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The Softer Side of Climate Control?



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The climate blog [Celsias](#) offers some [intriguing insight](#) into geoengineering. [Recently spotlighted](#) on DISCOVER's website, geoengineering involves drastic, planet-scale alterations to the climate so Earth remains habitable for humans, despite our impressive [negligence](#). The geoengineering schemes highlighted in the DISCOVER slideshow include blocking the sun with trillions of space-based shields and shading ourselves with stratospheric sulfur injections—but these are not the only innovative ways to help our climate.

As mentioned in the slideshow, there are significant drawbacks to all of the high-profile geoengineering techniques. Tinkering with the atmosphere on a large scale (such as, say, polluting) involves significant risks, and in the end the decision results from weighing the pros and cons. When it comes to geoengineering, human survival is the overriding “pro,” so collateral

damage like decreased biodiversity—while by no means desirable—might have to be brushed aside. Sorry, world, but humanity's looking out for number one.

Unless, that is, we can find a better solution—something that not only drops our temperature down, allowing humans to keep chugging along, but also decreases carbon dioxide levels and does little harm to the planet. Celsius refers to this as a “win-win-win” situation, and mentions a couple interesting ideas.

One is to replace roofs with reflective materials, which would increase the albedo of the Earth (i.e., cause it to absorb less and reflect more solar radiation). Celsius mentions that this solution is “highly cost effective because it can reduce air conditioning loads and increase roof longevity,” which is certainly true, but what about its efficacy as a climate moderator? The blog cites another great climate blog, [Treehugger.com](#), for some data from the Earth Institute at Columbia University that implies that if every building on Earth had a white roof, the global temperature would drop up to 1 degree Celsius (the temperature scale, not the blog). The problem with the data, as the post concedes, is that it assumes a highly simplistic “zero-dimensional model,” which excludes the atmosphere—meaning it doesn’t include clouds, nor does it take into account that only half of the sun’s radiation actually reaches the Earth’s surface.

Another idea that Celsius mentions is a “carbon-negative” soil known as [bio-char](#), which occurs in *terra preta*—the dark fertile soil used by the pre-Columbians for agriculture, [previously discussed](#) in the DISCOVER article about the pre-Columbian Amazon. Bio-char is produced by slash-and-char techniques—eliminating forest with low-intensity smoldering, as opposed to the big open flames of the slash-and-burn technique. The resulting soil is high in organic carbon and nitrogen, making it an effective fertilizer, and largely resistant to decomposition, which allows it to act as a significant, long-term sink for atmospheric carbon dioxide. So bio-char sequestration would be a carbon-negative by-product of the burning of bio-fuels, and improve soil quality. [One study](#) suggests that “up to 12 percent of the carbon emissions produced by human activity could be offset annually if slash-and-burn were replaced by slash-and-char.”

These are good ideas that are cost-efficient and don’t seem to have much potential to do any harm, so they certainly merit our attention. But although they will benefit the climate, they won’t have a *rapid* or significant impact on the temperature of the Earth—which, if the greenhouse effect [starts running away from us](#), is the bottom line. We don’t need to deploy any risky, [extravagant](#) geoengineering tactics right now, but we should encourage serious scientific research into such techniques to optimize their efficacy and evaluate their dangers.

Image credit: [Sandia National Laboratories](#)

March 7th, 2008 12:50 AM Tags: [agriculture](#), [carbon-negative](#), [geoengineering](#), [global warming](#) by [Lizzie Buchen](#) in [Pollution Solutions \(& Disasters\)](#) | 3 comments | [RSS feed](#) | [Trackback >](#)

3 Responses to “The Softer Side of Climate Control?”

1. [A Siegel](#) Says:
[March 7th, 2008 at 5:47 pm](#)

This is a nice write up building off my work. Thank you.

One element to emphasize, further, is that my post/discussion was about trying to figure out principles for prioritizing efforts in geoengineering.

I don’t think that I suggested that we should not be researching and reducing risk in pursuing more drastic approaches, but I do believe that we make significant progress with win-win-win strategies, maybe enough to obviate the need for far riskier options.

2. [Erich J. Knight](#) Says:
[March 9th, 2008 at 10:18 pm](#)

The best Win Win Win solution is Biochar.

the current news and links on Terra Preta (TP) soils and closed-loop pyrolysis of Biomass, this integrated virtuous cycle could sequester 100s of Billions of tons of carbon to the soils.

This technology represents the most comprehensive, low cost, and productive approach to long term stewardship and sustainability. Terra Preta Soils a process for Carbon Negative Bio fuels, massive Carbon sequestration, 1/3 Lower CH4 & N2O soil emissions, and 3X Fertility Too.

UN Climate Change Conference: Biochar present at the Bali Conference

<http://terrapreta.bioenergylists.org/steinerbalinov2107>

SCIAM Article May 15 07;

<http://www.sciam.com/article.cfm?articleID=5670236C-E7F2-99DF-3E2163B9FB144E40>

After many years of reviewing solutions to anthropogenic global warming (AGW) I believe this technology can manage Carbon for the greatest collective benefit at the lowest economic price, on vast scales. It just needs to be seen by ethical globally minded companies.

Could you please consider looking for a champion for this orphaned Terra Preta Carbon Soil Technology.

The main hurdle now is to change the current perspective held by the IPCC that the soil carbon cycle is a wash, to one in which soil can be used as a massive and ubiquitous Carbon sink via Charcoal Below are the first concrete steps in that direction;

S.1884 – The Salazar Harvesting Energy Act of 2007

A Summary of Biochar Provisions in S.1884:

Carbon-Negative Biomass Energy and Soil Quality Initiative
for the 2007 Farm Bill

Bolstering Biomass and Biochar development: In the 2007 Farm Bill, Senator Salazar was able to include \$500 million for biomass research and development and for competitive grants to develop the technologies and processes necessary for the commercial production of biofuels and bio-based products. Biomass is an organic material, usually referring to plant matter or animal waste. Using biomass for energy can reduce waste and air pollution. Biochar is a byproduct of producing energy from biomass. As a soil treatment, it enhances the ability of soil to capture and retain carbon dioxide.

<http://www.biochar-international.org/newinformationevents/newlegislation.html>

There are 24 billion tons of carbon controlled by man in his agriculture and waste stream, all that farm & cellulose waste which is now dumped to rot or digested or combusted and ultimately returned to the atmosphere as GHG should be returned to the Soil.

If you have any other questions please feel free to call me or visit the TP web site I've been drafted to co-administer.

<http://terrapreta.bioenergylists.org/?q=node>

It has been immensely gratifying to see all the major players join the mail list , Cornell folks, T. Beer of Kings Ford Charcoal (Clorox), Novozyne the M-Roots guys (fungus), chemical engineers, Dr. Danny Day of EPRIDA , Dr. Antal of U. of H., Virginia Tech folks and probably many others who's back round I don't know have joined.

The International Biochar Initiative (IBI) conference held at Terrigal, NSW, Australia in 2007. The papers from this conference are posted at their home page; <http://www.biochar-international.org/home.html>

.Nature article, Aug 06: Putting the carbon back Black is the new green:

http://bestenergies.com/downloads/naturemag_200604.pdf

Here's the Cornell page for an over view:

http://www.css.cornell.edu/faculty/lehmann/biochar/Biochar_home.htm

University of Beyreuth TP Program, Germany <http://terrapreta.bioenergylists.org/?q=taxonomy/term/118>

This Earth Science Forum thread on these soils contains further links, and has been viewed by 19,000 self-selected folks. (I post everything I find on Amazon Dark Soils, ADS here):

<http://forums.hypography.com/earth-science/3451-terra-preta.html>

Terra Preta creates a terrestrial carbon reef at a microscopic level. These nanoscale structures provide safe haven to the microbes and fungus that facilitate fertile soil creation, while sequestering carbon for many hundred if not thousands of years. The combination of these two forms of sequestration would also increase the growth rate and natural sequestration effort of growing plants.

All the Biochar Companies and equipment manufactures I've found:

Carbon Diversion

<http://www.carbondiversion.com/>

Eprida: Sustainable Solutions for Global Concerns

<http://www.eprida.com/home/index.php4>

BEST Pyrolysis, Inc. | Slow Pyrolysis – Biomass – Clean Energy – Renewable Ene

<http://www.bestenergies.com/companies/bestpyrolysis.html>

Dynamotive Energy Systems | The Evolution of Energy

<http://www.dynamotive.com/>

Ensyn – Environmentally Friendly Energy and Chemicals

<http://www.ensyn.com/who/ensyn.htm>

Agri-Therm, developing bio oils from agricultural waste

<http://www.agri-therm.com/>

Advanced BioRefinery Inc.

<http://www.advbiorefineryinc.ca/>

Technology Review: Turning Slash into Cash

<http://www.technologyreview.com/Energy/17298/>

3R Environmental Technologies Ltd. (Edward Someus)

WEB: <http://www.terrenum.net/>

The company has Swedish origin and developing/designing medium and large scale carbonization units. The company is the licensor and technology provider to NviroClean Tech Ltd British American organization WEB:

<http://www.nvirocleantech.com> and VERTUS Ltd.

<http://www.vertustechnologies.com>

Genesis Industries, licensee of Eprida technology, provides carbon-negative EPRIDA energy machines at the same cost as going direct to Eprida. Our technical support staff also provide information to obtain the best use of biochar produced by the machine. Recent research has shown that EPRIDA charcoal (biochar) increases plant productivity as it sequesters carbon in soil, thus reducing atmospheric carbon dioxide.

<http://www.egenindustries.com/>

If pre-Columbian Kayopo Indians could produce these soils up to 6 feet deep over 15% of the Amazon basin using “Slash & CHAR” verses “Slash & Burn”, it seems that our energy and agricultural industries could also product them at scale.

Harnessing the work of this vast number of microbes and fungi changes the whole equation of energy return over energy input (EROEI) for food and Bio fuels. I see this as the only sustainable agricultural strategy if we no longer have cheap fossil fuels for fertilizer.

We need this super community of wee beasties to work in concert with us by populating them into their proper Soil horizon Carbon Condos.

Erich J. Knight

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3. 3. [Weird Tube-Shaped Clouds Floating Above Australia | Discoblog | Discover Magazine](#) Says:
[August 24th, 2009 at 5:08 pm](#)

[...] Content: Discoblog: The Softer Side of Climate Control? Discoblog: Pentagon’s New Plan to Rain Down Painful Beams From the Sky Discoblog: It’s Raining [...]

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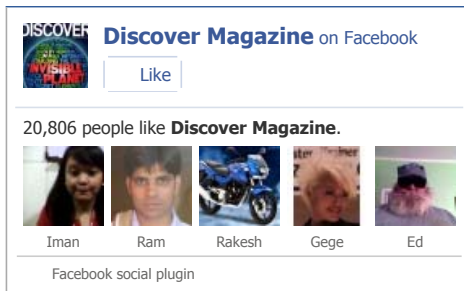
DiscoBlog is DISCOVER's compendium of quirky, funny, and surprising science news from the edge of the known universe. It's written by Patrick Morgan. Email tips, suggestions, or complaints to [azeeberg \[at\] discovermagazine.com](mailto:azeeberg@discovermagazine.com).

Also, Discoblog recently incorporated the brilliant blog [NCBI ROFL](#), in which two prone-to-distraction grad students post real scientific articles with funny subjects. [Email your tips to ncbirofl \[at\] gmail.com](#). Follow [the ROFL feed here](#).

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What's awesomer than a pic of the fiery descent of Atlantis from space? That same pic... in 3D! <http://is.gd/7QCPns>
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Bionic insect cyborg zeppelins: 80% insect, 10% robot, 100% terrifying. Run for the hills! <http://post.ly/2alhxx> <http://bit.ly/reVmAq>
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Newsflash! Gravity is now a little weaker: <http://bit.ly/ndTaY2>
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The A/C in the Discover office is out; the globe that is our office is warming. Send ice!
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Toxins from bacterial blooms might be causing ALS, Alzheimer's, and Parkinson's <http://bit.ly/nsQ5ZM>
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The space shuttle program was a debacle in which we're all complicit. Here's how to avoid repeating the mistake. <http://bit.ly/qMwIeq>
23 hours ago · reply · retweet · favorite

When a strange, an up, and a heavy bottom quark love each other very much...Fermilab discovers a new particle: <http://1.usa.gov/omqtGb>
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