equipped with the tools and knowledge needed to tackle these questions. Fischer *et al.* suggest a conflict between continental-scale ecology and the other, smaller scales at which ecological processes occur, but many of today's ecological challenges involve petals *and* petabytes; great ecology is not tied to a particular physical or informatic scale.

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Davis MB and Botkin DB. 1985. Sensitivity of cool-temperate forests and their fossil pollen record to rapid temperature change. *Quaternary Res* **23**: 327–40.

Davis MB. 1986. Climatic instability, time lags, and community disequilibrium. In Diamond J and Case TJ (Eds). Community ecology. New York, NY: Harper and Row.

Diaz RJ and Rosenberg R. 2008. Spreading dead zones and consequences for marine ecosystems. *Science* **321**: 926–29.

Ehrlich PR. 1997. A world of wounds: ecologists and the human dilemma. Oldendorf/Luhe, Germany: Ecology Institute.

Jenny H. 1941. Factors of soil formation: a system of quantitative pedology. New York, NY: McGraw-Hill.

Sherry TW and Holmes RT. 1995. Summer versus winter limitation of populations: what are the issues and what is the evidence? In Martin TE and Finch DM (Eds). Ecology and management of Neotropical migratory birds. New York, NY: Oxford University Press.

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Reconnecting floodplains

River ecosystems are commonly impacted by levees and dams, which control water flows to facilitate the transport of economic goods and to generate hydropower. The resultant loss of floodplains associated with these barriers has impaired riverine biota and abiotic processes (eg Ward and Stanford 1995; Clawson *et al.* 2001). Numerous vertebrates, invertebrates, and plants require floodplain habitats to complete their life histories; many of these species have been cut off from valuable resources, such as prey and refugia, by floodplain loss and degradation. Furthermore, nutrient cycling has been compromised within many existing floodplains, and nutrients (eg nitrogen and phosphorus) transported downstream ultimately promote the formation of anoxic conditions like those observed at the confluence of the Mississippi River and the Gulf of Mexico in North America.

On 2 May 2011, the US Army Corps of Engineers (ACOE) intentionally destroyed a ~3-km section of the levee near Birds Point, along the Mississippi River in the Midwestern US state of Missouri, in an effort to protect residents and property upstream from extreme flooding. Although several farmers unfortunately lost a substantial amount of agricultural land as a consequence, this breach represents an important opportunity to study the large-scale reconnection of Mississippi River waters with a substantial portion of its floodplain. Short-term changes beneficial to the biota of the river system – as a whole (eg Kobayashi *et al.* 2009), as well as to some endangered species (eg the pallid sturgeon, *Scaphirhynchus albus*) – will likely be observed because of this event, if left unmodified.

As of early September, the ACOE has begun the process of repairs but is having difficulty securing funding from the US Congress to rebuild the levee to its former height. Because sections left partially incomplete could potentially allow for inundation during floods, I advocate against restoring the breached levee at Birds Point. It is time that large-scale restoration processes begin under predicted or unforeseen circumstances. As for floodplain restoration, the short-term cost to local human populations may be severe. There is no doubt that farmers will feel the brunt of such efforts; indeed, inundated farmland – undoubtedly covered with sediments transported by the Mississippi and Ohio River basins – will be rendered useless for an unknown period of time. However, over evolutionary time, floodplains have supported biotic and abiotic processes on an entire watershed scale – processes that have been essentially wiped out for over a century by such artificial barriers. Efforts to farm floodplains have obviously benefitted our prosperity as a species, but in doing so humans have severely damaged these habitats and associated ecosystem services. As scientists, we also need to bear in mind that although the levee breach may be a major opportunity for study, restoration and sustainability of such natural resources come with a price.

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Clawson RG, Lockaby BG, and Rummer B. 2001. Changes in production and nutrient cycling across a wetness gradient within a floodplain forest. *Ecosystems* **4**: 126–38.

Kobayashi T, Ryder DS, Gordon G, *et al.* 2009. Short-term response of nutrients, carbon and planktonic microbial communities to floodplain wetland inundation. *Aquat Ecol* **43**: 843–58.

Ward JV and Stanford JA. 1995. Ecological connectivity in alluvial river ecosystems and its disruption by flow regulation. *Regul River* **11**: 105–19.

doi:10.1890/11.WB.023

Idiosyncrasy in ecology – what's in a word?

Peer-reviewed letter

One of the aims of ecological research is to find general rules and principles, but variation in nature is seemingly endless. General ecological rules are rare and apply best to large-scale patterns (Lawton 1999). At small to intermediate scales, effects may be species- or habitat-specific and are often called "idiosyncratic". Because variants of the term "idiosyncrasy" appear to be being used more frequently in ecological publications, we conducted a literature survey to confirm this observation, as well as to ascertain the word's intended meaning and the journals in which it is most commonly found.

Using Web of Science, we searched for papers – published in ecological journals – containing the words "idiosyncrasy" or "idiosyncratic" in the title, summary, or keywords (hereafter

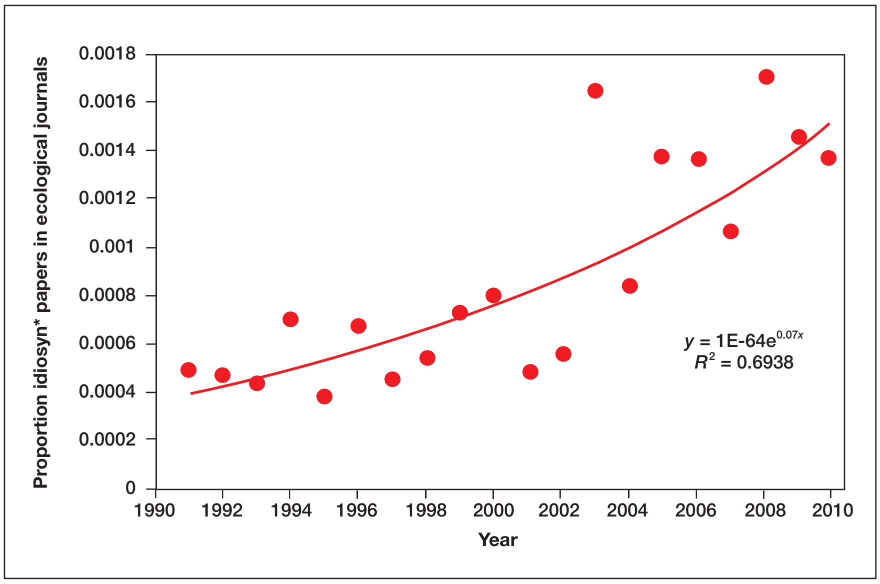

Figure 1. *Proportion of idiosyn* papers (ie those using variants of "idiosyncrasy" in ecological journals) published between 1991 and 2010, based on ISI Web of Knowledge (topic: idiosyn*, years: 1991–2010, subject area: ecology).*

"idiosyn* papers"). The average annual number of idiosyn* papers increased from four (year of publication: 1991–1996) to 21 (2005–2010). A similar trend appears when considering the proportion of idiosyn* papers (Figure 1), demonstrating that the observed increase is not just due to an increase in the total number of ecological papers (idiosyn* papers and non-idiosyn* papers combined) published annually. The correlation between

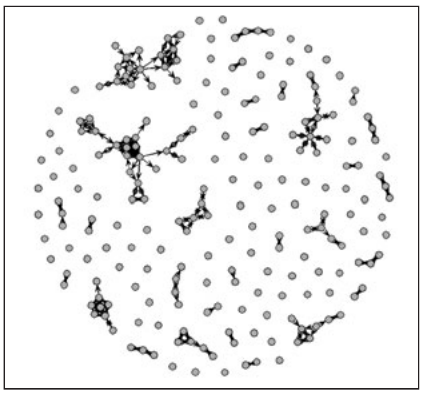

Figure 2. *Network showing links between idiosyn* papers in ecological journals published between 1986 and 2011. Each dot represents a paper (n = 216), and papers can be linked via authors or via citations. Single arrows indicate that one paper is cited by another paper; double arrows indicate papers that share at least one author, which can also be linked via citation.*

year and proportion of idiosyn* papers is significant (Spearman rank correlation $r_s = 0.81$, $P < 0.001$) and the best fit is an exponential curve, growing by 7% per year. Thus, the use of "idiosyncrasy" in ecology manuscripts is a relatively new trend.

According to the Concise Oxford English Dictionary (11th edition), idiosyncrasy is defined as: (1) something peculiar to an individual (eg a feeling, view, or mode of expression); (2) a distinctive characteristic of something; and (3) in medicine, individuals with an allergic reaction. We screened all identified idiosyn* papers (from 1 Jan 1986 to 1 Jan 2011) to determine the exact usage of idiosyncrasy in each. The earliest paper referencing idiosyncrasy applied it to the level of the individual (ie chemical variation in individual grasshoppers; Jones *et al.* 1986). In the other idiosyn* papers, idiosyncrasy and its variants were used for various levels – including individuals, species, families, functional groups, ecosystems, and landscapes – but application at the species level was most frequent. The described phenomena can be grouped arbitrarily into three common forms of idiosyn* usage: scatter, interactions, and outliers. Scatter includes positive, negative, and neutral effects of individuals or species to a treatment or environment (eg Boecklen *et al.* 1991). Non-additive or non-linear relationships (Brinkman *et al.* 2005; Hoorens *et al.* 2010) between treatment and response are often reported as idiosyncratic effects. Consistent deviations from the norm, which are visible as outliers in plots of experimental data, indicate unique behavior of individual species and are also labelled as idiosyncratic effects (Kappeler 1997; Edwards *et al.* 2001). Obviously, a single word may have multiple meanings, and sometimes the intended meaning can be deduced from the context. However, the use of "idiosyncrasy" may result in confusion or even contradiction. For many authors, idiosyncratic seems to be used as a synonym for "unpredictable" or for describing a "lack of pattern", whereas other authors argue that idiosyncrasies can be predictable (Emmerson *et al.* 2001). Many papers use variants of idiosyncrasy as an alternative for species-specific; yet we also found an instance of "species-specific and somewhat idiosyncratic", suggesting that the two terms are not synonymous. Unfortunately, idiosyncrasy appears only in the abstract in one-quarter of the papers, which, given the abridged nature of an abstract, complicates determining the word's intended meaning.

According to Web of Science, 216 idiosyn* papers appeared in 74 "source titles" (mostly journals). The list is headed by *Oikos*, followed in decreasing order by *Ecology*, *Global Ecology and Biogeography*, *Evolution*, and *Oecologia*. This raised the question of whether higher-impact journals are more likely to publish idiosyn* papers than lower-impact journals, which indeed appears to be the case (WebFigure 1). It will be difficult to determine whether high-impact journals use a different vocabulary or whether this positive relationship between impact factor and idiosyncrasy is due to inter-journal differences in topic or scope. Many idiosyn* papers appear to have no links with other idiosyn* papers via shared authors or citation, revealing idiosyncrasy as a widespread but disconnected label (Figure 2). The lack of context and definition severely hampers interpretation. We identified a few clusters with five or more papers (Figure 2) and within the contexts of those clusters the meaning of "idiosyncrasy" might be clearer. The two largest clusters fall within the specialties of biodiversity–ecosystem functioning and biogeography.

Idiosyncrasy is not currently a very meaningful label, given its unstandardized use and multiple meanings. If ecologists cannot agree on a common definition for "idiosyncrasy", it should be either clearly defined within each paper or replaced with a less ambiguous term. Ideally, the quality of scientific writing should match the accuracy of data collection and analysis.

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Boecklen WJ, Mopper S, and Price PW. 1991. Size and shape-analysis of mineral resources in arroyo willow and their relation to sawfly densities. *Ecol Res* **6**: 317–31.

Brinkman EP, Duyts H, and van der Putten WH. 2005. Consequences of variation in species diversity in a community of root-feeding herbivores for nematode dynamics and host plant biomass. *Oikos* **110**: 417–27.

Edwards W, Gadek P, Weber E, *et al.* 2001. Idiosyncratic phenomenon of regeneration from cotyledons in the idiot fruit tree, *Idiospermum australiense*. *Austral Ecol* **26**: 254–58.

Emmerson MC, Solan M, Ernes C, *et al.* 2001. Consistent patterns and the idiosyncratic effects of biodiversity in marine ecosystems. *Nature* **411**: 73–77.

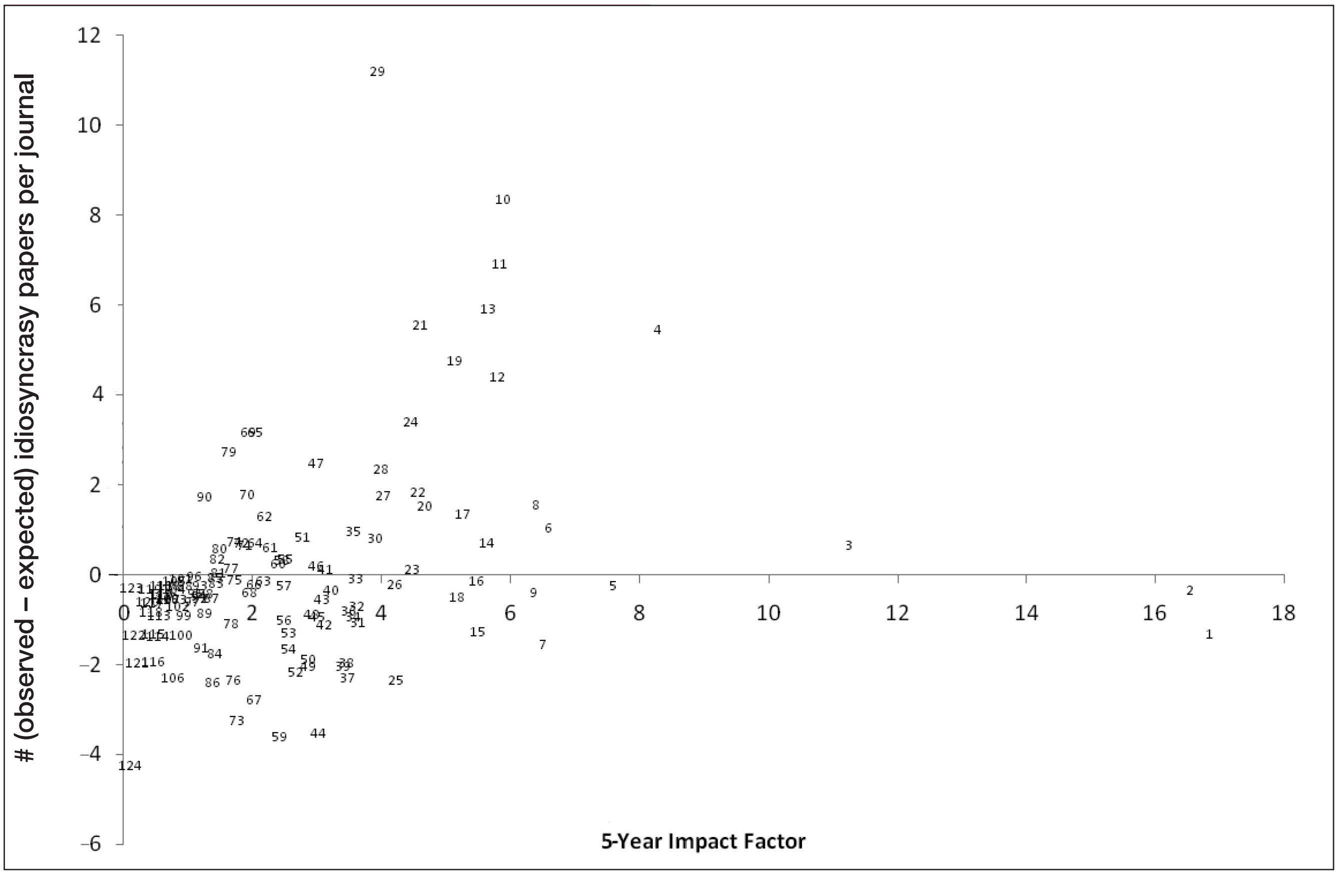
Hoorens B, Stroetenga M, and Aerts R. 2010. Litter mixture interactions at the level of plant functional types are additive. *Ecosystems* **13**: 90–98.

Jones CG, Hess TA, Whitman DW, *et al.* 1986. Idiosyncratic variation in chemical defenses among individual generalist grasshoppers. *J Chem Ecol* **12**: 749–61.

Kappeler PM. 1997. Intrasexual selection in *Mirza coquereli*: evidence for scramble competition polygyny in a solitary primate. *Behav Ecol Sociobiol* **41**: 115–27.

Lawton JH. 1999. Are there general laws in ecology? *Oikos* **84**: 177–92.

doi:10.1890/11.WB.024



WebFigure 1. *The relation between the 5-year Impact Factor of a journal and the number of observed – expected idiosyn* papers per journal. Plotted numbers refer to journal titles, listed in WebPanel 1.*

WebPanel 1.

To correct for the number of publications per journal, we calculated the expected number of idiosyn* papers as if they were occurring at random throughout all ecological journals. Journals publishing more papers would thus be more likely to have more idiosyn* papers.

With the help of Web of Science, the total number of publications in ecological journals was calculated between 1986 and 2010 (search performed on 1 Jan 2011). A total of 149 ecological journals were selected based on the subject category Ecology in the Journal Citation Reports. Together, these journals published 241 310 papers between 1986 and 2010. In this period, 213 idiosyn* papers were published in ecological journals (Topic = idiosyn*; Subject area = ecology). The observed idiosyn* papers per journal were obtained through the Analyze Results option based on Source Title. The expected number of idiosyn* papers per journal was calculated as follows: (total number of idiosyn* papers/total number of ecological publications) × total number of publications per journal. The difference between observed and expected idiosyn* papers per journal was plotted against the five-year Impact Factor 2009. We preferred the five-year Impact Factor over the yearly impact factor as a more robust measure of impact. Since not all 149 journals had a five-year Impact Factor 2009, only 124 points are plotted in the figure. Each number refers to a journal, as follows:

1: *Trends Ecol Evol*, 2: *Annu Rev Ecol Evol S*, 3: *Ecol Lett*, 4: *Ecol Monogr*, 5: *B Am Mus Nat Hist*, 6: *Global Change Biol*, 7: *Front Ecol Environ*, 8: *ISME J*, 9: *Mol Ecol*, 10: *Global Ecol Biogeogr*, 11: *Ecology*, 12: *Evolution*, 13: *J Ecol*, 14: *J Appl Ecol*, 15: *Am Nat*, 16: *Perspect Plant Ecol*, 17: *Conserv Biol*, 18: *P Roy Soc B-Biol Sci*, 19: *Ecography*, 20: *Ecol Appl*, 21: *J Biogeogr*, 22: *J Anim Ecol*, 23: *Ecosystems*, 24: *Divers Distrib*, 25: *Heredity*, 26: *Funct Ecol*, 27: *J Evolution Biol*, 28: *Oecologia*, 29: *Oikos*, 30: *Biol Conserv*, 31: *Biol Lett*, 32: *Biogeosciences*, 33: *Wildlife Monogr*, 34: *Biol Invasions*, 35: *Landscape Ecol*, 36: *Paleobiology*, 37: *Agr Ecosyst Environ*, 38: *Behav Ecol*, 39: *Microb Ecol*, 40: *Ecol Eng*, 41: *Behav Ecol Sociobiol*, 42: *J N Am Benthol Soc*, 43: *Ecol Soc*, 44: *Mar Ecol-Prog Ser*, 45: *Evol Ecol*, 46: *J Veg Sci*, 47: *Basic Appl Ecol*, 48: *Ecotoxicology*, 49: *Landscape Urban Plan*, 50: *Ecol Econ*, 51: *Adv Ecol Res*, 52: *J Chem Ecol*, 53: *Aquat Microb Ecol*, 54: *Mol Ecol Notes*, 55: *Anim Conserv*, 56: *Restor Ecol*, 57: *Ecol Complex*, 58: *J Exp Mar Biol Ecol*, 59: *Ecol Model*, 60: *Biotropica*, 61: *Biodivers Conserv*, 62: *Plant Ecol*, 63: *Theor Popul Biol*, 64: *Chemoecol*, 65: *Austral Ecol*, 66: *J Arid Environ*, 67: *Pedobiologia*, 68: *Popul Ecol*, 69: *Ecol Ecol Res*, 70: *Acta Oecol*, 71: *Appl Veg Sci*, 72: *Wetlands*, 73: *J Wildlife Manage*, 74: *J Trop Ecol*, 75: *Ecohydrology*, 76: *Polar Biol*, 77: *Ecoscience*, 78: *Oryx*, 79: *Ecol Res*, 80: *Aquat Ecol*, 81: *Ann Zool Fenn*, 82: *Eur J Soil Biol*, 83: *Ecol Inform*, 84: *Environ Biol Fish*, 85: *Theor Ecol-Neth*, 86: *J Soil Water Conserv*, 87: *Polar Res*, 88: *Eur J Wildlife Res*, 89: *Mol Ecol Resour*, 90: *Wildlife Res*, 91: *Biochem Syst Ecol*, 92: *Compost Sci Util*, 93: *Mar Biol Res*, 94: *Wildlife Biol*, 95: *Rangeland Ecol Manag*, 96: *Rev Chil Hist Nat*, 97: *New Zeal J Ecol*, 98: *Rangeland J*, 99: *Am Midl Nat*, *100:Afr J Ecol*, 101: *Fungal Eco*, 102: *Nat Area J*, 103: *S Afr J Wildl Res*, 104: *Vie Milieu*, 105: *Community Ecol*, 106: *J Nat Hist*, 107: *Int J Sust Dev World*, 108: *P Acad Nat Sci Phila*, 109: *Pol J Ecol*, 110: *Southeast Nat*, 111: *Polar Rec*, 112: *Northeast Nat*, 113: *Northwest Sci*, 114: *J Freshwater Ecol*, 115: *Russ J Ecol+*, 116: *Southwest Nat*, 117: *West N Am Naturalist*, 118: *Interciencia*, 119: *Amazoniana*, 120: *Rev Ecol – Terre Vie*, 121: *Can Field Nat*, 122: *Ohio J Sci*, 123: *Contemp Probl Ecol*, 124: *Nat Hist*.

