that can, and must, revolutionize mankind's mastery of his world, and the universe.

As Jonathan Tennenbaum describes in his feature article on "The Isotope Economy," our ability to overcome the near-term exhaustion of this planet's minerals and raw materials depends upon the deployment of an increasingly energy-dense array of energy technologies.

A fission-based "nuclear renaissance" is now in progress around the world, and the decision in 2006 to begin construction of the International Thermonuclear Experimental Reactor (ITER), have finally placed the world on the proper path for developing both fission and thermonuclear fusion.

Just as dozens of nations that had been excluded from using nuclear technology, for political and economic reasons, are now planning to enter the nuclear age, dozens of developing nations are likewise entering the space age.

What a nation can achieve through a focussed, nationally directed and supported, long-range program in space, is evidenced by China. That developing nation became the third country to launch a man into space three years ago, and has mapped out a multi-decade plan that will bring it up to par with the world's other spacefaring nations.

Under the pressure of Chinese space developments, in January 2007, India tested its first vehicle designed to safely reenter the Earth's atmosphere, which is a necessary first step to developing a manned spacecraft. For the first time in its history, Japan's space agency is considering its own manned spaceflight program.

These developments stand in stark contrast to recent space policy initiatives from the Bush Administration. As in many other aspects of strategic policy, the Administration is not putting America's best foot forward, as a leader that can offer the world new generations of technology, but is threatening other nations to allow the United States to operate unilaterally in space—or else.

Such preemptive war in space, like its counterpart on Earth, is a bad policy.

*—Marsha Freeman*


## On Duesberg and AIDS

*We continue to receive letters and comments asking about the Peter Duesberg theory on AIDS, citing his 2003 article, "The Chemical Bases of the Various AIDS Epidemics: Recreational Drugs, Anti-viral Chemotherapy and Malnutrition," authored by P. Duesberg, C. Koehnlein, and D. Rasnick, and published in the* Journal of Bioscience, *Vol. 28. Letters have also mentioned the chapter on AIDS in Tom Bethell's book,* The Politically Incorrect Guide to Science, *and Liam Scheff's March 12, 2005 article published by Accuracy in Media, "The Media Campaign for HIV Tests."*

*We point readers to our original article on the subject by Wolfgang Lillge, M.D. and others, "AIDS and the Duesberg Controversy" (Spring 1998), answering Duesberg's claims on AIDS. Here, Associate Editor Colin Lowry briefly responds on the issue.*

### Colin Lowry Comments on Duesberg's Latest Coverup

The latest cover-up attempt by Peter Duesberg et al. to deny the contagious nature of HIV is probably his most pathetic, and immoral masquerade yet. In his 2003 paper, he tries to ignore 22 years of scientific evidence about HIV and AIDS, and simply declares that HIV does not cause AIDS, and that it is not contagious.

Duesberg was a prominent researcher investigating retroviruses back in the 1970s, and surely does not believe the lies he tells publicly these days. His arguments have been answered and shown to be false for over a decade among professional scientists. The main argument of his paper is that AIDS is merely the result of recreational drug use, or in some cases, treatment with anti-retroviral drugs, or maybe just malnutrition.

How can that explain the millions of young children who are infected with HIV and those dying every day? Are they all on recreational drugs, even as infants? This should be mocked as a farce, except that the intent of such lies is to confuse and derail any serious attempt at stopping the AIDS epidemic.

Another of Duesberg's claims is that AIDS patients have HIV antibodies, but they don't have the virus. This too, is not true. The routine tests used for HIV do detect antibodies, but the reason we don't see HIV in the blood at all times is because it is a retrovirus: It can integrate into the genome of a cell, and lie dormant for periods of time, before reproducing and infecting other cells. When someone is infectious, they certainly have HIV in their immune cells circulating in the blood.

Duesberg also attacks the use of the anti-retroviral drugs that have increased the survival time of millions of AIDS patients in the industrialized nations, and have helped decrease mother to child transmission, even in Africa.

The HIV-AIDS epidemic is increasing worldwide every day, with 4.3 million people becoming newly infected last year. In 2006, 40 million people were living with the virus, and 3 million died of AIDS; of those deaths, 380,000 were children under 15 years old. It is amazing that with an epidemic that has already killed 25 million people, some are still confused by Duesberg's distraction, preventing the work required for a cure and the resources needed to build up the health-care infrastructure the world desperately needs.

## On Morals and Science

I take this occasion to briefly congratulate you for your editorial work, based on Lyndon LaRouche's intuition, moral certitudes, theoretical developments, and corresponding political action!

I have understood for a long time (even before meeting LaRouche in the 1970s):

(1) that there is no such things as a universe without humans of some sort (nothing to do with quantum mechanics!),

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USDA

*A Missouri farmer with rice plants. More $CO_2$ would increase rice productivity.*

# C4 vs. C3 Photosynthesis: A Response to Low $CO_2$ Levels

by Christine Craig

About 90 percent of land plants, including both monocots and dicots, are equipped to photosynthesize only through the C3 photosynthetic pathway. Chloroplasts of only one type of plant cell, the mesophyll cell, are primarily involved in photosynthetic light capture and $CO_2$ assimilation into 3-carbon carbohydrates, which are then used to manufacture plant structural and functional elements.

The problem with this situation, as far as human food production is concerned, is that, "under current atmospheric conditions (0.036% $CO_2$, 21% $O_2$), up to 50% of the fixed carbon is lost by photorespiration"[1] in such plants.

Why? The enzyme which catalyzes the primary $CO_2$ fixation reaction in mesophyll chloroplasts, Rubisco, is sensitive to $CO_2$ concentration. Under low $CO_2$ conditions, it will bind with oxygen instead, essentially, breaking down carbohydrate and releasing $CO_2$, in a process known as photorespiration. This is considered very wasteful to plant productivity.

C4-type photosynthesis apparently evolved at various times, in various plant groups, as a mechanism of concentrating $CO_2$ in the cells where $CO_2$ fixation is occurring. In monocots such as maize and sorghum, this is accomplished by a division of labor between two cell types: $CO_2$ is brought into mesophyll cells, chemically joined to a three-carbon molecule to make a four-carbon molecule, and shunted to the bundle sheath cell, where it is cleaved off and made available to the Rubisco-catalyzed C3 photosynthetic cycle.

The 3-carbon molecule resulting from the $CO_2$ removal in the bundle sheath cell is shunted back to the mesophyll cell for reuse, and two ATP are used up in the process. Therefore, C4 photosynthetic pathways are reactions in addition to C3 pathways, with a division of labor set up between bundle sheath cells, where photosynthetic carbon assimilation occurs, and mesophyll cells, which house the mechanisms for bringing $CO_2$ into the cell and temporarily adding it to a 3-carbon molecule for later use by Rubisco. So, both enzymatic and anatomical changes are part of the evolutionary developments which have allowed plants like maize to get around the problem of photorespiration under low $CO_2$ conditions.

**Higher $CO_2$ Would Boost Rice**

C4 plants function well in high-light, high-heat conditions as in the tropics, whereas C3 plants do best in lower light, more temperate conditions. The problem for crop scientists is, that one of the main food crops in tropical climates is rice, a C3 monocot. Under present atmospheric conditions, rice is not nearly as productive as it would be under higher $CO_2$ concentrations. Until—or unless—that situation occurs, scientists are in a bind

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## Letters

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(2) that mathematics cannot be separated from a general understanding of nature,

(3) that political action is coexistent with all the rest. . . .

It's not easy for a scientist to crawl against the current. Even if modern science is full of so-called accepted "paradoxes," it's not a good basis for reflection.

It's necessary, as you do, to return to older conflicts, an idea out-of-fashion, except perhaps recently. (As I must go frequently to an university hospital, I went to the library there, only to find that all books older than 10 years are thrown away!)

We must not accept "technical" truth, reread critically even Cauchy, and accept that morals may be a key of mathematics!

**Jean-Pierre Wallenborn**
**Brussels, Belgium**

## Correction

A box titled "Thorium Converter Reactor Ready for Development," on p. 49 of the Fall 2005 *21st Century* erroneously states that Tak Pui Lou, Ph.D., of Lawrence Berkeley National Laboratory, is a co-owner of the company Thorenco LLC. He is not, and we regret the error.