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Research Article

Dr. Mahadeva Srinivasan: Research Pioneer in the LENR Field

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Abstract

Dr. Mahadeva Srinivasan was one of the earliest and most productive researchers in the LENR field. He took an immediate interest in the phenomenon and began research within a day or two after the March 23, 1989 announcement – at a time when he already had more than 30 years of nuclear research experience at India's Bhabba Atomic Research Center (BARC). He conducted many LENR investigations using several methods, with emphasis on neutron emission and tritium generation as signatures of the effect.

After he retired from BARC in 1997, he became very active in the field after a 10-year "silent period". His main emphasis after 2008 was on promoting LENR research in India. Because of his stature in the nuclear field in India, Dr. Srinivasan was able through his connections and friendships to arrange for LENR research programs and funding at several organizations. He chaired the 16th International Conference on Cold Fusion (ICCF-16) in Chennai in 2011.

A project was undertaken with Dr. Srinivasan to document his research record under the umbrella of a wider initiative to capture such records worldwide while they are still available. For the Srinivasan LENR Research Documentation Project, he described six phases of his career before, during and after his LENR research at BARC. Interviews with him were conducted and trancribed, and copies of his papers and other relevant documents were also obtained for the Project.

Dr. Srinivasan was highly regarded both inside and outside the LENR community. He made many research, organizational and promotional contributions to a field whose benefits must be realized for the future of humankind.
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1. Preface

During the ICCF-21 meeting in Fort Collins, Colorado in June 2018, I had the pleasure of getting to know Dr. Mahadeva ("Srini") Srinivasan[a] quite well. We had met previously at ICCF meetings but became closer friends, discussing – in addition to cold fusion and science generally – higher-level topics like philosophy and religion. I had presented a poster at ICCF-21 on a project to document Dr. Edmund Storms' 29 years of LENR research [1] That project became the pilot for a broader initiative for LENR research preservation. Srini and I agreed to preserve his research as part of the initiative in what became the Srinivasan LENR Research Documentation Project (SLRDP).

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[a]Dr. Srinivasan also had the nickname "Chino", but he informed me that he preferred "Srini" in our reports.

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As I was preparing the third draft of the SLRDP report in June 2020, I contacted Srini asking if he had any more corrections to make. He answered that he was leaving to join his daughter in Bangalore to get away from a high number of COVID-19 cases in Chennai. He indicated he would get back to me after he settled in his new location. Knowing that I could make more changes later if needed, I proceeded with the third draft two days later. Unfortunately, I did not hear from Srini again before he passed away two months later.

Dr. Srinivasan's research career is an inspiration to LENR investigators worldwide. He would certainly want the world to know about his career if that would help achieve LENR. This paper is offered with confidence that he would approve wide dissemination of his work for the benefit of the field – and of humankind generally. It was a privilege and a pleasure to work with Srini on documenting his LENR research.

2. Introduction

Dr. Mahadeva Srinivasan was a foremost LENR researcher going back to the time of the March 23, 1989 announcement by Martin Fleischmann and Stanley Pons. He was then a staff member and manager at India's Bhabba Atomic Research Center (BARC), where he had been employed since 1957. When the news of LENR arrived, Dr. Srinivasan was assigned by the BARC director to an unofficial coordinating role for cold fusion work at the Center.

During the initial period after the 1989 announcement, BARC built up the largest LENR research effort in the field at the time. However, when cold fusion became marginalized by mainstream science, India generally followed suit. Dr. Srinivasan nevertheless continued research on LENR at BARC until his retirement in 1997. A photo of Dr. Srinivasan with Dr. Martin Fleischmann is shown in Figure 1.

After he retired, Dr. Srinivasan continued to monitor developments in the field by attending conferences and staying in touch with researchers. A decade after his retirement, he renewed his attempts to revive LENR investigations in India by working with government officials to organize research groups in the field. He also had responsibility for

Figure 1. Dr. Srinivasan (Left) with Dr. Martin Fleischman. (Photo Probably at ICCF-16, Chennai, India, 2011).

organizing the 16th International Conference on Cold Fusion (ICCF-16), which took place in Chennai in 2011, and he edited the papers for the conference proceedings.

Dr. Srinivasan was born in Madras (now Chennai), India in about 1937. He received his B.Sc. Degree in Physics in 1955 and the B.Sc. Degree in Technology in 1957, both at the University of Madras. He subsequently received the M.Sc. Degree in Physics at the University of Bombay in 1966. In 1984 he received the prestigious honorary D.Sc. Degree in Physics from the University of Bombay.

In addition to his distinguished career in physics, Dr. Srinivasan had a strong interest in the relationship between science and spirituality [2]. As a member of the Theosophical Society, Adyar, he was interested in occult chemistry [3], alchemy [4], distant viewing, collective consciousness, the influence of mind on matter at the quantum physics level, and zero point energy. He was also a philanthropist who was involved in both environmental work and social service.

A project was undertaken with Dr. Srinivasan to document and describe his contributions to the LENR field. The Srinivasan LENR Research Documentation Project (SLRDP) began at ICCF-21 in Colorado in 2018 and continued into 2020. The Project encompasses three major parts – a brief LENR autobiography, an interview and copies of his publications and related documents. The SLRDP was performed under the umbrella of the LENR Research Documentation Initiative[b], whose objective is to document LENR research records while they are still available.

The main components of the SLRDP report [5] are an "autobiographical sketch" authored by Dr. Srinivasan and a listing and collection of his publications and related works. The autobiography focused on his research and other contributions to the LENR field and consisted of six phases:

I. Pre-Cold Fusion Era (1958 to 1988)
II. Cold Fusion Era Prior to My Retirement (1989 to 1997)
III. "Silent Decade" following Retirement from BARC (1997 to 2007)
IV. Fresh Attempts to Revive CF/LENR Research in India (2008 to 2011)
V. The Emergence of the Ni-H Based Rossi Reactor and Its Impact (2011 to 2016)
VI. Appeal to the Politicians in Power for Intervention for LENR (2014 to 2018)

The autobiography has been supplemented with information from three interviews, a list of his publications and related works completed for the SLRDP and two other primary sources [6, 7] for this integrated description of his LENR career. The first interview was by Russ George in 1994 [8], and the second was by Marianne Macy in 2011 [9]. The third was for the SLRDP by the author; it took place in 2019 at ICCF-22 in Italy.

3. Phase I. Pre Cold Fusion Era (1958 to 1988)

After completing his graduate studies in 1957, Dr. Srinivasan entered a year-long training program at BARC. At the end of the program, he became a BARC Science Officer and joined its nuclear power research program. BARC has its origins in 1948 when Homi Bhabba, under the sponsorship of Jawarhal Nehru, initiated India's nuclear program with the formation of the Atomic Energy Commission. The AEC formed the Atomic Energy Establishment Trombay in 1954, which was renamed to BARC in 1967 after Bhabba was killed in a plane crash the year before.

Dr. Srinivasan was promoted to head of Experimental Reactor Physics in 1963 and the Nuclear Physics Division in 1974. During this time, BARC was supporting India's "three-stage nuclear power program" which consisted of Pressurized Heavy Water Reactors, Plutonium and Uranium Fast Breeder Reactors, and Thorium-U233 Fuel Cycle Reactors. The final stage was important to the country because of its abundant thorium resources. Nuclear fusion research was also underway at BARC by a plasma physics group in Dr. Srinivasan's organization. The objective of

[b]LENR Research Documentation Initiative, LRDI. http://lenr-documentation.org/.

this research was to improve understanding of the basic physics of fusioning plasma. The method used was plasma focus, which is a variety of the Z-pinch research approach.

Dr. Srinivasan's specific BARC assignments began as Science Officer in the Nuclear Physics Division followed by the Reactor Engineering Division, where he headed the experimental Reactor Physics Section. This Section was in charge of experimental work at the Zero Energy Reactor Zerlina. He was then a leading researcher in the Pulsed Fast Reactor Project, which designed, constructed and commissioned the Plutonium-Fueled Purnima Small Fast Reactor. Subsequently, he worked on three U233 fueled research reactors – the Purnima II, Purnima III and Kamini Reactors. Dr. Srinivasan also initiated fusion and related experiments, including the Z-pinch, Plasma Focus and 500 MJ Capacitor Bank Project.

During the 1960s, Dr. Srinivasan had two leaves of absence of about two years each, one at Argonne National Laboratory (US) and the other at Chalk River Nuclear Laboratories (Canada). Also during this phase, he developed the Trombay Criticality Formula [10], which enabled predictions to be made of the neutron leakage from fusion reactor assemblies based on its geometrical and physical characteristics.

4. Phase II. Cold Fusion Era Prior to My Retirement (3/1989 to 2/1997)

BARC responded quickly and forcefully to the 1989 LENR announcement. The Director, Dr. P.K. Iyengar, was very open-minded and assembled about a dozen representatives of various research units to launch an investigation program. Dr. Srinivasan served as informal coordinator of the efforts and was co-author with Dr. Iyengar of a comprehensive progress report of the first six months of research. Dr. Srinivasan was at the time an experienced nuclear researcher with some 32 years at BARC, and he held a senior position as Head of the Nuclear Physics Division. Within a year or so, BARC had the largest LENR research program in the world underway.

BARC's primary interest in LENR initially was as a potential source of neutrons for India's thorium-U233 Fuel Cycle Reactor Program. As noted above, a neutron source was needed to convert thorium to U233 as a critical step for the country's nuclear power program. Dr. Srinivasan stated that he was "in the right place at the right time" when BARC learned of the 1989 LENR announcement.

An electrolytic cell was used initially to verify the Fleischmann and Pons' claim. A commercial Milton Roy cell was on hand for producing hydrogen (and deuterium) gas and was quickly modified for LENR experiments. Investigations began within a day or so after the March 23 announcement. The Milton Roy cell produced positive results as neutron bursts and production of tritium, but two similar additional cells obtained afterward were not successful, which was Dr. Srinivasan's first experience with LENR's continuing problem of lack of reproducibility. Subsequent BARC LENR research included deuterated titanium chips, nickel-hydrogen setups and transmutation studies.

Dr. Srinivasan believed the neutron and tritium signatures were definitive [11] and indicated that the tritium channel of the branching ratio was predominant, in which tritium production was far greater than neutron emissions. This "branching ratio anomaly" is based on observation that the tritium to neutron ratio is 1 million or more rather than unity. The anomaly was observed at BARC in the electrolytic cell [12] and other LENR methods employed [13].

Dr. Srinivasan's LENR experiments with titanium were done in full cognizance of similar work by Francesco Scaramuzzi and Howard Menlove. The initial experiments involved exposing X-ray film to samples of titanium deuteride in a technique called autoradiography [14]. The exposed film showed many bright spots caused by emissions from tritium, indicating that LENR occurs in isolated locations [15]. Subsequent experiments were performed with deuterated titanium chips that were shock-treated by immersion in liquid nitrogen [16]. Four of the 1000 chips tested showed evidence of tritium as a clear signature of LENR, thus confirming the findings of Scaramuzzi and Menlove.

Dr. Srinivasan's nickel-hydrogen work was inspired by the reported findings of Randell Mills. After meeting Mills, he conducted experiments with electrolytic cells having a nickel electrode and light-water electrolyte. However, when positive results were reported by Srinivasan, potential errors in calorimetry were pointed out by Michael McKubre

of SRI. This resulted in Dr. Srinivasan spending six months at SRI working with McKubre using the two-balance method [17], which clarified the calorimetry error.

Dr. Srinivasan was also interested in elemental transmutation occurring in LENR [18], [19], [20]. Iron was observed in BARC transmutation experiments and by a BARC post-graduate student working with John Bockris at Texas A&M. Both sets of experiments were conducted using the carbon arc method.

During this period of his LENR work, Dr. Srinivasan did an important statistical analysis of neutron emissions [21]. He had conducted similar analysis of neutron emissions previously for his masters thesis. The neutron emissions from LENR were shown to occur in short bursts. Along with the autoradiography findings of localization in spots [22], Dr. Srinivasan concluded that the LENR phenomenon is isolated both in space and in time. This discovery, and that of the branching ratio anomaly (Tr/n $> 10^6$) are two of his most important contributions to the LENR field.

Although LENR proved to be a disappointment as a source of neutrons for conversion of thorium to U233, research at BARC nevertheless continued in order to pursue other benefits, particularly energy production. As noted, the results of the first six months of BARC's LENR research were summarized in an unpublished report ("BARC 1500"). About 10 of the BARC groups investigating LENR confirmed the phenomenon with tritium production and/or neutron emissions.

When in 1990 Dr. Iyengar was promoted from Director of BARC to Chairman of India's Atomic Energy Commission, a new Director was appointed who was not supportive of LENR research. Most of the work therefore came to an end. Dr. Srinivasan was able to continue his research because of researcher independence in India, but without institutional support and at a major cost to his professional career. For example, his nomination to Fellow of the Indian National Science Academy was rejected, even though it was supported by two former BARC Directors and the Chairman of the AEC, because of pro-LENR stance. Dr. Srinivasan's research continued until he retired at age 60, as was customary for government employees, in 1997. All LENR research at BARC came to an end when Dr. Srinivasan retired.

Dr. Srinivasan prepared two internal BARC documents regarding the importance of LENR to the future of the organization. In the first document, written in 1991 after the new Director was in charge, was in entitled "Whither Cold Fusion?" [23] It made reference to the ill fate of LENR and identified five "levels of response" to the phenomenon, from the most skeptical to the most supportive level. He then set forth his understanding of the reasons for LENR skepticism.

The second document, "Paradigm Shifts Which Can Drastically Affect Our Extrapolations/Projections" [24], was prepared in 1995 and made the case for LENR research based on avoiding technological surprise for power production in India. Dr. Srinivasan noted that fast breeder technology (the second stage of India's three-stage nuclear power program) was extremely unlikely to become reality because of international nuclear non-proliferation concerns. He emphasized the fortuitous emergence of LENR at the same time as the decline of the prospects of fast reader reactors.

Dr. Srinivasan believed that BARC made three major contributions to the LENR field – the discovery of the branching ratio (Tr/n) anomaly, statistical analysis of neutron emissions (showing emission bursts) and the use of autoradiography showing the localized nature of the LENR in materials.

5. Phase III. "Silent Decade" following Retirement from BARC (3/1997 to 11/2007)

For 10 years after his retirement, Dr. Srinivasan deliberately kept a low profile regarding his interest in LENR. As noted, when he left BARC all LENR investigations came to a halt. Although there was no official order, the message was loud and clear. The Director who was antagonistic to the field was subsequently promoted to India's Principal Scientific Advisor, a position he held for 20 years, which meant that there was little chance of LENR research anywhere in India. Despite his low profile, Dr. Srinivasan maintained his contacts in the field and regularly attended the ICCF conferences. His reticence came to an end in 2007, when he attended ICCF-13 in Sochi, Russia.

6. Phase IV. Fresh Attempts to Revive CF/LENR Research in India (2008 to 2011)

The concluding session of ICCF-13 was very positive, including talk of imminent commercialization of LENR. As a consequence, Dr. Srinivasan was motivated to take a more active role in the field. In 2008 he was able to arrange a one-day brainstorming session, "Energy Concepts of the 21st Century" [25] at India's National Institute of Advanced Studies. He invited Michael McKubre and Steven Krivit to participate.

Later, while attending ICCF-15, Dr. Srinivasan accepted responsibility for ICCF-16 in Chennai, India in 2011. He was able to engage many of his colleagues and contacts in the country, including the former BARC Director, P.K. Iyengar, in arranging and securing funding for the conference. He then edited the conference proceedings [26], [27]. In addition to the conference, Dr. Srinivasan made arrangements for a pre-conference and two post-conference meetings. The pre-conference event was a LENR tutorial. One of the post-conference meetings was on "Materials Science Aspects of Hydrogen Loaded Metals", and the other was a one-day session on biological transmutation [28].

7. Phase V. The Emergence of the Ni-H Based Rossi Reactor and Its Impact (2011 to 2016)

Dr. Srinivasan invested a great deal of time and other resources in responding to Andrea Rossi's E-cat demonstrations in 2011 [29]. The E-cats were based on a nickel-hydrogen system for LENR, which resonated strongly with Dr. Srinivasan because of his earlier nickel-hydrogen experiments at BARC in response to the work of Randell Mills. Rossi's January 2011 demonstration was just three weeks before ICCF-16, so Dr. Srinivasan changed the program to accommodate presentations and discussions on the development of the E-cat. Rossi's demonstration of his 1-MW reactor in October 2011, as well as the apparent verification by the Lugano test [30], increased Dr. Srinivasan's interest in supporting E-cat development. The reported Parkhomov confirmation [31] and publication of Mats Lewan's book "Impossible Invention" also contributed to Dr. Srinivasan's belief that "LENR had turned the corner" as he put it.

In the period 2012 to 2015 he lobbied three multinational power companies in India to be prepared to manufacture Rossi's LENR reactors. When Industrial Heat began working with Rossi, Dr. Srinivasan persuaded that organization, as well as Defkalion Green Technologies [32] whose approach was apparently similar to Rossi's) that companies in India would be excellent candidates for manufacturing and marketing decentralized LENR power units. Like many others in the LENR field, Dr. Srinivasan was deeply disappointed in the negative outcome of the relationship between Rossi and Industrial Heat [33].

During 2014 Dr. Srinivasan took the initiative to convince the chief editor of India's Current Science Journal to bring out a special issue on LENR. The issue, for which he invited Andrew Muhlenberg to be a co-author, came out in February 2015.

8. Phase VI. Appeal to the Politicians in Power for Intervention for LENR (2014 to 2018)

During the final phase of his autobiographical sketch, which overlaps the previous phase by a couple of years, Dr. Srinivasan again worked to revive interest in LENR in India. His work started in 2014 with organization of a session on cold fusion at a mini-conference that was held on the use of Nb-Ta alloys in particle accelerators. He took this opportunity to work with the host of the conference to arrange a meeting with the Prime Minister of India about cold fusion. Although the meeting was scheduled, the PM failed to attend because of competing priorities at Parliament.

However, a subsequent meeting with the Minister for Power was much more productive. The Minister made arrangements for funding a LENR brainstorming session at India's National Institute for Advanced Studies. The meeting was attended by more than 15 heads of leading scientific laboratories. In a second meeting almost a dozen team leaders from their respective labs pledged to initiate LENR experimental programs. Subsequent efforts to secure

funding for this work led to four active research groups – at the Indian Institute of Technology (IIT) Bombay, IIT Kanpur, sVayasa University and Dr. Srinivasan's former home laboratory, BARC.

Dr. Srinivasan continued to be active in LENR afterward, including attending ICCF-22 in Italy in 2019, which is when the interview was accomplished for the SLRDP. The third draft of the SLRDP report was completed in June 2020, just two months before his death in August.

9. LENR Publications and Related Works

During his nearly 30 years of LENR research, Dr. Srinivasan prepared (or was a party to) at least 45 papers and other documents related to the phenomenon. These papers were identified and collected for the SLRDP. He was careful to note that, while he was often a lead author or was responsible for synthesizing LENR results, the investigations were actually done by many researchers.

About 22 LENR papers by Dr. Srinivasan as author or co-author were found for Phase II, while he researched LENR at BARC from 1989 to 1997. The topics reflect the course of his LENR research and include overviews of the research [34], autoradiography, deuterated palladium and titanium, tritium detection, neutron emissions, statistical analysis, liquid nitrogen treatment, gas loading, electrolysis and gas absorption with nickel and hydrogen, and the two-balance method (at SRI).

As noted above, one of the earliest and most significant works was the BARC report [35] ("BARC 1500") that he co-authored with Dr. Iyengar in 1989. The report included 19 papers by 37 authors in three parts: electrolytic cell investigations, deuterium gas loading experiments and theoretical papers. No papers were prepared during Phase III, the "silent period". Approximately 23 papers and related materials were prepared by Dr. Srinivasan in Phases IV, V and VI (2008 to 2017). The ICCF-16 proceedings he edited (published in 2011) had 67 papers in six categories: gas loading, electrolysis, theory, nuclear particle measurements, transmutation and hotspots, materials, and engineering technology. The Current Science Journal special edition he co-edited with Dr. Andrew Muehlenberg was published in February 2015 and included 35 papers by many of the most senior figures in the LENR field [36].

10. Summary: A Sterling Career in an Essential Field for the Future of Humankind

Dr. Srinivasan was responsible for a number of advances in understanding of the LENR phenomenon, and he reported results of his investigations in many publications and reports. As noted above, he stressed three main LENR accomplishments at BARC in his autobiographical sketch – the tritium to neutron ratio anomaly, the demonstration by statistical analysis that neutrons are emitted in bursts, and the use of autoradiography to show that LENR occurs in isolated spots. He thus concluded that the phenomenon takes place in spots that are isolated in space and time.

Dr. Srinivasan made substantial contributions to the LENR field, which has major potential to meet the need of humankind for a clean and inexpensive source of energy. He was one of the earliest researchers to respond to the LENR announcement and led one of the largest research efforts in the world in the first two years afterward. He enjoyed a sterling career both in his research contributions and his effective advocacy for LENR. He was very personable and easy to work with, and he became an international presence in the field.

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References

[1] Grimshaw, T., and E. Storms, 2018. Documentation of Dr. Edmund Storms' 29 Years of CF Research: Lessons Learned for Long-Term LENR Researchers. Poster Presented at the 21st International Conference on Cold Fusion (ICCF-21), June.

[2] C.V.K. Maithreya, Science, Spirituality and Srinivasan, *Infinite Energy*, No. 154 (2020) 27-28.

[3] M. Srinivasan, Occult Chemistry: The Amazing Phenomenon of Extra-Sensory Perception of Nuclear Structure and Subatomic Particles, *Infinite Energy*, No. 36 (2002) 20-25.

[4] M. Srinivasan, Alchemy: Myth or Science?, Rejoinder to "The Curious Case of an Experiment with Alchemy" by Atul Sethi. *Times of India*, 2008.

[5] M. Srinivasan and T.W. Grimshaw, Documentation of Dr. Mahadeva Srinivasan's Cold Fusion Research, A Project of the LENR Research Documentation Initiative, Volume 1, Report and Volume 2, Copies of Papers. LENRGY, LLC Unpublished Report, June 12, 2020.

[6] M. Srinivasan, "Mahadeva, Srinivasan: Commentary on Cold Fusion: The First Ten Years", *Infinite Energy*, No 24 (1999) 17.

[7] C.L. Frazier, The Passing of Indian Cold Fusion Researcher Mahadeva Srinivasan, *Infinite Energy*, No. 153 (2020) 10-11.

[8] R. George, The Cold Fusion Phenomenon Is Real: An Interview with Dr. Mahadeva Srinivasan Conducted by Russ George, *Cold Fusion Magazine*, No. 2 (1994).

[9] M. Macy, ICCF-16 in India: A Historic Perspective, *Infinite Energy*, No. 95 (2011) 9-13.

[10] A. Kumar, M. Srinivasan and R.K. Subba, *Trombay Criticality Formula for the Characterization of Neutron Leakage Variations from Small Reactor Assemblies, Part 1: Basis*, Bhabha Atomic Research Centre, BARC-1120, 1981.

[11] M. Srinivasan, Wide Ranging Studies on the Emission of Neutrons and Tritium by LENR Configurations: An Historical Review of the early BARC Results. in *Low Energy Nuclear Reactions and New Energy Technology Sourcebook, Vol 2*, (Oxford University Press, 2008).

[12] R.K. Rout et al., Reproducible, Anomalous Emissions from Palladium Deuteride/Hydride. *Fusion Technology* 30 (1996) 273.

[13] M. Srinivasan, et al., *Observation of Tritium in Gas/Plasma Loaded Titanium Samples*. in Anomalous Nuclear Effects in Deuterium/Solid Systems, AIP Conference Proceedings 228 (1990).

[14] R.K. Rout, M. Srinivasan, and A. Shyam, *Autoradiography of Deuterated Ti and Pd Targets for Spatially Resolved Detection of Tritium Produced by Cold Fusion*, in BARC Studies in Cold Fusion, P.K. Iyengar and M. Srinivasan, Eds., Atomic Energy Commission, BARC-1500, p. B 3, 1989.

[15] M. Srinivasan, Hot Spots, Chain Events, & Micronuclear Explosions. Capstone Presentation. Fifteenth International Conference on Cold Fusion (ICCF-15) 2009.

[16] T.C. Kaushik, et al., Preliminary Report on Direct Measurement of Tritium in Liquid Nitrogen Treated TiD Chips, *Indian Journal of Technology* 28 (1990) 667-673.

[17] M. Srinivasan and M. McKubre,. Two-Balance Method of Faraday Efficiency Measurement with External Open Cell Calorimetry for Identifying Origin of Excess Heat Ni-H2O Electrolytic Cells. *Cold Fusion Magazine* 1 (1994).

[18] M. Srinivasan, Transmutations and Isotopic Shifts in LENR Experiments: An Overview. *Journal of Condensed Matter Nuclear Science*, 12 (2013) 1-10.

[19] M. Srinivasan, G.H. Miley, and E. Storms, Low Energy Nuclear Reactions: Transmutations, in *Nuclear Energy Encyclopedia: Science, Technology and Ap*plications (Wiley, 2011) 503-540.

[20] M. Srinivasan, Neutron Emission in Bursts and Hot Spots: Signature of Micro-Nuclear Explosions? *Journal of Condensed Matter Nuclear Science*. 4 (2011) 161-172.

[21] M. Srinivasan, et al., *Statistical Analysis of Neutron Emission in Cold Fusion Experiments*, in The First Annual Conference on Cold Fusion (ICCF-1). 1990.

[22] C.R. Narayanaswamy, Observation of Anomalous Production of Si and Fe in an Arc Furnace Driven Ferro Silicon Smelting Plant at Levels of Tons per Day. *Journal of Condensed Matter Nuclear Science* 24 (2017) 1-8.

[23] M. Srinivasan, *Whither "Cold Fusion"?*, Letter to Friends and Colleagues, Internal Unpublished BARC Document, April 8, 1991.

[24] M. Srinivasan, *Paradigm Shifts Which Can Drastically Affect Our Extrapolated Projections*, Internal Unpublished BARC Document Prepared for Seminar on Vision 2020, July 19-21, 1995.

[25] M. Srinivasan, Energy Concepts for the 21st Century, A Report on the One-Day Discussion Meeting on 'Emerging New Energy Concepts for the 21st Century: Low Energy Nuclear Reactions' Held at the National Institute of Advanced Studies on 9 January 2008, *Current Science* 94 (7) (2008) 842-843.
[26] M. Srinivasan, Ed., Proceedings of the ICCF-16 Conference, February 6–11, 2011, Chennai, India, Part 1, *Journal of Condensed Matter Nuclear Science*, 8 (2012).
[27] M. Srinivasan, Ed., Proceedings of the ICCF-16 Conference, February 6–11, 2011, Chennai, India, Part 2, *Journal of Condensed Matter Nuclear Science*, 10 (2013).
[28] M. Srinivasan, Advisor, One Day Workshop on Biological Nuclear Transmutations : Historical Perspective and Applications. Organized by SRM University, Kattankulathur and Indian Institute of Metals, Kalpakkam (2011).
[29] The Rossi demonstrations are described in M. Lewan, *An Impossible Invention – The True Story of the Energy Source that Could Change the World*, Self-Published by Lewan (2014).
[30] G. Levi, et al., Observation of Abundant Heat Production from a Reactor Device and of Isotopic Changes in the Fuel, Unpublished Report, Bologna University (2014).
[31] A.G. Parkhomov and E.O. Belousova, Research into Heat Generators Similar to High-Temperature Rossi Reactor, *Journal of Condensed Matter Nuclear Science*, Vol 19 (2016) 244-256.
[32] Defkalion Green Technologies, Company Overview, Market Strategy, Global Positioning. Unpublished Document, 2011.
[33] M. Macy, Reporting a Lawsuit in LENR, *Infinite Energy*, No. 127 (2016) 8-19.
[34] P.K. Iyengar and M. Srinivasan, Overview of BARC Studies in Cold Fusion, in The First Annual Conference on Cold Fusion (ICCF-1), 1990.
[35] P.K. Iyengar and M. Srinivasan, BARC Studies in Cold Fusion, BARC-1500, Government of India, Atomic Energy Commission, 1989.
[36] M. Srinivasan and A. Muehlenberg, Eds., *Current Science, Special Section: Low Energy Nuclear Reactions*, 108 (4) (2015).