Edited by **Jennifer Sills**

# *Climate change drives tree mortality*

In their Report "Classifying drivers of global forest loss" (14 September, p. 1108), P. G. Curtis *et al.* reported a global assessment of forest loss from 2001 to 2015. They attributed 99% of the loss to land-use change and wildfire, and they urge companies to eliminate 5 million hectares of land-use change per year to prevent further deforestation. Their analysis underestimates climate change–driven drought, storms, and insect epidemics, which also contribute to substantial tree mortality each year.

During the period Curtis *et al.* investigated (2001 to 2015), climate change–driven forest loss increased, affecting large forest areas across the globe (*1*). Growing evidence shows that increasingly hot droughts killed most of the trees in an area of 1.2 million hectares in southwest North America (*2*), and warming-driven mountain pine beetle outbreaks affected forests in northwest North America at a rate of 6 to 7 million hectares per year between 2005 and 2008 (*3*). Additional forest losses of large magnitude due to drought, ice, snow, and wind storms occurred in China, Spain, Chile, and other countries (*1*). The order of magnitude of these forest loss events is similar to the estimated deforestation rate of 5 million hectares a year reported by Curtis *et al.*

One potential cause of the substantial underestimation of climate change–driven forest loss is our limited ability to detect it with remote sensing tools (*4*), which Curtis *et al.* used for their analysis. Unlike most land-use change forest losses and wildfire, climate change–driven tree mortality is often diffuse and gradual. Although measurements on the ground are sufficient to infer that climate change has caused tree loss [e.g., (*1*–*3*)], algorithms and analysis tools that rely on remote sensing data are still under development. In some cases, Curtis *et al.*'s analysis places climate change–induced changes in other categories. For example, they attributed both mountain pine beetle damage in Canada (*3*) and drought-induced tree mortality near Los Alamos, New Mexico (*2*), and Beetle Rock, California (*1*), to forestry.

The analysis presented by Curtis *et al.* provides only a partial view of the magnitude and causality of global forest loss. Ground-based data from national forest inventories and research plot networks, combined with improved remote sensing image analysis, are essential to identify diffuse forest losses due to climate change. Given that global temperatures continue to rise and droughts are expected to occur more frequently and with higher severity (*5*), quantifying and monitoring these forest losses could potentially become even more important than controlling man-made deforestation.

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# *Halt speculation on U.S. embassy in Cuba*

Since 2016, the U.S. State Department has reported that 25 staff at the U.S. embassy in Havana have complained of symptoms such as hearing loss and vertigo (*1*). Embassy staff have reported hearing unusual and unsettling sounds at home or at hotel rooms in addition to their workplaces at the embassy (*2*). In the ensuing 2 years, Pine beetle infestations driven by climate change can lead to deforestation.

scientists have allowed speculation about the causes of these health issues to outpace the evidence.

Neuroscientists at the University of Pennsylvania (the affiliation of K.R.F., who was not involved in the study) reported evidence for brain injury related to perceived sound in some of the affected individuals (*2*), but this work has been firmly contested by other scientists, some of whom advance other, more mundane explanations for the symptoms (*3*–*5*). An editorial in the neuroscience journal *Cortex* notes internal inconsistencies in the neuroscience evidence published so far (*6*). After nearly 2 years of investigation, neither Cuban nor U.S. officials have identified the cause of the health problems or even provided convincing evidence that the diverse health problems reported by the staff have a common cause (*7*). While acoustic or electromagnetic fields might conceivably have produced audible sounds at the embassy, no physical agents have been reported at levels that might plausibly have injured the employees. Evidence available to the public remains largely anecdotal.

Nevertheless, discussion by scientists and the media about the cause of the reported health problems has been characterized by speculation and unwarranted inferences about possible effects of physical agents supposedly directed at the employees [e.g., (*8*, *9*)]. Such speculation is unhelpful in treating the affected individuals and hinders relations between the two countries. The affected members of the embassy staff need careful medical follow-up without presumptions about the etiology of their problems, and the U.S. embassy needs a careful occupational health assessment to identify any potential health risks. Alternative explanations (including preexisting diseases or stress-induced exacerbation of functional disorders) must not be discarded because they do not fit in preconceived theories. There is insufficient evidence to guess about the cause of the sounds, let alone assess their potential health relevance. We need to halt the speculation and instead encourage more science and careful medicine.

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# Standardizing return of participant results

As members of the National Academies of Sciences, Engineering, and Medicine committee that wrote the report on the return of individual research results (*1*), we reject the allegations in the Policy Forum "Return of results and data to study participants" (S. M. Wolf and B. J. Evans, 12 October, p. 159) that the report is paternalistic, misunderstands the law, burdens Institutional Review Boards (IRBs), and creates barriers to the return of results.

In the National Academies report, we advocate regulatory changes to expand the opportunities to give research participants access to their individual results. The Centers for Medicare and Medicaid Services (CMS) interprets the law governing laboratory standards as prohibiting any communication about research results to participants unless the laboratory is certified according to the Clinical Laboratory Improvement Amendments of 1988 (CLIA). Wolf and Evans contend that CMS does not have the statutory authority for this restriction. However, there is no consensus regarding this position (*2*, *3*) and CMS's interpretation has not been overruled by the courts. Given substantial penalties for noncompliance, many research institutions abide by CMS's interpretation. Our report recommends an explicit change to the regulations to bring clarity to the field that will not be achieved by assuming that CMS's position can be ignored, as Wolf and Evans suggest.

We recommend that the Office of Civil Rights (OCR) clarify what research results participants have a right to under the Health Insurance Portability and Accountability Act (HIPAA) rule by clearly defining the Designated Record Set (DRS) to include all research results generated in laboratories that meet an accepted quality standard. Although the DRS includes information maintained by a covered entity that could be used for individual decision-making (*4*), there is no consensus about what research data should be included. In the absence of guidance from OCR, some institutions are excluding some research data from the

DRS (*5*). Our recommendation supports broadening participant access to high-quality research results while adhering to the principle that results lacking demonstrated quality should not be used by participants or their health care providers for individual decision-making.

We disagree with the notion that our recommendations are paternalistic. During our study, we consulted a diverse group of community members, study participants, and advocacy groups to fully understand how individuals might use results, as well as barriers to using and understanding results. The committee sought a balance that promotes broad access to results while addressing public expectations that results are accurate. Disclosing poor-quality results reflects bad science and does not respect participant autonomy or welfare. We maintain that quality standards for research laboratories will better ensure accurate results that meet the expectations of participants and will enhance the overall validity and reproducibility of the research enterprise.

We believe that IRBs are up to the challenge of addressing the new responsibilities recommended by our report, although we acknowledge that these demands cannot be addressed overnight. The report recommends that investigators work with stakeholders to develop plans on whether and how to disclose results as protocols are developed. The informed consent process is key to fostering participant understanding of their options for return of results and to documenting expression of their preferences. IRBs must be involved in evaluating the return of results plan and consent process and, over time, will need to develop expertise and policies for this purpose.

We are confident that our recommendations break down many of the existing barriers to the return of individual research results and, if followed, will enhance the collaboration among all stakeholders. Return of individual results is not a common practice (*6*) despite existing guidelines, and research participants rarely request results under their HIPAA access rights. Our report promotes the routine consideration of return of results by funders, researchers, and participants; the development of standards and policies to foster return, greater transparency, and engagement with participants; and an informed consent process that informs participants of their opportunities and rights.

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## TECHNICAL COMMENT ABSTRACTS

### Comment on "Predicting reaction performance in C–N cross-coupling using machine learning"

**Kangway V. Chuang and Michael J. Keiser**

Ahneman *et al.* (Reports, 13 April 2018) applied machine learning models to predict C–N cross-coupling reaction yields. The models use atomic, electronic, and vibrational descriptors as input features. However, the experimental design is insufficient to distinguish models trained on chemical features from those trained solely on random-valued features in retrospective and prospective test scenarios, thus failing classical controls in machine learning.

Full text: dx.doi.org/10.1126/science.aat8603

### Response to Comment on "Predicting reaction performance in C–N cross-coupling using machine learning"

**Jesús G. Estrada, Derek T. Ahneman, Robert P. Sheridan, Spencer D. Dreher, Abigail G. Doyle**

We demonstrate that the chemical-feature model described in our original paper is distinguishable from the nongeneralizable models introduced by Chuang and Keiser. Furthermore, the chemical-feature model significantly outperforms these models in out-of-sample predictions, justifying the use of chemical featurization from which machine learning models can extract meaningful patterns in the dataset, as originally described.

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# Climate change drives tree mortality

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