Does the Sun's core consist of iron instead of hydrogen?

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Abstract

For years, scientists have assumed that the sun is an enormous mass of hydrogen. Galileo was the first to propose that the sun is filled with gas. But Dr. Oliver Manuel says iron, not hydrogen, is the sun's most abundant element. IF his suggestion is true then it may imply that the source of solar energy is different of the presently held theory of hydrogen fusion.

Introduction

This article is summary of discussion in researchgate.net on the chemical composition of the sun's core. For years, scientists have assumed that the sun is an enormous mass of hydrogen. Galileo was the first to propose that the sun is filled with gas. But Dr. Oliver Manuel says iron, not hydrogen, is the sun's most abundant element. IF his suggestion is true then it may imply that the source of solar energy is different of the presently held theory of hydrogen fusion. In principle, Dr. Manuel suggests that the hydrogen-filled sun hypothesis is obsolete. See: http://arxiv.org/ftp/astro-ph/papers/0410/0410569.pdf
Reference to Dr. Oliver Manuel's papers:
”An iron-rich Sun and its source of energy," Proceedings of the 8th International Symposium on Nuclei in the Cosmos, Vancouver, BC, Canada, 19-23 July 2004 (Manuscript submitted for publication)
http://www.omatumr.com/abstracts2005/IronRichSun.pdf

Answers:

[1] Johannes Gruenwald

But if this would be the case, I would assume that you would see massive iron lines in the spectrum of the sun. Furthermore, if this was true, the mass of the sun would be much higher and the orbits of the planets would be much smaller - this can be disproven be simple mechanical calculations.
So, no I don't agree with such suggestions.

[2] **Oliver Manuel**

Precise experimental data from the world's top research facilities* leave no doubt:

The most abundant element in the interior of the Sun is iron (Fe), not hydrogen (H).

Fred Hoyle's autobiography, "Home Is Where the Wind Blows," admits on pp. 153-154, that mainstream astronomers and astrophysicists all believed:

1. The interior of the Sun was mostly iron (Fe) in 1945
2. The interior of the Sun was mostly hydrogen in 1946 . . .

and they all unanimously changed their opinions without discussion or debate !

That was the birth of the lock-step, standard, "consensus" models that destroyed the integrity of science and eventually surfaced as Climategate in November 2009.

*Nine pages of precise experimental data that falsify the standard solar model are on pages 19-27 of my autobiography.

Here is the link to Fred Hoyle's autobiography:

http://www.amazon.com/gp/aw/d/093570227X

[3] **Victor Christianto**

Dear Dr. Manuel, thank you for your explanation. Do you find massive iron lines in the spectrum of the sun? Best wishes

[4] **Oliver Manuel**

Victor,

Fred Hoyle noted on page 153 of his autobiography that the spectrum of sunlight is "chock-a-block with lines of iron" [Fred Hoyle's autobiography, "Home Is Where the Wind Blows"]
http://www.amazon.com/gp/aw/d/093570227X

That is why Fred Hoyle, Sir Arthur Eddington and other mainstream astronomers and astrophysicists believed the interior of the Sun was mostly iron until 1946.

Describing a meeting with Sir Arthur Eddington in 1940, Hoyle says:

1. “We both believed that the Sun was made mostly of iron, two parts iron to one part of hydrogen, more or less. The spectrum of sunlight, chock-a-block with lines of iron, had made this belief seem natural to astronomers for more than fifty years.” . . . [p. 153],

2. “The high-iron solution continued to reign supreme in the interim (at any rate, in the astronomical circles to which I was privy) until after the Second World War,” . . .

3. “when I was able to show, to my surprise, that the high-hydrogen, low iron solution was to be preferred for the interiors as well as for the atmospheres.” [pp. 153-154]

4. “My paper on the matter confounded a doctrine of (Raymond) Lyttleton, who used to say there are three stages in the acceptance by the world of a new idea.

_ a. The idea is nonsense.
_ b. Somebody thought of it before you did.
_ c. We believed it all the time.

This matter of the high-hydrogen solution was the only occasion, in my experience, when the first and second of these stages were missing." [p. 154].

The above information was given to the Congressional Space Science & Technology Committee staff on 17 July 2013:
https://dl.dropboxusercontent.com/u/10640850/Creator_Destroyer_Sustainer_of_Life.pdf

[5] **Johannes Gruenwald**

I am afraid that quotations from some scientists are not sufficient experimental or theoretical evidence.

Show me some spectrum of the sun (which is very easy to obtain) with huge Fe lines and I will start rethinking my views immediately. Or show me a proper calculation of a sun made of iron (the mass of it, that is) - which is also very easy to be done and from that and the law of gravity calculate the orbits of the planet and compare that to the actually measured ones...

[6] **Oliver Manuel**

Johannes,

Ordinary textbooks of astronomy used to have line spectra of sunlight with the lines from various elements identified. You may have to find an older textbook if that information has now been removed from newer textbooks.

1. Many ordinary welders instinctively know that light from the Sun is like that emitted from a "red hot" piece of iron: A chariot of fire moving across the heaven each day.

2. Two of the founders of modern astronomy and astrophysics, Fred Hoyle and Arthur Eddington, were quoted above as agreeing that sunlight is "chock-a-block with lines of iron."

3. Nine pages of precise experimental data on pages 19-27 of my biography (See attachment) show the interior of the Sun is mostly iron and hydrogen is a waste product in the photosphere.

[7] **Oliver Manuel**

Johannes: "Show me some spectrum of the sun (which is very easy to obtain) with huge Fe lines and I will start rethinking my views immediately."

Here are visible emission lines of iron (Fe) in sunlight.

https://dl.dropboxusercontent.com/u/10640850/Visible_iron_emission_lines_in_sunlight.pdf

Here is an image of a solar eruption recorded in emission lines from highly ionized iron.

http://trace.lmsal.com/POD/movies/T171_000828.avi

[8] **Johannes Gruenwald**

First of all, your spectrum is a spectrum of the emission lines of iron - so there should be all the iron lines (naturally) - compare that to the sun's spectrum and you will see that this is totally different. Also when I use the spectrometer from my own lab, I don't see any iron lines in the sun light.

Secondly as a chemisist you should know that every black body radiates the same wavelength at the same temperature - the colour is independent of the material (as long as the emissivity is the same). However, I am not sure that every ordinary welder knows that...

Thirdly, your link does not even have 27 pages and on page 19 ff. there are just some citations of works which mostly (as far as I saw from the title don't even have something to do with iron content of the sun).

So as long as you cannot disprove my points (and they are REALLY basic physics points) by reproducable measurements and/or calculations, I can asure you that a sun made of iron is just phantasy (at the best). - Just make the simple calculations I mentioned above (should take you about 10 min).

[9] **Oliver Manuel**

Johannes,

Did you not find time to watch the video of a solar eruption recorded in UV light emitted from highly ionized iron (Fe)?

http://trace.lmsal.com/POD/movies/T171_000828.avi

The TRACE satellite recorded those images on 28 August 2000 using a 171 Å filter. This filter is specifically sensitive to light emisssions from iron ions, Fe IX and FeX.

If you prefer to consider only the Sun's major dark (Fraunhofer) absorption lines for iron (Fe), see the list at: http://en.wikipedia.org/wiki/Fraunhofer_lines:
516.891 nm
495.761 nm
466.814 nm
438.355 nm
430.790 nm
382.044 nm
358.121 nm
302.108 nm

Nine pages of precise experimental data on pages 19-27 of my biography (See attachment) show the interior of the Sun is mostly iron and hydrogen is a waste product in the photosphere. The page numbers are given at the bottom of each page.

[10] **Johannes Gruenwald**

So, there are several Fe lines in the range of 171 Angstrom, the problem is that if you use a filter in that range - these lines are blocked (also basic optics).

Furthermore it doesn't matter wether you look at the emission or absorption lines as they are identical...

So, if you cannot really disprove my simple arguments, I see no more value in discussing such a matter any further...

[11] **M.A. Padmanabha Rao**

I agree with Johannes Gruenwald in saying that there are no Fe lines in Sunlight.
1. On comparison of solar lines and Fe lines I did not find any valid links. Please refer 2.1 'Solar and Fe lines have no valid links' in my paper 'Discovery of Sun's Bharat Radiation emission …..' mentioned below.

2. In the Solar spectrum obtained by Woods et al on May 5, 2010, existence of Bharat Radiation wavelengths in 12.87 to 31 nm range from radioisotopes were discovered by me. Therefore, solar lines attributed to Fe lines in 12.87 to 31 nm range are of Bharat Radiation caused by beta, gamma or X-ray emission within the excited atoms of radioisotopes (235Uranium fission products).

3. For the first time in solar physics, the following paper 'Discovery of Self-Sustained 235-U Fission Causing Sunlight …. ' reports a comprehensive study how 235Uranium fission causes Sunlight by the atomic phenomenon, Padmanabha Rao Effect against the theory of fusion. The first major breakthrough lies in identifying as many as 153 solar lines in 12.87 to 31 nm range reported by various researchers since 1960s (refer Table) as of Bharat Radiation caused by beta, or gamma emission from within excited atoms of 235Uranium fission products (radioisotopes).

M.A. Padmanabha Rao,
Discovery of Sun's Bharat Radiation emission causing Extreme Ultraviolet (EUV) and UV dominant optical radiation,
IOSR Journal of Applied Physics (IOSR-JAP), Volume 3, Issue 2 (Mar. – Apr. 2013), PP 56-60, DOI: 10.9790/4861-0325660
http://www.iosrjournals.org/iosr-jap/papers/Vol3-issue2/H0325660.pdf

M.A. Padmanabha Rao,
Discovery of Self-Sustained 235-U Fission Causing Sunlight by Padmanabha Rao Effect,
IOSR Journal of Applied Physics (IOSR-JAP), Volume 4, Issue 2 (Jul. – Aug. 2013), PP 06-24, DOI: 10.9790/4861-0420624
http://www.iosrjournals.org/iosr-jap/papers/Vol4-issue2/B0420624.pdf

[12] **A. Uryson**

Element composition of stars is tested in experiments investigating possible sources of star energy. These sources are nuclear fusion inside stars: pp-cycle in the Sun and CNO-cycle in heavier stars. To check on pp-cycle the experiment which counts solar neutrinos emitted via nuclear fusion in the Sun was performed (Davis experiment, USA). The number of detected neutrinos was lower than predicted theoretically. However at presence this discrepancy is explained by a non-zero mass of neutrino. Due to this neutrino oscillation takes place. It means that a neutrino of one type can change into one of a different type (types of neutrino are: electron neutrino, muon neutrino, and tau neutrino). Neutrino oscillation was discovered in several experiments (K2K, OPERA et al.). Results of Davis experiment is

interpreted as confirming pp-cycle and element composition of the Sun. At present this is the main stream in solar physics and astrophysics (previously attempts took place to explain in other ways the low number of solar neutrinos in Davis experiment).

[13] **Oliver Manuel**

1. Dr. Rao:

   Please take the time to watch the video posted above of a solar eruption recorded with light (171 Å) emitted by highly ionized iron in the Sun:

   http://trace.lmsal.com/POD/movies/T171_000828.avi

   Emission lines (167 Å to 220 Å) from highly ionized iron in the Sun have been known for at least fifty years:

   A. H. Gabriel, B. C. Fawcett & Carole Jordan, "Classification of iron Lines in the spectrum of the Sun and Zeta in the range 167 Å to 220 Å," Nature 206, 390 - 392 (1965)
   http://www.nature.com/nature/journal/v206/n4982/abs/206390a0.html

   2. Dr. Uryson:

   I knew Ray Davis personally and I am familiar with the work you cite.

   I do not agree that solar neutrinos oscillate. A few months after we presented the attached paper at the 32nd Lunar Science Conference in MARCH 2001, one hundred and seventy eight (178) members of the Sudbury Neutrino Observatory research consortium reported that their latest measurements showed solar neutrino oscillations as the solution to the solar neutrino puzzle:

   Q. R. Ahmad et al. (~177 co-authors), “Measurement of charged current interactions produced by 8B solar neutrinos at the Sudbury Neutrino Observatory,” Physical Review Letters 87 (JULY 2001).
   http://arxiv.org/pdf/nucl-ex/0106015v2
   http://prl.aps.org/abstract/PRL/v87/i7/e071301

[14] **M.A. Padmanabha Rao**

Dr. Oliver Manuel:
"This is regarding your comment "Please take the time to watch the video posted above of a solar eruption recorded with light (171 Å) emitted by highly ionized iron in the Sun": You have cited very old 1965 reference. I hope you would give credence to latest discoveries reported in Solar Physics in 2013.

FRANKLY SPEAKING 171A LINE DOES NOT REPRESENT HIGHLY IONIZED IRON IN THE SUN. Please peruse excerpt of my paper published in 2013: Contrary to the findings of Fawcett and Gabriel, the most intense 17.107 nm emission in the middle of the solar spectrum in Figure 3 disagrees with 17.1073 nm (Fe IX) emission mentioned by NIST due to low relative intensity just 120 in Fe spectrum, yet identified with Fe IX in Figure 3 [20]. Inaccurate measurements made by Fawcett and

Gabriel that did not agree with the latest spectral data led to the misinterpretation of their findings.

You said "Emission lines (167 Å to 220 Å) from highly ionized iron in the Sun have been known for at least fifty years". Only after doing research work with radioisotopes and XRF sources, it became possible to interpret that these wavelengths represent Bharat Radiation caused by beta, gamma or X-ray from 235-Uranium fission products.

Reference:
M.A. Padmanabha Rao,
Discovery of Sun's Bharat Radiation emission causing Extreme Ultraviolet (EUV) and UV dominant optical radiation,
IOSR Journal of Applied Physics (IOSR-JAP), Volume 3, Issue 2 (Mar. – Apr. 2013), PP 56-60, DOI: 10.9790/4861-0325660
http://www.iosrjournals.org/iosr-jap/papers/Vol3-issue2/H0325660.pdf

Do you agree with me that Solar spectrum measured by various astrophysicists since 1960s could not be identified for a half century until 2013 what the range of wavelengths represent (1) up to 12.87 nm (2) 12.87 to 31 nm, and (3) beyond 31 nm. For the first time, I have identified these three ranges are of X-rays, Bharat Radiation, and EUV (Ref: above cited paper). If you agree with my classification, 171A represents Bharat Radiation caused by beta, gamma or X-ray from radioisotopes presents on Sun's core surface.

Precisely, I have reported that the 171A line is caused by 606.31 keV beta energy of 131-I (235-Uranium fission product).

Reference:
M.A. Padmanabha Rao,
Discovery of Self-Sustained 235-U Fission Causing Sunlight by Padmanabha Rao Effect,
IOSR Journal of Applied Physics (IOSR-JAP), Volume 4, Issue 2 (Jul. – Aug. 2013), PP 06-24, DOI: 10.9790/4861-0420624
http://www.iosrjournals.org/iosr-jap/papers/Vol4-issue2/B0420624.pdf

[15] **Oliver Manuel**

Sorry, Dr. Rao, this thread is not about self-sustaining U-235 fission as the source of solar energy. You may want to discuss that idea with Dr. Marvin Herndon, the best authority on that after Paul K. Kuroda died.

Literally hundreds of measurements show Iron (Fe) is the most abundant element in:

The Sun
The Earth
Ordinary Meteorites
Other Rocky Planets

Fe-56 is the most abundant atom, and also the atom with the greatest nuclear stability.

I could provide a few references but there is no indication you would read them.

[16] **M.A. Padmanabha Rao**

Dr Oliver Manuel:
You wanted me to discuss that idea with Dr. Marvin Herndonm, the best authority on that. I salute Dr. Marvin Herndonm.

You also said "Fe-56 is the most abundant atom, and also the atom with the greatest nuclear stability". I have mentioned in my previous reply that THE MOST INTENSE 17.107 nm emission in the middle of the solar spectrum disagrees with 17.1073 nm (Fe IX) emission mentioned by NIST due to LOW RELATIVE INTENSITY just 120 in Fe spectrum, yet identified with Fe IX in Figure 3 (Reference mentioned in my previous reply).
You have not denied what I said on this.
Anyhow, please peruse atomic spectrum of Fe from NIST and express clearly that you agree 17.1073 nm do not represent (Fe IX) emission.
If fellow scientists do not agree with the facts given, solar physics will not make any progress. .

[17] **Oliver Manuel**

Dr. Rao,

The standard solar model is wrong. I admire your search for other sources of solar energy, but restricting your studies to spectral lines may limit your understanding.

These references could help:

01. P. K. Kuroda, “On the nuclear physical stability of the uranium minerals,” Journal Chem. Phys. 25 (1956) 781-782.

02. P. K. Kuroda, “On the infinite multiplication constant and the age of the uranium minerals,” Journal Chem. Phys. 25 (1956) 1295-1296.

03. P. K. Kuroda, “Nuclear fission in the early history of the Earth,” Nature 187 (1960) 36-38.

04. Peter Toth, "Is the Sun a pulsar?" Nature 270, 159-160 (1977): http://www.nature.com/nature/journal/v270/n5633/abs/270159a0.html

05. P. K. Kuroda, The Origin of the Chemical Elements and the Oklo Phenomenon (Springer Publishing), 165 pages (Dec 1982). http://www.amazon.com/Origin-Chemical-Elements-Oklo-Phenomenon/dp/3540116796

06. P. K. Kuroda, ”The Oklo phenomenon,” Naturwissenschaften 70, 536-539 (1983). http://www.springerlink.com/content/n556224311414604/

07. Carl A. Rouse, “Evidence for a small, high-Z, iron-like solar core”, Solar Physics 110 (1987) 211-235: http://www.springerlink.com/content/k26825872rv64411/

08. J. M. Herndon, “Nuclear fission reactors as energy sources for the giant outer planets,”

Naturwissenschaften 79, 7-14 (1992).

09. Alexander Wolszczan, “Confirmation of earth-mass planets orbiting the millisecond pulsar PSR B 1257+12”, Science 264, 538-542 (1994): http://www2.astro.psu.edu/~niel/astro485/homework/set003-wolsz-planets-confirm.pdf

10. V. A. Kotov, “A pulsar inside the Sun?” Radiophysics and Quantum Electronics 39, 811-814 (1996): http://link.springer.com/article/10.1007%2FBF02120961

11. Oliver K. Manuel, "Neutron repulsion,” The APEIRON Journal 19, 123-150 (2012): http://redshift.vif.com/JournalFiles/V19NO2pdf/V19N2MAN.pdf

[18] **M.A. Padmanabha Rao**

Dr. Oliver Manuel:
The original debate is "Does the Sun's core consist of iron?"
I have mentioned two discoveries in solar physics on the interesting topic. If we discuss on old references of 1956 etc you mentioned, we do not gain anything.

I have published in 2013 that the Solar lines in 12.87 to 31 nm range do not represent Fe lines but of Bharat Radiation. First of all, please accept that there are no Fe lines in solar spectrum on comparing solar lines with atomic spectrum of Fe available from NIST. This is for sake of debate. If disagreed, one can publish a paper contradicting my views.

[19] **Oliver Manuel**

I offered you references to the original, 1956 papers on self-sustaining nuclear reactors actors. They were written by my research mentor.

If you want to learn, you must be willing to study original work.

But the decision is yours.

[20] **Victor Christianto**

@Oliver. Dear Dr Oliver Manuel, i am interested particularly in Carl Rouse,s 1987 paper, but alas i don,t have access to springerlink. If you do not mind, please kindly send me this paper. Thanks. Best wishes

[21] **Oliver Manuel**

By 1975 Dr. Carl A. Rouse (PhD, Caltech, 1956) had already reported a flaw in the SSM (standard solar model) of hydrogen-filled stars [1]; Precise meteorite analysis provided evidence local element synthesis [2,3] produced the iron-rich solar interior Dr. Rouse would later conclude from helio-seismology [4].

In 1977, Peter Toth [5] first suggested that the Sun had a pulsar core.

In 2001 we first reported that the Sun shines from repulsive interactions between neutrons in the Sun's pulsar core [6], just as repulsive interactions between neutrons in the cores of uranium and plutonium ignited the "nuclear fires" that consumed Hiroshima and Nagasaki on 6 and 9 Aug 1945, respectively.

The "nuclear fires" that burned spontaneously on Earth 2 Ga ago (Kuroda, 1956), were also powered by neutron repulsion.

1. Carl A. Rouse, "A solar neutrino loophole: Standard solar models", Astronomy and Astrophysics 44 (1975) 237-240. http://tinyurl.com/7vx4arv

2. O. K. Manuel and D. D. Sabu, "Elemental and isotopic inhomogeneities in noble gases: The case for local synthesis of the chemical elements", Trans. Missouri Acad. Sci. 9 (1975) 104-122.

3. O. K. Manuel and D. D. Sabu, "Strange xenon, extinct superheavy elements and the solar neutrino puzzle", Science 195 (January 1977) 208-209. http://www.omatumr.com/archive/StrangeXenon.pdf

4. Carl A. Rouse, "Evidence for a small, high-Z, iron-like solar core", Solar Physics 110 (1987) 211-235.
http://www.springerlink.com/content/k26825872rv64411/

5. Peter Toth, "Is the Sun a pulsar?" Nature (1977)

6. O. Manuel, C. Bolon, A. Katragada and M. Insall, "Attraction and repulsion of nucleons: Sources of stellar energy," J. Fusion Energy 19 (2001) 93-98.
http://www.omatumr.com/abstracts/jfeinterbetnuc.pdf

[22] **A. Uryson**

Doctor Manuel,
thank you much for references.
In my opinion such discussions are useful.

[23] **Oliver Manuel**

Thank you for taking the time to read documents that were seldom referenced by the peer-review club of consensus dogma.

Pages 19-27 of the attached biography presents nine pages of precise experimental data that FALSIFY the post-1945 consensus models of cores of:

1. Ordinary stars like the Sun
2. Heavy atoms like Uranium

[24] **Oliver Manuel**

I do not have copies of Carl Rouse's publications, but

1. Here is a hyper-link to his complete 1985 paper,
"Evidence for a small, high-Z, iron-like solar core," Astronomy and Astrophysics 149, 65-72 (Aug. 1985)
http://adsabs.harvard.edu/full/1985A%26A...149...65R

2. Here is the abstract to his 1987 paper,
"Evidence for a small, high-Z, iron-like solar core," Solar Physics 110, 211-235 (1987)
http://link.springer.com/article/10.1007%2FBF00206420

[25] **Oliver Manuel**

Victor,

To see if the distribution of planets might be explained by fragmentation, I recommend that you also look at publications by a former explosive weapons physicist at Los Alamos (Dr. Wilbur K. Brown) :

1. Brown, W.K.: 1970, “A model for formation of solar systems from massive supernova fragments." Los Alamos Scientific Laboratory report LA 4343, 28 pp.

2. Brown, W.K.: 1971, “A solar system formation model based on supernovae shell fragmentation," Icarus 15, 120-134.

3. Brown, W.K. and Gritzo, L.A.: 1986, “The supernovae fragmentation model of solar system formation," Astrophys. Space Sci. 123, 161-181.

4. Brown, W.K.: 1987a, “High explosive simulations of supernovae and the supernovae shell fragmentation model of solar system formation," Los Alamos National Laboratory report LA-11005, 10 pp.

5. Brown, W.K.: 1987b, “Possible mass distributions in the nebulae of other solar systems," Earth, Moon and Planets 37, 225-239.

6. Brown, W.K.: 1987c, “High explosive simulation of supernovae,” Pub. Astro. Soc. Pacific 99, 858-861.

7. Brown, W.K.: 1989, “A theory of sequential fragmentation and its astronomical applications,” J. Astrophys. Astr. 10 89-112.

8. Brown, W.K.: 1991, “The supernovae as a genesis site of solar systems,” Speculat. Sci. Tech. 15, 149-160.

9. Brown, W.K. and Wohlety, K. H.: 1995, “Derivation of the Weibull distribution based on physical principles and its connection to the Rosin-Rammler and lognormal distributions,” J. Applied Physics 78, 2758-2763.

10. Brown, W.K.: 2000, “The birth of planetary systems directly from supernovae,” in Origin of Elements in the Solar System: Implications of Post 1957 Observations (Kluwer Academic/Plenum Publishers) 225-240

Concluding Remarks

While this discussion may be not conclusive, it seems that Dr. Oliver Manuel can be right in suggesting that iron-rich sun core may be a correct model. However, since this contradicts to mainstream belief of many scientists, then it seems that further research is needed to verify this hypothesis. This article is intended to stimulate further observation in this direction.

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References:

1. “Xenon in carbonaceous chondrites”, Nature 240, 99-101 (1972) www.omatumr.com/archive/XenonInCarbonaceousChondrites.pdf
2. “Strange xenon, extinct super-heavy elements, and the solar neutrino puzzle”, Science 195, 208-210 (1977) http://www.omatumr.com/archive/StrangeXenon.pdf
3. “Solar abundances of the elements," Meteoritics 18, 209-222 (1983); http://tinyurl.com/224kz4
4. “The Sun’s origin, composition and source of energy”, Abstract 1041 , 32nd Lunar and Planetary Science Conf., Houston, TX, March 12-16, 2001, LPI Contribution 1080 (2001). http://www.omatumr.com/lpsc.prn.pdf
5. “Composition of the solar interior: Information from isotope ratios," Proceedings of SOHO 12/GONG Conference on Local and Global Helioseismology: The Present and the Future, 27 Oct-1 Nov 2002, Big Bear Lake, CA, U.S.A. (ESA SP-517, editor: Huguette Lacoste) pp. 345-348 (2003): http://www.omatumr.com/abstracts/gong-2002.pdf
6. A Journey to the Core of the Sun: Chapter 2 - Acceptance of Reality (Jan 2014) https://dl.dropboxusercontent.com/u/10640850/Chapter_2.pdf