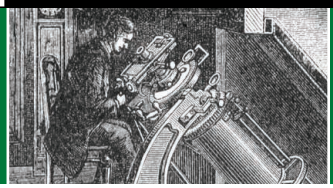

LETTERS

edited by Jennifer Sills

Give Beach Ecosystems Their Day in the Sun

THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE FOURTH ASSESSMENT REPORT (*1*) LARGELY overlooked the impacts of climate change on marine ecosystems (*2*). In their Review ("The impact of climate change on the world's marine ecosystems," 18 June, p. 1523), O. Hoegh-Guldberg and J. F. Bruno redress this gap by synthesizing recent literature. In so doing, they made the disparities in research among ocean systems apparent. Specifically, there are no studies of climate change impacts to sandy beach ecosystems. Rather than any oversight by Hoegh-Guldberg and Bruno or previous authors (*3*), we believe that the omission of beaches from this and other assessments of anthropogenic impacts reflects a relative lack of appreciation of beaches as ecosystems.

This paucity of beach studies (*4*, *5*) is alarming, not only because beaches comprise ~70% of open-ocean coasts and have high socioeconomic and ecosystem value, but also because their position at the land-sea margin renders them highly vulnerable to climate change (*5*, *6*). Beaches are at risk of significant habitat loss and ecological impacts from warming, acidification, and erosion caused by sea-level rise and increased storms. Where landward retreat of beaches is restricted by development or topography, beach habitat may disappear. When engineering interventions seek to mitigate beach erosion, negative ecological consequences may be severe but are only beginning to be understood (*6*, *7*). The inadequacy of information on ecological impacts of climate change on this vulnerable and challenged coastal ecosystem must be addressed.

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References

1. C. Rosenzweig *et al.*, in *Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M. L. Parry, O. F. Canziani, J. P. Palutikof, P. J. van der Linden, C E. Hanson, Eds. (Cambridge Univ. Press, Cambridge, 2007), pp. 79–131.
2. A. J. Richardson, E. S. Poloczanska, *Science* **320**, 1294 (2008).
3. A. S. Brierley, M. J. Kingsford, *Curr. Biol*. **19**, R602 (2009).
4. P. G. Fairweather, *Proc. Ecol. Soc. Aust*. **16**, 71 (1990).
5. T. A. Schlacher *et al.*, *Divers. Dist*. **13**, 556 (2007).
6. O. Defeo *et al.*, *Est. Coast. Shelf Sci*. **81**, 1 (2009).
7. C. H. Peterson *et al.*, *J. Exp. Mar. Biol. Ecol*. **338**, 205 (2006).

Methane from the East Siberian Arctic Shelf

IN THEIR REPORT "EXTENSIVE METHANE VENTing to the atmosphere from sediments of the East Siberian Arctic Shelf" (5 March, p. 1246), N. Shakhova *et al*. write that methane (CH_4) release resulting from thawing Arctic permafrost "is a likely positive feedback to climate warming." They add that the release of Arctic CH_4 was implied in previous climate shifts as well as in the recently renewed rise in atmospheric CH_4. These claims are not supported by all the literature they cite. Their reference 5 (*1*) presents measurements of emissions only of carbon dioxide, not CH_4. Their reference 8 (*2*), a study we conducted, suggests that a very large (~50%) increase in atmospheric CH_4 concentration associated with an abrupt warming event ~11,600 years ago was driven mainly by wetlands, without distinguishing between high and low latitudes. Their reference 9 (*3*) was published in 1993 and is not relevant to the renewed growth of atmospheric CH_4 that started in 2007. Their reference 10 (*4*) does not imply Arctic CH_4 releases in this renewed growth, and other recent work (*5*) also does not support sustained new emissions from the Arctic as the cause.

These findings of CH_4 emissions from the Arctic sea floor [in the Report and in (*6*)] add to our understanding of the atmospheric CH_4 budget, but they do not show that Arctic warming has produced a positive feedback

Letters to the Editor

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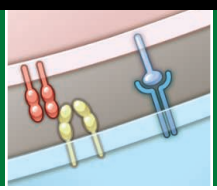

Skin sentinels

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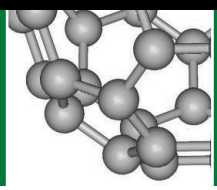

Carbon's fate in space

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in radiative forcing by causing these emissions to increase recently. A newly discovered CH_4 source is not necessarily a changing source, much less a source that is changing in response to Arctic warming. Shakhova *et al*. do acknowledge these distinctions, but in these times of enhanced scrutiny of climate change science, it is important to communicate all evidence to the scientific community and the public clearly and accurately.

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References

1. E. A. G. Schuur *et al.*, *Nature* **459**, 556 (2009).
2. V. V. Petrenko *et al.*, *Science* **324**, 506 (2009).
3. W. C. Oechel *et al.*, *Nature* **361**, 520 (1993).
4. M. Rigby *et al.*, *Geophys. Res. Lett.* **35**, GL036037 (2008).
5. E. J. Dlugokencky *et al.*, *Geophys. Res. Lett.* **36**, GL039780 (2009).
6. G. K. Westbrook *et al.*, *Geophys. Res. Lett.* **36**, GL039191 (2009).

Response

WE THANK PETRENKO *ET AL*. FOR BRINGING attention to the community that, despite worrisome trends of warming in the Arctic with postulated positive climate-biogeochemistry feedback processes (*1*), there are still very few studies that can be cited for studying potentially relevant phenomena over extensive Arctic scales. Their criticism concerns the representativeness of some of our references.

We cited reference 5, Schuur *et al*. (*2*), because it shows that old C release increases as permafrost thawing increases, and that "emission rates will depend on the form of C gases released" (*2*). Strictly speaking, Schuur *et al*. did measure only CO_2, but we feel that the implications of their findings for methane budgets are clear.

It is correct that reference 8 (*3*) did not distinguish between high and low latitude, but the modeling of wetland emissions used radiocarbon signature of a thermokarst lake. We do not know of low-latitude wetlands or thermokarst lakes that could have provided such sudden and massive releases of methane. Given the ubiquity of subsea and land-fast wetlands and thermokarsts around the Arctic, we consider this citation fair.

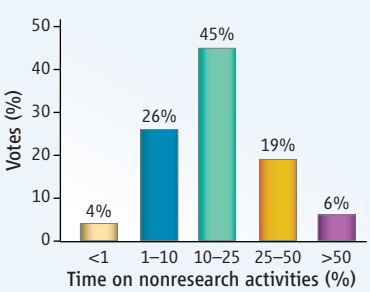
References 9 and 10 (*4*, *5*) referred to the growth of contemporary (i.e., the time period in which we live) atmospheric CH_4 and CO_2. Data from both studies stand in contrast to data of the past. Growth in CH_4 concentrations was observed before the late 1990s (*4*) and after 2007 (*5*), in support of our assertions; thus, these references are appropriate.

Readers' Poll Results

The Time of Young Scientists

On 6 August, we asked what you thought about this question:
In the coming years, there is likely to be a growing focus on science communication; scientists will be asked to explain their science and the scientific process to the general public and policy-makers. How much time should the next generation of young scientists devote to these nonresearch activities?*

More than 3000 of you responded, from more than 60 countries. Here are your results:



A selection of your thoughts:

"Communications skills, management skills, professionalism, and responsible conduct of research should balance the 'scientific theoretical' and 'research skill' components to develop the ideal young scientist. No one really learns how to 'communicate' without practice…"
—reader Emil Chuck

"[E]ach young scientist's career should first and foremost be driven by his or her passion for quality research. Yes, it is vital to be able to communicate about research, but the research must come first."
—reader Katrina Molland

Several readers based their responses on the assumption that nonresearch activities included all daily activities, not only science communication. Interpreting the results through this lens, these readers expressed concern that young scientists are subjected to unrealistic expectations, which in turn could lead to errors, exhaustion, and compromised creativity.

"[Y]oung scientists ought to get 8 hours of sleep per night, as a basic need for mental, physical, and emotional health. They should take at least one day per week off of their intellectual scientific pursuit, to leave room for unstructured reflection; to maintain their curiosity and inspiration; and, of course, to do laundry, garden, shop for groceries, etc. … Let's be realistic with regard to our expectations of young scientists, and foster an environment in which they might thrive, not just as counted in numbers of publications."
—reader Dr. S. Fischer

*See the poll, and links to the related Letters and Editorial, at www.sciencemag.org/extra/polls/20100806-1.dtl.

Polling results reflect the votes of those who chose to participate; they do not represent a random sample of the population.

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Contrary to what is claimed by Petrenko *et al*., reference 10 (*5*) states, "we find that a substantial increase in [methane] emissions from both hemispheres was necessary between 2006 and 2007 to fit the observations." Given that Arctic/Subarctic wetlands are major contributors of northern hemisphere methane emissions, we maintain that this is a fair citation.

Unlike its land-fast cousin, subsea permafrost is not only changing in response to glacial/interglacial Arctic warming (~7°C), but is experiencing an additional ~10°C warming from overlying seawater since inundation in early Holocene. Hence, it must be understood that the greater vulnerability of the subsea permafrost methane pool may lead to an unfortunate coincidental timing with anthropogenic greenhouse gas releases. Whether additions of methane to the atmosphere can be linked to anthropogenic activities or are caused by nature, the radiative effect of the sources will be additive.

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References

1. N. Gruber *et al.*, in *The Global Carbon Cycle; Integrating Humans, Climate, and the Natural World,* C. B. Field, M. R. Raupach, Eds. (Island Press, Washington, DC, 2004), pp. 45–76.
2. E. A. G. Schuur *et al*., *Nature* **459**, 556 (2009).
3. V. V. Petrenko *et al*., *Science* **324**, 506 (2009).
4. W. C. Oechel *et al*., *Nature* **361**, 520 (1993).
5. M. Rigby *et al*., *Geophys. Res. Lett*. **35**, GL036037 (2008).

Candidate Gene Approach's Missing Link

J. COUZIN-FRANKEL, IN HER NEWS FOCUS story "Major heart disease genes prove elusive" (4 June, p. 1220), presents an excellent summary of the scientific community's satisfaction and disappointment regarding genome-wide association studies. I would like to clarify one point that may have hampered the progress of those who use the candidate gene approach to investigate the genetics of complex human traits.

Given the many surveys of individuals of European ancestry, one might assume that the majority of common genetic variants are represented by at least one of the single-nucleotide polymorphisms (SNPs) in the genotyping platforms (*1*). However, this is not true. For instance, the immunoglobulin GM loci have at least 18 alleles, but none of the SNPs useful for indentifying these are included in the human diversity panel used in the HapMap project. Almost all GM markers are expressed on the Fc region of immunoglobulin gamma heavy chains, candidate genes for variation in immune responses because they interact with receptors expressed on effector cells (e.g., natural killer cells). They also contribute to antibody-dependent cell-mediated cytotoxicity, a major host mechanism for destroying virally infected cells as well as tumors. Yet genome-wide association analyses of infectious and malignant diseases are unlikely to detect these genes.

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Reference

1. The International HapMap Consortium, *Nature* **449**, 851 (2007).

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