenza di fattori cosmici sulle sezioni colonie batteriche (CSD) che appaiono connessi alla conta dei neutroni che così neutri non sembrano (tema abbastanza trascurato e rilanciato dal fisico moscovita Boris Kukeski con il suo nuovo dosimetro per neutroni che merita ulteriori attenzioni teoriche ed industriali), riportiamo un commento del New York Times sulla Fusione Fredda che evidenzia come oramai il tema sia al centro dell'attenzione sui tavoli della grande stampa e della grande industria mondiale come peraltro il coinvolgimento di primari gruppi industriali già indicava (Pirelli, Moratti ecc. Italia, Mitsubischi in Giappone, la Marina militare americana ecc). Per il vero già numerosi gruppi di ricerca di un certo peso erano all'opera ovunque, come si può leggere dalla nota moscovita di Mudretskaya e Nedospasov del 1995 pubblicata su Fusion Technology nel 1997 che riportiamo anche per l'originalità dell'approccio teorico con cui è bene confrontarsi. In questo numero riportiamo inoltre alcuni contributi presentati a Coherence 2004 alla "Sapienza" di Roma che affrontano la complessità dell'approccio alla materia condensata vista da ricercatori della Scuola di Preparata come Renata Mele e Luca Gamberale attualmente operativi presso i Pirelli Labs, che affrontano gli stessi problemi da un'angolatura che sfrutta le teorie elettrodinamiche quantistiche coerenti per tentare di decifrare le dinamiche interne alla materia condensata tra cui la superconduttività , la fusione fredda ecc.

Una menzione particolare all'ancella della scienza moderna, la gravitazione, che come dice Pizzella dopo Newton non ha avuto grandi sviluppi a parte le vicende sulle navicelle spaziali. Un campo molto difficile che abbiamo voluto proporre all'attenzione della comunità scientifica che ci segue, anche perché nonostante tutto le forze e le onde gravitazionali ci condizionano non poco e non solo in campagna dove l'azione della luna continua ad essere monitorata su base empirica. Sarà un bene nella valutazione delle interazioni tra ambiente e sistemi biologici focalizzare l'attenzione anche sulle influenze gravitazionali che non sono da abbandonare alla saggazza contadina , ma vanno inserite nelle valutazioni scientifiche correnti.

Su questi temi continueremo discutere e a lavorare nell'ambito del programma Interazioni tra ambiente e sistemi biologici in ambito PRIN coordinato da Giorgio Monaco, e nell'ambito del programma INTAS che ci dovrà vedere all'opera per sviluppare programmi comuni di ricerca tra i colleghi europei ed i russi ucraini ecc. Di questi argomenti e di altri continueremo a scrivere sulla nuova edizione della Rivista di **Ricerca Aerospaziale** con la quale stiamo strutturando una collaborazione fin dal prossimo autunno come CSB e come CIFA News, che resterà una news letter in internet, con una estensione editoriale sulla rivista di ricerca aerospaziale a cui chiamiamo tutti i colleghi a collaborare ed a sostenere ,in modo da rilanciare lo studio dell'ambiente e dello spazio da cui ancora una volta contiamo di avere benefici sulla nostra amata e purtroppo bistrattata Terra. Infine il nostro pensiero va al nostro amico e collega Alexander Konradov che non si è mai risparmiato per la scienza e il progresso umano. Noi continueremo il lavoro che facevamo insieme memori del Tuo esempio di grandezza e di semplicità e amore per la vita e la conoscenza.

Ciao Alessandro!

Vincenzo Valenzi

THE NEW YORK TIMES REPORTS: NEW U.S. DEPARTMENT OF ENERGY REVIEW TAKES COLD FUSION TO BRINK OF ACCEPTANCE

"THE 2004 COLD FUSION REPORT" PROVIDED BACKGROUND INFORMATION TO NEW YORK TIMES REPORTER KENNETH CHANG FOR STORY RESEARCH

LOS ANGELES, March 25, 2004 -- Investigators Steven Krivit and Nadine Winocur have released the most current work on the history and progress of the science. "The 2004 Cold Fusion Report," the outcome of a four-year investigation, establishes the veracity of cold fusion. The Department of Energy committed to a second review after meeting on Nov. 6, 2003 with several scientists who requested an evaluation of progress in the field of cold fusion. Dr. James F. Decker, deputy director of the science office in the Energy Department, was quoted by The New York Times on March 25, 2004 as saying, "The scientists who came to me are from excellent institutions and have excellent credentials." The scientists reported that cold fusion is real, with results that are robust, verifiable and reproducible.

The Energy Department review is expected to decide whether government funding should be applied toward cold fusion research. "For advocates of cold fusion, the new review brings them to the cusp of vindication after years of dismissive ridicule," the New York Times said. "The 2004 Cold Fusion Report" is based on personal communication with more than 50 scientists from around the world, 28 of whom Krivit interviewed on camera at the 10th International Conference on Cold Fusion in Cambridge, Mass.

The 53-page report includes quotes from such scientists as Dr. Melvin Miles, former senior electrochemist of the Naval Air Warfare Center Weapons Division at China Lake, Calif., who, commenting on an eight-year series of U.S. Navy cold fusion experiments, concluded, "In our opinion, these [findings] provide compelling evidence that the [cold fusion effects] are real. This research area has the potential to provide the human race with a nearly unlimited new source of energy. It is possible that [cold fusion] will prove to be one of the most important scientific discoveries of this century." It also cites a senior member of the technical staff at the U.S. government's Sandia National Laboratories, James Corey, who expressed at the September 2003 Energetic Materials Intelligence Symposium that "an overdue revolution in science will arrive, [and] the reputations of cold fusion scientists and those who revile them may be reversed."

Although 3,000 scientific papers have been written about cold fusion, progress is underreported in the scientific and popular media because of a rift between cold fusion researchers and the scientific establishment, which has refused in its journals to publish articles relating to cold fusion. In a September 2003 article, science columnist Sharon Begley of the Wall Street Journal noted of this phenomenon, "the only thing pathological about cold fusion is the way the scientific establishment has treated it."

"The 2004 Cold Fusion Report" includes the following findings:

- Demographic data showing that more than 150 scientists worldwide, including 60 physicists, hold that cold fusion is a verifiable, reproducible low-temperature nuclear reaction, free of harmful radiation and nuclear waste.
- Survey results documenting that the effect is reproducible and has been demonstrated in many laboratories around the world, through a variety of methods.
- Citations from five scientific papers which report correlation between excess energy and the nuclear by-product helium-4, a key finding which verifies the claims of low-temperature nuclear

reactions. Historically, critics of cold fusion erroneously assumed that "cold fusion" should emit the same nuclear products as "hot fusion." Later research demonstrated that the hunt for the "missing neutrons" was misdirected and that the dominant product of cold fusion, instead, is helium-4.

"The 2004 Cold Fusion Report" also includes evidence of the veracity of cold fusion in several previously unreleased documents:

- A 1993 report to the Pentagon by former JASONS chairman Richard Garwin and by chemistry professor Nathan Lewis of Caltech that supports the findings of "excess heat," providing key evidence for the cold fusion effect. Four years earlier, Lewis tried unsuccessfully to replicate the cold fusion effect and subsequently became one of the most outspoken critics of cold fusion.
- A 1991 report by chemistry professor Alan Bard of the University of Texas, a vocal critic of cold fusion who confirmed the presence of "excess heat" in an independent laboratory experiment at SRI International.
- Two 1995 papers by scientists from Amoco Production Co. and Shell Research reporting positive, unambiguous evidence from their own cold fusion experiments.

Part 1 of "The 2004 Cold Fusion Report" examines factors that led the scientific community to a premature rejection of the validity of cold fusion and explains why developments in cold fusion have gone virtually unreported. It reviews studies revealing that the early experiments conducted by prominent laboratories that were presumed to have debunked cold fusion were in fact seriously flawed.

Part 2 of the report discusses the current status of cold fusion research. It reviews advances over the past 15 years and identifies the major unanswered questions. The report concludes with a glimpse of possible future applications for cold fusion technology.

"The 2004 Cold Fusion Report" was reviewed for technical accuracy by two physicists with decades of experience in conventional fusion, one of whom has studied cold fusion, as well. The other, a skeptical plasma physicist who works for a major U.S. fusion research center, described the report as "correct, readable, even and unbiased, suitable for reaching physicists and educated people."

"The 2004 Cold Fusion Report" has garnered the following praise:

"This is very interesting for me, in part because of my continuing interest in neglected science, and in part because I knew Fleischmann & Pons. Several things in the report were new to me and look very promising indeed."

- Dr. Henry H. Bauer, Editor-in-Chief, Journal of Scientific Exploration

"This is a fine report. It is a work well done, the old-fashioned way, with hard work. I hope the world reads it -- it is well-written and powerful."

I hope the world acts on it -- it is clear, concise and concrete."

- Dr. Michael Staker, materials scientist and research engineer, U.S. Army Research Laboratory, Aberdeen Proving Grounds

"The 2004 Cold Fusion Report' has brought a wide variety of interesting and complex material together. It should be helpful for someone trying to understand what the arguing has been about."

- Dr. Michael Melich, senior research professor at the U.S. Naval Postgraduate School and former branch head of the U.S. Naval Research Laboratory

Pull quotes and art are available on request. For a copy of "The 2004 Cold Fusion Report," e-mail your request with full contact information to New Energy Times at press@newenergytimes.com.

Recent Research Progress on Low Energy Nuclear Reactions in Metal-Deuterium Systems

Francesco Celani (INFN, Frascati) and Akito Takahashi (Osaka University)

1. Introduction

Through the recent international conferences^{1,2)} and meetings^{3,4)}, several concrete experimental results have been reported on anomalous nuclear reactions in metal deuterium systems. Faint stream of research on low energy nuclear reactions (LENR) in condensed matter has been sustained by about 100 researchers for last 15 years after the notorious Pons-Fleischmann report on cold fusion on March 1989, and now we are getting to a confident conclusion that there happen some new kind of nuclear reactions in condensed matter containing deuterium. The phenomena do not look necessarily “cold fusion” of known fusion reactions of hydrogen isotopes such as d+d and p+d, but do confidently appealing the opening of new science of Condensed Matter Nuclear Science (CMNS) which is a new nuclear process under the strong linkage between nuclear physics and condensed matter (solid-state) physics.

This report treats a brief review of recent progress of LENR/CMNS researches in the world, picking up most impressive and important experimental results and persuasive theoretical models.

2. Anomalous Enhancement of Deuteron Fusion in Beam-Target Experiments

Rather orthodox nuclear physics experiments have been done using low energy deuteron beams irradiating solid targets of metal deuterium systems for observing 3MeV protons by d+d reactions and other possible charged particles. Historically, d+d and d+t reactions are utilized for neutron sources by low energy accelerators, and we know the reaction yields can be well predicted usually by calculations of beam-target interactions using computer codes like TRIM and SRIM. However, in some of recent experiments using metal-deuteride targets with surface modifications in nano-meter scale depth, anomalous enhancement of d+d fusion rates have been observed^{5,6,7,8,9)}. Kitamura et al.^{5,6,7)} have reported strong enhancement of d+d fusion rates in d-beam-target experiments using palladium-deuteride targets with 20-100nm surface modification of Au layer and supplying continuous deuterium gas flow from the backside of the Pd target. They observed anomalous enhancement factor of d+d fusion rates on the order of 1E1 to 1E3. It is interesting to see similarity of experimental condition between Kitamura experiments and Iwamura experiments for selective transmutation which we mention later; namely the nano-size surface modification and dynamic flow of deuteron flux through samples look something to do with stimulating the New Phenomena. Kasagi et al.^{8,9)} have done more basic experiments using 1-10keV deuteron beam irradiating various metal samples. They observed anomalous enhancement factors of d+d fusion rates in some samples like Pd and PdO. They estimated effective screening energies to be about 300eV for Pd and 600eV for PdO, which were very large compared with about 20eV of screening energy by established theory of electron screening in condensed matter as Thomas-Fermi gas.

Takahashi group have made efforts on detecting products of 3D(d+d+d) fusion using highly D-loaded TiDx targets with irradiation of low energy deuteron-beam^{10,11,12,13)}. They observed anomalous enhancement factors of [3D]/[2D] yield ratios on the order of 1E25, compared with the calculation of established random reaction theory of nuclear physics.

Results of Kitamura, Kasagi and Takahashi are considered to suggest that there were existing anomalously high density of close d-d pairs which would be stimulated by their experimental conditions, and these results can solely be explained by assuming a linked nuclear process between nuclear strong force process and atomic motion process with electrons in condensed matter. Some states of electrons in such condensed matter should have a role of very enhanced screening effect on d-d Coulomb repulsive force.

3. Anomalous Foreign Products and Nuclear Transmutation

Most striking results were reported by the Mitsubishi Heavy Industry group, Iwamura et al.^{14,15,16,17}. They have done deuterium permeation experiments using multi-layered complex samples of Pd/CaO-Pd/Pd. Surface modification of Pd substrate was made with 100 to 1000nm thick multi-layers of Pd/CaO-Pd. They mounted ¹³³Cs layer (or Sr layer) on surface. During a week of run, they observed surprisingly the decrease of ¹³³Cs (or ⁸⁸Sr) and increase of ¹⁴¹Pr (or ⁹⁶Mo). Using H₂ gas, they saw no change of ¹³³Cs (or Sr) and no generation of ¹⁴¹Pr (or ⁹⁶Mo). They made conclusion that there happened selective transmutation from M(A,Z) to M(A+8, Z+4), namely transmutation adding 2-alpha-particles. Higashiyama et al.¹⁸ replicated the MHI results, and Celani et al.^{19,20} have also observed similar selective transmutations.

Before ICCF9, many claims of observation of nuclear transmutation with various isotopes looking like fission-products by T. Mizuo, G. Miley, A. Karabut, and so on (see papers down-loadable from Ref.2 for other than ICCF10 proceedings). These claims may have relation to Iwamura experiments.

4. He-4 Generation and Excess Heat

One of most important results for potential application to energy production is the observation of helium generation, some times in correlation of excess heat generation. After the first claim by Miles²¹, McKubre²², Arata et al.²³, de Ninno et al.²⁴, Isobe et al.²⁵, and so on, have studied the problem to report very positive results. Emission of neutrons in these experiments were seriously searched, but no detectable neutrons were observed. Some times, generation of He-3 and tritium was reported²². A recipe of 100 % reproducible conditions is not yet established, but the methods by above groups look promising. Especially, Arata et al. applied nano-size (about 5nm in diameter) crystal powder of Pd to see very strong indication of He-4 generation under stimulation by ultrasonic wave or laser irradiation. Stimulation by laser irradiation is current topics to initiate excess heat generation after Letts-Cravens works²⁶. Usage of nano-size modification of metal-deuteride systems with external stimulation (laser, permeation, beam, discharge, etc.) technique may be the hint to initiating of effects.

5. Theories

If above reviewed major results of recent experiments are coming from the same origin of nuclear process in condensed matter, we need a very challenging theoretical modeling which must be consistent for super-screening of Coulomb repulsion, very weak neutron emission, major helium-4 generation without hard radiation on the order of reaction rate level to explain excess heat and selective transmutations. No established theories exist. However, some recent developments of models have some hopes to approach the challenging problem.

Takahashi et al. have developed a clean fusion model (helium-4 generation without hard radiation) of deuteron cluster fusion under tetrahedral and octahedral symmetric condensations²⁷⁻³⁰. Quadruplet electronic quasi-particle state is considered to generate in an orthogonal coupling of two D₂ molecules under a dynamic Bose-type condensation state in the symmetric condensations, which makes a miracle of super-screening of Coulomb barrier and resonant 4D and 8D strong interactions. Mathematical formulations and numerical estimations of barrier factors, fusion rates and their products were given^{28,29,30}. They claim that the model can consistently explain major claims by experiments, i.e., He-4 generation with excess heat, very weak neutron level, no hard radiation, and secondary selective transmutations like two-alpha added transmutation and clean fission products^{31,32}. Kirinskii-Novikov³³ has given a Montecarlo molecular dynamics simulation for transient PdD_x system, and his results may be corresponding to the EQPET model results by Takahashi.

No other theoretical works have ever tried to numerically explain from helium-4 generation to selective transmutations. However, theories by Hagelstein, Chub-Chub, Li, and so on (see Ref.1 and 2) may be promising when they will be ready to show quantitative results.

References:

- 1) Proceedings of ICCF9, Condensed Matter Nuclear Science, May 19-24, 2002, Beijing, Tsinghua University Press
- 2) Proceedings of ICCF10, Internet Version, August 24-29, 2003, Cambridge USA, <http://www.lenr-canr.org>
- 3) Proceedings of JCF4, October 17-18, 2002, Iwate University, Japan, <http://www.eng.osaka-u.ac.jp/nuc/03/nuc03web/jcf/>
- 4) Abstracts of JCF5, December 15-16, 2003, Kobe University, Japan, *ibid.*
- 5) M. Miyamoto, Y. Awa, N. Kubota, A. Taniike, Y. Furuyama, A. Kitamura: deuterium ion beam irradiation of palladium under in situ control of deuterium density, Ref.1, pp.261-264
- 6) M. Miyamoto, Y. Awa, N. Kubota, A. Taniike, Y. Furuyama, A. Kitamura: reaction yield enhancement under deuterium ion irradiation of deuterated Au/Pd samples, Ref.3, pp.37-41
- 7) A. Kitamura, Y. Awa, T. Minari, A. Taniike, Y. Furuyama: D(d,p)t reaction rate enhancement in a mixed layer of Au and Pd, Ref.2
- 8) H. Yuki, J. Kasagi: *J. Phys. Soc. Japan*, 66(1997)73
- 9) J. Kasagi: Screening energies of DD reactions in metals, Ref.4
- 10) A. Takahashi, et al.: Studies on 3D fusion reactions in TiD_x under ion beam implantation, Ref.2
- 11) A. Takahashi, et al.: *Fusion Technology*, 27(1998)256-272
- 12) A. Takahashi, et al.: *Physics Letters A*, 255(1999)89-97
- 13) Y. Isobe, et al.: *Jpn. J. Appl. Phys.*, 41(2002)1456-1556
- 14) Y. Iwamura, T. Itoh, M. Sakano, S. Sakai: Observation of low energy nuclear reactions induced by D₂ gas permeation through Pd complexes, Ref.1
- 15) Y. Iwamura, M. Sakano, T. Itoh: *Jpn. J. Appl. Phys.*, 41(2002)4642-4650
- 16) Y. Iwamura, et al.: Low energy nuclear transmutation in condensed matter induced by D₂ gas permeation through Pd complexes: correlation between deuterium flux and nuclear products, Ref.2
- 17) M. Sakano, S. Sakai, T. Itoh, Y. Iwamura, S. Kuribayashi: Ref.4
- 18) T. Higashiyama, et al.: Replication of MHI transmutation experiment by D₂ gas permeation through Pd complex, Ref.2
- 19) F. Celani, et al.: Thermal and isotopic anomalies when Pd cathodes are electrolyzed in electrolytes containing Th-Hg salts dissolved at micromolar concentration in C₂H₅OD/D₂O mixtures, Ref.2
- 20) F. Celani, et al.: Ref.4
- 21) M. Miles: Correlation of excess enthalpy and helium-4 production, Ref.2
- 22) M. McKubre: Ref.2
- 23) Y. Arata, et al.: Ref.2
- 24) De Ninno, et al.: Ref.2
- 25) Y. Isobe, et al.: see Ref.13
- 26) D. Letts, D. Cravens: Ref.2
- 27) A. Takahashi: Tetrahedral and octahedral resonance fusion under transient condensation of deuterons at lattice focal points, Ref.1, pp.343-348
- 28) A. Takahashi: Drastic enhancement of deuteron cluster fusion by transient electronic quasi-particle screening, Ref.3, pp.74-78
- 29) A. Takahashi: Mechanism of deuteron cluster fusion by EQPET model, Ref.2
- 30) A. Takahashi: Clean fusion by tetrahedral and octahedral symmetric condensations, Ref.4, see also attached file for full paper.
- 31) A. Takahashi, M. Ohta, T. Mizuno: *Jpn. J. Appl. Phys.*, 41(2001)7031-7046
- 32) M. Ohta, A. Takahashi: Analysis of nuclear transmutation induced from metal plus multi-body-fusion products, Ref.2
- 33) V. Kirkinskii, Y. Novikov.: Numerical calculations of cold fusion rates in metal deuterides, Ref.2, pp.162-169

COMMENTS ON THE POSSIBLE NATURE OF “COLD FUSION“ PHENOMENA

E.V. Mudretskaya*, A. V. Nedospasov* (From Fusion Technology vol. 31 Jan.1997)

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At present it is impossible to ignore some data on strange phenomena designated as “cold fusion”. These phenomena are not yet explained (Ref.1-2). It seems to us that the nature of cold fusion may be found in the framework of the modern physics of elementary particles. Almost all theories have predicted a non zero value for the particle electric dipole moment (EDM) when CP and T violations were discovered. The existence of such particles was absolutely rejected by science before these discoveries.

We think that a fundamental neutral particle with EDM could exist. This particle would create, together with a neutrino, a new long-lived neutral boson compound system with EDM. We named it “eleptino”. A number of models for a theory of grand unification predict extremely small masses of the neutral lepton (see Ref. 3). The total number of residual neutrinos in the universe is evaluated as 10 billion/proton. The total number of eleptinos may have the same order of magnitude. Assuming that only 1% of all particles are captured in matter, would be of the order of 10^{30}cm^3 . Such high densities are possible because the attractive forces of the electric charge in atoms and because of their mutual interaction due to EDM. We do not know the mass and the EDM of Eleptino, but we believe that they are very small.

The natural question of why such densities have never observed arises. Estimates show that a Bose gas has an extremely low specific heat because of its degeneracy. In spite of the smallness of the proposed properties of the eleptinos, their existence may be checked owing to some collective effects.

Many events in the cosmos and on the Earth may be related to the possibility that the eleptinos penetrate into nuclei because the Coulomb barrier does not stop them.

Probably the cosmic flux to Earth contains the eleptinos together with other Bose particles: residual photons, which were discovered in 1965. We venture to foresee that the events described in the literature about cold fusion and the discovery of the gamma ray of earth origin(4) may be result of some “exotic” reactions of eleptinos with nuclei. As a result of the decomposition of an eleptino, the electric charge of nuclei may change. We believe. For example, that the reaction $D + \text{ept} \Rightarrow \text{He} + e$ may destroy the nucleus of deuterium because He is unstable. This reaction is equivalent to one with neutron decay, $n + \nu \Rightarrow p + e$. In the framework of the four fermion interaction postulated by Fermi for the explanation of beta decay of the nuclei, such a reaction is possible because creation of an antineutrino and decay of a neutrino make use of the same operator(3). The reaction $2 D \Rightarrow \text{He}$ discussed in ref. 5 as a possible explanation of cold fusion phenomena may be related to the eleptinos. The high concentration of hydrogen ions at electrodes is attributed to the cold fusion phenomena.

References

1. H. Hora, J.C. Kelly, J.U. Patel, M.A.Prelas, G.H. Miley and J. W Tompkins , Phys. Lett. A. 175,138 (1993).
2. Trans. Fusion Technol. 26 (1994).
3. L.B. Okun, The physics of elementary particles, Nauka, Moscow (1984) (In Russian).
4. G. J. Fishman et al. Science 264 1313 (1994)
5. S. R. Chubb and T. A. Chubb. Fusion Technol., 24 4003 (1993)

*QED Coherence in “Super” Matter: theory and perspectives**

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“Super” system, such as superconductors and superfluids, are characterized by a peculiar phenomenology, that is generally recognized as due to the presence of a macroscopic quantum state at finite temperature. Since 1966 P. Anderson suggested that superfluid systems can be described in terms of a macroscopic wave function Ψ , representing a quantum state with a macroscopic occupation number N and a phase φ :

$$\Psi = \sqrt{N} e^{i\varphi} \quad (1)$$

This view has been extended to the other “super” systems, suggesting that the peculiar macroscopic quantum properties arising in these systems are basically due to a spontaneous symmetry breaking. Presently it is generally accepted that in superfluids and superconductors spontaneous gauge symmetry breaking determines a phase transition at low temperatures, with the formation of a low symmetry phase, described by an order parameter that is simply the generalization of the macroscopic wave function (1)

$$\Psi(\underline{x}, t) = \sqrt{N(\underline{x}, t)} e^{i\varphi(\underline{x}, t)} \quad (2)$$

It has been clearly shown that all the typical properties of superconductors and superfluids can be explained in terms of the quantum phase of the macroscopic wave functions; moreover, this assumption matches very well with the Landau- Ginzburg theory of the continuous phase transition, allowing a very accurate description of the complex phenomenology of “super” properties.

All this theoretical building is based on the assumption that the “super” state can be described by the macroscopic quantum wave function but no evidence of the dynamical formation of the macroscopic quantum state has ever been provided in generally accepted condensed matter physics. The formation of the coherent quantum state is generally attributed to the process of quantum mechanical condensation predicted in 1924 by Bose and Einstein in ideal quantum gases, assuming, against any experimental evidence, that superfluids and superconductors behave as non interacting systems.

On the other hand according to the general view of condensed matter physics, matter systems are generally described as a collection of N ($N \sim 10^{23}$) elementary components (atoms, molecules..) held together by static forces, assuming that the relevant interactions are short range electric and magnetic interaction (Van der Waals forces, hydrogen bond, ionic bond...) whose range is confined in a few Å. The effect of the long range radioactive component of the electromagnetic field is usually neglected, because its two-body component is too weak and thus ineffective in this scheme.

In the Preparata superradiance theory for the first time this long range component has been taken in account in dense systems and it has been clearly shown that in suitable conditions N -body coherent interaction among elementary components can take place spontaneously and stably.

In this theoretical framework the appearance of a macroscopic quantum state is a direct consequence of the QED dynamical equations, arising in the formalism of the quantum field theory.

This view has been successfully applied in the past to the study of the conventional “super” system, i.e. superfluid ^4He and simple metals BCS superconductors, providing a first principle description of these systems. The anisotropic triplet state superfluidity of ^3He has also been described in this frame, together with the superfluidity phenomena in neutron stars.

Finally this approach has been successfully applied to the description of coherent phenomena in condensates of highly diluted ultracold alkali atoms, giving a definite theoretical assessment of the QED coherence in “super” matter.

This view represent a new approach to the theory of macroscopic quantum phenomena in matter whose consequences are still to be explored, opening the way, for instance, to future development of exotic high temperature superconductivity or new methods for developing quantum bits.

References

1. P. W. Anderson *Rev. Mod. Phys.* **38** (1966) 298
2. L. Landau A.Lifshitz *Meccanica Statistica II* (1978) Editori Riuniti
3. G. Preparata *QED Coherence in Matter* (1995) World Scientific
4. E. Del Giudice, M. Giuffrida, R. Mele, G. Preparata *Phys. Rev.* **B 43** (1991) 5381
5. E. Del Giudice, R. Mele, A. Muggia, G. Preparata *Il Nuovo Cimento* **15D** (1993) 3366
6. E. Del Giudice, R. Mele, G. Preparata, C. Gualdi, G. Mangano, G. Miele, *Int.Jour.Mod.Phys.* **D4** (1995) 531
7. E. Del Giudice, G. Preparata: *Bose-Einstein vs. electrodynamic condensates: The question of order and coherence.* Preprint MITH-98/8.

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Quantum coherence and the sensitivity of gravitational wave resonant bar detectors

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Abstract

“Classical” estimates of the sensitivity of gravitational wave resonant detectors schematize the bar as a classical or quantum oscillator, whose initial thermal state is that of a single oscillator driven by a single external stochastic force. Quantum coherence effects could enhance by several orders of magnitude the sensitivity. This possibility was considered by many authors in the last two decades. An accurate description of the initial thermal state of the bar would be needed to give an accurate solution to this problem. Some qualitative considerations suggest that coherence effects could play a significant role. Indeed, the resonant, yet random, nature of the Brownian thermal motion may justify considering the bar response at the fundamental longitudinal eigenfrequency as that of a large number of effective quantum mechanical oscillators. Assuming this hypothesis, quantum coherence effects, as first suggested by Weber in 1984, lead to a much larger cross-section than that “classically” predicted.

INTRODUCTION

The “classical” estimate for the sensitivity of gravitational wave (GW) resonant detectors assumes the bar in a fully incoherent thermal initial state¹. The result is, in units with $\hbar=c=1$:

$$\sigma(\omega) = 2\pi M \omega_0^2 L^2 \quad (1)$$

where L is the length M the total mass and ω_0 the fundamental longitudinal eigenfrequency of the bar. Some controversial experimental results obtained in the last decades using resonant bar GW detectors^{2,3} have prompted theoretical investigations on the possible sensitivity gain provided by coherent mechanisms. The effect of coherence of the resonant bar excitation from GWs was first analyzed by Weber⁴, and, later, by Preparata^{5,6}, Gryshchuk⁷, and Brautti and Picca⁸. Weber⁴ suggested that a quantum computation of the coherent excitation of the N_a atomic quadrupoles constituting the resonant bar would result in a large increase, by a factor $N_a^{1/3}$, of the “classical” cross section. Weber considered a gravitational antenna made up of an ensemble of N_a elementary quadrupoles with atomic mass and arm equal to the lattice spacing. In his model, the GW interacts independently with each elementary quadrupole, the total cross section being the result of a coherent sum of elementary interactions. As pointed out by Preparata⁵, Weber’s computation would be formally correct, but the physical assumption that the wave excites separately structures of atomic length would be acceptable only for much higher frequencies. Later, Preparata⁶ assumed that the initial state of the atoms of the antenna might be described by a coherent quantum state, corresponding to a macroscopic wave function representing the collective behavior of the lattice atoms. In his model, correlation of the atomic motions is assumed to exist at the Debye frequency. The papers by Weber⁴ and Preparata⁶ have been criticized by Gryshchuk⁷, who rejected both, on the basis of quantum calculations. The main criticism was that the normalization factor of the matrix element of displacement should contain the total mass of the bar. This comment seems to ignore the authors’ assumption of coherent excitation of independent quantum oscillators. With respect to Preparata’s model, Gryshchuk also noted that no mechanism was proposed to transfer the energy absorbed at the frequency of the Debye modes to the fundamental longitudinal frequency, which is the one monitored by the existing experiments. Brautti and Picca⁸ assumed coherence of the initial quantum state to hold at the antenna resonance frequency. They described the initial state of the bar as a coherent state of a single quantum (or classical) oscillator. To support this hypothesis the authors cited Zurek et al.⁹, who demonstrated that the interaction of a harmonic oscillator with a thermal bath leads, in the weak coupling limit, to a coherent state as the most probable state of the system. As a consequence, they concluded that the energy increase associated to a GW perturbation would also contain a term that is linear in the GW amplitude, in addition to the much smaller quadratic term that is normally considered. The idea that coherent mechanisms associated to the brownian initial state could increase the cross section of GW bar detectors is very interesting, because the “classical” description of the bar is really not satisfactory.

DISCUSSION

The resonant shape of the Brownian noise power spectrum of bar detectors is the indication that organization of the atomic microscopic motions takes place on the (macroscopic) length scale of the bar, which is associated with the fundamental resonance frequency. The “classical” interpretation of this behaviour is based on two apparently reasonable assumptions: the first one is that the bar is considered as a perfectly elastic body. In the elastic approximation, the body is defined by its geometry and by the elastic tensor, and it is assumed to react coherently (with the same phase anywhere in the body) to a stimulation at one of its resonance frequencies. This may be approximately true only if the applied forces do not change rapidly¹⁰. In addition, one should consider that the amplitude of the thermal motion of the bar at the sensitivity level of present day GW detectors is on the order of 10^{-19} m. Of course, this number has just the meaning of average displacement of the macroscopic bar surface, which is made up of a very large number of atoms, each one experiencing much larger displacements. In this light, the elastic scheme involving instantaneous spatial coherence appears to be even more questionable. The second key assumption is that the thermal atomic motion acts as a single external macroscopic source of random force (a Nyquist force) on a single passive macroscopic oscillator (the elastic bar as a whole). In the real case, the random force does not act as an external perturbation on the motion of the bar as a whole, but it is instead an internal distributed source, varying on the atomic time and length scale, leading, through a chain of internal interactions, to the resulting complex thermal resonant state. In the case of the bar, it is quite difficult to believe that the internal random atomic excitations generate an initial state that is completely spatially coherent and time-incoherent, because this would imply the travelling of the instantaneous phase information at infinite speed through the bar. Partial temporal and spatial coherence should be expected, with a strongly anisotropic pattern, because the radial direction is weakly related (at second order) to the fundamental longitudinal frequency, which is set by the geometrical condition for coherent reflection that is responsible for the development of the resonance. This condition would apply in the longitudinal direction, and the distributed nature of the stochastic driving force would likely produce different phases of the resonant motion at different positions along the transverse dimensions of the bar. Thus the measurable noise-like thermal signal could be made up of the incoherent superposition of partly coherent motions of a large number N of structures extending over the whole length of the bar, but much more tightly localized in the orthogonal direction. These hypothesized longitudinal structures would effectively behave as independent oscillators. It is reasonable to assume a thermal initial state in which the longitudinal structures are incoherently (between each other) excited, because the resonance condition sets their frequency and not their relative phase. The advantages, with respect to Weber’s hypothesis⁴, are that: 1) these oscillators are intrinsically resonant at the fundamental longitudinal frequency; 2) it is quite natural to consider them as independent oscillators, because the transverse coupling of the longitudinal oscillations is very small at the fundamental longitudinal resonance frequency. The overall coherence of the motion excited by a GW on such a system would be limited by thermal noise itself, which would rapidly cause diffusion of the excitation phase. This effect is important to evaluate the cross section, and leads to the concept of non-linear cross-section, function of the GW energy. In the zero-temperature limit case, in which phase-locking is complete, the cross section results:

$$\sigma(\omega) = 2\pi m \omega_0^2 L^2 N^2 = 2\pi M \omega_0^2 L^2 N \quad , \quad (2)$$

which is N times larger than the “classical” cross section. Phase-locking by external stimulation of an oscillator in the presence of a stochastic force has already been studied by Bialek and Wit¹¹ in the more complex case of the nonlinear Van der Pol oscillator. In our case:

$$m \frac{d^2 x}{dt^2} + \gamma \frac{dx}{dt} + kx = \delta F + F \cos(\omega t) \quad (3)$$

The forcing sinusoidal term is in this case associated to the GW:

$$F = mL \frac{\partial^2 h}{\partial t^2} \quad (4)$$

When the same stimulus is applied simultaneously to a large number N of incoherent oscillators, the phases of the excited oscillations are partially synchronized, as a function of the ratio $\lambda = E_s Q / k_B T$. The form of the phase probability density is such that significant phase-locking starts to take place if the energy E_s is of the same order of $k_B T / Q$.

CONCLUSIONS

The GW resonant bar detector sensitivity is not well known, because the “classical” schematization of the Brownian initial state is questionable, and no fully satisfying alternative theory has been proposed yet. A new model of the bar thermal initial state is proposed here, which predicts a large cross section, due to the coherent excitation of a large number of independent effective oscillators associated with the longitudinally resonant thermal motion.

REFERENCES

1. C.W. Misner, K.S. Thorne, J.A. Wheeler, *Gravitation*, (Freeman and Co., 1973).
2. J. Weber, *Phys. Rev. Lett.* **20**, 1307 (1968).
3. M. Aglietta et al., *Il Nuovo Cimento* **12C**, 75 (1989);
4. G. Pizzella, *Il Nuovo Cimento* **105B**, 993 (1990).
5. J. Weber, *Found. Phys.* **14**, 1185 (1984).
6. G. Preparata, *Il Nuovo Cimento* **101B**, 625 (1988).
7. G. Preparata, *Mod. Phys. Lett.* **5**, 1 (1990).
8. L.P. Gryshchuk, *Phys. Rev.* **D45**, 2601 (1992).
9. G. Brautti and D. Picca, *Int. J. Mod. Phys.* **A17**, 327 (2002); G. Brautti and D. Picca, *Int. J. Mod. Phys.* **A17**, 1111 (2002).
10. W.H. Zurek et al., *Phys. Rev. Lett.*, **70**, 1187 (1993).
11. H. Kolsky, *Stress waves in solids* (Dover, 1963).
12. W. Bialek and H.P. Wit, *Phys. Lett.* **104A**, 173 (1984).

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Recent developments in Coherent Quantum Electrodynamics and some of its experimental consequences*

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The reason why matter is present in nature in so many different forms has since ever puzzled the mind of physicists. How can an atom or molecule decide to live in a gas, liquid or solid phase? How can the electrons of a metal decide to be in a superconducting state? What makes phase transitions so sharp, in spite of very small variations of thermodynamic parameters? All these questions are now becoming less mysterious and a reasonable, consistent and (in principle) simple explanation is being formulated.

The theory of electromagnetic phenomena has been established long ago, at the beginning of the 20th-century and its quantum version (QED) saw the light in the Fifties mainly by the contributions of R.P.Feynman. The successes of QED have been astonishing, to the point that QED is considered the most successful theory formulated in physics up to now. In spite of this the advances of QED in Condensed Matter Physics (CMP) have not been seemingly sensible.

In 1987 Giuliano Preparata, a respected researcher of particle physics that spent part of its scientific career in the study of the quantum stability of the perturbative vacuum of quantum chromo-dynamics (QCD, the theory of quarks), started working on this subject, having found strong analogies between some relevant problems of CMP and the corresponding problems in QCD. The outcome of a 10 years-long work on this subject is summarized in an extraordinary book¹, where all the basic results are presented.

The attention is concentrated in the solution of the two-level system, the simplest and most physically significant of the many-body systems. The results obtained are expected to be almost entirely valid for any condensed matter system.

The central idea of this analysis is the observation that above a certain density threshold the fields undergo to collapse and generate a coherent phase. The reason of such breakdown relies on the fact that while matter

Hamiltonian scales like the number of particles N , the interaction term scales like $N\sqrt{N}$ and, since in certain phase conditions it may have negative sign, above a certain value of N the energy acquires negative values for large amplitude of the electromagnetic field.

Such a quantum state always acquires a negative energy gap (i.e. a more favourable condition for the system), whose magnitude depends on the actual parameters of the system. The energy gap acquired by the quantum coherent state gives special features to the system accounting for strange phenomena like superfluidity, superconductivity, etc.

The coherent solution found is at zero temperature and, when the system is heated, a certain amount of elementary systems will be forced to leave the coherent state and will go in the so-called *normal phase*, that is responsible for thermal properties of matter. As far as the temperature is increased the coherent fraction is depleted and the thermal excitations increase their density and at a certain point, the density of the coherent phase is not sufficient for the existence of the coherent fraction and a phase transition occurs. During this process the amount of energy to be supplied to the coherent fraction in order to reach the incoherent (normal) fraction is nothing but the latent heat of the system.

More recently a deeper analysis of the two-level system has been carried out taking into account the spatial dependence of the matter and electromagnetic fields for the single coherence domain in the lowest energy state and an approximated solution has been found. The result essentially confirms the previous solutions, apart from rescaling factors of order 1. The analysis has also revealed the existence of special solutions corresponding to population inversion of the two-level system corresponding to a negative energy gap. Such solutions deserve further study when we consider finite temperature.

One important step is certainly to test on an experimental basis the predictions stemming from the theory. In particular it would be of crucial importance to detect experimentally the presence of the Coherence Domains, whose existence is an unavoidable element for the theory.

A further consequence of coherent dynamics is the possibility of coherent scattering, i.e. the enhancement of orders of magnitude of the scattering cross section of weakly interacting particles. At Pirelli Labs is presently under development a series of experiments on scattering of neutrinos and optical photons with stiff crystals, aimed to the detection of such enhancement of cross section.

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¹ G.Preparata, *QED coherence in matter* World Scientific (1995)

NON LOCALITY IN BIOLOGICAL SYSTEMS ? AN EXPERIMENTAL APPROACH *

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The Penrose-Hameroff model [1][2][3] identifies microtubules inside neurons as responsible for quantum effects in brain. A few experiments carried out in the past seem to indicate that EPR-like correlations are possible at the biological level[4][5][6]. At the Department of Information Technologies, in collaboration with the Stem Cells Research Institute of DIBIT San Raffaele in Milan, a research group was born composed by physicists, computer scientists, biologists and engineers. Our purpose is the study of the collective behaviour of human neurons adhering to microelectrode arrays (MEAs).

One of our interests is exactly the search for quantum processes in neurons.

We ascertained that a viable method could be the search for non-locality processes between neurons [7][8].

Our experimental set up is constituted by two separated and completely shielded basins of human neurons adhering to microelectrode arrays, connected to a PC by means of a signal acquisition card. Each electrode is connected, by means of a sharp insulated track, to a pad suitable for the external connection.

The distance between electrodes varies between 100 and 200 μm , whereas the diameter of each electrode is around 10 μm .

Another circuit allows to connect, by means of a connection matrix, each electrode to the input of the data acquisition card in such a way as to select which basin has to be connected.

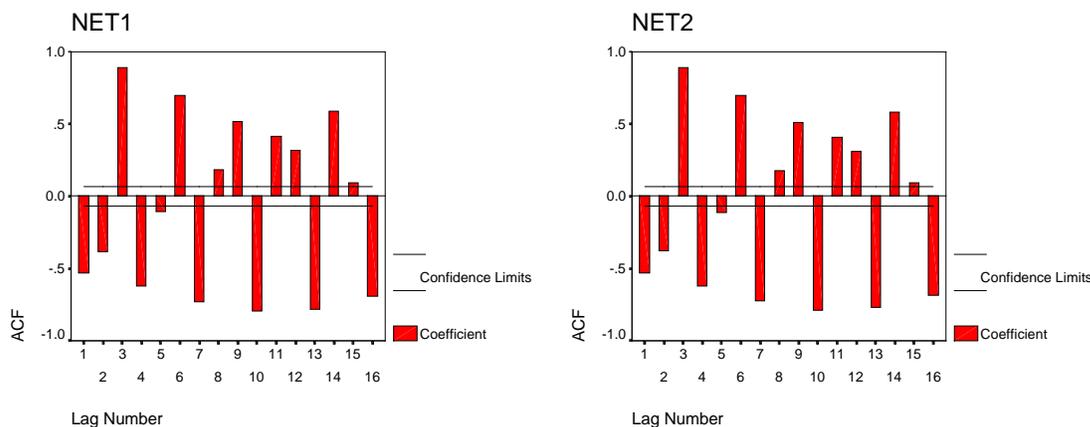
RESULTS

During the experiment we recorded several signals emitted before, during and after laser stimulation of one or both basins, with both connected and separated basins.

We analysed the signals in several ways, with particular attention to the correlation/coherence between the signals coming from the two basins.

The most interesting analysis has been carried out on the signals **coming from separated basins, during stimulation of a single basin.**

The original signals show a completely different behaviour in amplitude and frequency, but their signal autocorrelation functions are portrayed below (up to a few lags):



It can be seen that either signal is strongly auto correlated over several lags. Further, the structure of the autocorrelation function is clearly the same for both signals. Despite the difference in

mean level and amplitude of oscillation, both signals seem to share the same (non-linear) production mechanism. Moreover, their coherence and cross-correlation functions show near-to-one levels.

In order to test for a possible added effect of Net1 on the auto regression structure of Net2, we built an ARIMA model with 6 autoregressive terms, 6 moving average terms and the Net1 effect (no differencing).

Except for the MA term of order 6, all terms are highly significant, including Net1.

We might conclude that the two series are so strongly correlated that, even after correcting for a substantial amount of self-correlation, the values of one series seem to impact the prediction of the other in a highly significant way.

CONCLUSIONS

Maximum care has been adopted in shielding the basins and the electrical devices. The connection cable between electrodes and the acquisition/stimulation circuit is made by a flat cable with 40 wires shielded against EMI emissions with a suitable copper jacket.

All the cables used for the connection between culture basins, stimulation circuit and acquisition card have been carefully shielded. We also minimized the power supply ripple using a condenser with low ESR, in order to avoid a possible ripple in the generated signals.

The data acquisition card is an external device, connected to the PC through the USB port, that can be located up to 5 meters from the PC without batteries. This configuration allows to shorten the connections neurons/acquisition card and to reduce at the same time the risk of possible electrical noise generated by the computer electronic circuits.

Anyway, a separated test on the acquisition card and on the MEAs' circuits has been performed and it completely excluded possible cross talks.

However, the situation is extreme and a great deal of caution should be exercised before offering a non classical explanation.

Several other experiments, also involving super-position of light stimulation, have been and will be performed in the future to get a clear picture and possible hints to understand the deep physical reasons of this non-local correlations.

We also tried to represent a possible quantum model for the observed effect.

If we associate a network of brain matter to a lattice of qubits (i.e. vectors in the complex 2-dimensional Hilbert space), the information inside the network is represented by a sequence of qubits $S = \{q_0, q_1, \dots, q_n\}$, where contiguous qubits reflect the physical neighbourhood of associated neural elements. Thus the global state of the system will be represented by a $|_S\rangle$ vector belonging to a 2^n -dimensional Hilbert space.

The other assumption in our model is that these qubits locally interact following a unitary transformation \hat{U} .

Therefore we assume that all these transforms are identical and correspond to the CNOT operator (\hat{C}).

The choice of this operator is due to the fact that any unitary transformation on a space of n qubits can be approximated by a sequence of \hat{C} operators acting on pairs of qubits and phase rotations acting on single qubits [9]. Moreover, the \hat{C} operator is the simplest operator able to generate the so-called *entangled* states.

Let's now suppose that the system $S = \{q_0, q_1, \dots, q_n\}$ is physically divided into two subsystems, $S^A = \{a_0, a_1, \dots, a_l\}$ and $S^B = \{b_0, b_1, \dots, b_m\}$, not interacting each others.

In the hypothesis that a pair of qubits $\{a_i, b_j\}$ is in an entangled state $\frac{1}{\sqrt{2}}(|00\rangle + |11\rangle)$, in a

following global interaction \hat{U} generated by the concurrence of the local actions \hat{C}^A (acting on the pair $\{a_i, a_{i+1}\}$ of the subsystem S^A) and \hat{C}^B (acting on the pair $\{b_j, b_{j+1}\}$ of the subsystem S^B), it will include in the whole entangled state the spatially separated qubits $\{a_{i+1}, b_{j+1}\}$ that we assume in a previous non-entangled state $|0\rangle|0\rangle$.

The physical meaning of this process is that the model depicts a sort of spontaneous generation of entanglement between separated sections of matter.

The entangled states differ from the non-entangled ones because in the first case the statistical correlation between the results of the measures of the qubits participating in the entangled state vary depending on the possible rotation phases $\hat{\Phi}$ applied to the single qubits, whereas in the case of non-entangled states the correlation is zero, independently from any possible $\hat{\Phi}$.

Thus the model foresees that, after an initial stage where the system interacts by direct contact, also in the following stage where the system has been separated into two sections, a sort of correlation persists between sections.

This is what, at a macroscopic level, we verify in our experiment. It seems that neurons utilize the quantum information to synchronize.

Of course the biological responsible for the quantum behavior are to be identified (neurons, microtubules or other structures), and both the connection between theoretical correlation and electrical correlation, and the connection between laser stimulation and phase rotation $\hat{\Phi}$ are still under investigation.

Another issue to be investigated is a possible classical explanation of the described effect. In particular, we are studying the application of the Kuramoto-Yokoyama model [10]. We think that a promising approach is the development of a model where the quantum processes represent a sort of a microscopic primer of a macroscopic phenomenon as the synchronization of the electrical signals.

REFERENCES

- [1] Hameroff S., Quantum computation in brain microtubules? The Penrose-Hameroff "Orch OR" model of consciousness. Philosophical Transactions Royal Society London (A) 356:1869-1896 (1998).
 - [2] Hagan S., Hameroff S. and Tuszynski J., Quantum Computation in Brain Microtubules: Decoherence and Biological Feasibility, Physical Review E 65, 61901:1-10 (2002).
 - [3] Penrose R., Shadows of the Mind, Oxford University Press (1994).
 - [4] Grinberg-Zylberbaum, G., Ramos, J., 1987. Patterns of inter-hemispheric correlation during human communication. Int. J. Neurosci. 36, 41–53 (1987)
 - [5] Grinberg-Zylberbaum, G., Delaflor, M., Attie, L., Goswami, A., The Einstein–Podolsky–Rosen paradox in the brain: the transferred potential. Phys. Essays 7, 422–428 (1994).
 - [6] Wackermann J., Seiter C., Keibel, H. Walack H, Correlations between brain electrical activities of two spatially separated human subjects, Neuroscience Letters 336:60-64 (2003).
 - [7] Pizzi R., Fantasia A., Gelain F., Rossetti D., & Vescovi V., Looking for quantum processes in networks of human neurons on printed circuit board, Quantum Mind 2, March 15-19, Tucson (2003) <http://www.consciousness.arizona.edu/quantum-mind2/abstracts.html> .
 - [8] Pizzi R., Fantasia A., Gelain F., Rossetti D., & Vescovi V, Non local correlations between separated neural networks, Proc. SPIE Conf. On Quantum Information, April 12-16, Orlando (2004), in press.
 - [9] Zeilinger A., The Physics of Quantum Information, Springer Verlag (2000).
 - [10] Kuramoto Y., Chemical Oscillations, Waves and Turbulence, Springer Berlin (1984).
- Caro Valenzi,

<http://www.nonlocal.com/hbar/coherence.html> for more information on non locality and coherence

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“An interesting remarks on CSD frequency correlated with Neutron Monitor Variations from 1970 to 1991.”

Cifa News Publishing House c/o Study Biometeorology Center Onlus, Via Caio Mario 6/A Roma .

(*) *During the experimental part of this search the A. was in Hygiene and Profil. Labor. of Milan and Prov.(1961-1975) as hygiene microbiologist and after in Hyg. and Prof. Labor. of Rome and Prov., as medical director (1976-1991).*

INTRODUCTION

The A. and coll., already remarked in their previous papers, there was found the significant negative correlation between CSD frequency data and Solar Activity .

It should be very much suggestive to show through statistical elaborations more extended, so as this very presumable is, a significant positive correlation of CSD with neutron monitor data.

EXPOSITION

The **CSD** is a bacterial sector colony showing one or more sectors different in some phenotypic characteristic (as *colour , transparency , surface , thickness or general appearance*) from the parent strain grown simultaneously and competing successfully with it (Servin-Massieu,1961)°.

CSD represent most likely mutations or other genetic changes in a micro organism so as several AA. said (2);(9).

The **CSD** study was in two phases : the 1-st one , with colonies of air micro organisms [1970-1982] and the 2-nd one, with colonies from Staphylococcus Aureus pure populations of laboratory[1984-1991] .

The Air-tests were realized daily, through exposition of tryptose agar actidione plates opened to culling the micro organisms in free sedimentation from air .

The Broth culture-tests were realized to streaking every day, a loop of daily S.Aureus broth culture on tryptose agar plate (4) (8).

CSD developed significantly after thermo-incubation not only in cultural plates exposed to air- micro organisms but also in cultural plates already streaked with laboratory strains of S.Aureus broth-cultures . It was counted daily the **CSD**-number expressed as percentage of total counted colonies of air and broth culture tests . In total in these two phases, more than 4 millions of colonies were controlled .

Before the analysis mentioned above, the air micro organisms were a bacteria-miscellany exposed to environmental factors with undetermined time suspension and altitude (uncontrolled conditions) ; otherwise the S.Aureus strains were pure bacteria populations always grown and kept in laboratory controlled conditions .

It was very exciting to remark the correspondence of **CSD** frequency data during the time, in these two phases of experiments , especially well emphasized by yearly means values and this pattern was evident regardless of the different origin and initial conditions of micro organisms studied (fig. A).

After completion of the 1-st phase, a hypothesis was suggested, that microbiological substrate was under influence of cosmic external factors which may increase number of **CSD** in bacterial cultures .

A then the goal of the 2-nd phase of **CSD** study was to show that the cosmic factors may influence the development of **CSD** in biological substrate, independently to be in open air but they are able also to pass through a variety of artificial shields as in confined site it is .

The results confirmed this possibility and this last one was further more confirmed through test realized in gallery-sites under rocks 1400 m thick in confronting with test realized in confined sites in altitude, at 1000 m. above sea (5) .

The conclusion was that the concordant results of these two phases may not be separated, and only together they represent the whole **CSD**-research in its possible scientific meaning .

Several investigators statistically studied the **CSD** data obtained by A., and demonstrated significant correlations with several cosmic factors, such as **Solar Activity**(2,6,7,8), **Geomagnetic Activity**(6,8) and **Magnetic Storms**(8), and also **Low Frequency Electromagnetic Waves**(7) .

Among them were M. De Meyer from Astr.Observ.of Liegi(2), G. Villoresi and coll. from Rome University La Sapienza(6), J. O'rményi from Meteorol. Institute of Budapest(7), and more recently, F. Halberg and coll. from Minneapolis University (8).

In common there was found a strong negative correlation between yearly mean values of CSD-frequency and Wolf Numbers (WN) .

As Van Allen stated, **Galactic Cosmic Rays (GCR)** are increasing when Solar Activity is declining and vice versa.

Considering negative correlation of **CSD** curve with Solar Activity, and **CSD** positively correlated with neutrons, we should ask physicists :

Might the cosmic rays serve as a factor affecting **CSD**, or could it be connected to such a factor ?

After the considerations mentioned above, the A. can suggest now that neutrons may play an interesting role as a factor affecting **CSD** and this role is possible to deduce from the figures A and B together. It's possible to see through them that the **Neutron Monitor Variations** are in concordance with **CSD** frequency during a long period of time (1970-1991).

CSD and **NMV** are both in negative correlation with Solar Activity (**NW**) but in positive correlation between themselves : the A. and Coll. showed as significant the correlation negative of **CSD** frequency with Solar Activity in several previous papers but the correlation between **NMV** and **CSD** also is so clear to see, that may be confirmed easy by more deepened statistical elaborations.

But what said before doesn't impede in the meantime to admit already the non-causality of **CSD** frequency that is confirmed again (3 -12) .

Remarks ° : Servin Massieu M., "Spontaneous appearance of sectored colonies in Staphylococcus Aureus cultures." J. Bacteriology, 82 : 316-317, 1961.

CONCLUSIONS

There is a sort of "*opening*" through which the cosmic rays (i.e., neutrons here considered) may pass more easy to arriving to the Earth and then on several biological substrates .

This "*opening*" is more large in the period of less Solar Activity and more limited when Solar Activity is more high .

The A. intends here to emphasize the probability that the micro organisms may be influenced in their biological substrate, especially during the more high **Neutron Variations** and corresponding to a lower **Solar Activity Variation**, giving i.e. a higher **CSD**-frequency , as it's here before exposed .

And then the A. asks himself how much and in which way the alternating of these two periodical variations like a sort of cosmic breathing ,may affect biological substrates, more or less conditioning their same life .

Is this "cosmic breathing" a sort of energetic input that induces rhythmically periodical modifications as CSD, so evident in simple living beings as bacteria are ? It's evident at all to be in presence of bio-physical phenomena that may be considered fluctuating phenomena (°) so much studied since 1952 by Piccardi G. and then by Capel Boute C., for about 20 years.

How much Neutron-Variations and Solar Activity are **protagonists** for these rhythmical, periodical variations, in confronting of other cosmic factors ?

How many of these other cosmic factors, till now considered or not, are their most important **co-protagonists** ?

Is it too much hazardous and premature to put now all these questions ?

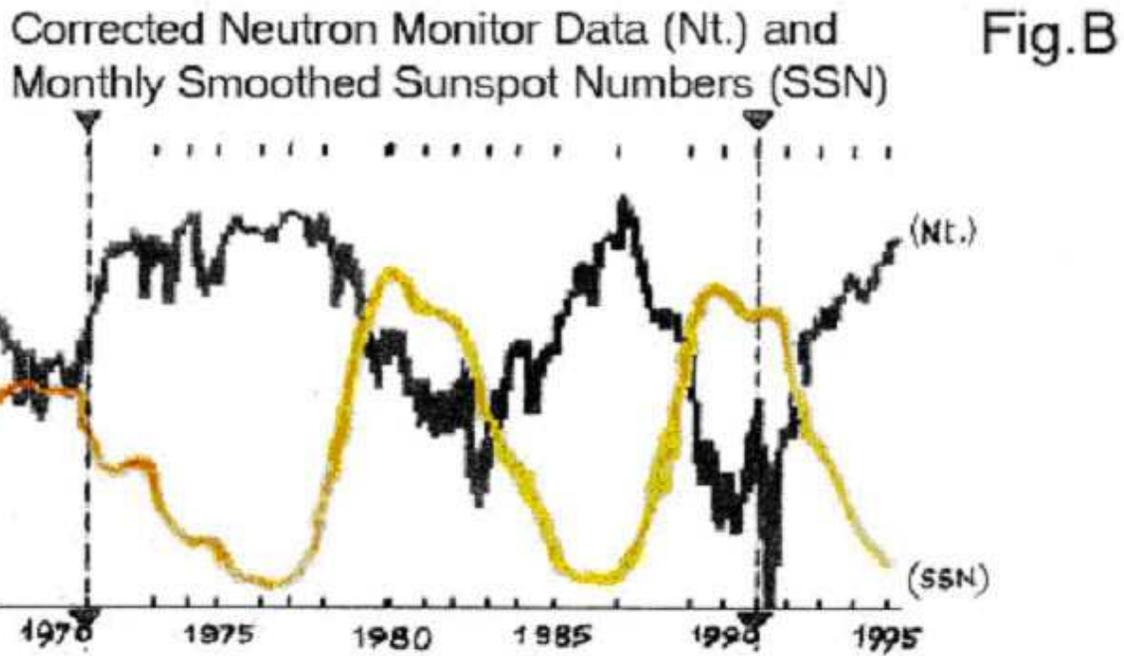
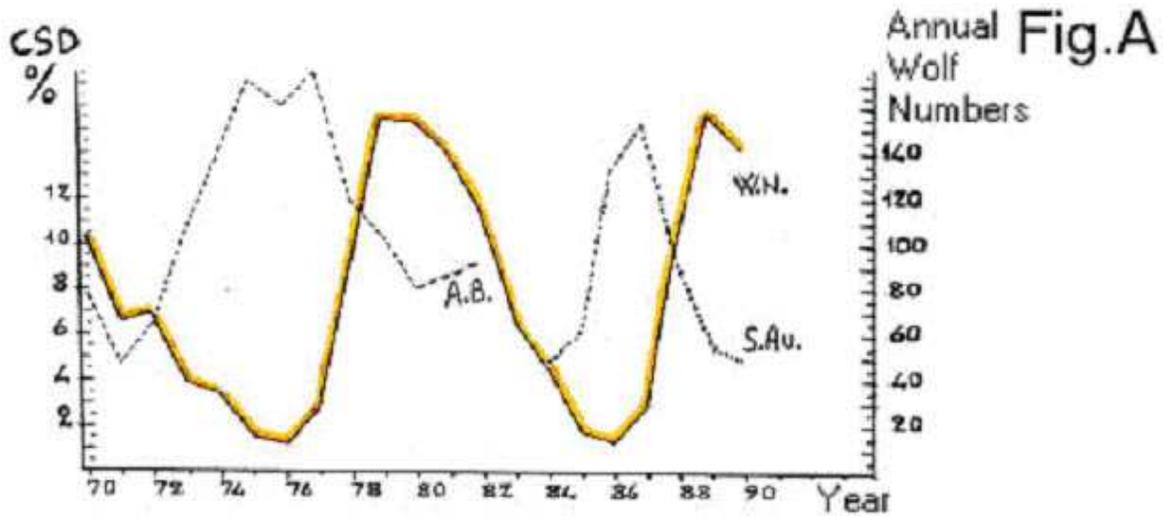


Fig. A , see References, n.5, “ The CSD frequency variation with Solar Activity and with Altitude, after 20 years researches “. CSD [Colony with Sector < or more sectors > Differentiated] in Air Bacteria (AB frequency-curve) and in Staphylococcus Aureus <Nn strain> (S.Au. freq.-curve) . Both curves are in broken-lines ,A.B <----> and S.Au <.....> . CSD is referred as percentage of total counted bacteria , in every daily test-recording . **Solar Activity** as Wolf’s Number (WN activity-curve is in unbroken line) .

Fig. B is a particular section of picture, from the Internet: [GDC/WDC STP , Boulder-Cosmic Rays](#). **Cosmic Rays** as Corrected **Neutron** Monitor Values (Nt . variations curve is dark line) .**Solar Activity** as Smoothed Sunspot Numbers (SSN curve is yellow line) .

SOME REMARKING ABOUT THE EXPERIMENTAL PART AND THE ATYPICAL COLONIES PRESENCE ON CSD - RECORDING .

It's not opportune to well reading CSD, to emulsion daily a single colony of *S.Aureus* taken from agar media-culture and streak it on surface of another agar media for incubation . But it's to prefer to streak daily a sterile agar media with a loop of *S.Aureus*-brothculture to have after CSD readings better comparable in their data (5, 6, 9) .

Moreover some time, innumerable **abnormal colonies** of *S.Aureus* not corresponding at all to typical CSD-forms, appear on the top of strain -utilizing .

If this problem persists after repeated streaking on agar media surfaces, with daily brothcultures, it's necessary to repeat the daily brothcultures to verify this persistence with daily controls .

If these abnormal colonies are persisting after 7-10 days, compromising a regular recording of typical CSD forms , it has to prefer to change the utilizing of *S.Aureus* strain with another one .

But this drawback fortunately was not so frequent .

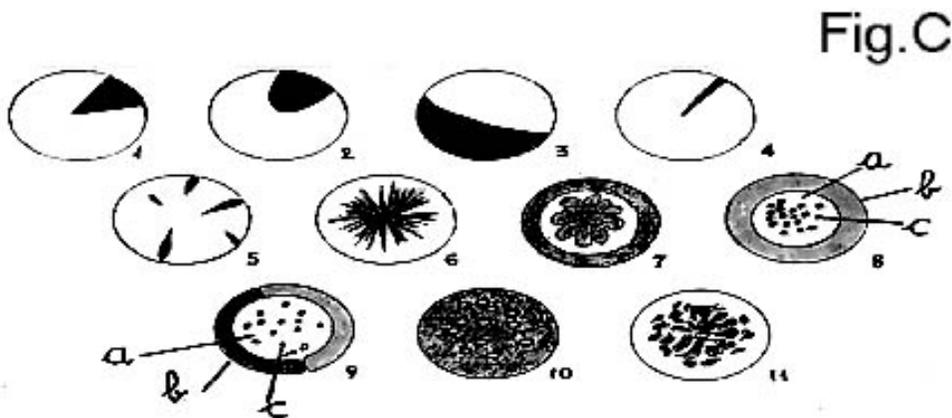


Fig.C. Examples of typical CSD and atypical colonies of *S.Aureus*. Hints at phagical lysis. **Some colonies of S.Aureus** :

1-4 . Some typical colony considered CSD ; **5-11** . Some atypical forms non considered CSD ; they were seen only rarely except in 1987) .

8 - 9 , **a** , large lysis areas ; **b** , ringform colonies ; **c** , little colonies formed in large lysis -areas ; **10** , colony with several little lysis-areas (LA) .

An **energy-input** may be to such a degree to realize the passage from latent form (**prophage**), already present in cell bacteria, to his mature form (**phage**) that give LA . It's well known that a phage may also modify a bacterial DNA by a transduction mechanism .

The LA were expecially more remarked by A., when the CSD-incidence was detected much more frequently (i.e., in 1987) .

Remarks : the A. here reported to have more in completion, the **fig.C** before sent out to C.News 35, Ricerca Spaziale Rev., IBN Edit..

REFERENCES *

- 1) **Faraone P.**, "Ricerche sull'inquinamento batterico dell'aria esterna nel quadro dei dati meteorologici, attraverso un anno e mezzo di osservazioni. La frequenza delle colonie a settore differenziato." In : Lacustrine Climatology. Proc.of the International Congress, Como, May 20-30, 1971, Univ.di Milano Edit., pp 474 - 508 .
- 2.) **Faraone P.**, La frequenza delle colonie a settore differenziato(CSD)fra i batteri in sospensione nell'aria esterna, in tre anni di osservazione. *Annali Sclavo*,15: 207-224, 1973 .
- 3) **Faraone P.**, "Significant correlations of CSD data with solar activity (*solar flux*) ". Lecture in the Seminaire Interdiscipl. mod. sist. viv. et interact.avec leur environnement, Fresnes / Paris, June 23, 1984 (*the statistical consulence of the belgian astronomer dr. De Meyer M. was not published but its copy is in A.'s, possession*) .
- 4) **Faraone P.**, The possible influence of some astrophysical factors on microorganisms. Proc.First Int. Congr. on Geocosmic Relations, Amsterdam, 19-22 April 1989 , (Eds. G.J.M. Tomassen et al.), p. 105-115, Pudoc, Wageningen (1990) .
- 5) **Faraone P.**, Te CSD frequency variation with the solar activity and with the altitude,after twenty years researches. In: Atti,International Medical Congress of Mountain Climatology,Roccaraso (L'Aquila), Italy, June 7-9,1991, pp. 1-18 .
- 6) **Faraone P.**, "Daily observations(1970-1992) of fluctuations in the frequency of appearance of a sectorial structure in colonies of bacteria taken from the surrounding air and cultures of *S.Aureus*.", Pushchino Meeting on Biol.Physiochem.proc.with Solar Activ.and oth.Envir.factors,sept 27-oct.1,1993, *Biophysics*,Vol.40,n°4, pp.786-792,1995 (*in russian language*) .
- 7) **Faraone P., Orlando M, Ptitsyna N, Villoresi G.** "The dependence of the *Staphylococcus aureus* CSD population upon the level of geomagnetic activity." Abstract, 14th Int. Congr. Biometeorology, Ljubljana, Slovenia, 1996, p. 277.
- 8) **'O'rmenyi I.*** "Long-term experiments of meteorological and solar wave particle radiation on air bacteria/CSD/level". Technologiezentrum, T NOVA, K. Berichte 2000: band 43, 243-249. Hungarian Section, CIFA, 1061 Budapest, Kiraly u. 52) .
- 9) **Faraone P., Halberg F, Cornélissen G, Schwartzkopff O, Katinas GS.** " Anticipations on the deepening of astrophysical influence on appearing of sectors in microbial colonies named CSD (some statistical correlations and reminiscences about lost CSD-data." Convegno a Palazzo Baleani in Roma, 25 maggio,2001, Centro Studi Biomet.di Roma in collab. Univ.La Sapienza di Roma e CNR ; *Interazione tra Ambiente e Sistemi Biologici* . CIFA News 2002; 31 (Suppl.): 1-15 .
- 10) **Faraone P.,Katinas G.,Cornelissen G.,Halberg F.,** "Solar cycle stage-dependent circasemiseptan chronome component in sectoring(mutations?) of air bacteria and staphylococci." Proceedings of the 3th Internat.Synposyium: Workshop on Chronoastrobiology and cronotherapy . Research Center for Advanced Science and Technology, University of Tokyo, 2002
- 11) **Faraone P.**, "A Panoramic vision of CSD data collected through 21 years(1970-1991) in more than four millions of bacterial colonies.,Abstracts of International Crimean Conference,Paternit, sept/oct. 2003 .
- 12) **Halberg F, Cornelissen G, . Faraone P, Schack B, Elena V. Syutkina E.V, Chibisov S, Schwartzkopff O, Jozsa R, Katinas G.S, Bakken E ,** "Chronomics: a cartographic memory in chronomes (timestructures) of exophased human to prokaryotic endocycl.", Abstracts Act., Interdisciplinary Seminar on *Biological Effects of Solar Activity*, Pushchino, April 6-9, 2004 .

REMARKS:

* **Faraone P.** gave his contribution to the paper cited in (4) with microbiological part .

****fig. A** from A.'s paper , corresponding to n5 of references

*****fig B** from internet : [NGD/WDC STP](#) , [Boulder-Cosmic Rays](#) –OAA Logo, NOAA Satellites and Information, National Geophysical Data Center (NGDC), search NGDC . Go to NGDC home...

*° Recently a study of [George Fox](#) e [Richard Wilson](#) dell'Università di Houston [USA] was published(2003), showing that bacteria mutations are increasing in space,causing problems of higher bacteria pathogenicity and as a result higher risks for human health.

The A. considers the fine opportunity to propose this interesting abstract in this remarking , especially in referring of his studia before shown :

Getting to grips with mystery space bugs
New Scientist vol 177 issue 2380 - 01 February 2003, page 20.

<< *Dangerous mutants on the bridge are not merely the stuff of Star Trek .*

On long space flights, normally harmless bacteria could mutate in unforeseen ways and threaten the crew's health or the life-support systems .

So NASA is developing a "gene chip" to identify such menacing microbes en route Most bacteria found on spacecraft have been carried aboard by the crew .

On extended missions, the crew will have to grow plants and recycle waste, water and air, providing unique ecological niches in which the bugs could flourish.

On Earth, species that cause disease or other problems tend to be well known and behave in familiar ways. But in the alien conditions of near-zero gravity and increased radiation , little-known bugs might become virulent, and even familiar species could start behaving differently , for example clogging up air filters or water purification systems . There is evidence to support this concern.

Simulated microgravity experiments have shown that Salmonella bacteria become more virulent.

And George Fox of the University of Houston, Texas , and his team have found microgravity causes changes in gene expression in E. coli bacteria .

" If [a microorganism] for some reason is causing a problem, we need to have a mechanism of figuring out what it is," he says .

Bacteria can be identified using probe DNA sequences that each bind only to a specific species.

But it would be impossible to carry probes for every possible bacterium that could mutate.

So Fox and his colleague Richard Willson have developed a means of quickly identifying which group of microorganisms a mystery bug belongs to.

Instead of DNA, they look at portions of the bacteria's ribosomal RNA . These regions are highly variable, and groups of related bacteria have unique signature sequences . The researchers are building a chip that will incorporate 4000 RNA probes , carefully chosen to cover a wide range of bacteria .

Although the chip can't pinpoint the exact organism, if a mystery microbe's signature matches any one of the probes, the astronauts will know roughly what they are up against. "It doesn't have the yes-no answer of the single-target probes," says Willson. But it would almost always provide at least some information - suggesting which antibiotics might be effective , for example Duane Pierson, director of microbiology at NASA's Johnson Space Center in Houston, agrees. He says that while bacterial infections in space haven't caused astronauts any major problems so far, they remain a concern.

"If you are going to Mars, you don't want to have to send somebody back because of some sort of infection which could have been prevented if we understood more about it," he says.

"This technology could be very valuable."

The gene chip could also help on Earth . For instance, in front - line bio defense , it could quickly identify whether a suspicious powder in an envelope is a microbe or just sugar. And in cases of infectious diseases,

if clinicians are unable to identify the exact organism, despite clear signs of infection in a patient, the chip could at least narrow things down .

"This is a way of getting a clue about the puzzling cases," says Willson . >>

SIMULTANEITY OF LONG-TERM FLUCTUATIONS OF COSMOGEOLOGICAL PARAMETERS AND DYNAMICS OF BIOCHEMICAL PARAMETERS OF PEOPLE.*

© 2004 M.S. Lushnov

I.M.Sechenov Institute of Evolutionary Physiology and Biochemistry, Russian Acad. Sci., Saint-
Petersburg, Russia

Long-term supervision biochemical parameters of the person comparable on duration with a 11-years solar cycle, in the scientific literature us it is not revealed. Researches of 12-years fluctuations biochemical parameters of blood at persons with mental frustration in comparison to dynamics cosmo-geo-physical factors in this connection are spent. Researches are based on 443 tests of biochemical parameters, and the appropriate daily measurements of cosmo-helyo-geo-physical parameters. It is shown, that biochemical system, and also the mental status are modulated by influence of these factors that follows from identical spectral-temporary harmonics and the periods of the mentioned biological and physical processes.

Key words: biorhythms, biochemical parameters, the cosmo-geophysical factors, spectral-temporary analysis, statistical modeling.

The hypothesis of influence cosmo-geo-physical factors on biochemical system of blood of people is checked up on an example of 443 tests of biochemical parameters 415 person surveyed in the period with 1977 on 1988. In each test 12 parameters are investigated: 2 transferring enzymes, creatinin, cholesterol, urea, bilirubin and glucose, the common fiber, ions K^+ , Na^+ , P^{5+} , Cl^- . Analyses were made on biochemical automatic device "TECHNICON".

Estimated statistical communications of biochemical parameters of blood with the following systems of natural factors: solar activity (SA) (relative number of solar spots and density of a stream of a solar radio emission on frequency 3000 MHz), space beams (SB) (global intensity of space beams in a stratosphere and intensity of space beams at height of 220 m above sea level), ionosphere in parameters (IP): limiting frequency of layer F_2 - f_0F_2 , limiting frequency of electronic layer E_s - f_0E_s , the minimal frequency of layer F - f_{min} , height of layer F - $h'F$ and factor of reflection from layer F_2 - $M(3000)F_2$. Plural correlations (PC), spectral-frequency characteristics and the periods of monthly average values biochemical and cosmo-geophysical parameters paid off.

As a result of research of correlation dependences of biochemical parameters with cosmo-geophysical factors new data on their annual parities (table) are received. It is shown, that system changes in investigated set of biochemical parameters, are accompanied by authentic correlations of biochemical parameters with cosmo-geophysical parameters during maxima of intensity SB and minima SA (1977 and 1986 – 1987 yrs.). It specifies on about 11-years periodicity of system changes of the biochemical environment of the organism conterminous to 11-years variations of space beams and activity of the Sun (table).

Plural correlations between biochemical and cosmogeophysical parameters 1977 – 1988.

Parameters	PC	< p	Year	n	Parameters	PC	< p	Year	n
ions P^{5+}	0.909	0.038	1978	34	creatinin	0.926	0.044	1983	32
Enzyme AST	0.996	0.012	1980	22	common fiber	0.821	0.050	1984	43
Enzyme ALT	0.990	0.050	1980	22	glucose	0.846	0.050	1985	40
ions P^{5+}	0.991	0.044	1980	22	glucose	0.817	0.014	1986	48
ions P^{5+}	0.928	0.038	1981	32	cholesterol	0.703	0.031	1987	64
Enzyme AST	0.885	0.001	1982	44	ions Na^+	0.814	0.049	1988	44
creatinin	0.866	0.004	1982	44	cholesterol	0.813	0.050	1988	44
Enzyme AST	0.923	0.050	1983	32					

The note to the table: n - volume of sample, $< p$ - a level of probability (reliability) of a checked statistical hypothesis.

The data given in the table, show a high degree of correlations of biochemical parameters with external factors as sizes PC are high enough - from 0.7 till 0.99. It is necessary to note, that by comparison to other investigated physiological systems, biochemical appeared most "sensitive" in the same time intervals (with 1977 on 1988) in comparison, for example, with blood system. In a case blood systems plural correlations with investigated ecological parameters change from 0.31 till 0.66.. The conclusion therefore is natural that different physiological systems are unequally steady against influence cosmo-geophysical factors.

Studying of correlation connections of biochemical parameters with seasonal variations cosmo-geophysical factors also has found out their seasonal modulation by external factors. Here the level of plural correlations also is high enough.

The received data testify to presence of system changes in the summer period, shown through authentic correlations biochemical (1988) with ionosphere parameters. Studying of correlations in other seasons of year have shown, that the greatest plural correlations of the biochemical status meet in the autumn-winter periods - in the winter with ionosphere parameters (1978) and space beams (1984), an autumn - solar activity (1979) . The level of plural correlations in these periods varies from 0.4 up to 0.9. During dynamic researches with 1977 on 1988 periodically authentic correlations of the maintenance of glucose, bilirubine, ions (K^+ , Na^+ , P^{5+}), the common fiber, urea, creatinin, cholesterol of blood with ionosphere parameters that specifies an interlinking of electrolyte balance, power exchange processes, nitrogenous, fat an exchange and, probably, immunity as there are authentic statistical connections of the maintenance of fiber with cosmo-geophysical factors also were shown.

Let's consider spectral-frequency long-term parities biochemical and cosmo-geophysical parameters. For last 3-4 decades fluctuations of many physical and chemical and biological processes are investigated. Features of many kinds of fluctuations, including noise - such as $1/f$, where f - frequency of some processes were found out. In our work these positions have received the uttermost acknowledgement by virtue of that investigated cosmo-geophysical factors (SB and SA) have the basic approximately 11 - years periodicity and their revealing trends demands long supervision, and the appropriate variations of biological parameters and systems also should be at least not less long. We receive results concerning spectral harmonics and the periods appropriate to them, testifying about concurrence trends monthly average biochemical with the basic monthly average parameters cosmo-geophysical processes.

Received monthly average long-term trends of cosmo-geophysical and biochemical parameters are close on type to process $1/f$. The following common harmonics and periodicity of cosmo-geophysical and biochemical parameters are revealed: 0.0093 - 144 months (about 12 years), 0.0185 - 72 months (about 6 years), 0.0278 - 48 months (about 4 years), 0.037 - 36 months (about 3 years), 0.0463 - 29 months (about 2,5 years), 0.0556 - 24 months (2 years), 0.0741 - 18 months (1,5 years), 0.2130 - about half-year (6 months), 0.3333 - 4 months, 0.4444, 0.463 - near seasonal harmonics (3 months).

Thus, it is received about 11-years periodicity of system gradual changes of the biochemical environment of the organism, conterminous with minima of solar activity and maxima of space radiations. Exist synchronous controlling shifts of biochemical parameters with a high probability of system adaptation or gradual disbalance a functional condition of an organism from influences of cosmo-geophysical processes. As it was already mentioned, the greatest changes in system of biochemical parameters occur in the autumn-winter periods. Hence, the interlinking of power exchange processes and parameters of immunity of an organism with cosmo-geophysical factors is received.

Research is maintained by Russian Humanitarian Scientific Found (grant N 03-06-002200a)

* Proceeding of COHERENCE 2004 University of Rome "La Sapienza" 12-13 february 2004

Call for INTAS cooperation

Deadline on 3 September 2004 for INTAS calls 2004

Sent: Thursday, April 22, 2004 5:06 PM

Subject: Fwd: New INTAS calls

In 2004, the calls of INTAS, the International Association for the promotion of cooperation with scientists from the New Independent States (NIS) of the former Soviet Union, either address specific scientific & interdisciplinary subjects (thematic calls), or encourage international cooperation with industrial or national partners (collaborative calls with Airbus S.A.S., Kazakhstan and Uzbekistan)

In line with its mission and strategic plans, INTAS officially published on 2 April 2004 its Thematic and Collaborative Calls 2004. A particular attention has been given to scientists from NIS countries weakly represented in the international research

programmes: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Tajikistan, Turkmenistan and Uzbekistan. The web based submission system is now open for:

* INTAS Thematic Call for Proposals for Research Projects and Networks on Information Technology (indicative budget Euro 1 million)

* INTAS Thematic Call for Proposals for Research Projects and Networks on Position Sensitive Detectors (indicative budget Euro 800,000)

* INTAS Thematic Call for Proposals for Research Projects and Networks on Transforming Societies: East and West (indicative budget Euro 1.5 million)

* INTAS Collaborative Call with Airbus for Proposals for Research Projects in the field of Aeronautics (indicative budget Euro 1 million)

* INTAS Collaborative Call with Kazakhstan for Proposals for Research Projects on Management of Man-made Pollution (indicative budget Euro 1.5 million)

* INTAS Collaborative Call with Uzbekistan for Proposals for Research Projects on Sustainable Development through the Use of Local Natural Resources and New Technologies (indicative budget Euro 1 million)

In parallel to these calls, the INTAS programme for Young NIS Scientist Fellowships (indicative budget Euro 2.5 million) fosters the mobility of researchers in Europe and enables them to either pursue or start their career in Science. Additionally, special support to promote innovation and marketing of innovative results derived from INTAS funded projects is offered through the INTAS Innovation Grants with an indicative budget of € 500,000 for 2004.

The deadline for all the above INTAS calls is 3 September 2004, 13H00 Brussels time.

The General Rules and a Technical Guide on the electronic submission for each of the actions can be obtained on <http://www.intas.be>, Section "Funding Opportunities". For further questions on the INTAS calls 2004, please send an e-mail to infopack@intas.be

For general information about INTAS, please contact the Public Relations Team at intas@intas.be or by fax: +32-2-549 01 56, or check our web site at <http://www.intas.be>

International Association for the Promotion of Co-operation with Scientists from the New Independent States of the Former Soviet Union Avenue des Arts 58 B-1000 Brussels Tel: +32 2 549 01 20

Ms Patrizia Asirelli, Scientific Officer

Fields 2: Mathematics, Telecommunications and Informatics & Infrastructure Actions

INFLUENCE OF SOLAR ACTIVITY UPON BIOSPHERE

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 VLADIMIRSKY Boris M., MARTYNYUK Victor S., and **BRUSIL Olga.**

Influence of Solar Activity upon Biosphere 1B. M. Vladimirsky , 2N. A. Temuryants , 3V.S. Martynyuk, 4O.Brusil

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At present, changes in practically all physiological system of humans - nervous, endocrine, cardiovascular, blood, etc. - have been correlated with changes in solar activity (Vladimirsky, Temuryants, 200). Serious indications exist that variations in solar activity may affect embryogenesis. Simultaneously, similar tendencies were found when results from other areas of biology had been analyzed. For example, statistically significant data exists indicating that solar activity affect avian navigation apparatus (Schreiber, Rossi, 1979), proliferation of clams *Crenomytilus grayanus* (Zolotarev, 1974), crab catch on the West Coast of the United States (Caming, 1984) and herring (*Clupea harengus harengus*) catch in Norway (Protasov et el, 1982) and so on. Thus, we are faced with a general tendency in the biological systems, which for the first time was recognized by Chizhevsky and that is that dynamical changes in various biological processes depend on solar activity. Research in recent decades has accumulated additional data with regard to effects of solar activity in physical and chemical laboratory systems. These studies follow the works pioneered by G. Piccardi.

In general, accumulated empirical data on possible connection between biological processes and variations of solar activity is extensive and, for the most part, are concordant (although such data was gathered independently in different areas of biology) and, without a doubt, reflects real processes. Scepticism expressed towards results that have been obtained in the course of investigations is driven, in our opinion, by an assumption that all changes that have been made possible by solar activity are very "insignificant".

The fact that this erroneous point of view is not sustainable became apparent following formalization of the concept of the "biological action of micro doses" of various physical and chemical agents (Burlakova, 1999). Results of the conducted experiments clearly demonstrated that life-supporting processes are susceptible to some utterly miniscule doses ("microdoses") of, for instance, background ionising radiation (Kuzin, 1991, Kuzin et al, 1994). Even exclusion from the natural background radiation of such isotope as potassium-40 impacts life-supporting activity of plants. The change in activity of a certain biologically active compound depends on its concentration and has a characteristic representation. The biological effect decreases as concentration decreases (region of classical effect) and following the "silent region" the biological effect reappears again ("microdose" zone). It has been shown that this correlation is of the same type regardless of the physical and chemical nature of agents exerting their effects.

Cellular and molecular mechanisms that mediate the influence of weak physical fields of cosmic and geophysical genesis on living organisms are key problems that demand answers. Nevertheless, it can be said of the research projects discussed herein that an important ecological role of natural electromagnetic fields has been established. Quite feasibly, the same factor plays a visible role in classical biometeorology, as all synoptic processes are accompanied by variations of electromagnetic fields and these variations, it seems, contribute to the human reaction to weather changes (Assman, 1966).

It's seems to us it is advisably to found ISB special Study Group to coordinate this type investigation.

Let us remember our friend and Cifa's Secretaire **Alexander Konradov**

Dear italian **Cifa** friends, your vicepresident received yesterday, may-21, this gloomy message :

<< Dear Piero,

I am writing from Moskow (Russia) , Alexander Konradov passed away (18 May) after hypertonic shock followed by ischemic stroke. I am just back from his funerals. This is very sad unexpected event for all my friends. I came to Moscow to meet him and other friends... I have no words... I will place some informations and fotos on CIFA web site after I come back to California in June.

Sorry for the short message. Please inform other italian CIFA members, if you can. All the best, Natalia >>.

I may only try to tell something about this famous researcher and also dear recent collaborator .

I have known Alexander not so long ago, and we little by little, was becoming two good friends .

Our collaboration agreement was excellent .

On the last days I have his last writing . He told me : <<..... *My interest to your data is intense and stable, but my vital interest in this problem is a mathematical methods and models for data analyses and data processing.....*>>

< Look ! - *I said to myself* - look Piero ! this is an authentic conscientious man , take great care of his collaboration ... >

But he suddenly was definitively out of this our world . And I'm yet a incredulous...and disconcerted man .

He went away and perhaps, is now in some remote site , outside of our dimensions, where it's impossible to come back and where the scientist-intuition may never arrive...: not even through your mathematic models, Alexander ! Alas ...

Our mysterious universe need of a God, I think , to avoid to feel ourselves to be lost at all .

Now you , Alexander, you could directly verify how much this is true....! I hope it .

Yes, because you are already meeting God , there ! where you are now....

Where scientists are not able to know anything , during this our earthly life .

A scientist as you was, deserve to complete his learning only through a simple meeting with this inaccessible True but this, avoiding at all to have every big engagement so as you had before, in realizing all your many studies in elaborations of many data

You sacrificed very much yourself during the life to Science helping , and now I want believe that there is a God for a honest person as you were. The persons as you are lead me to believe more in God .

I cried, through my mind, all these words to Alexander, through my mind !

But I don't know indeed what he want in this moment .

He need perhaps to be lovely reminded from us together .

I repeat again what in his last writing he remarked to me :

<<.....*my vital interest in this problem is a mathematical methods and models for data analyses and data processing.....*>> but where you are now Alexander ? to resolve all these problems ?

I hope always to meet you I do'nt know where or when or how I'll have this possibility but our conversation must absolutely go on . Good bye Alexander ! loving , your Piero .

REMARKINGS :

I retain to remember after, something of Konradov' life : his curriculum, his working and his mind through some of his citations and his opinions .

Alexander Konradov, MS

Head of Math. Modeling group (Mathematical models and methods for investigation of living systems' response to ultra weak actions.)

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Response of living and physico-chemical systems to ultra-weak action may not be revealed until adequate method of analysis is used. The specificity of living systems response is determined by background and sub background action level, which is evolutionary customary. The system does not recognize this action as a significant external one and has a power to compensate such "signal" by internal resources. Compensation is able to keep systems parameters inside a normal range. So, we may not notice any changes by means of standard descriptive statistics. But these small changes may become apparent in the interrelationship between variables, which may be revealed by correlation analysis and some integral measure of difference (multivariate distance). Experience shows, that it is true. The application of some integral index of correlation and multivariate distances allows discovering the effect of low-level radiation on individuals and people populations, for example.

Chronic "signal" action may lead to changes not variables but parameters of system and, hence, is able to move phase point to unstable region near bifurcation. Low stability near bifurcation point leads then to the increase of system noise level. Measuring any flows, emitted by the system (electromagnetic, optic, thermal and so on), is a potent source of information about the system state. So, the methods of analysis of noise-similar processes, the revelation of hidden and quasiperiodic patterns are really useful for evaluation of system's state changes, as a result of action. Examples will be presented of application of such methods to cell populations and even to non-living physico-chemical systems.

He said :

"My work has been dependent on other researchers . They provided information, data, and assistance, I owe them much stimulation and inspiration ."

Some agreeable citations remarked from him :

"When you are right, you have no need to be angry. When you are wrong, you have no right to be angry." *Mahatma Gandhi*

"To avoid criticism do nothing , say nothing , be nothing ." *Elbert Hubbard*

"The public is the only critic whose opinion is worth anything at all ." *Mark Twain*

Several considerations through his rememberings :

The common denominator

The common denominator of my approaches, viewed from a distance, is probably my fancy for piecing together what appears to be entirely disparate at first sight .

I wish to find relation ships among seemingly independent levels of human experience and behaviour. A desire of trespassing frontiers arose on the fertile ground of my teacher's, Wolfgang Metzger's, Gestalt psychology, whose urge to attend comprising wholes, associated with an experimental and analytical mind, doesn't set you at rest .

Experience is based on latent abstract relations :

On further pondering over general qualities , searching by factor analysis what is behind them, I ended up with three relational components: degree of relatedness (strong to weak) , dominance

(dominant to sub-dominant). and equilibrium (balanced to imbalanced) . A triplicity of relational facets thus seems to operate on elementary functional levels . Here an abstract phenomenology of experience might merge neuronal processes. It seems to me today that my digging underground relations which I considered "deeper" than units, objects etc., anticipated, in principle, some of the spirit of modern connectionism(1970).

Open and closed minds revealed by content analysis

The fact that man is endowed with the capacity to connect phenomena of seemingly unrelated levels of experience may be viewed as resulting from leaps of evolution. They gave rise to adaptive intelligence, eventually to humankind's advantage over immutable specializations which characterize other primates and lower species. Very often, however, human minds show less than optimal mutability. Moreover, people differ in this regard, some are generally more versatile, flexible and adaptable than others. Such insights might

have been one of the reasons why, in 1971, I devised a content analytical procedure (DOTA, Dogmatism Text Analysis) to assess, by objective means, traits and states of open versus closed modes of cognitive functioning

A. L. Chizhevsky's claim of solar-human connections

Soon I found myself looking, with due sense of duty, at unconventional claims of disrespected authors. Is there anything at Alexander Chizhevsky's (see pic) claim that variations of solar activity and dependent geomagnetic oscillations have any impact on human mental life? I there any evidence of his claim that changes of minds among masses of people are triggered by solar magnetism manifesting themselves as upheavals, revolts, civil wars, revolutions, and other forms of "power from below"? (Chizhevsky had been banished by Stalinist "power from above" to some gulag in Ural). I found weaknesses in the Russian's archival procedure. To my surprise, however, my scrutiny of this hypothesis based on own data corroborated the gist of his results. Fortunately, representatives of mainstream science in the West where tolerance is decreed by law could not simply react to this finding by jailing there searcher.

CONCLUDING I WANT HERE REMEMBER THESE HIS COLLABORATORS :

Golovanov, L. W., Dr., Historian, Moscow, Russia.

L. W. G. , provided much biographical information about A. L. Chizhevsky, the discoverer of solar-sociological relations, with whom he was befriended .

Halberg, Franz, Professor of Medicine, University of Minnesota, Minneapolis, MN, USA

F. H. showed interest in my helio-psychological studies and let me participate as observer and critic at his own vast research on chronomedicine. See a study on sunspots and heart attacks.

Landscheidt, Theodor, Dr., Freelance Researcher, Nova Scotia, Canada.

Prolific controversies characterized our interchange of ideas about methods of research.

Vladimirsky, Boris, Professor of Astronomy, Crimea, Ukraine.

B. M. invited me repeatedly to speak about my universe-related anomalistic research on International Meetings in Partenit, Crimea, Ukraine. I enjoyed participation and was amazed by the amount of research in this field, and by some outstanding results. See his picture here, Read an abstract of a talk on INFLUENCE OF SOLAR ACTIVITY UPON BIOSPHERE, co-authored by Boris.

YOUR **FARAONE PIERO**, CIFA V.PRESIDENT

Information on meeting

ASSOCIAZIONE PER LA
FONDAZIONE GIULIANO PREPARATA

ISTITUTO ITALIANO PER GLI STUDI FILOSOFICI

LEZIONI IN ONORE DI GIULIANO PREPARATA

Programma 2004

- 22 marzo Prof. Sen. Marcello Pera, Presidente del Senato della Repubblica
- 7 giugno Prof. Gino Tarozzi, Università di Urbino
- 27 settembre Prof. Martin Fleishmann, fellow of the Royal Society
- 27 ottobre Prof. Carlo Rubbia, premio Nobel per la Fisica nel 1984

Le lezioni si terranno alle ore 17.30 presso la sede dell'Istituto: Palazzo Serra di Cassano, Via Monte di Dio 14 - Napoli

Biografia di Giuliano Preparata

Giuliano Preparata nasce a Padova nel 1942, si laurea (*summa cum laude*) in Fisica teorica nel 1964, presso l'Università di Roma, relatore Raoul Gatto. L'anno successivo, è a Firenze, borsista CNR, poi professore incaricato di Fisica dei Neutroni. Dal 1967 al 1972, insegna nelle più prestigiose Università americane, Princeton, Harvard, Rockefeller, New York University. Consegue la libera docenza in Fisica teorica, nel 1969, vince il concorso a cattedra di Fisica Teorica, nel 1975. Dal 1974 al 1980 è Staff Member nella Theory Division del CERN di Ginevra.

Giuliano Preparata ha dedicato gran parte della sua attività scientifica alla Fisica delle Alte Energie, portando rilevanti contributi alla costruzione del Modello Standard, la nuova sintesi delle interazioni subnucleari. In particolare ha chiarito la natura di campo quantistico di Dirac del Quark, premessa fondamentale della *unificazione elettrodebole*, e ha risolto il problema cruciale del *confinamento del Colore* nell'ambito della Cromodinamica Quantistica (QCD).

Dal 1987 ha rivolto la sua attenzione anche ai problemi della materia condensata e alla fisica nucleare nel quadro della Teoria Quantistica dei Campi, scoprendo nuove soluzioni coerenti della QED in sistemi *abbastanza densi* e *abbastanza freddi*. Ciò gli ha permesso di affrontare problemi vecchi, come la teoria dell'acqua liquida, e nuovi, come quello della "fusione fredda", da un'ottica completamente nuova che appare molto promettente.

Ha inoltre sviluppato con Cecilia Saccone, Ordinario di Biologia Molecolare all'Università di Bari, un modello markoviano di evoluzione molecolare che ha ricevuto notevole attenzione da parte della Comunità scientifica internazionale.

Ha pubblicato circa 400 lavori nei seguenti campi: fisica subnucleare, fisica nucleare, fisica del Laser, superconduttività, superfluidità, acqua liquida e solida, materia condensata (vetri, colloidali, elettroliti, ecc.), fisica delle stelle di neutroni, astrofisica dei GRB (Gamma Ray Bursts), fusione fredda.

Ha scritto 4 libri (tre postumi):

- G. Preparata, *QED Coherence in Matter*, World Scientific, 1995, pp. XIII, 236
- G. Preparata, *L'architettura dell'Universo*, Bibliopolis, 2001
- G. Preparata, *Dai quark ai cristalli*, Bollati Boringhieri, 2002
- G. Preparata, *An introduction to a realistic quantum physics*, Word scientific, 2002