comparison suggests that coarse sediments such as sand are required as a foundation to form deltaic land initially. Subsequently, vegetation can colonize the elevated topography and capture fine sediment[6]. The plants also produce organic soil and inflate the delta volume by about 20%[8]. Thus, for river diversions to be effective in building land without deep cuts into the riverbed or complex siphon or pumping mechanisms, there must be sufficient sand available in the upper portion of the river flow.

Nittrouer *et al.*[1] have taken a significant step by identifying a large sandy deposit, about 8 million metric tons, in the Bonnet Carré Spillway. The sediments were deposited when the spillway was opened during the 2011 Mississippi River flood. Such a large delivery of sand is surprising: the spillway diverted less than 25% of the flood discharge and skimmed only the uppermost few metres of the river, where sand concentrations are expected to be lowest. Nor was the spillway designed to optimize sand diversion or land building. Yet, more than 30% of the total sand load that the river carried during the opening was diverted into the spillway.

This accidental build-up of large amounts of sand shows that diversion channels in the right position — on the inside bends and downstream from the river-bend apex — can take advantage of elevated sand within the water column and optimize the amount of suspended sand to be redirected. When the Bonnet Carré Spillway was opened during the 2011 Mississippi River flood, the mechanism was demonstrated fortuitously. It should be possible to use the same principles to engineer diversions that promote sand deposition in the delta.

Nittrouer *et al.*[1] demonstrate, in principle, the feasibility of land building through controlled river diversions. Engineers can use local channel morphodynamics to construct diversions that optimize total sand loads and, thus, land-building capability. It is becoming clearer that we may be able to use the river's sand to rebuild the delta, instead of doing nothing and watching helplessly as the delta shoreline retreats. ❐

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References

1. Nittrouer. *et al. Nature Geosci.* **5,** 534–537 (2012).
2. Blum, M. D. & Roberts, H. H. *Nature Geosci.* **2,** 488–491 (2009).
3. Fischetti, M. *Sci. Am.* **285,** 77–85 (October, 2001).
4. Törnqvist, T. E. *et al. Science* **316,** 201b (2007).
5. Kim, W., Mohrig, D., Twilley, R. R., Paola, C. & Parker, G. *Eos Trans.* **90,** 373–374 (2009).
6. Paola, C. *et al. Annu. Rev. Mar. Sci.* **3,** 67–91 (2011).
7. Majersky, S., Roberts, H. H., Cunningham, R., Kemp, G. P. & John, C. J. *Basin Res. Inst. Bull.* **7,** 50–66 (1997).
8. Morton, R. A., Bernier, J. C., Barras, J. A. & Ferina, N. F. *Gulf Coast Assoc. Geol. Soc. Trans.* **55,** 555–571 (2005).

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SOCIOLOGY

Plugging the leaks

Women are obtaining an increasing percentage of advanced degrees in mathematics and sciences, but this growth has not permeated into the proportion of women in academia. Some lag is to be expected, particularly with heavy financial pressure in departments slowing hiring. But even this inertia can't fully explain the lack of women in permanent academic roles. One frequently cited hurdle is the confluence of the demands of a young family and some of the most stressful years on the path to tenure, as well as the expense and scarcity of childcare in many countries. Hidden (and not-so-hidden) biases also play a role, as does poor or absent mentoring and a lack of role models.

It has proven difficult, however, to quantify the relative effects of these obstacles, and the dialogue surrounding the leaky pipeline of female academics is passionate and often emotive. To try to better constrain the loss of female talent, Allison Shaw of Princeton University and Daniel Stanton of the Australian National University devised a numerical model using the leaky pipeline schematic and data on female participation in the social and natural sciences in the US (*Proc. R. Soc. B* http://doi.org/h3k; 2012).

Their model clearly shows that mere inertia cannot explain the lack of women advancing in academic settings. Instead, they identify two bottlenecks: first, in undergraduate science enrolment by women, and then in the transition of female doctoral students to the professoriate, even though female students are more likely to pursue graduate studies than their male counterparts. These bottlenecks have let more women through in the past 30 years, but not enough to allow an equal proportion of women in academia once the inertia runs its course. And, worryingly, the loss of female scientists is most pronounced at the transition from doctoral studies to academia.

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The model can't distinguish between causes of the academic bottleneck, but Shaw and Stanton point out that some studies fail to find any discrimination in the interviewing and hiring of female academic candidates, suggesting that the bottleneck occurs at the decision to apply. Of course, a smaller but still significant number of men are also lost at this PhD-to-professor transition, implying that the factors driving this steady drip are not limited to females. Indeed, the frequent relocation, contracts lasting only a few years with minimal chance for renewal and the delicate balancing act of a two-career family can be off-putting to a recent doctoral graduate of either gender.

In this light, it is important to note that attempts to make academia more inviting to women — whether through the introduction of more flexible hours or teaching loads, the addition of on-site childcare, enhanced mentorship schemes or other as-yet unidentified interventions — should help to retain the most promising of doctoral students, male and female alike. As long as the undergraduate bottleneck continues to erode, these most promising upcoming faculty candidates will include an ever-growing number of women.

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