The original powerpoint file was retrieved by Steven B. Krivit of *New Energy Times* from

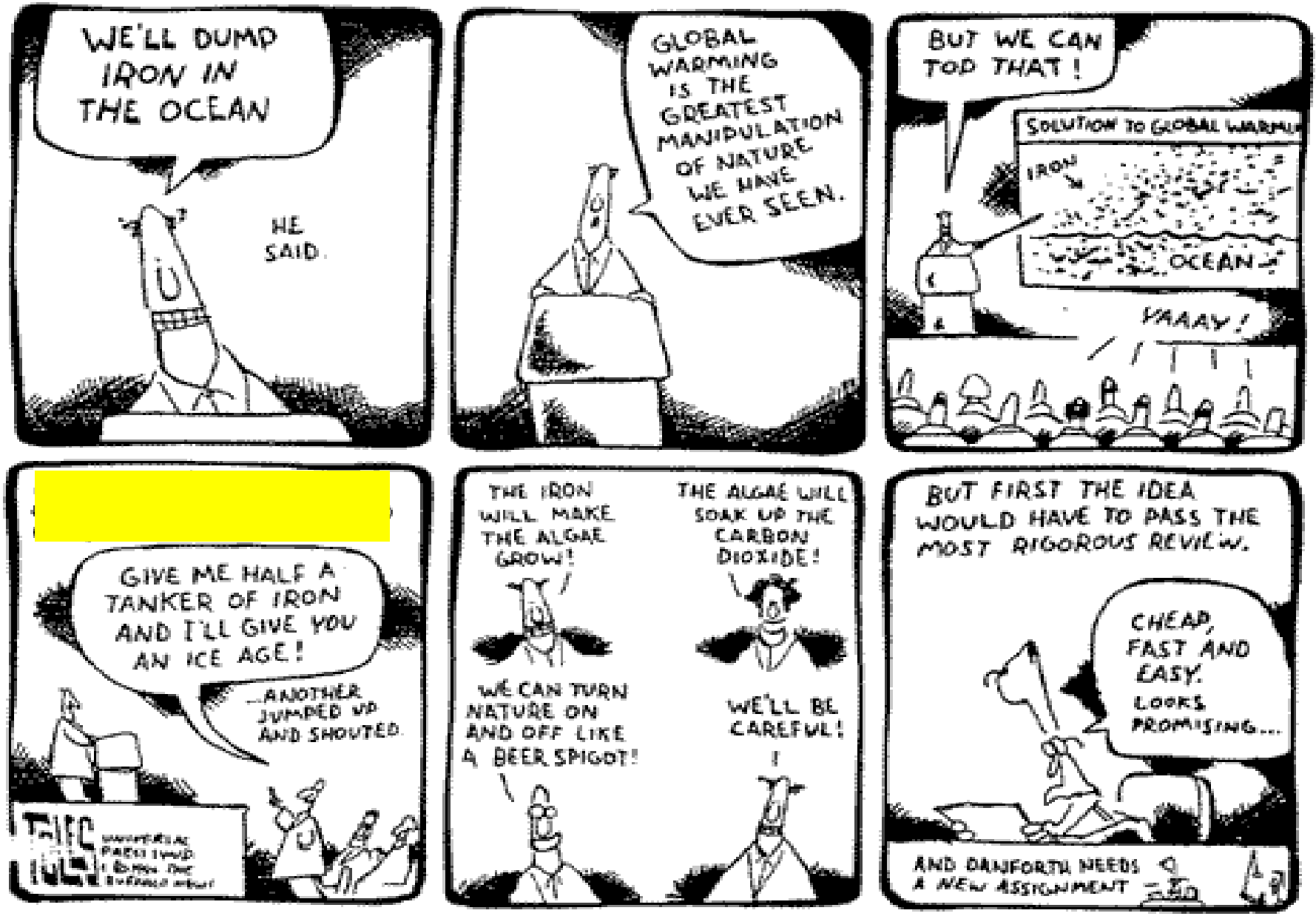
www.archive.arlingtoninstitute.org/library/GEORGE.PPT

This was presented by Darcy Russ George in Sept. 2006 at the Integrity Research Institute Conference on Future Energy

Some of the information, attributions and respresentations of intellectual property in this presentation regarding “cold fusion” are inaccurate, false and misleading.

"Do not be alarmed...I am the cold fusion fairy."

John Martin's conference presentation 1990



Two Patches for the Global Ecosystem before we face the blue screen of death and system reboot.

D2FUSION

Russ George – President & Founder

Silicon Valley, CA Los Alamos, NM

We have assembled two world class teams of scientists to deliver affordable global solutions

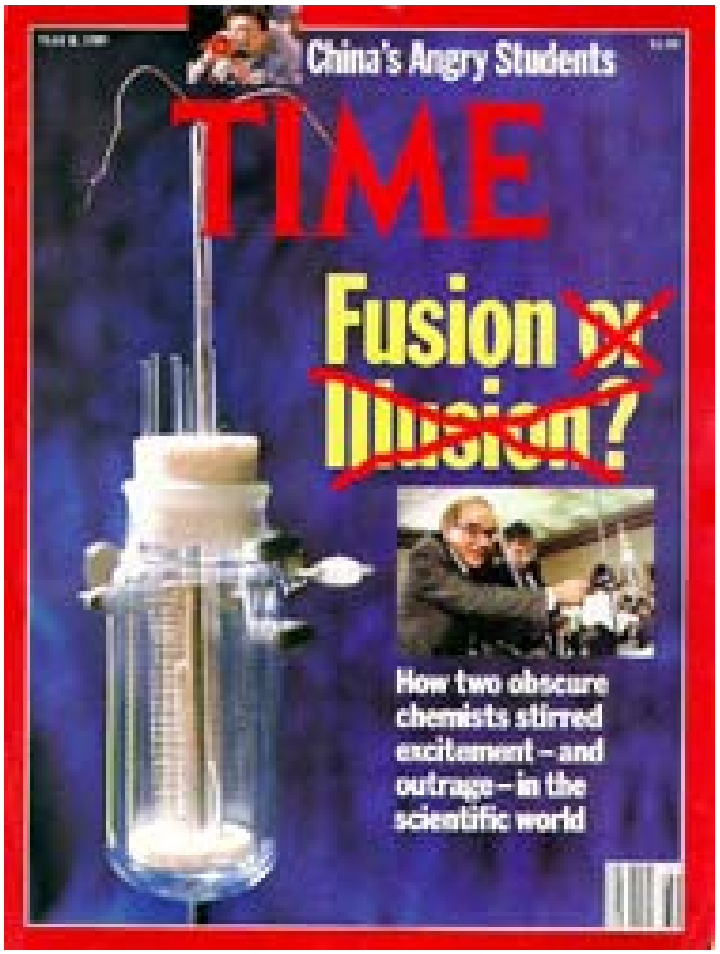
- The most urgent problem facing the world today is the imminent collapse of the global ecosystem due to our CO2 shock treatment of our oceans and atmosphere.

- To stop the immediate and critical hemorrhage Planktos proposes planetary first aid in the form of ecosystem restoration. Hold on Mother Ocean we are almost there.

- The source of this eco-crisis is the burning of fossil fuels. To stop the emissions and usher in the end of the fossil fuel age D2Fusion offers planetary treatment in the form of clean, reliable, non-polluting cold fusion.

What sort of energy are we talking about?

It started 17+ years ago!



COLD FUSION !!!

Not LENR, Not CANR, Not some other girly man dodgy description….

just Cold Fusion

Our Cold Fusion

- Occurs only in solid matter especially in hydrogen loving metals including palladium and titanium
- Not a uniform bulk reaction in all regions of such metals
- Deuterium is the preferred isotope of hydrogen for the fusion yielding 4He as the primary but not exclusive end product
- NO neutrons have been reproducibly observed
- NO energetic gammas or x-rays have been observed
- Some tritium is observed but at much reduced rates six orders of magnitude below 4He and only under some few conditions

Cold Fusion Modalities We Employ

- There are a variety of modalities for reliably creating cold fusion
- Electro-chemistry as per Martin Fleischmann's designs
  (Sustained boiling cells)
- Glow Discharge
  (Not quite so cold fusion produces some tritium)
- Nano Particle Gas Phase
  (Almost as complicated as a standard light bulb, makes readily observable and abundant helium)
- Sono Fusion – via asymmetric cavitation in deuterated liquids
  (Highly energetic but challenging to prevent vaporizing chain reaction fusion)

The Twin Miracles Required for Cold Fusion

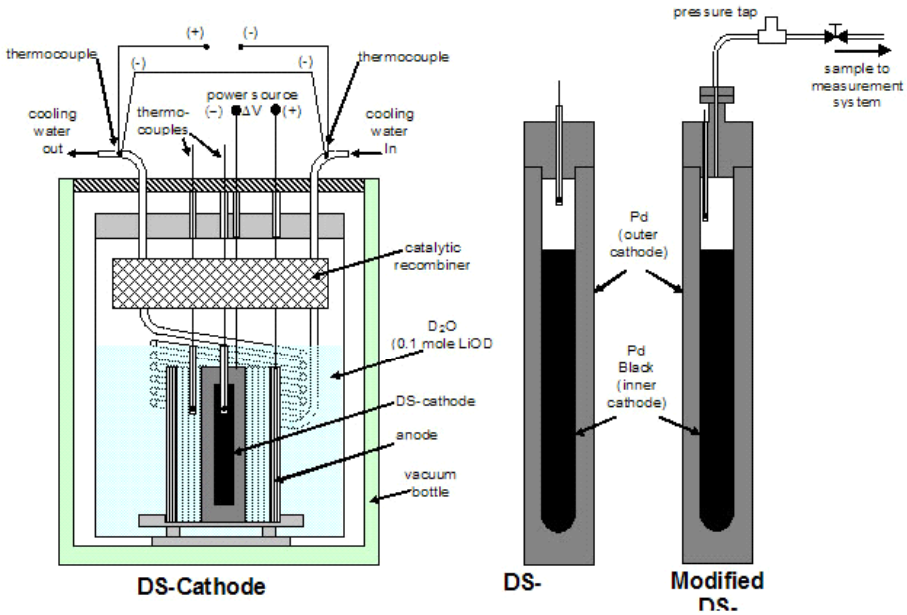
- Not one but two events must be happening in cold fusion
- First the Coulomb Barrier needs to be crossed for the fusion to occur.
- Second and perhaps more unconventional the new excited state helium nucleus must go to the ground state without energetic particle emission.
- When we can create such a state of hydrogen in metals pairing of nuclei can and does occur. Such pairs may be said to be analogous to Cooper Pairs wherein we know the Coulomb repulsion is altered.
- Julian Schwinger introduced the quantum mechanism of slowing de-excitation by a factor of a million and emitting a flood of phonons instead of fast particles

Cold Fusion in Nano Materials

- Nano-domains of certain metals provide for and exhibit coherent behavior by populations of deuterons (D's)
- The coherent condition reduces the Coulomb barrier. Resulting overlap of DD pairs provides a high probability fusion will/must occur.
- This solid-state DD fusion leaves an excited 4He nucleus entangled in a coherent population of D's coupling energy of fusion over many D’s and metal atoms yielding 4He and heating.
- This contrasts with plasma DD fusion in collision space where an isolated excited 4He nucleus must seek the ground state via fast particle emission.
- In momentum constrained solid state fusion, fast particle emission is effectively forbidden.

Nano-Phase Fusion

- Two protocols have yielded anomalous heat, helium, and tritium
- Both are characterized by nano-particles of Palladium
- Both operate in gaseous Deuterium at low temperature



ARATA Style Double Structure
Hollow Powder Filled Cathode

D2FUSION Pd Catalyst Device

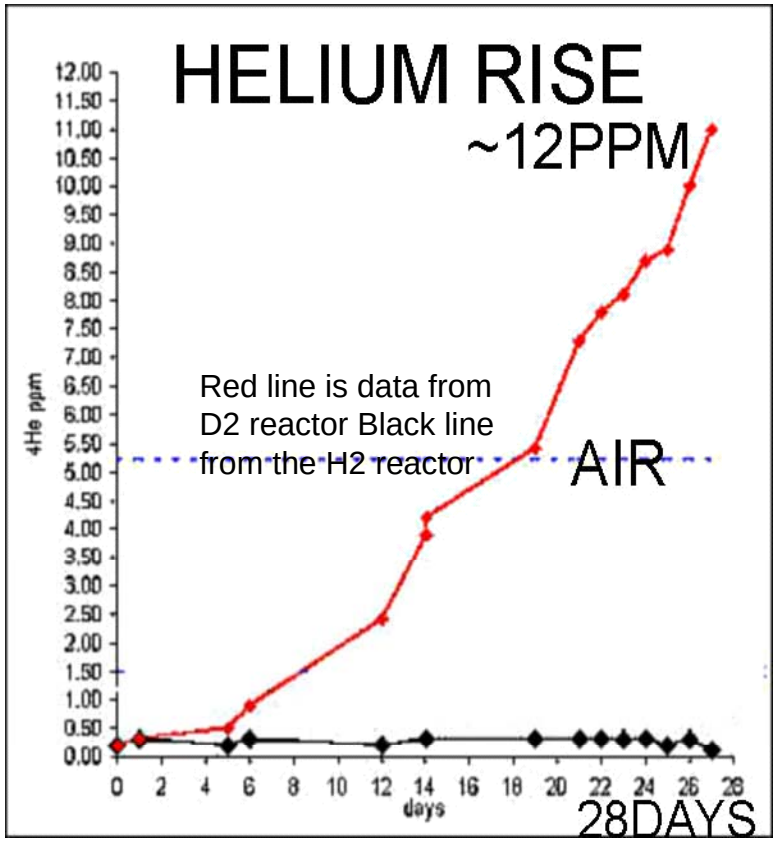
Helium from Nano-Particle Pd

- In experiments conducted at SRI a few years ago helium was observed in a D2 Pd nano-particle gas phase experiments. In an identical simultaneous control experiment using H2 no helium was observed.

- A bit under a watts of anomalous heat was produced which is roughly commensurate with the helium observed if D+D ? 4He @23mev

- Our current helium measurement in house allows us to make definitive measurements at sub-ppb levels in under 5 minutes. Helium is now the very finest tool for studying and fine tuning cold fusion reactions. It can resolve sub-milliwatt reaction energy.

Early Lab and Results
The Original Pd Nano Phase Reactor



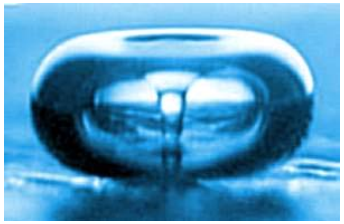
Current results with D_2 are showing an order of magnitude greater helium results!

Nano-domains offer ideal Coherent Conditions for Hydrogen

- Because the wavelength of a proton or deuteron in a metal lattice is very small a coherent condition may be established in very small domains, some few tens of nanometers in diameter
- Such nano-domains do not ordinarily occur in metals as lattice features in metals are usually in the micron dimension (1000's of nm)
- When such domains are loaded with deuteron pairs will fuse with greatly enhanced rates
- Optimally in materials where this dimensional size range is created intentionally solid state fusion will appear at significant rates
- In ordinary metals such domains do rarely occur due to working and fracture of larger lattice domains, this explains both the observation of cold fusion by Fleischmann and Pon's and the problem reproducing their results in ordinary palladium metal.

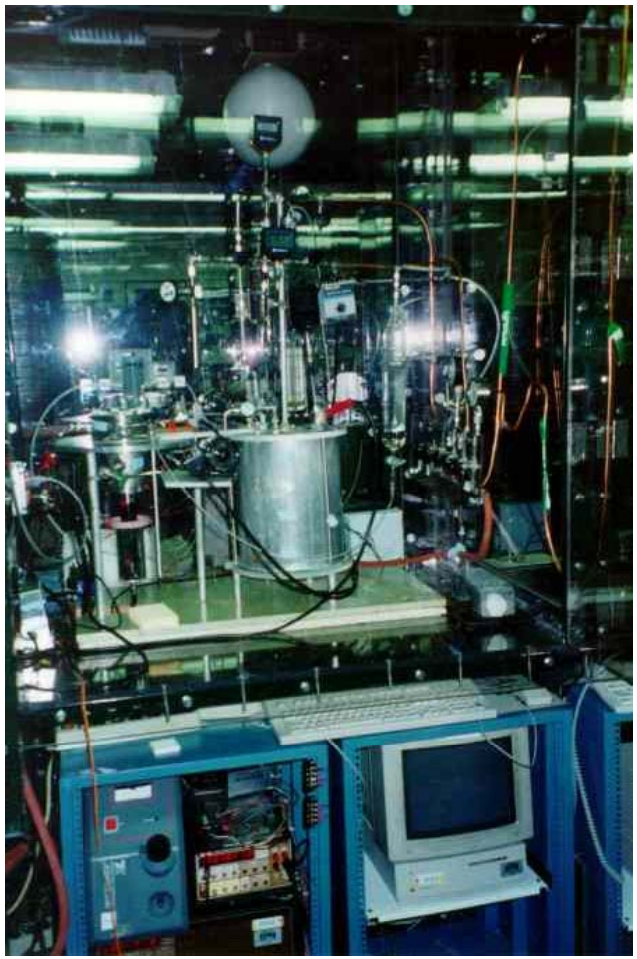
SONOFUSION - A Second Method

- Using ultrasound driven asymmetric cavitation of bubbles in D2O on can both dramatically work and fracture lattices creating useful domains and simultaneously load with Deuterium



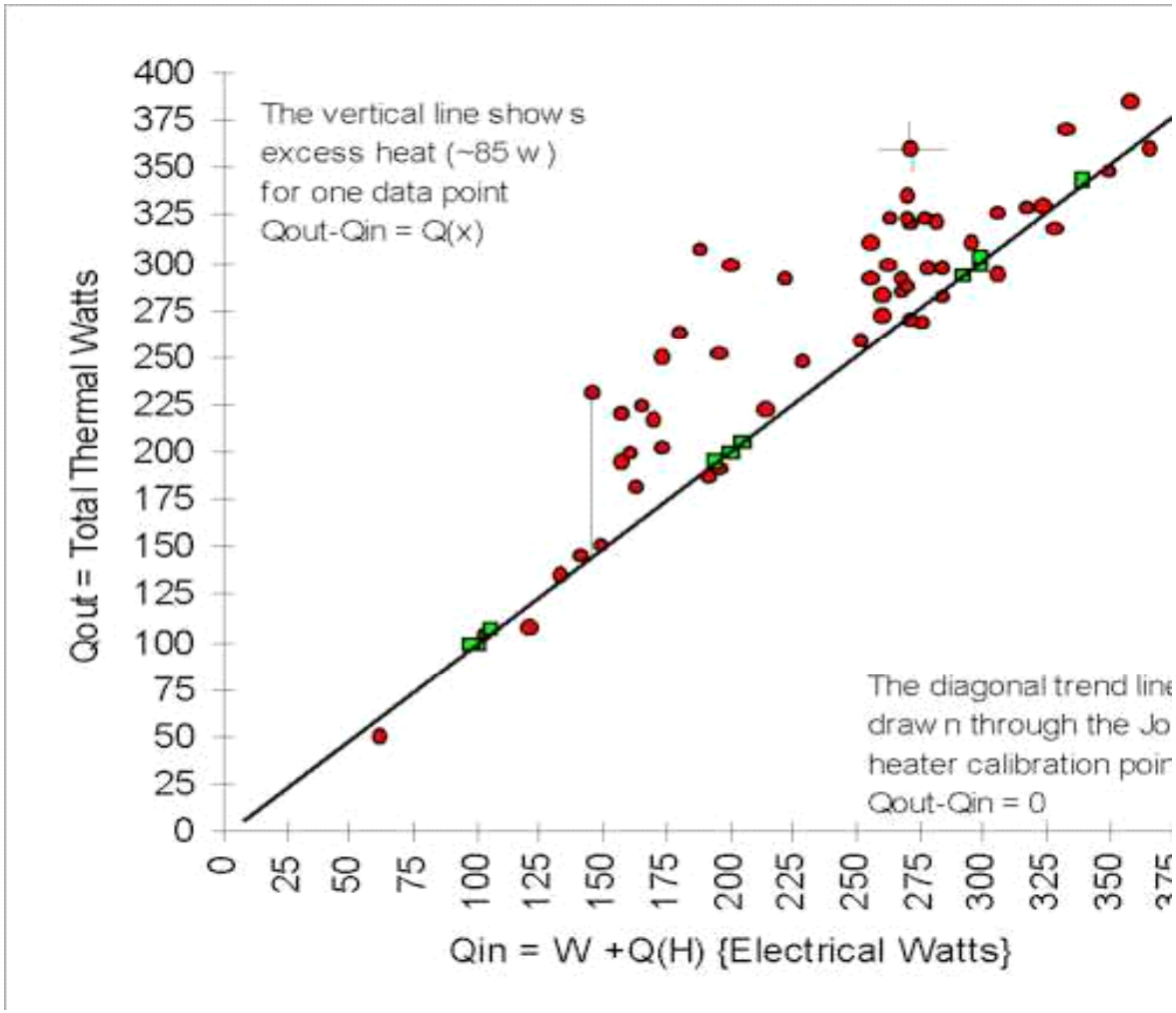
- The apparatus uses a simple piezo ceramic transducer to produce intense cavitation similar to that formed in common ultrasonic cleaning devices.
- When deuterated liquids are chosen the result is anomalous heating and again the production of helium
- No measurable energetic emissions are observed
- The heating is dramatic!

Sonofusion Devices Operated by Russ at SRI and University of Osaka

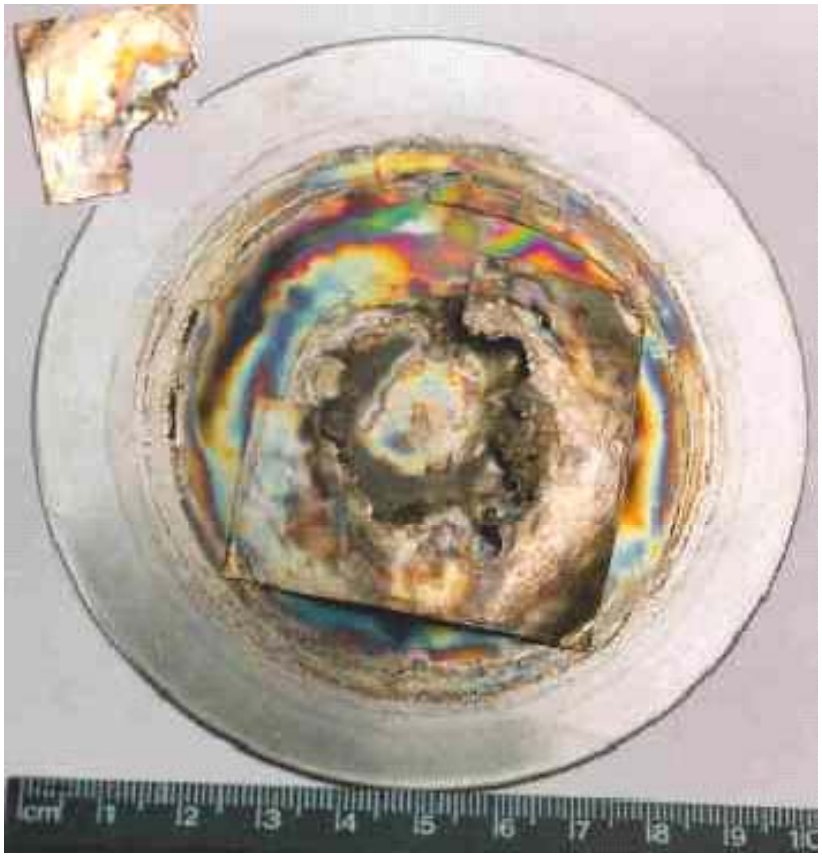


Device on left is the Mark II Reactor - Device on right is the Mark IV

Heat Results from Sonofusion Device Operated Under Contract with EPRI



Further Evidence of Heating by Sonofusion



Palladium Metal Target
100 microns thick 5X5cm

Palladium melts at ~1600 C

This metal was immersed in rapidly circulating heavy water maintained at a temperature between 50-80 C

Melting clearly occurred but via micro-sites over a period of time not all at once

Examination of the metal (active and inactive regions) by vaporization and helium mass spectroscopy revealed greatly enhanced concentrations of 3He and 4He in the active metal

Analysis of Helium in Sono-fusion Reactor Gas from 1993 LANL Experiments Analysis at Rocketdyne

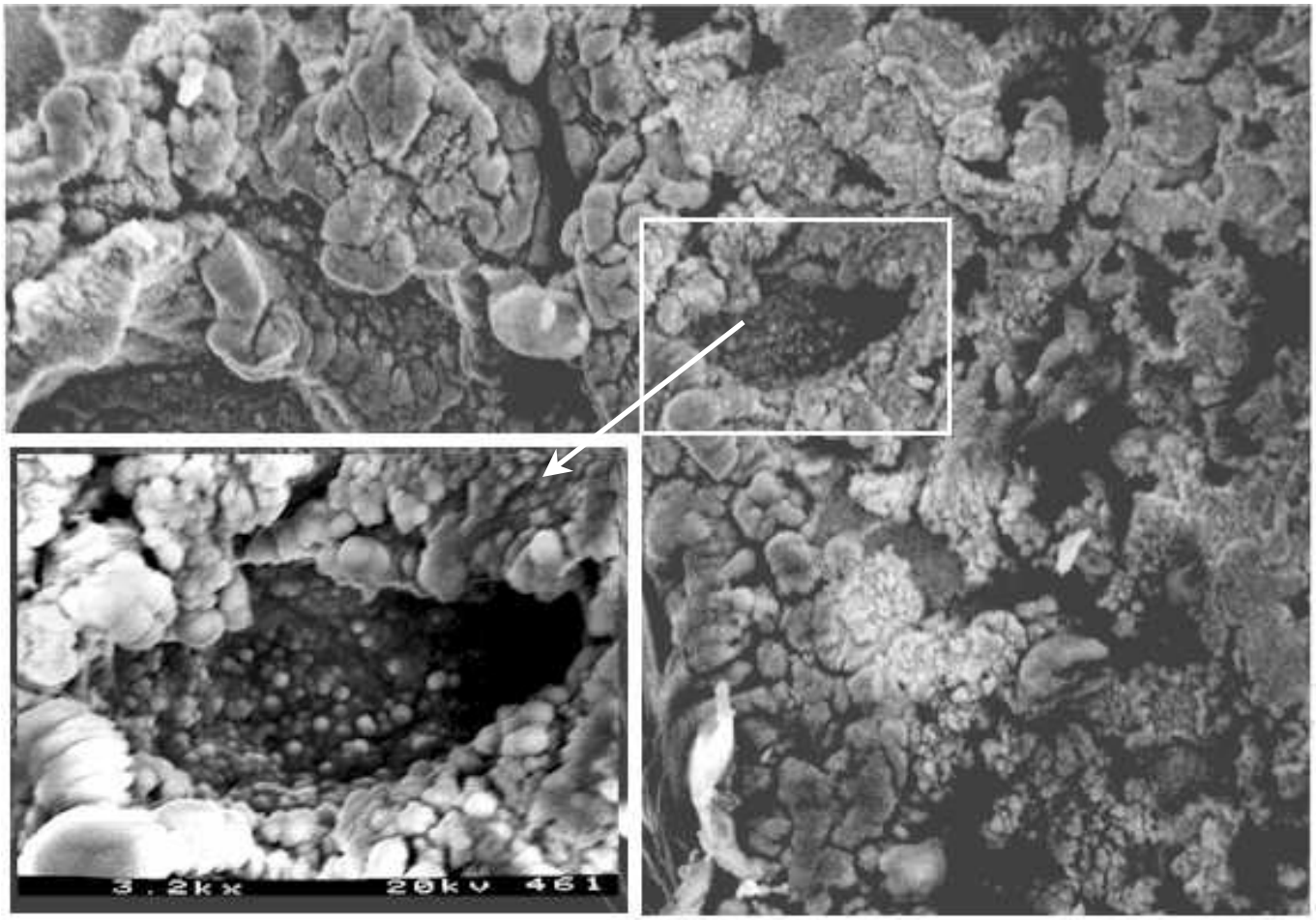
Sample #	^{3}He (10^{14} atoms)	^{4}He (10^{14} atoms)	^{4}He in sample (10^{14} atoms)	^{4}He (ppm)
Reactor gas Short run <20 hrs	0.0042 0.0042 0.0039	0.7696 0.7521 0.7357	31.31 31.37 31.46	2.548 2.552 2.560
Argon	NM			<0.475
Air	NM			5.22

Notice the ratio of 3He to 4He… the ordinary ratio is ~1/1,000,000
This work shows ~1/200. Skewed isotope ratios prove a nuclear process.

Recent work suggests this is not unusual for cold fusion reactions.
The Mystery – where are the neutrons from the e18 3He atoms.

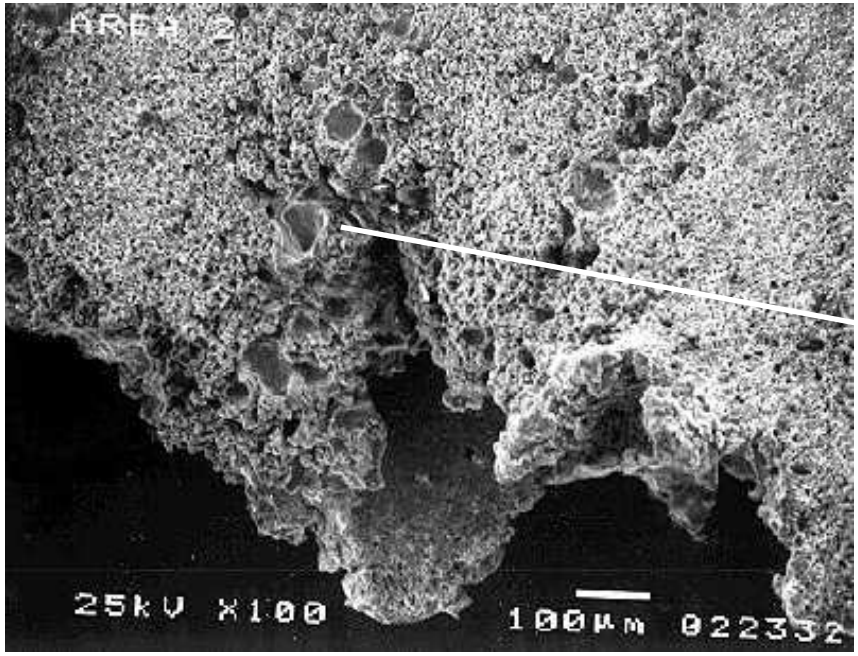
Sono/Micro Fusion Melting

Micro Volcanos are seen with sputtered fragments under SEM



Sono/Micro Fusion Melting

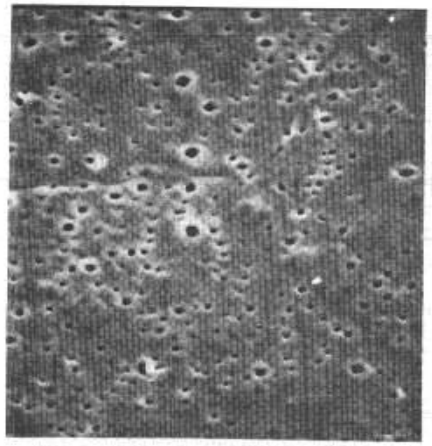
Micro volcanoes with glassy surfaces are seen under SEM

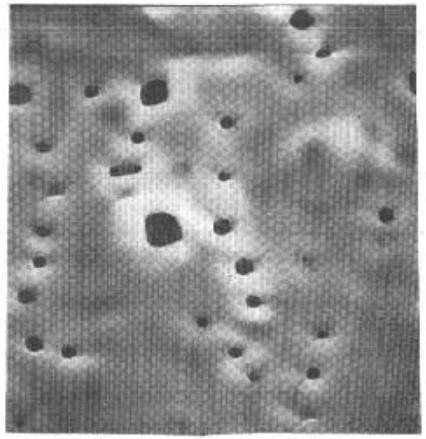


These Volcanic Ejecta Features Are Otherwise Observed but ***ONLY*** in Fissioning Heavy Metals

- Some References
- M D Rodgers, "Mass transport and grain growth induced by fission fragments in thin films of uranium dioxide," J. Nucl Materials 15, 65-72 (1965)
- B V Ershler and F S Lapteva, "Evaporation of metals by fission fragments," J Nucl Energy 4 471-474 (1957)
- G Nilsson, "Ejection of uranium atoms from electropolished foils of uranium metal by fission fragments," J. Nucl Materials 20 231-235 (1966).
- P J Peterson & M M Thorpe, "Comparative measurements of uranium atom emission from fissioning surfaces," Nucl Sci & Energy 29 425-431
- (1967)
- J P Bierstock, "Sputtering and chunk ejection from UO2 and metallic layers deposited in UO2," J Nucl Materials 53 194-200 (1974)

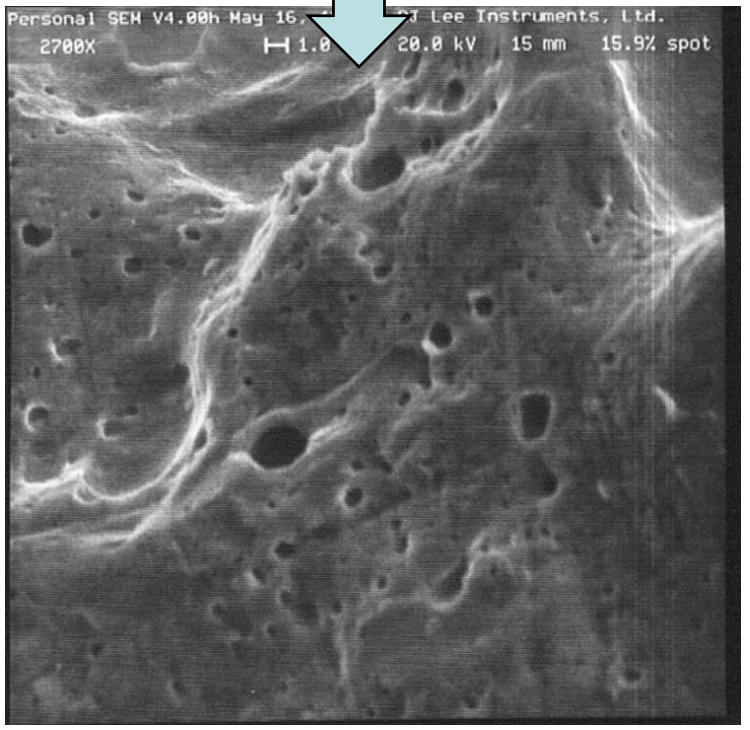
More Evidence – Classical "Loop Punching" Helium Bubbles Form in Cold Fusion Palladium

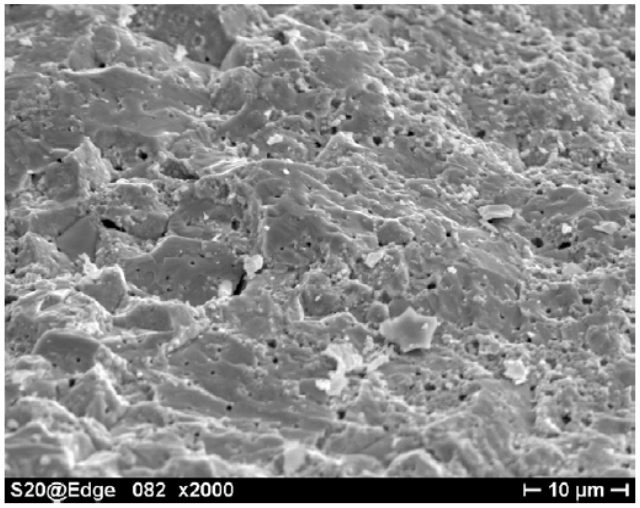




Above Helium Bubbles in Neutron Irradiated Metals. The helium forms as a result of N Alpha reactions.

Similar "helium bubbles" in palladium from sonofusion experiments with D2O. Helium forms from DD fusion.





SEM : Fracture

Spent Uranium Fuel with helium bubbles

Glow Discharge

- For a number of years and especially at present we have been working on cold cathode cold fusion in a glow discharge environment.
- This ongoing work uses a variety of configurations and is producing some promising results from ultra-low power 1/10th watt glow discharge micro-fusion cells.
- We are now testing some of these heat producng devices for nuclear product signatures focusing on the quantification of helium and tritium production rates.
- By understanding the reaction pathways that yield tritium we hope to understand how to avoid it in commercial applications.

Summary

- Cold / Nano / Sono / Solid State Fusion is robust and reliable.
- Key nuclear reaction products are clearly shown including helium, tritium, as well as classical nuclear reaction in metal internal fingerprints.
- Cold fusion is really a solid-state process and conventional solid state theory is both predictive and descriptive of the conditions required and observations.

What's Next

- D2FUSION Inc. was formed and funded to develop solid state thermal modules suited for a wide range of applications beginning as small scale distributed heat sources.

- Our work will proceed with the participation of a number of the worlds most noted fusion scientists and laboratories.

- We plan to develop and deliver our first prototype thermal modules over the course of the next few years, very few.

D2Fusion - 2nd. Generation Prototype Product Concept

The D2FusionGen micro power unit is an innovative distributed energy system designed to replace central heating, hot water tanks, and supplement domestic electric power with 3-5 kilowatts of electrical capacity.

The D2FusionGen represents the future of domestic heating and power production, with the potential to reach tens of millions of homes.

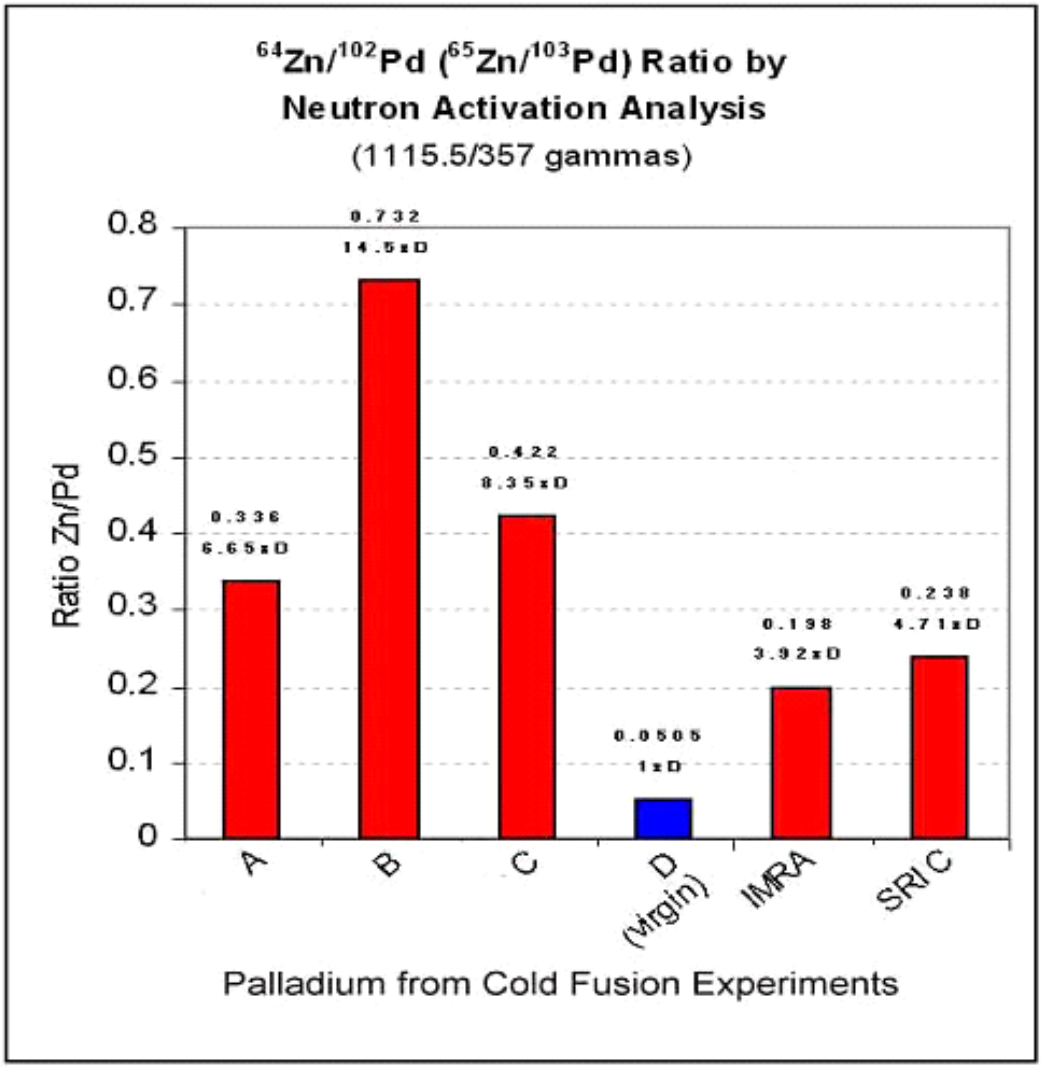
Similar in size and shape to a domestic dishwasher the D2FusionGen will be quiet and requires little maintenance. Best of all fuel for years of operation is preloaded within the internal solid-state fusion thermal modules.

Acknowledgements

- **Many organizations have contributed to the work of D2FUSION:**
  - Electric Power Research Institute
  - Stanford Research International
  - Los Alamos National Laboratory
  - Pacific Northwest National Laboratory
  - Rockwell National Laboratory
  - Lockheed Martin Corporation
  - General Atomics Corporation
  - The US Naval Research Laboratory
  - Charles Evans and Associates Research
  - The US Bureau of Mines Helium Laboratory
  - The US National Institute for Electron Microscopy
  - The Boreskov Institute for Catalysis
  - Catalytica Corporation
  - United Catalysts
  - Stanford University
  - Portland State University
  - The University of Osaka

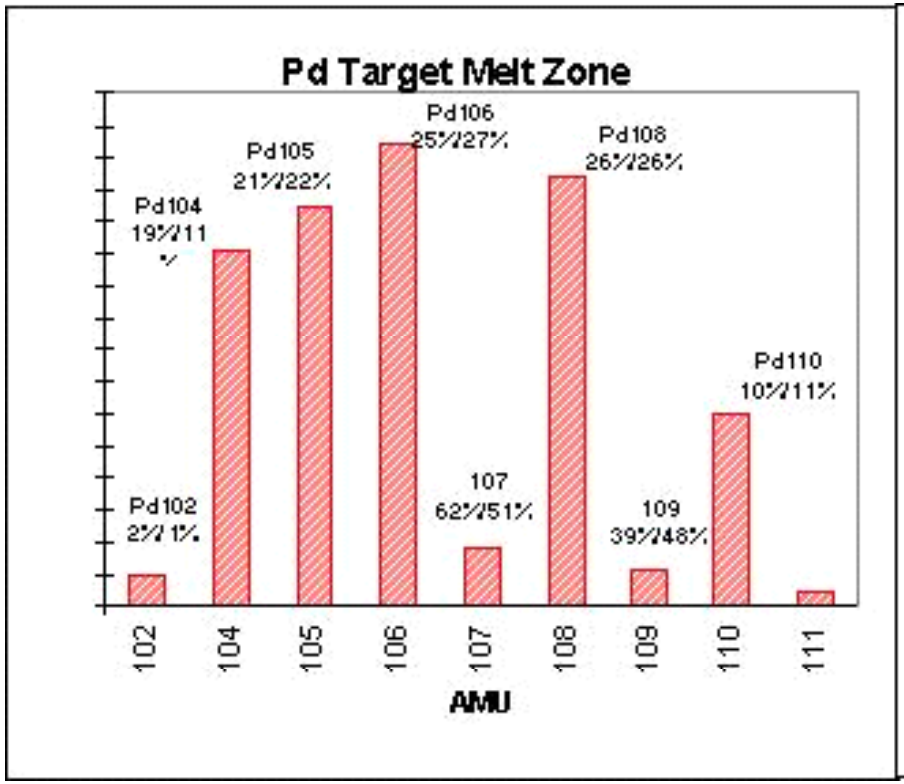
D2Fusion Inc. Silicon Valley 650-638-1975 russ@d2fusion.com

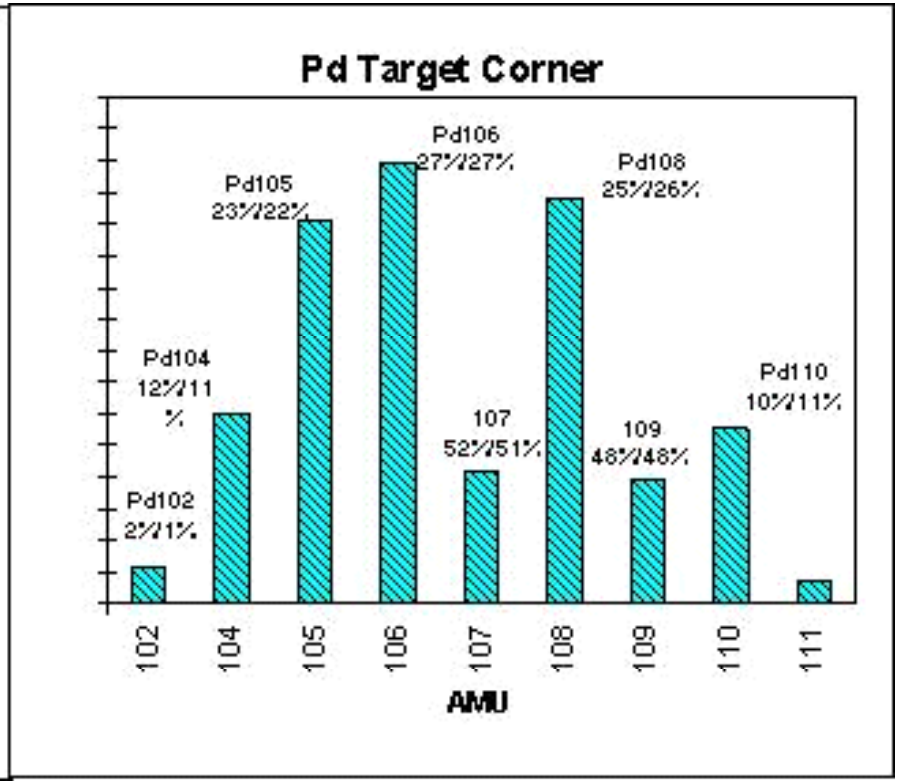
Extra Slide 1 : Neutron Activation Analysis Search for high Z isotope shifts



Extra Slide 2: Isotope Shifts in Palladium

TOF Sims Analysis





Alchemy ?.

Maybe that comes next.

Why is this man smiling? **He's holding 'green gold'**

The result of ocean plankton restoration.

PLANKTOS

Ocean Ecosystem Restoration

Biomass Carbon Sequestration

Large-Volume Low-Cost Solutions to Mitigate Climate Change

Russ George Planktos Inc.
1151 Triton Drive, Suite C,
Foster City, CA, USA 94404

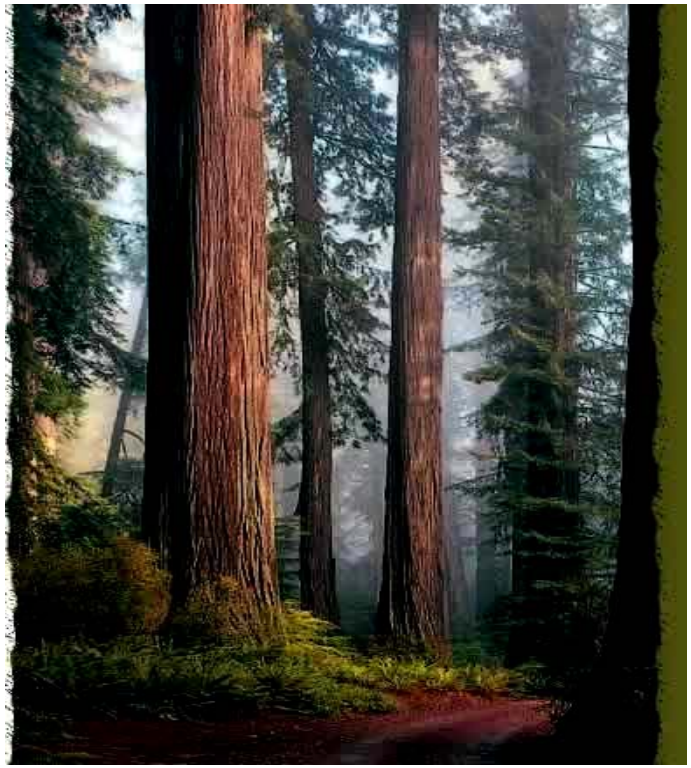
www.klimafa.com **www.planktos.com** **www.haidaclimate.com**

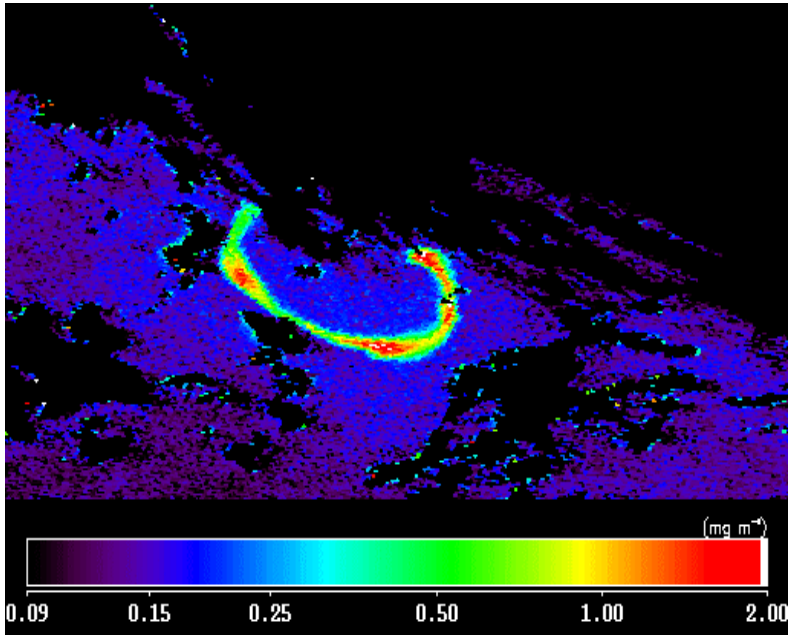
PLANKTOS

GHG Mitigation via '*Phyto-synthesis*'

Plants on land *&* in the oceans remove CO_2 from the air via photosynthesis.
This slows the pace of both climate change and ocean decline
while delivering tremendous ecological co-benefits.

Ecosystem restoration equals source GHG reduction in terms of effect
but far exceeds source reduction in terms of benefits





(satellite chlorophyll image of an
experimental ocean forest created in 2002)

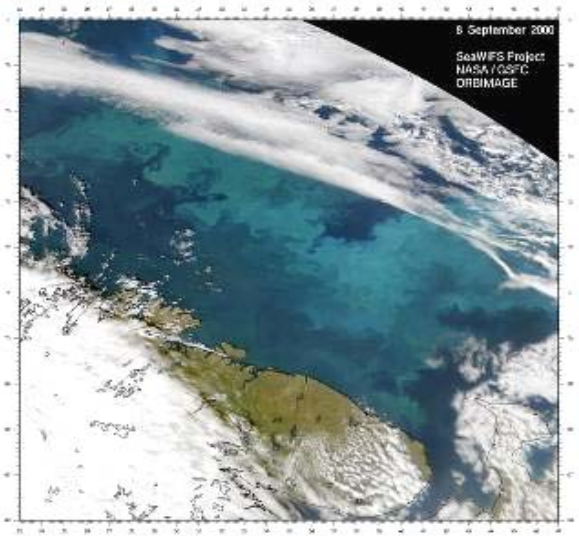
PLANKTOS

Ocean Restoration

- Planktos seeks to restore phytoplankton populations (the planktos) that have been greatly reduced and are in a crisis of decline.
- Restored ocean productivity will take up atmospheric CO_2 via photosynthesis while replenishing all forms of marine life
- Planktos biomass is sequestered for centuries in the deep ocean
- Our approach closely mimics natural processes that have been studied for more than 100 years.

George's Bank bloom

Barents Sea bloom



Falkland Islands bloom

Global climate change as ominous as it appears to be is the lesser environmental crisis facing our blue planet.

Rising CO_2 impacts both global climate and the stability and health of ocean systems

Life on Earth depends on the protection of two thin blankets:
– the atmosphere, a lifeless low density layer consisting of gases, and
-- the oceans, a life filled high density layer consisting of water

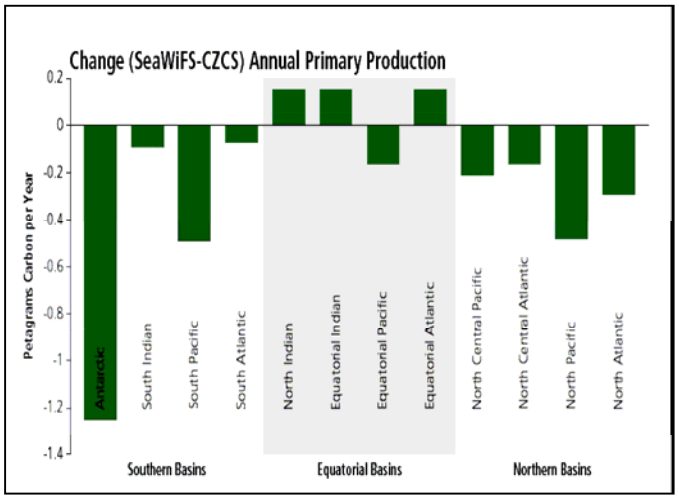
These domains exchange water, gases, particulates, thermal & kinetic energy.

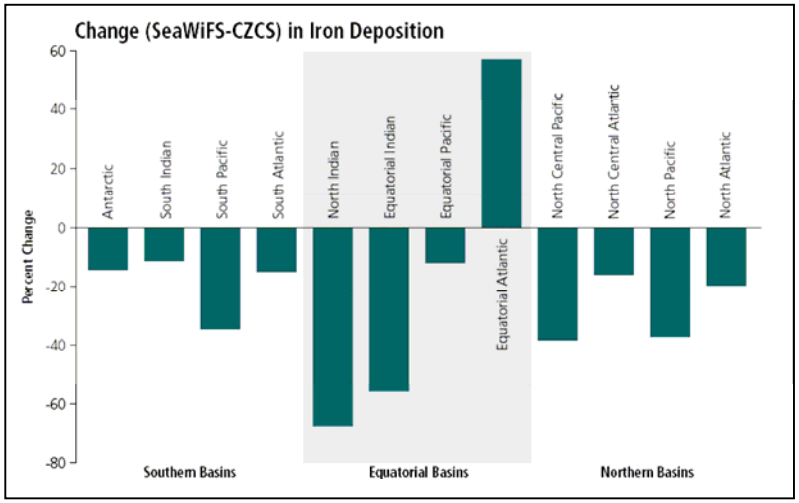
This exchange effects the development of currents, weather systems, ecosystems, natural resources, and the pace of environmental variability and change.

PLANKTOS

Five Ocean 'Alarms' Are Sounding

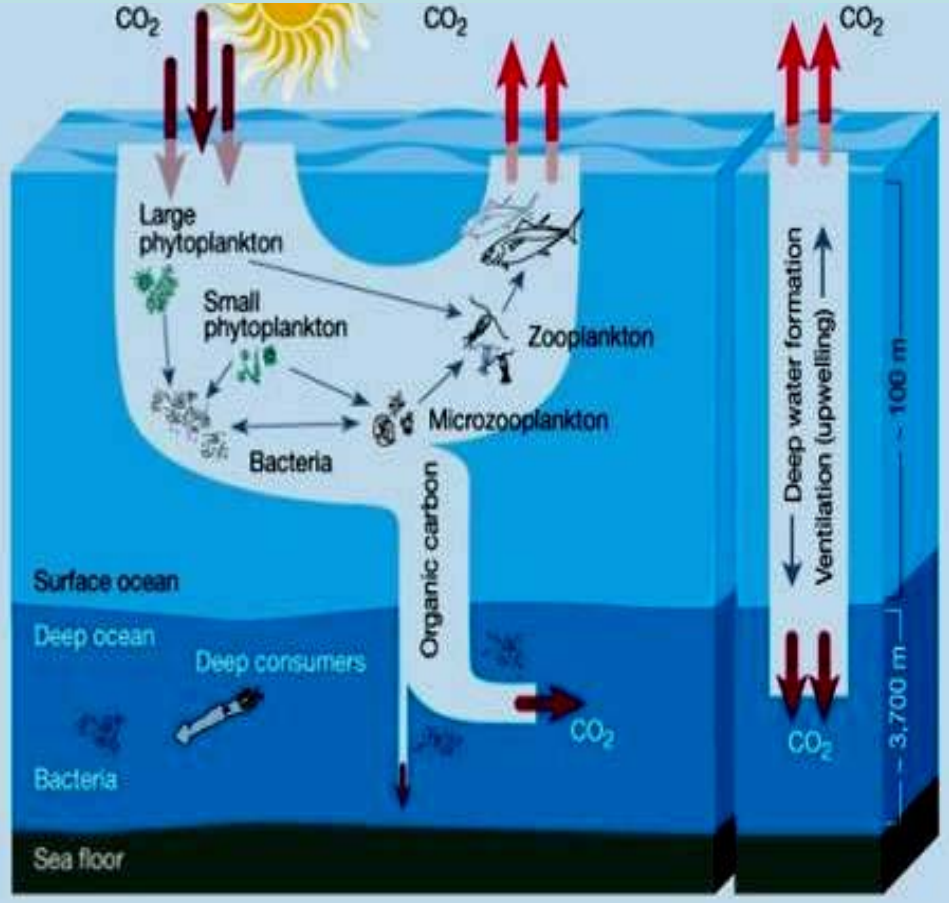
1. Ocean Productivity is dramatically down – globally nearly 10% in some oceans 26%!





2. Ocean iron deposition is down 25%

3. The biological pump is faltering and the ocean ecosystem is rebooting. If we do not help arrest ocean change the original bacterial ecosystem will take over.



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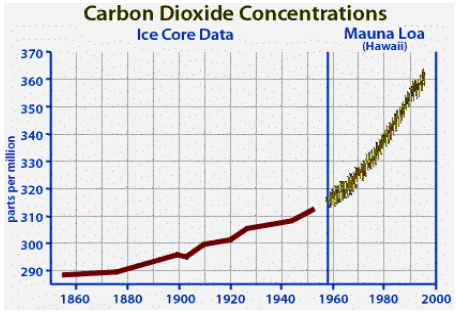
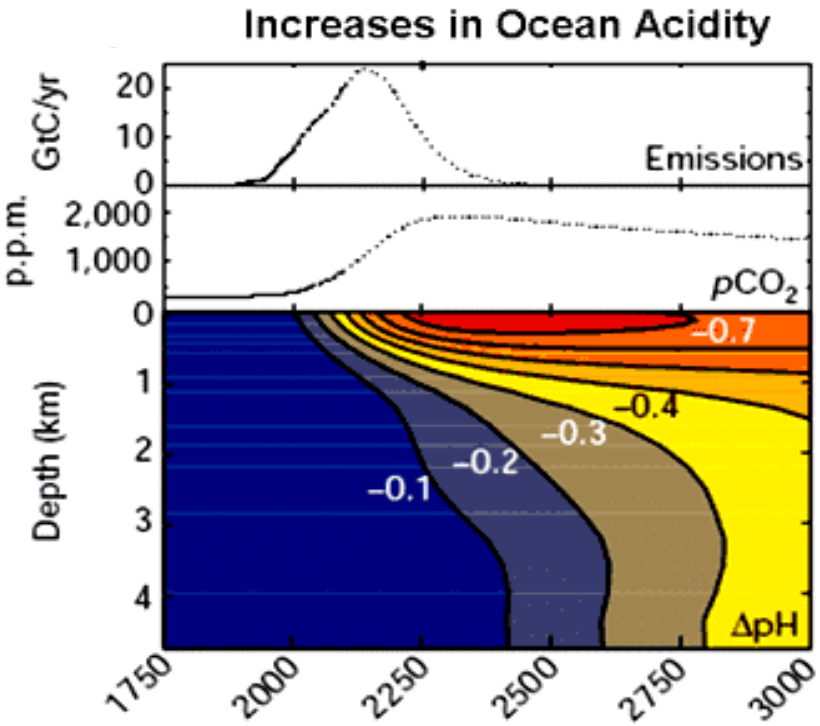
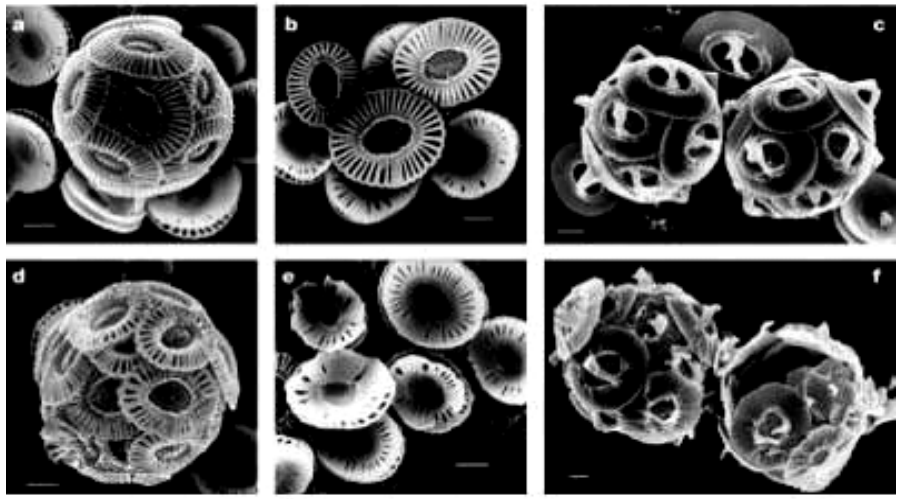
4. Ocean acidity has increased by 10% in recent years







Source: Caldeira K, Wickett E. "Anthropogenic carbon and ocean pH". Nature, 2003.

This impacts the integrity of silica and calcium based shells and coral formations. Between 2050 and 2100 the solubility of carbonates will have increased to such an extent as to make it difficult for marine microorganisms to precipitate their hard shells.

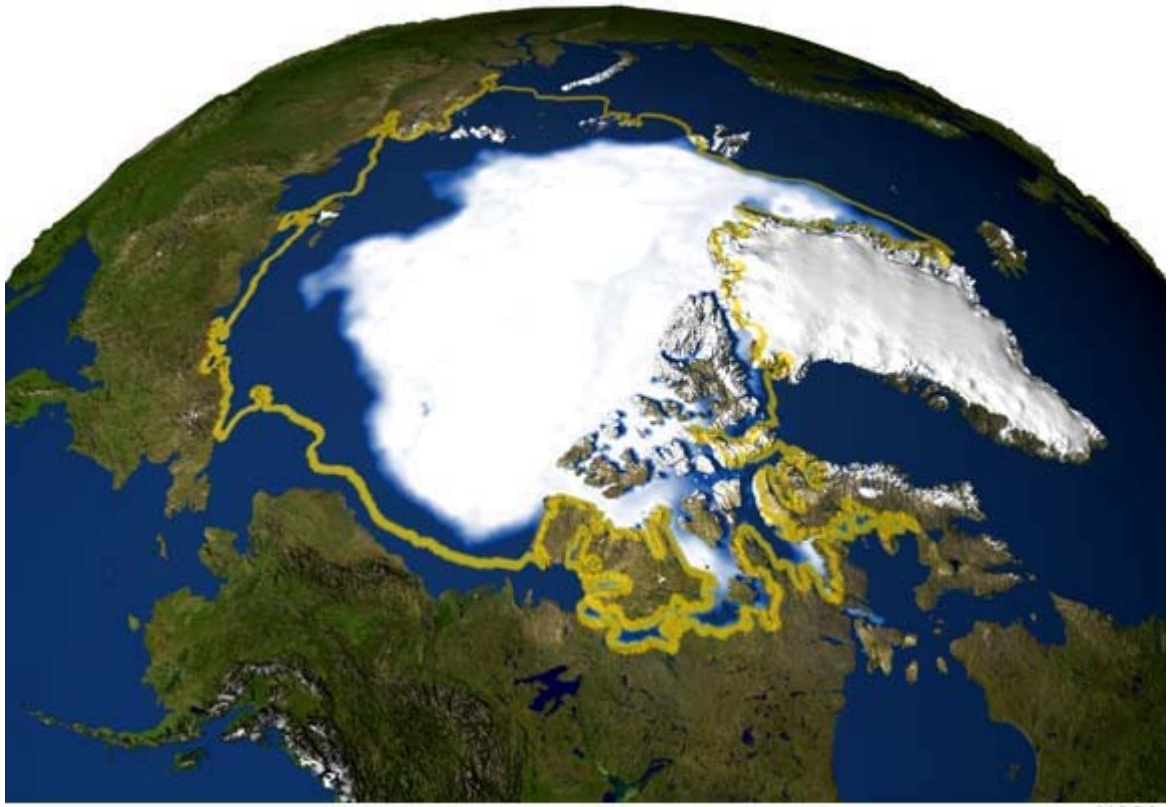
Royal Society Report 2006

PLANKTOS

5. As the ocean warms ice caps are in rapid retreat

“EVEN IN WINTER, ARCTIC ICE MELTING
Alarmed scientists warn that polar thawing threatens wildlife and is 'strongest evidence yet of global warming' in region”

- Jane Kay, SF Chronicle
Thursday, September 14, 2006



Yellow border indicates the median edge of Arctic ice from 1979-2000. (NASA)

PLANKTOS

Retreating ice means large volumes of fresh water are flowing into the ocean

A 2005 report suggests a slowdown of the Atlantic gyre.

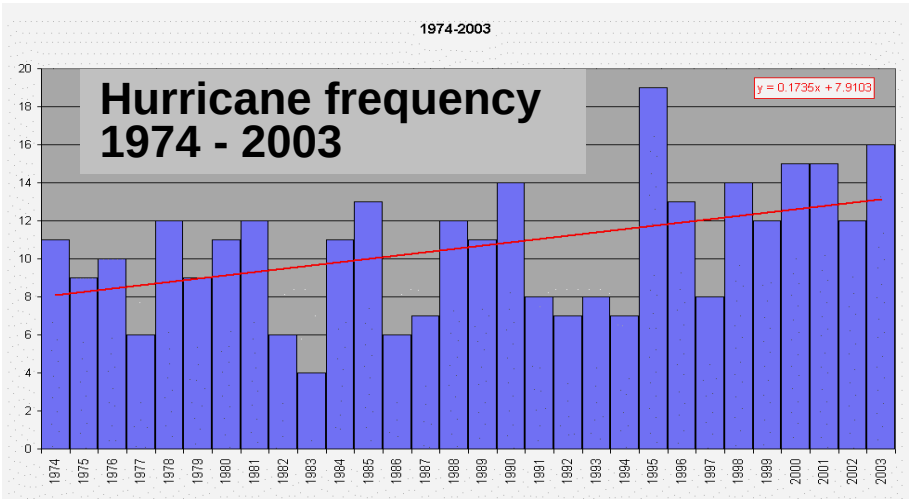
Dr. Harry Bryden's team (UK) measured north-south heat flow in the North Atlantic.

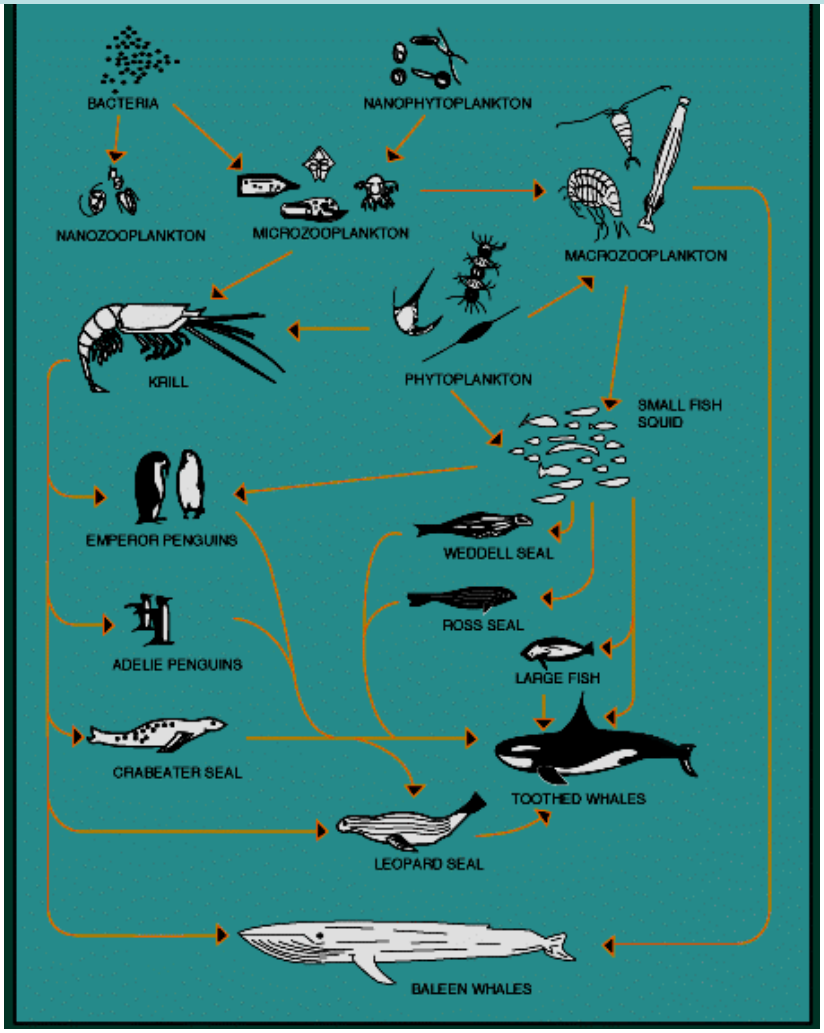
"They calculated that the quantity of warm water flowing north (from the Gulf) had fallen by around 30% since earlier surveys in 1957, 1981 & 1992."

(Geophysical Research Letters, Vol. 32, L10604, May 2005)

PLANKTOS

The same heat melting the polar ice also leads to more frequent and intensified storms, and shifts finely tuned ocean ecosystems





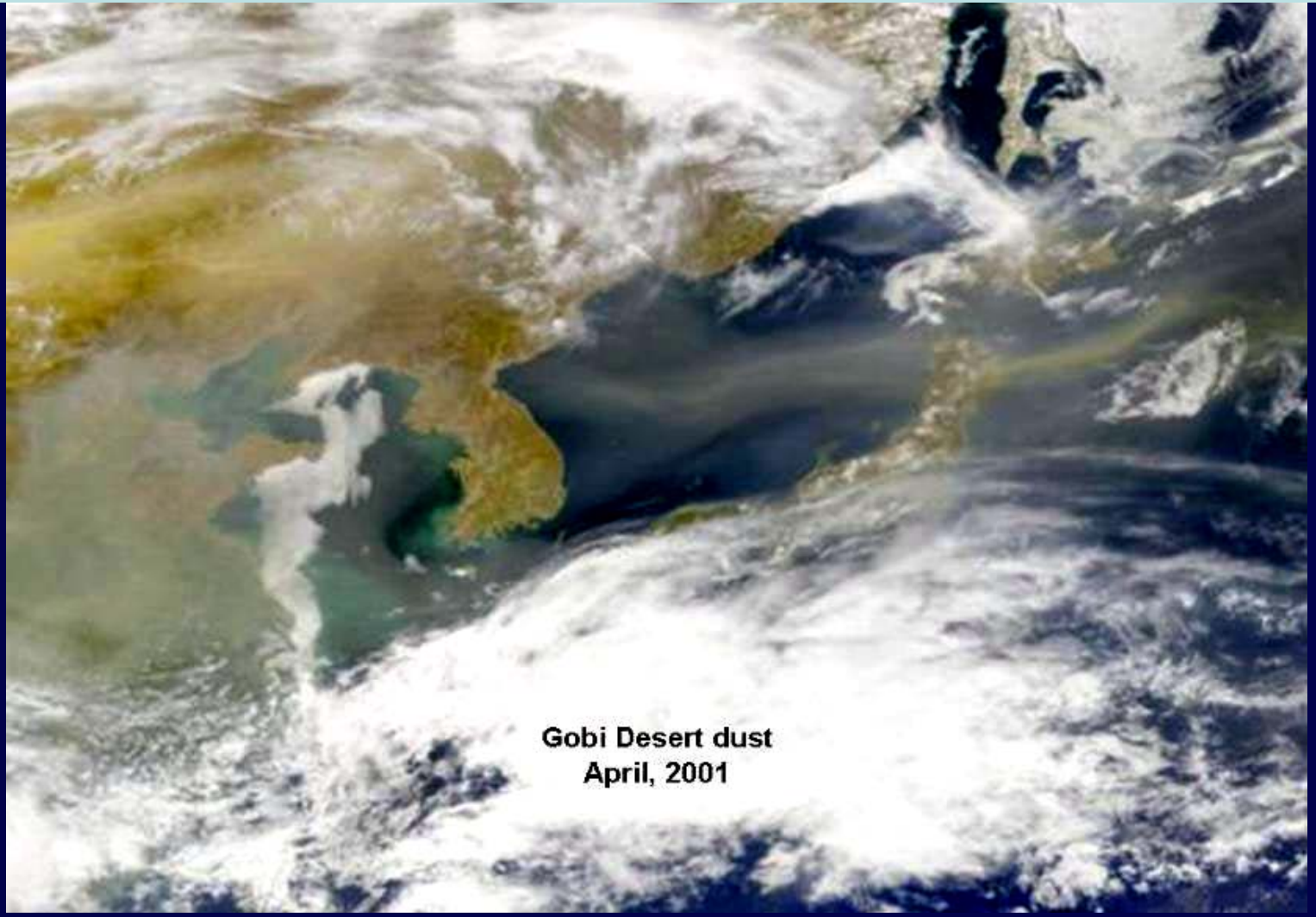
PLANKTOS

Restoring ocean productivity will revive lost biomass and offers the only means to buffer ocean acidity

Aeolian (wind- blown) dust, largely from the deserts of central Asia, fertilizes the worlds oceans

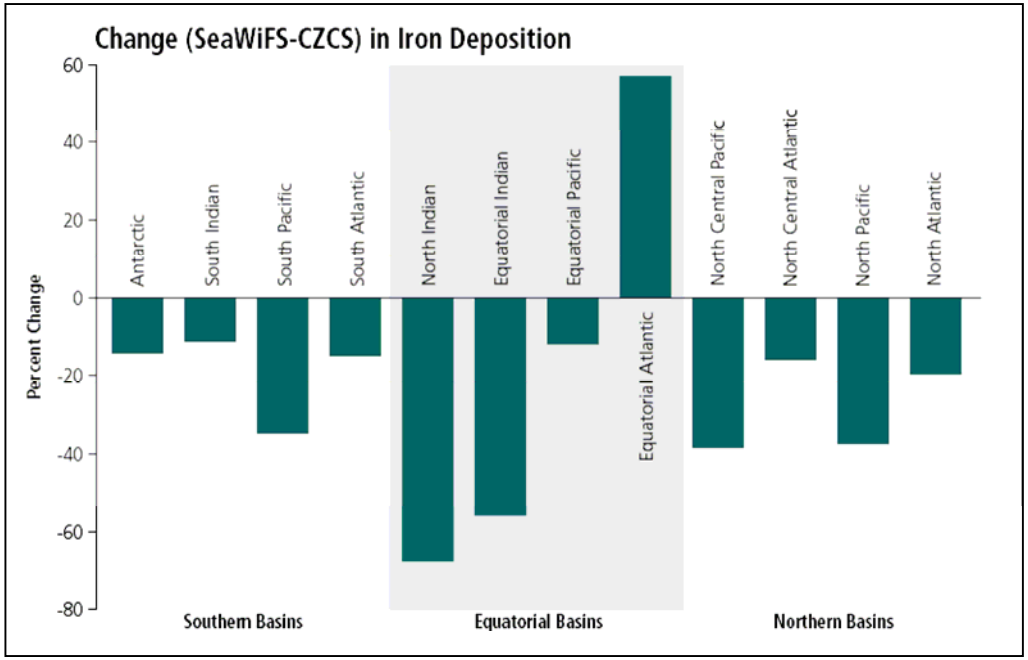
PLANKTOS

Ocean productivity is regulated by natural dust events which are hemispheric, even global in scale.



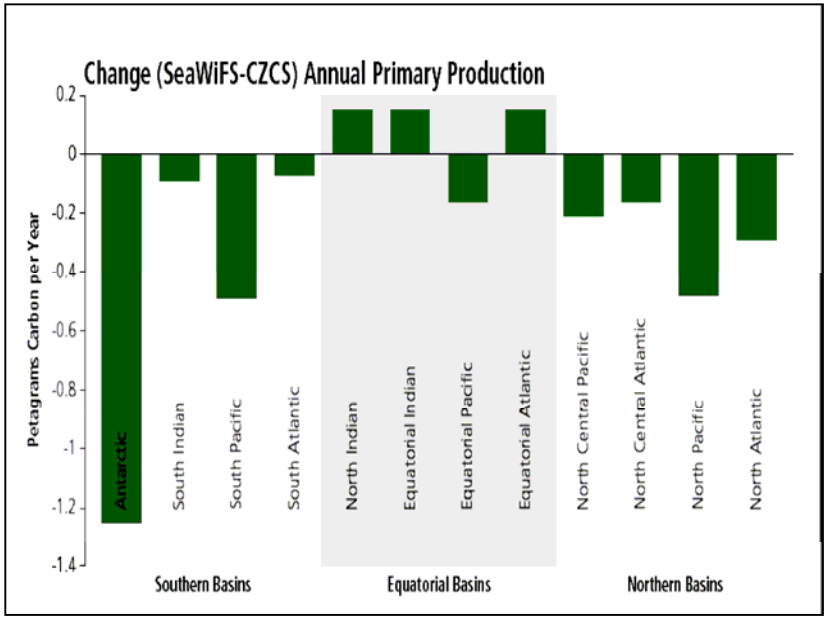
PLANKTOS

Global dust and its iron, a key ocean micro-nutrient, has decreased by about 25% since 1985 (NASA 2003)



Percent change in iron deposition across 12 oceanographic basins (NASA, 2003)

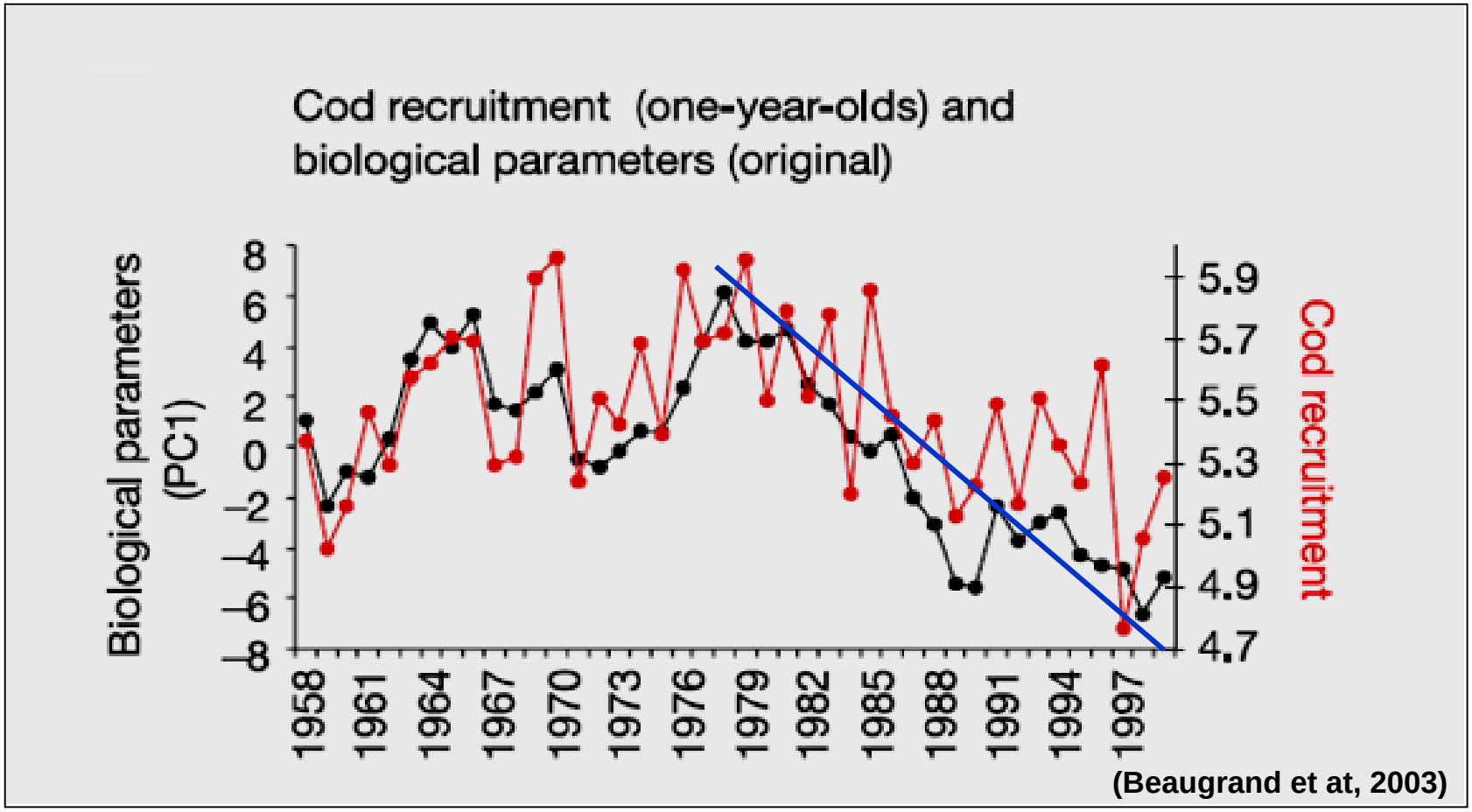
(note correlation of iron deposition and productivity)



Change in plankton productivity

PLANKTOS

Plankton losses correlate with declines in commercial fisheries

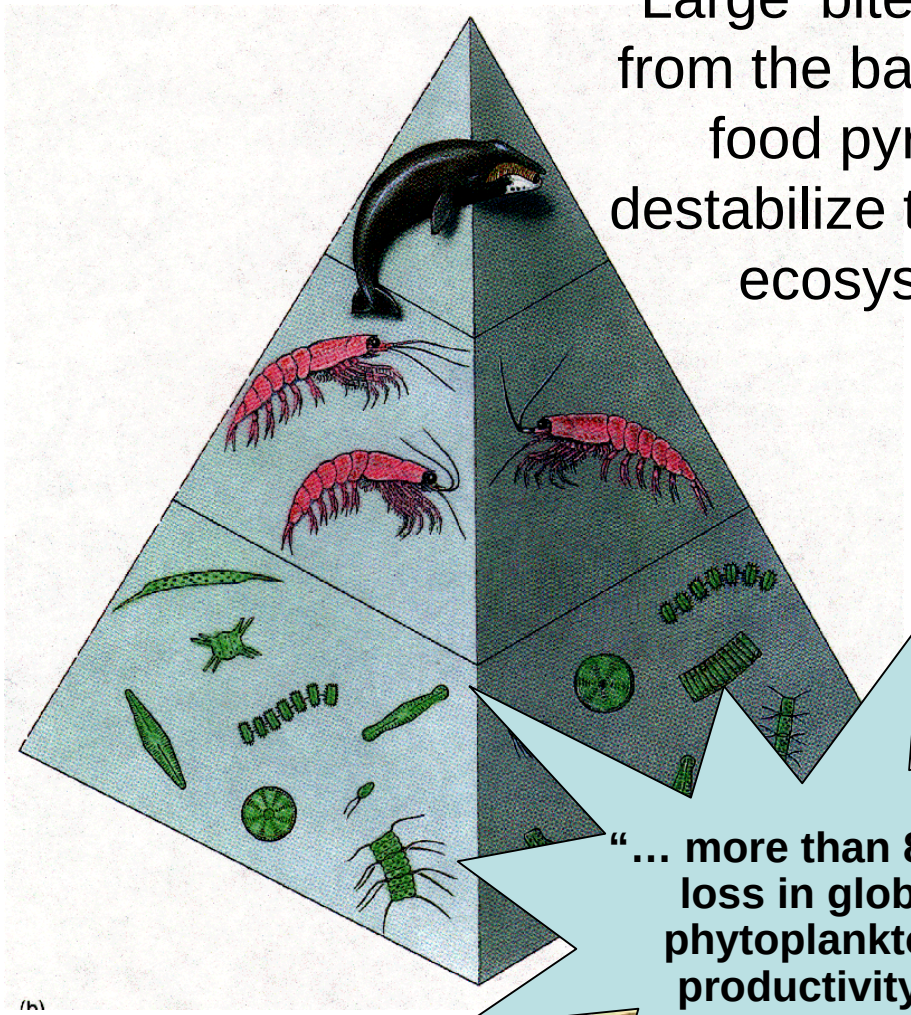


North Atlantic plankton fluctuations (black) compared with cod recruitment (red).

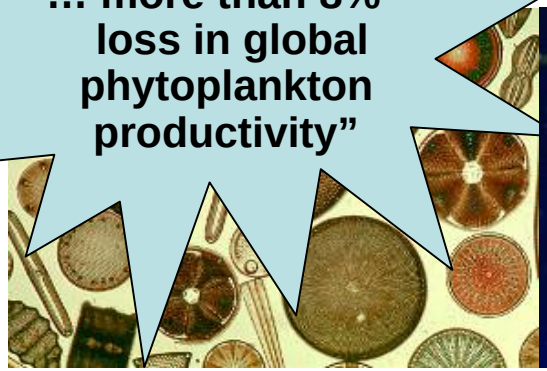
PLANKTOS

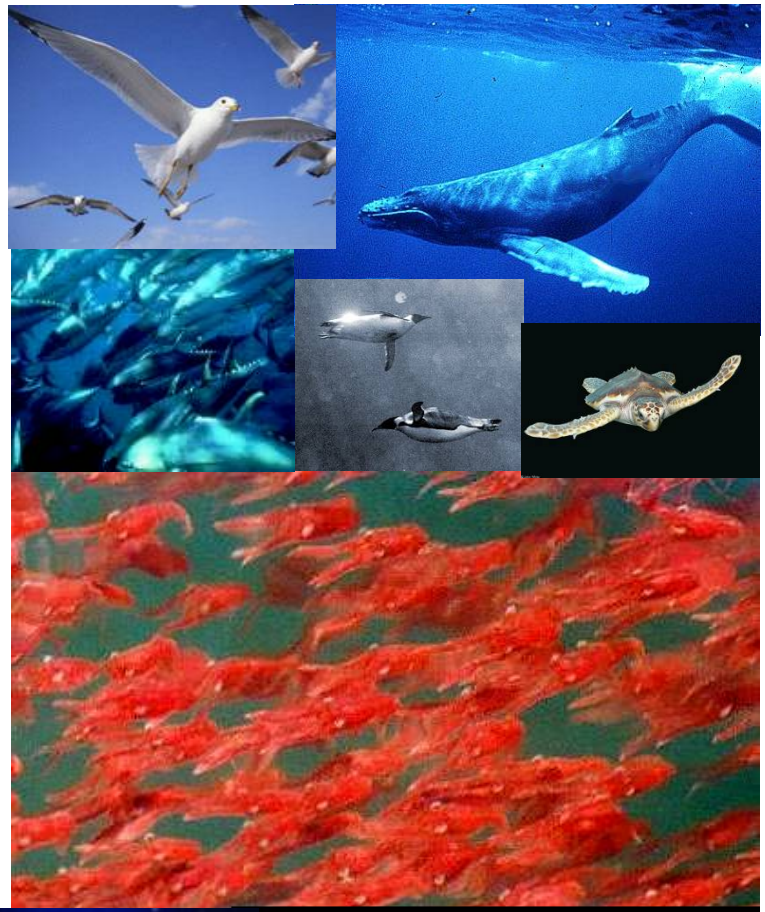
It is basic Ocean Ecology 101

Large ‘bites’ taken from the base of the food pyramid destabilize the entire ecosystem



“… more than 8% loss in global phytoplankton productivity”





PLANKTOS

“All fish is diatoms”

Henry Bigelow

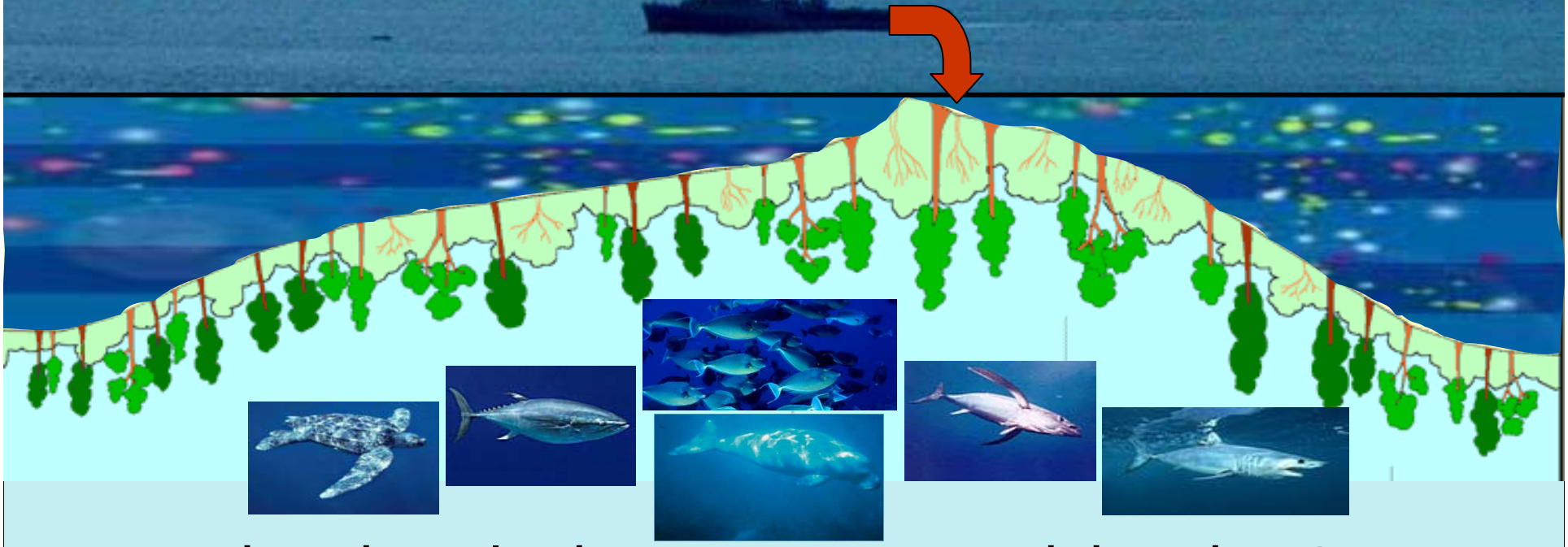
“All plankton depends on iron”

John Martin

“A forest behaves much like a human body:

remarkably tough, adaptable and resilient as long as its basic health is maintained “

The Yuba Institute



Restoring the Plankton ‘Forest’ Reviving the Oceans

PLANKTOS

Plankton losses reflect the importance of a healthy ocean

AQUATIC ECOSYSTEMS :

1991 REPORT SUMMARY

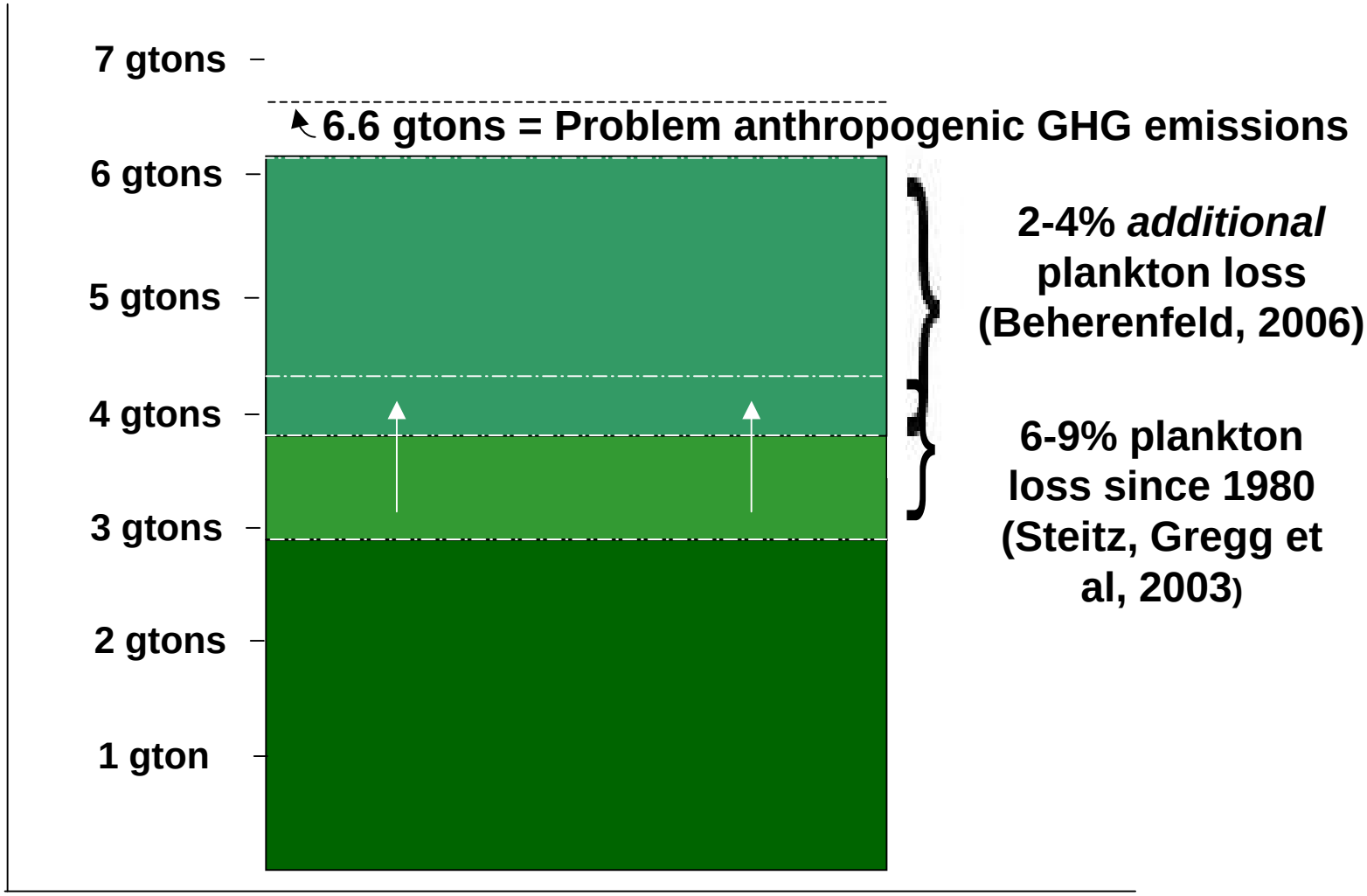
"Phytoplankton not only produce more than half of the biomass on our planet, but also absorb and fix more than half of the CO_2 from the atmosphere."

"A loss of only 10% of the phytoplankton would prevent about 5 gigatons of carbon (in the form of CO_2) from being removed from the atmosphere annually (which is nearly equal to the amount of CO_2 emitted currently by fossil fuel utilization)."

D.-P. Häder (FRG Institute for Botany)
R.C. Worrest (Columbia University), and
H.D. Kumar (India, Banaras Hindu University)

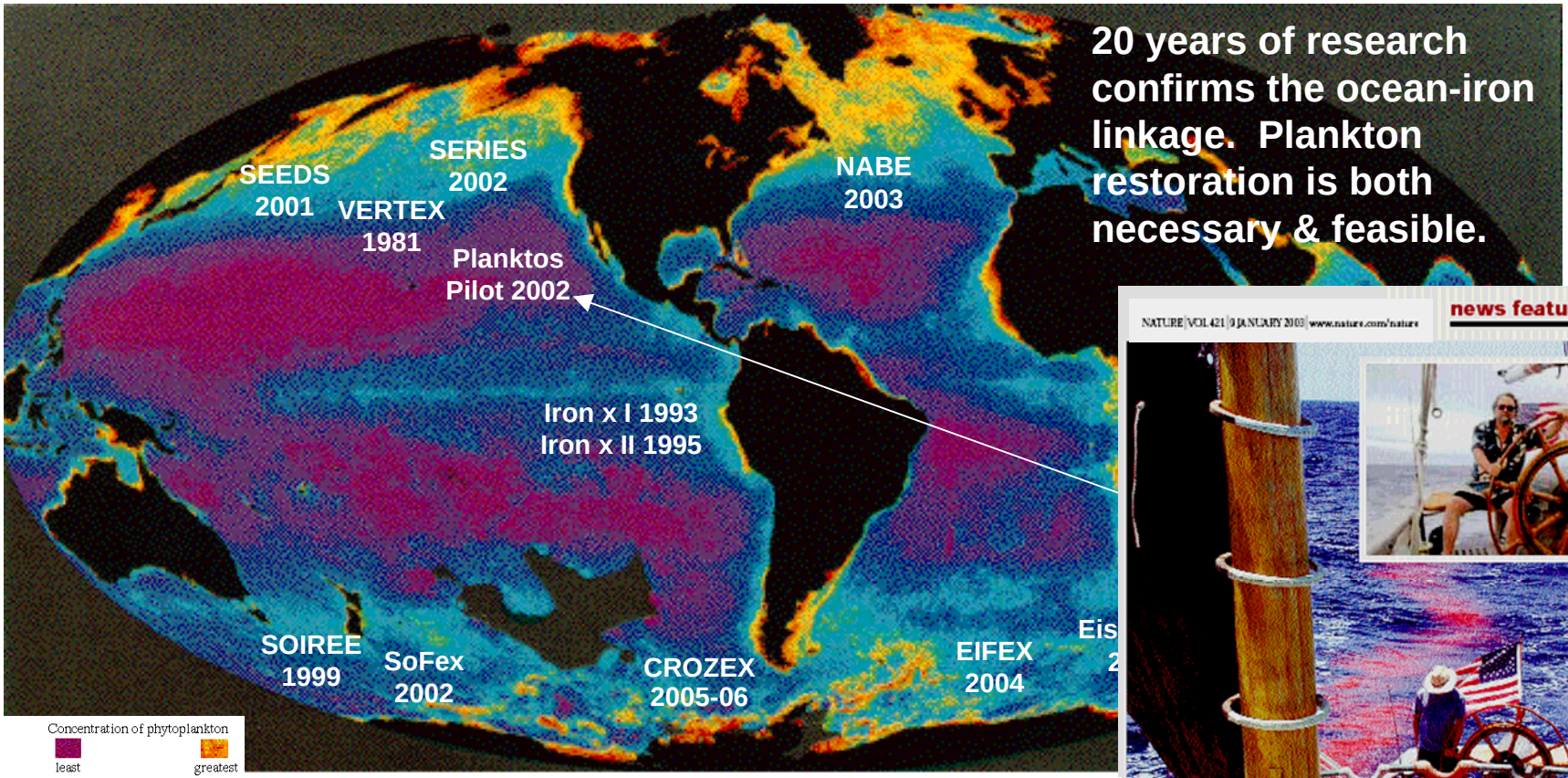
PLANKTOS

New estimates of lost ocean CO_2 uptake have recently been published



PLANKTOS

The Planktos sustainable business model builds on a solid foundation of science.



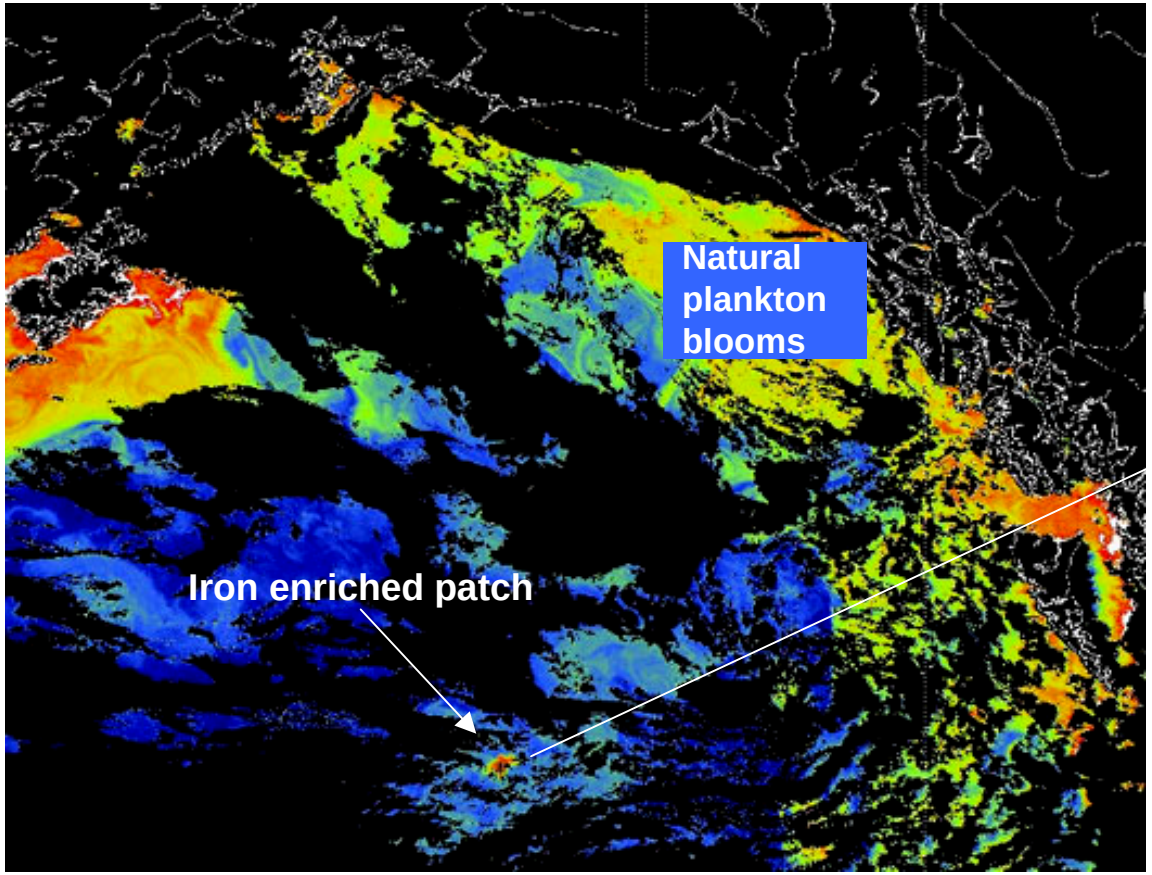
20 years of research confirms the ocean-iron linkage. Plankton restoration is both necessary & feasible.

Planktos staff is shown at the helm of Neil Young's *Ragland* performing a pilot bloom experiment near Hawaii (2002).

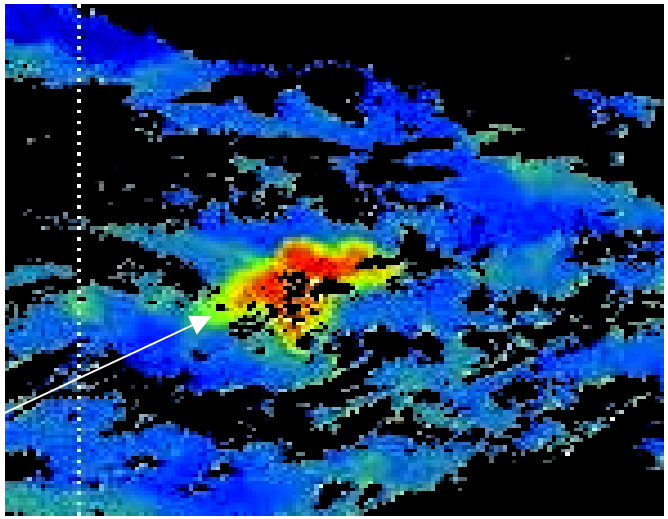
Building on that scientific foundation, Planktos will conduct commercial demonstration projects beginning in 2007.

PLANKTOS

Iron stimulated blooms are very similar to natural blooms



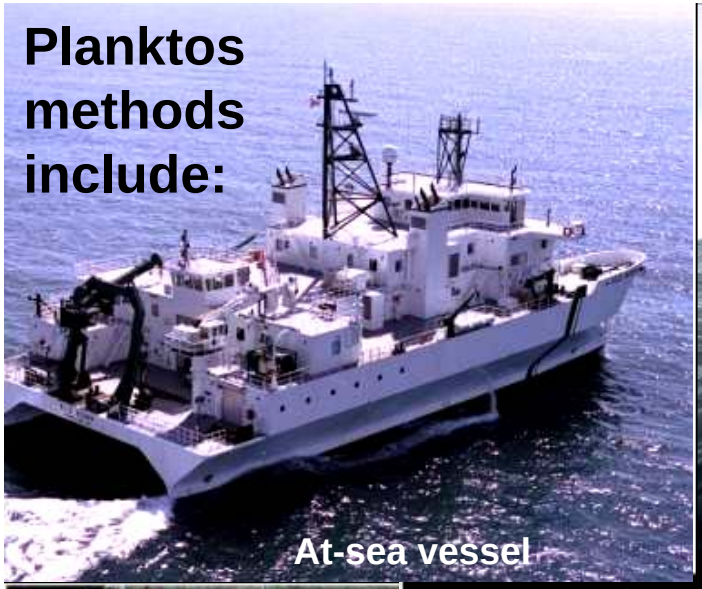
SERIES (2002) iron fertilization patch near Alaska compared with a natural bloom



Close-up of the SERIES bloom (~ 2000 km^2) 20 days after iron application

A Planktos bloom will be 5-10 times this size … still a small fraction of the surrounding natural blooms

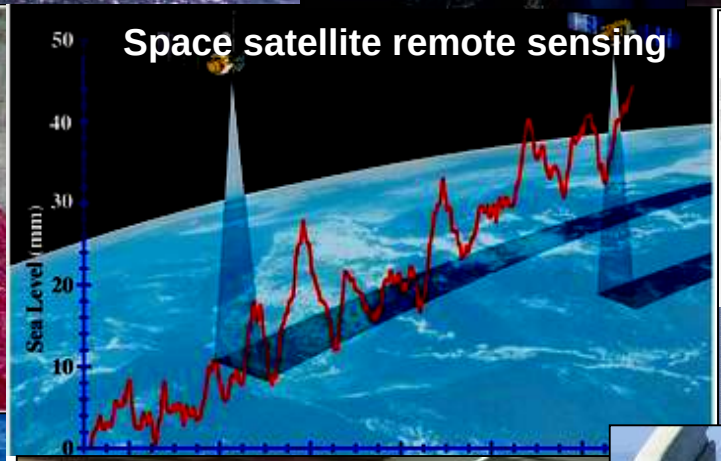
Planktos methods include:


At-sea vessel

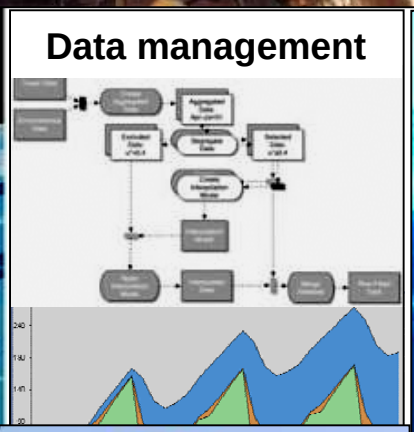

Baseline sampling


Iron additions

Sea satellite application



Space satellite remote sensing

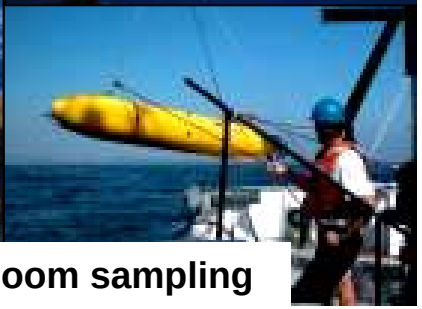

Data management

On board and undersea bloom sampling


Ocean Drifter monitoring

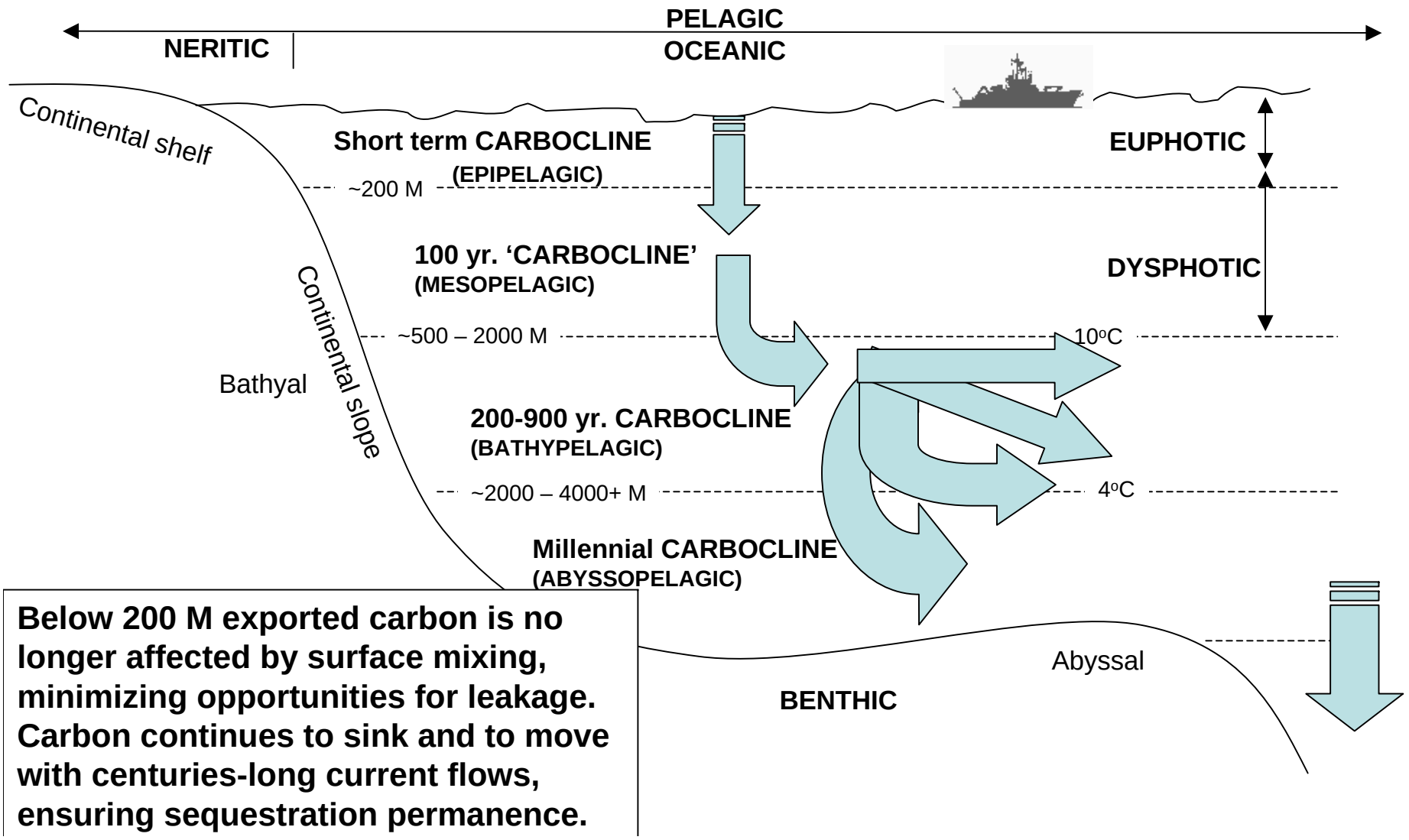

On board lab analysis


Remote bloom sampling



PLANKTOS

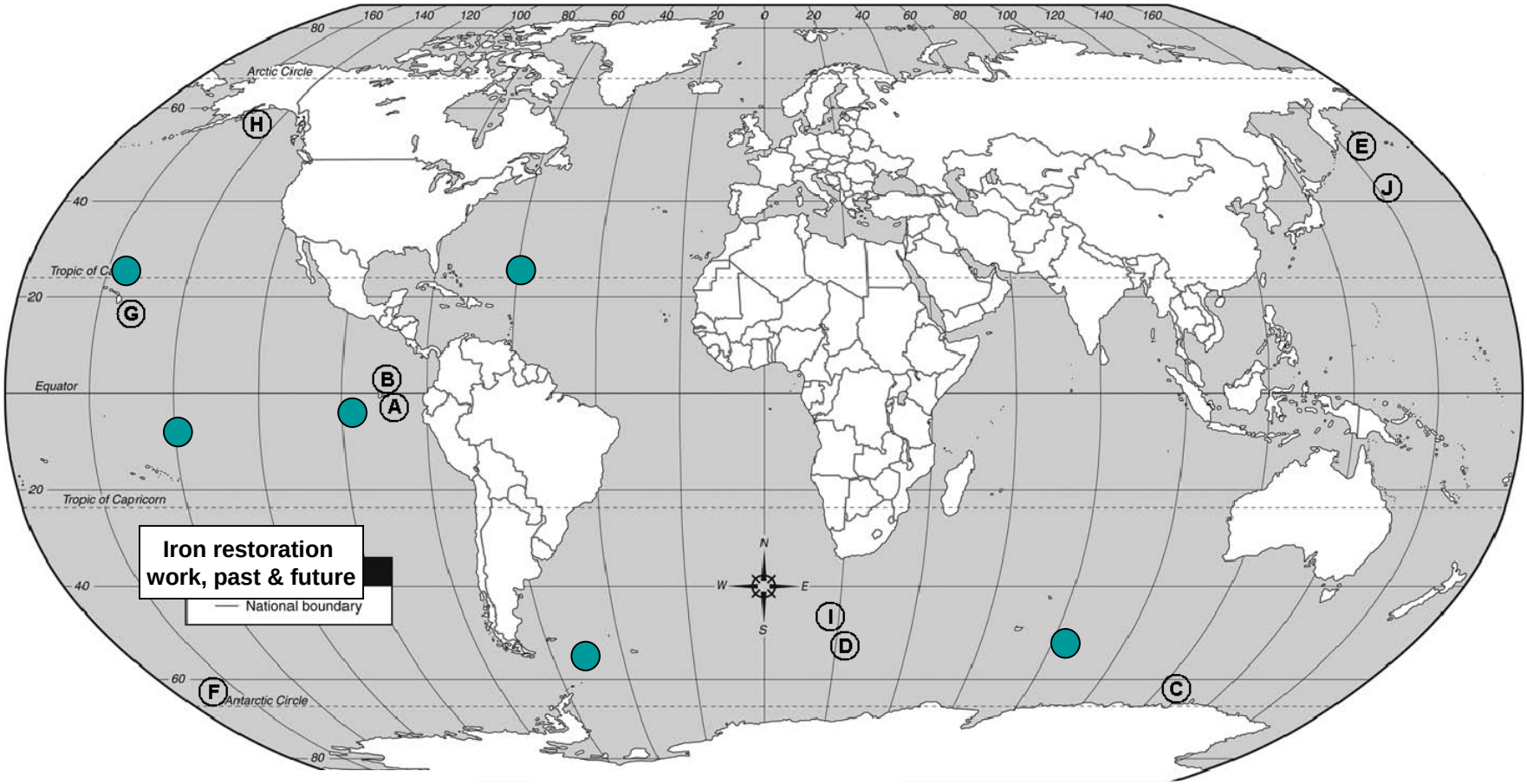
What does long term ocean biomass ‘export’ mean?



Below 200 M exported carbon is no longer affected by surface mixing, minimizing opportunities for leakage. Carbon continues to sink and to move with centuries-long current flows, ensuring sequestration permanence.

PLANKTOS

Iron Infusion Research & Planktos Ocean Restoration Pilot Projects



A.	IronEx I	1993	F.	SOFeX	2002
B.	IronEx II	1995	G.	Planktos	2002
C.	SOIREE	1999	H.	SERIES	2002
D.	EisenEx	2000	I.	EIFEX	2004
E.	SEEDS	2001	J.	SEEDS II	2004

Planktos Pilot Projects, 2007-2009

PLANKTOS

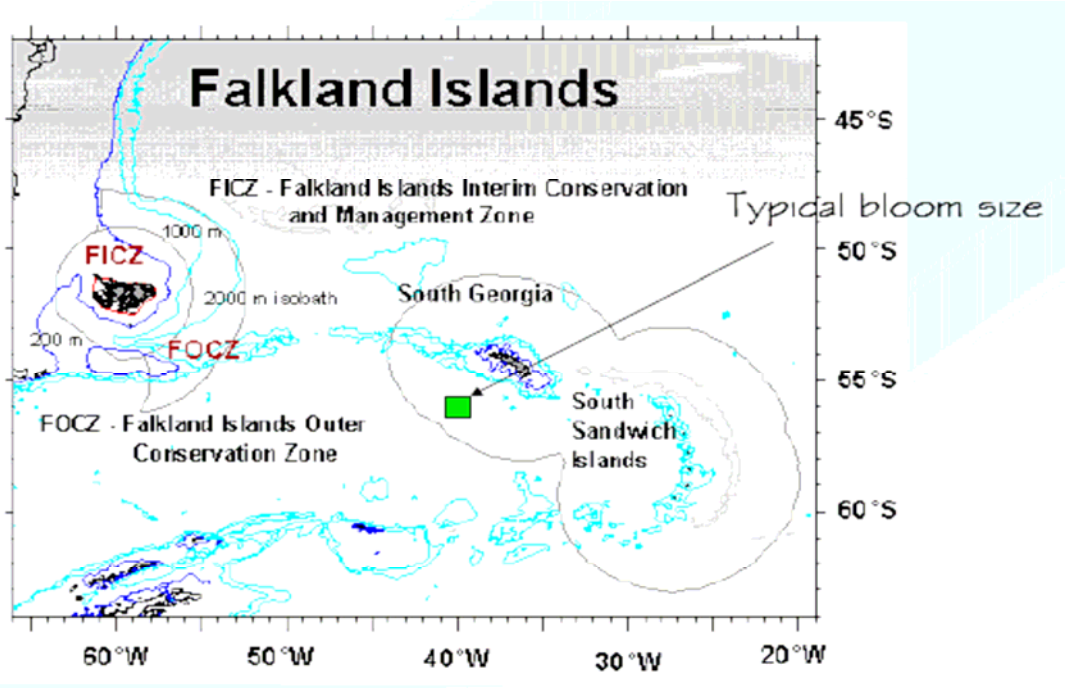
Commercial Pilot Project Bloom Southern Ocean

Planned for the Scotia Sea where krill populations are down by 80%

Time Frame Jan 06 - May 07 (summer-fall)

Projected plankton growth
50+ million tonnes

Sequestration effect
~ 5+ million tonnes CO_2e



German Research Ship Polarstern

- **conducted the largest iron stimulated Plankton blooms to date**
- **750 km northeast of our proposed bloom location**
- **Ship & crew are available to Planktos for our Southern Ocean demonstration**

PLANKTOS

Planktos Inc.

For more information contact:

Russ George – President
1151 Triton Dr. Suite C
Foster City, CA 94404

Tel 650-638-1975
Email russ@planktos.com

www.planktos.com
www.klimafa.com Budapest, Hungary
www.haidaclimate.com Vancouver, BC Canada

PLANKTOS

Planktos Ecosystem Restoration Offsets

Shrinking your carbon footprint with eco-restoration credits will help revive vital ecosystems, habitats, and failing food chains worldwide. To begin clearing the skies, greening the hills, and feeding the seas, just select an offset type below

Homes

Big house or small, most of our personal CO_2 emissions come from our homes. You can cut yours by 25% or zero them out completely here.

Vehicles

Until we're all scooting around in solar or solar-sourced hydrogen vehicles, our cars and trucks will always be CO_2 headaches for the Earth. Clean up your act here.

Flights

It feels so fine to soar aloft and leave land speed far behind. Unhappily we can't outrace the CO2 our graceful craft still spew. Zero out your aerial litter here.

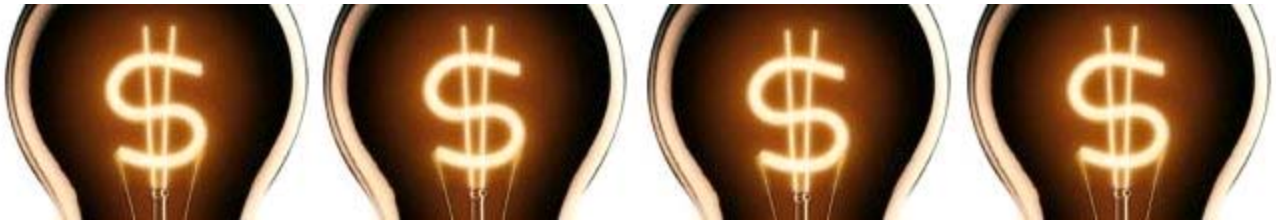
Events

Planktos offers free offsets for many environmental events and attractive rates for conferences, weddings, concerts, rallies, etc. Please click here to inquire...

To make your home, travel, and events carbon neutral.
visit www.planktos.com

BAN THE BULB

Want something easy to do to save the planet and save some money.



In 2001, lighting accounted for 101 billion kWh 9% of U.S. household electricity use.

Incandescent lamps, which are commonly found in households, are highly inefficient sources of light because about **90% of the energy used is lost as heat**. For that reason, lighting has been one focus of efforts to increase the efficiency of household electricity consumption.

A powerful means to do the right thing is to say our final goodbyes to Thomas Edison and his incandescent bulbs.