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ESEX Commentary

Laws, place, history and the interpretation of landforms

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Earth Surface Processes and Landforms

ABSTRACT: The state of an Earth surface system (ESS) is determined by three sets of factors: laws, place, and history. Laws ($\boldsymbol{L} = L_1, L_2, \ldots, L_n$) are the *n* general principles applicable to any such system at any time. Place factors ($\boldsymbol{P} = P_1, P_2, \ldots, P_m$) are the *m* relevant characteristics of the local or regional environment. History factors ($\boldsymbol{H} = H_1, H_2, \ldots, H_q$) include the previous evolutionary pathway of the ESS, its stage of development, past disturbance, and initial conditions. Geoscience investigation may focus on laws, place, or history, but ultimately all three are necessary to understand and explain ESS. The LPH triad is useful as a pedagogical device, illustrated here via application to explaining the world's longest cave (Mammoth Cave, KY). Beyond providing a useful checklist, the LPH framework provides analytical traction to some difficult research problems. For example, studies of the avulsions of three southeast Texas rivers showed substantial differences in avulsion regimes and resulting alluvial morphology, despite the proximity and superficial similarity of the systems. Avulsions are governed by the same laws in all cases [$\boldsymbol{L}(A) = \boldsymbol{L}(B) = \boldsymbol{L}(C)$], and the three rivers have undergone the same sea-level, climate, and tectonic histories, as well as the same general anthropic impacts [$\boldsymbol{H}(A) \approx \boldsymbol{H}(B) \approx \boldsymbol{H}(C)$]. Though regional environmental controls are similar, local details such as the location of the modern main channel relative to Pleistocene meander channels differ, and thus these place factors explain the differences between the rivers. The LPH framework, or similar types of reasoning, is implicit in many types of geoscience analysis. Explicit attention to the triad can help solve or address many specific problems and remind us of the importance of all three sets of factors. Copyright © 2016 John Wiley & Sons, Ltd.

KEYWORDS: laws; place; history; Earth surface system; contingency

Introduction

Geomorphic systems (as well as soil, hydrological, ecological, and other Earth surface systems or ESS) are controlled and influenced by generally applicable global factors that apply to all ESS of a given type (e.g. granitic weathering profiles, salt marshes, alluvial channels, etc.) everywhere and always. These include fundamental laws of physics and chemistry, and general principles and relationships of geology, geography, biology, geophysics, hydrology, that are independent of context. ESS are also controlled and influenced by local, contingent factors that are not universally applicable and may be unique, at least in their details and their particular combination, to a specific location or system. Because ESS are spatial entities with long lifespans (even the shorter-lived ones have long temporal scales compared with those of laboratory sciences), the local, contingent factors include both geographical and historical elements.

This paper outlines a law–place–history (LPH) framework for the study of ESS that is useful as a pedagogic tool and a research guide, and possibly as an analytical tool as well. Hereafter the focus will be on landforms and geomorphic systems, but the general principles are applicable to ESS in general.

Law is used here as shorthand for laws *per se*, such as the conservation of mass, energy, and momentum, and for other generalizations and representations that are independent of time and place. These latter are either implicitly or explicitly based on the *ceteris parabus* (all other things being equal) principle. For example, all other things being equal, aeolian sediment transport capacity increases or decreases with wind velocity. These may be specific and quantitative, as in equations for sediment transport or dissolution kinetics, or general and qualitative, such as: all other things being equal, soil erosion is inversely related to vegetation cover. Laws in the LPH framework are equivalent to what I referred to as 'global' factors in earlier work; place and history were lumped as 'local' factors (Phillips, 2002, 2007).

Place factors represent the environmental context in which laws operate – the 'other things' that are rarely equal. The relevant properties or characteristics of the local or regional environment will vary according to the problem at hand, but may be general or specific. Geology (lithology, structure, tectonic setting), climate, biological or ecological factors (e.g. vegetation) and land use are common general place factors relevant to geomorphic systems. Place factors may also be specific, such as particular climate metrics (e.g. soil temperature or heating degree days), rooting depth of vegetation, or grain size and shape.

History factors represent the path-dependent, historically contingent aspects of geomorphic systems. Some systems are sensitive to initial conditions; other history factors are related to previous evolutionary or developmental pathways, stages of development, disturbance histories, and time available for system development or evolution. For instance, coastal barrier island morphology and dynamics may be linked to inherited geological factors; the sequence and timing of storm events; the time since the last storm disturbance; vegetation history (for example, successional stages and introduced species); and divergent development trends associated with biogeomorphic feedbacks between overwash dynamics, morphology, and vegetation (*cf.* Godfrey and Godfrey, 1973; Riggs *et al.*, 1995; Stallins and Parker, 2003; Houser and Hamilton, 2009; Morton, 2010).

Place and history factors are associated with what Schumm (1991) called singularities – the characteristics of landforms, geological formations, etc. that make each to some extent unique. Schumm argued that singularities are a fundamental trait in Earth science and indicated that sensitivity to and responses of geomorphic systems to disturbances or environmental changes always vary to some degree between apparently similar systems, and within the same system under the same conditions (Begin and Schumm, 1984; Schumm, 1991). Phillips (2007, 2015), Marston (2010), Preston *et al.* (2011), and Brierley *et al.* (2013) linked singularities to nonlinear complexity and historical contingency.

Simpson (1963) contrasted 'immanent' and 'configurational' processes and controls. Immanent factors are ubiquitous, at least within a given domain, while configurational elements are historically contingent states resulting from interactions of the immanent factors with historical circumstances. Simpson's (1963) immanent factors correspond to laws in the sense used here, and configurational is directly linked to historical factors, and implicitly to place factors. Geological events are unique, Simpson (1963: 29) argued, because the immanent phenomena (laws) are acting on and within particular contexts (configurations or history/place factors). This framework was applied to river channels by Lane and Richards (1997), who showed that morphological changes arise from conditioning of the immanent processes of flow and sediment transport by configurational aspects of the channel.

The LPH framework can be visualized as shown in Figure 1, and deployed as a pedagogic device, as an explanatory checklist, and as an analytical tool, as discussed below.

The law–place–history triad has several antecedents. WM Davis (1902) developed a conceptual framework for the study of landscape evolution based on structure, process, and time, roughly corresponding to place, law, and history. Davis' idea was that landforms and landscapes are the result of geomorphic processes (governed by general laws), operating on geological structures (defined broadly) over time. The LPH framework differs primarily with respect to much broader conceptions of place (including non-geological aspects) and time/history, where Davis was concerned chiefly with elapsed time following an initial episode of uplift.

A triangular pedagogic and research-guidance device is also commonly used in medical geography and epidemiology. The epidemiological triangle (Gatrell and Elliott, 2014) is based on the spread of disease or afflictions being determined by characteristics of the host organism, the disease-causing agent, and environmental characteristics. For instance, the spread of a mosquito-borne pathogen would be explained or analyzed based on vulnerability of the host (victim) organism, the characteristics and geographic spread of the vector (mosquito species), and environmental characteristics that determine the viability for mosquito populations and density of potential hosts.

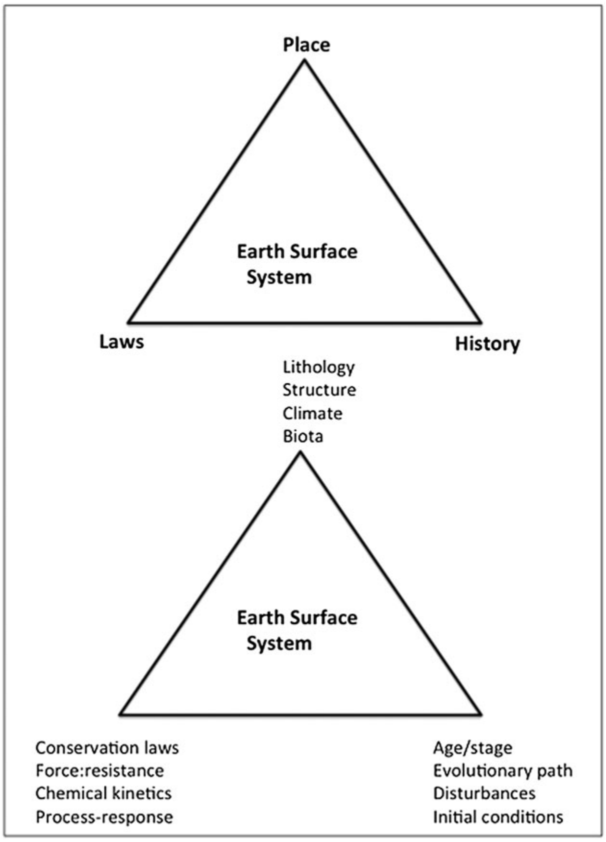

Figure 1. The law–place–history triad, in general form on top and with examples relevant to landforms below.

The factorial model of soil formation developed by Dokuchaev (1883) and Jenny (1941) and subsequently adapted to geomorphology, physical geography, and other fields (Johnson and Hole, 1994; Huggett, 1995) is often expressed as the 'clorpt' model:

$S = f(cl, o, r, p, t)\ldots$

where S represents the soil type or soil properties, and cl = climate, o = organisms or biota, r = relief or topography, p = parent material, and t = time. The trailing dots represent environmental factors that may be locally important (e.g. sea-level change or tidal range in a coastal setting) but do not apply to all soils. The factorial model therefore includes place and history factors, and makes a distinction between globally and locally influential controls. However, the inclusion of laws and processes is essentially implicit (Paton and Humphreys, 1996).

The distinction between global (laws) and local (place, history) factors at least superficially resembles the distinction between necessary and contingent factors invoked in philosophy. However, the LPH framework is based on the notion that, at least in Earth sciences, it is often important to explicitly consider both historical and geographical contingency. Further, while LPH demands that law, place, and history all be considered, it is not concerned with a strict, mutually exclusive distinction among them.

LPH as a pedagogical tool

Geoscience investigations may be focused on laws (e.g. theoretical deductions, process modeling, laboratory experiments), place (e.g. regional geology or geography, soil–landscape studies), or history (e.g. paleoenvironmental studies, environmental history, historical geology or geography). Ultimately, however, for geomorphology as a whole, all three sets of factors are necessary to fully understand and explain geomorphic systems.

The triad is a useful pedagogical tool in geomorphology teaching to emphasize the role of geographical and historical contingency, and to explain to students why strictly law-based models do not always work (or why they produce different outcomes with different boundary conditions). It also serves as a useful checklist for students in identifying potentially relevant factors, and obliges them to consider the difference between context-dependence vs. independence.

Use of the triadic framework as a pedagogic tool is illustrated here using Mammoth Cave, Kentucky, USA, the world's longest cave. While LPH can be applied to any geomorphic system, in introducing the idea it often helps to use a spectacular or unusual but familiar feature. In the case of Mammoth Cave (for background see Palmer, 1981) the applicable laws are those that would apply to any cave. These include principles of limestone dissolution, surface and ground water fluxes, karst landscape evolution, and so on. The most important place factors, beyond the lithology and climate necessary to produce karst features, are the presence of very thick and relatively pure limestones (it takes a lot of room to grow a huge cave), and the presence of insoluble sandstone caprock, which prevents surface karstification from collapsing caverns underneath (Figure 2). With respect to history the focus is on age (it takes time to grow a huge cave) and the incision history of the Green River, to which Mammoth Cave drains, which has allowed multiple interconnected cave levels to form. After illustrating how the LPH triad can explain the presence of an obviously unique feature (Figure 3), the students are ready to apply it to geomorphic systems in general.

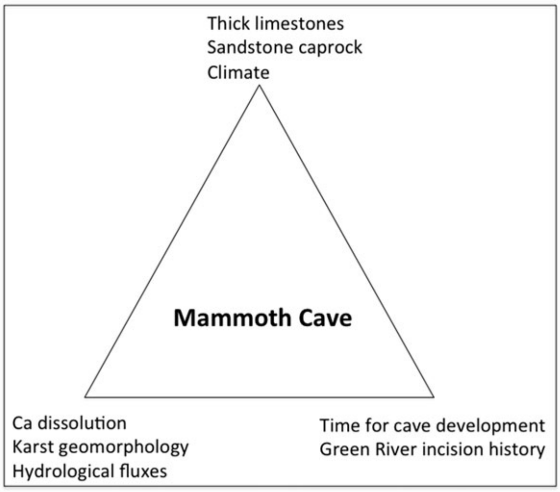

Figure 3. Key law, place, and history factors for Mammoth Cave shown on the LPH triangle.

The LPH framework can also be useful to guide research, as a sort of checklist to facilitate the identification of potentially relevant variables and controls, at stages from field reconnaissance and research design, to interpretation and explanation. Just as the soil geomorphologist often implicitly or explicitly checks off the 'clorpt' factors in describing and explaining soil landscapes, one can run through the list of potential laws, place factors, and historical elements.

Note that it is not critical that phenomena be uniquely classified as law, place, or history factors, as there is often uncertainty or overlap. In coastal plain environments, for instance, an important factor may be which of several Quaternary coastal plain terraces a feature occupies. This

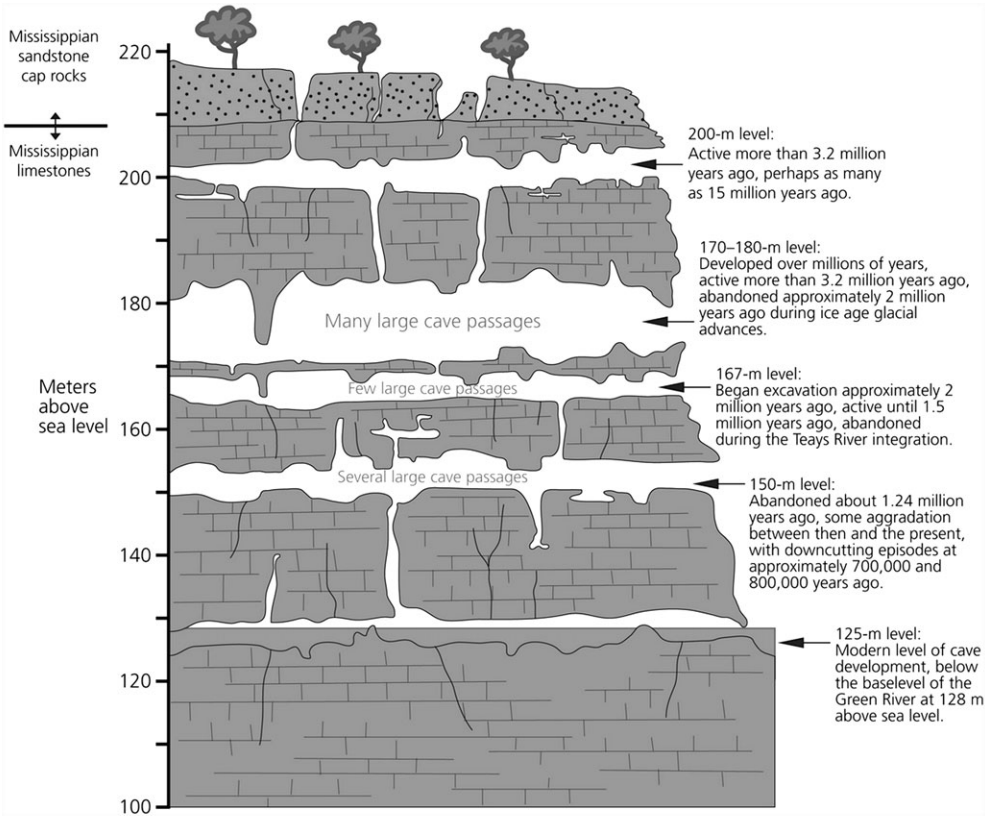

Figure 2. Diagram used by the US National Park Service to illustrate the development of Mammoth Cave, Kentucky. Key laws are those applicable to caves and karst anywhere. Important place factors, other than environmental characteristics conducive to caves and karst, include the thick, relatively pure limestones and the sandstone caprock. The most important history factors are time for cave development, and the incision history of the Green River, accounting for the multiple cave levels (original diagram by T.L. Thornberry-Ehrlich).

could be argued to be either or both a place or history factor, but its designation either way is not significant. What is crucial is that the terrace setting is identified as important, and the LPH framework can help avoid overlooking key factors.

LPH as an analytical tool

Consider two geomorphic systems, *A* and *B* (the logic applies to any number, I use two here to keep it simple). Denoting the state or characteristics of the system as $S(A)$, $S(B)$, if they are different, $S(A) \neq S(B)$. If this is the case, the LPH framework can be used to isolate the causes of the differences. If, for instance, the two geomorphic systems are governed by the same laws and have the same place characteristics ($L(A) \approx L(B)$; $P(A) \approx P(B)$), then the differences must be due to historical factors.

Now consider a case where two systems, or some key aspect thereof, are identical [($S(A) = S(B)$] but the local characteristics of place and history differ [($P(A) \neq P(B)$; $H(A) \neq H(B)$]. In this case LPH logic indicates that existing similarities must be attributable to the same applicable laws: $L(A) = L(B)$. This logic is evident, implicitly and communally, in the study of stream channel networks. Many such networks have striking geometric, topological, and statistical similarities despite a wide variety of environmental settings, ages, and histories. Given this, the similarities imply some fundamental underlying general principles or laws that produce the regularities (for reviews see Abrahams, 1984; Rodriguez-Iturbe and Rigon, 1997).

Below the LPH triad is applied to two problems arising from my own research to illustrate its potential role as an analytical tool.

Avulsion regimes in Texas rivers

The lower Sabine, Neches, and Trinity Rivers lie on the Gulf of Mexico coastal plain in southeast Texas. Despite their geographical adjacency and some obvious similarities, the three systems have different avulsion regimes and related valley morphologies (Figure 4), as outlined in detail in previous work (Phillips, 2009, 2011, 2014). The lower Sabine River features extensive anastomosing subchannels, flood or high-flow channels, distributary channels, and Yazoo channels, at a lower elevation than the alluvial ridge associated with the main channel of the modern Sabine River. Avulsions here often result in anastomosing channels that, while connected with the main channel, are fed independently by tributaries and local runoff rather than diversions of flow from the dominant channel.

The lower Neches valley is characterized by anabranching crevasse channels prograding into Pleistocene floodplain depressions. Other anabranching channels connect the depressions downvalley, and intermingle with Holocene paleo- and sub-channels.

In the lower Trinity River, single and multi-channel crevasse channels prograde into Pleistocene floodplain depressions. The Trinity features fewer subchannels than the Neches or Sabine, and these tend to be single-thread rather than anastomosing. Whereas sub-channels in Sabine and Neches deltas lie at a lower elevation than the modern alluvial ridge, in the Trinity delta some old channels are at a higher elevation.

In terms of laws, all three are governed by the same laws that influence all alluvial rivers, as well as the same general principles relative to avulsions and anastomosing (Phillips, 2011). They also occur within the same regional climate and geologic settings, and have experienced the same climate and sea-level changes, as well as the same general Quaternary land use histories (Phillips, 2009, 2014)). The three rivers are in fact part of a single larger drainage system, with their former confluences now submerged by the Sabine Lake estuary and the Gulf of Mexico, having been drowned by sea-level rise.

As the law factors and broad-scale place and history factors are common among the three systems, the differences must arise from idiosyncrasies associated with local place or history factors. This LPH logic led to a search for such factors, the most important of which turns out to be the location of the Pleistocene meander depressions relative to the Holocene and contemporary channel.

In all three cases these depressions, associated with paleomeanders from a larger Pleistocene channel, constitute distinct topographic lows. When high flows transgress natural levees (crevasses), these lows create topographic slope gradients for the crevasse flows. In the Sabine River, the depressions mainly occur near the modern river and adjacent to the modern alluvial ridge. Thus when crevasses occur they flow quickly into the depressions, with spreading and decelerating flow creating splays rather than channels. Thus crevasses that create channels rather than splays generally do not lead into the depressions.

In the lower Neches River, by contrast, the modern channel and alluvial ridge are generally farther from the depressions. Crevasses are thus able to cut channels into the depressions rather than forming splays. The Trinity River has a lower density of meander depressions than the Sabine or Neches, and they are more likely to occur at the valley edge. Further, the Trinity depressions do not necessarily present anything more than a highly localized gradient advantage (Phillips, 2011).

More details on the avulsion regimes in the rivers is given elsewhere (Phillips, 2009, 2011, 2014). The main point here is that explicit application of the LPH framework points to place factors associated with the juxtaposition of the modern channel to paleomeander depressions as an explanation of the differences among the three rivers.

Tree roots and regolith

In the Ouachita Mountains of southwestern Arkansas, USA, tree roots often penetrate bedrock joints, fractures, and bedding planes, where they accelerate rock weathering. Roots may also encircle bedrock fragments, which can be 'mined' if the trees uproot. If the tree does not uproot, infill of stump depressions occurs. This results in locally thicker soils and favorable microsites for future tree establishment, providing a positive feedback mechanism. As a consequence, regolith thickness is systematically deeper under trees than in adjacent sites. The general set of relationships is summarized in Figure 5, and details are described by Phillips (2008), and Shouse and Phillips (2016).

The generally applicable factors (laws) associated with the phenomena involved include principles of root growth, hydrologic principles associated with infiltration and moisture flux along roots and root channels, and laws relating CO_2 from root respiration and formation of organic acids to chemical weathering. Other generally applicable aspects are facilitation of microbial activity in the root zone (which also promotes chemical weathering), and the factors that determine susceptibility of trees to uprooting. These global factors are detailed in Pawlik *et al.*'s (2016b) review of tree root impacts on hillslope geomorphology.

The law factors suggest that the phenomenon of regolith deepening by individual trees and divergent evolution of regolith thickness in forests could be applicable anywhere that

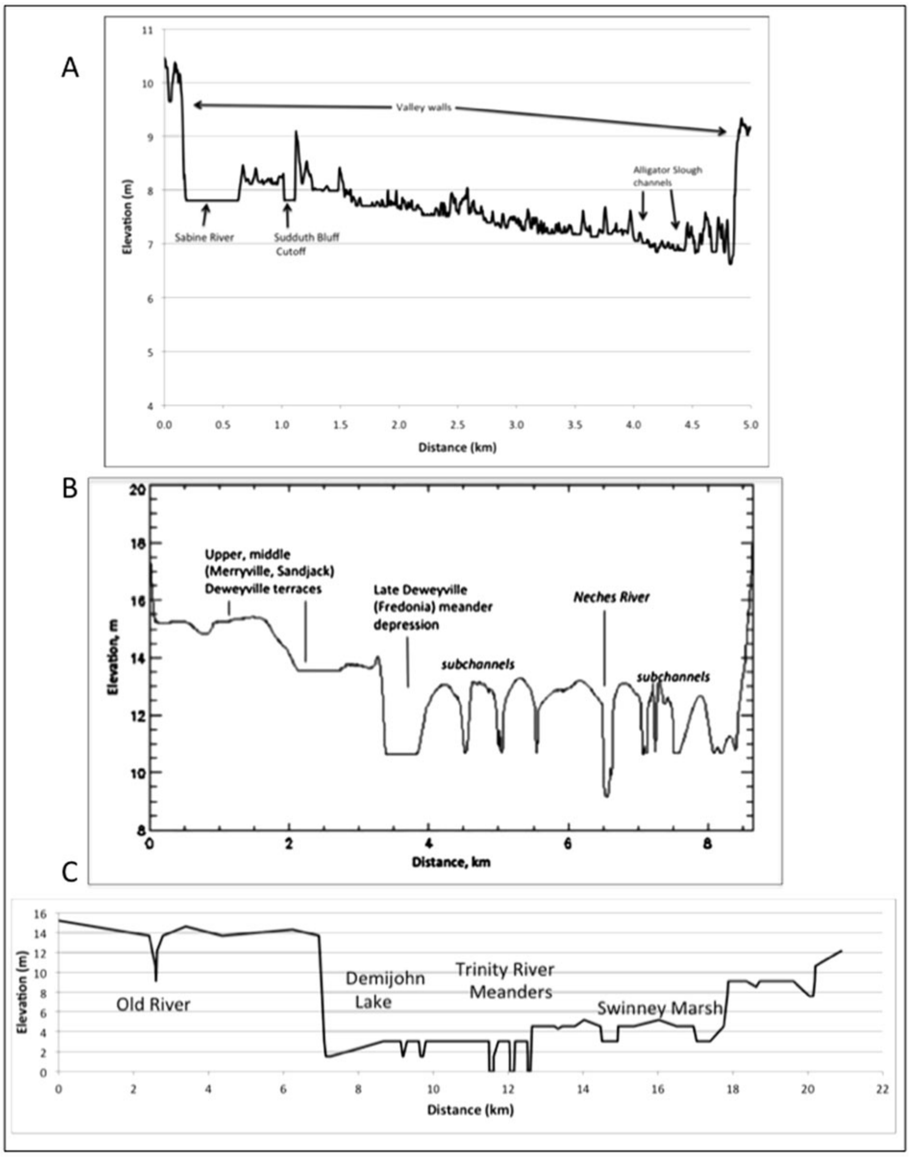

Figure 4. Cross-sections across the lower Sabine (A), Neches (B), and Trinity (C) Rivers. Figure 4(A) (Figure 7 in Phillips, 2013) shows the Alligator Slough channels at a lower elevation than the modern Sabine. Figure 4(B) Figure 9 in Phillips, 2014) shows examples of Neches River subchannels leading to Pleistocene meander depressions. Figure 4(C) (from an unpublished technical report by the author) shows the Old River anabranch higher than the modern Trinity River. Demijohn Lake occupies a Pleistocene meander depression; Swinney Marsh is a Trinity subchannel. A, B profiles are derived from DEM data with 3 m horizontal resolution; C from 30 m DEM data.

characteristic regolith thickness is less than the typical rooting depth of trees (i.e. relatively thin-soil areas overlying bedrock). However, applying the LPH logic to the problem indicates some place factors in the Ouachita Mountains that might predispose the area to the tree root–regolith interactions described above.

First, of course, is the relatively thin regolith cover (<1 m in most cases; often <0.5 m). But other place factors also play a role. The Ouachita Mountains are a former continental collision zone, where Paleozoic sedimentary rocks have been subject to large compressive stresses. Strata are steeply dipping (30^{o} to vertical in most cases), and occasionally overturned. Faults are common, and the rock is strongly fractured. The numerous joints and fractures, and the steep dips that make bedding planes available to downward-growing roots, provide abundant access to bedrock partings for roots. Further, the tilting of the sedimentary strata (mainly sandstones, shales, chert, novaculite, and quartz) leads to a high degree of local lithological variability in the horizontal as well as the vertical dimension, particularly as the easily-weathered shales are generally interbedded with the more resistant rocks.

Root–rock–soil interactions are also strongly affected by vegetation traits, particularly growth habits and root architecture. All the common overstory trees in the Ouachita study area have a taproot style. This is characterized by a single dominant root extending downward in a generally conical taper from the trunk, with other roots radiating from this. Taproots, compared with other root architectures, are ideal for focusing bedrock penetration and associated impacts immediately beneath the tree.

Many other place factors may also influence the processes described above, including lithology and geochemistry of the underlying bedrock, soil properties, species composition and traits of microbial and understory plant communities, regional and microclimate, and so forth. However, the complex geology described above and the tap root nature of the trees stand out as factors that make the Ouachita Mountain slopes particularly susceptible to the root–rock interactions described.

Potentially important history factors include initial conditions with respect to regolith thickness and weathering, topography, disturbances, forest management and land use, growth stage/age of individual trees and successional stage of forest

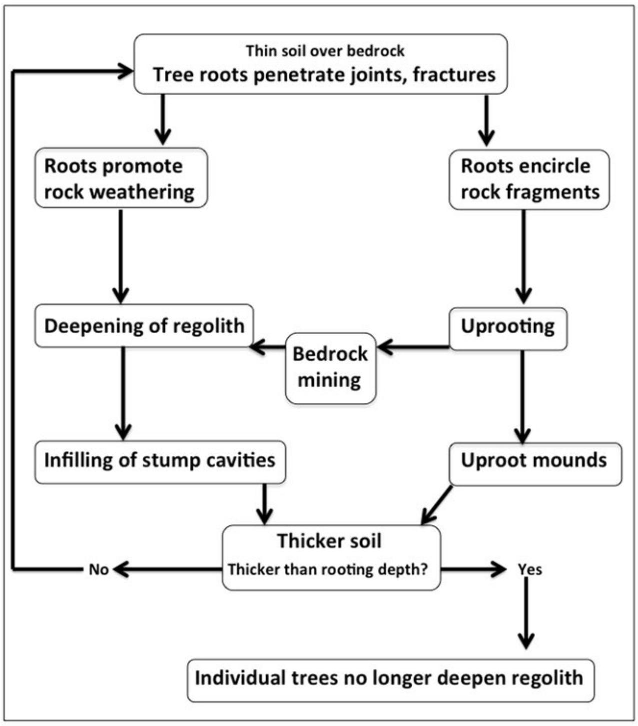

Figure 5. Conceptual model of regolith/soil deepening due to effects of individual trees.

stands, antecedent weathering conditions, biological legacies, and the timing and sequence of meteorological disturbances such as tornadoes and ice storms.

The fire regime is a historical factor in the Ouachita region that stands out as being particularly important with respect to regolith deepening. Fires often burn root systems, creating pits, soil pipes, and macropores. As opposed to the gradual decay and gradual infilling of a dead tree or stump, this creates pits and pathways that can be filled much more rapidly, and that, until filled, provide even more focused moisture flux to the tree site. This is accentuated by the sealing of the pit walls by fire, which retards their collapse. The Ouachita Mountains are inherently subject to occasional lightning-triggered fires. However, aboriginal native American populations, as well as earliest European settlers, frequently used fire to clear underbrush (Guyette *et al.*, 2002). This produced fire-tolerant and fire-dependent vegetation communities, particularly on drier south-facing slopes. This was followed by decades of fire-suppression, and most recently by use of controlled burns in forest management and habitat restoration.

Thus, while the applicable laws suggest that the phenomena observed in the Ouachita Mountains may be widespread, the place and history factors that predispose the area to regolith deepening by individual trees advise caution.

The way forward is to examine the problem in various locations with different place and history factors. Several studies in a variety of environments provide partial support – either they confirm the operation of key processes or mechanisms, or present findings with respect to tree–soil thickness relationships consistent with the conceptual model (Gabet and Mudd, 2010; Roering *et al.*, 2010; Finke *et al.*, 2013; Pawlik *et al.* 2013, 2016a; Nie *et al.*, 2014). However, direct tests have only just begun.

To focus on the structural role, Shouse (2014) and Shouse and Phillips (2016) examined sites in Kentucky with broadly similar sedimentary rocks (i.e. sandstone and shale dominated), but flat-bedded and tectonically undisturbed. The specific forest community composition also differed, but the Kentucky sites also featured trees with mostly tap-root architectures. The general model shown in Figure 5 indeed applies at those sites. Phillips (2016a) also identified local soil deepening by trees associated with bedrock factors in limestone, but focused on a single (tap-root) tree species.

The limited evidence so far generally supports the conceptual model of local regolith deepening, but additional studies are needed, particularly at sites dominated by non-sedimentary rocks, and by trees with cluster-type root architectures. In addition, the model implies that the high degree of local regolith thickness variability should not be evident at thicker-soil sites where depth to bedrock is generally greater than tree rooting depth, but this has not been tested.

Discussion

The logic used in applying the LPH framework to the examples above is hardly revolutionary, or even novel; nor is the use of a triadic device. The utility of the LPH triad lies in standardizing or formalizing an analytical logic that explicitly differentiates among local and global controls, and ensures that due consideration is given to geographically and historically contingent (as well as non-contingent) factors. The LPH construct seems clearly useful as a pedagogic tool and as a guide for research, though its utility for individuals will likely vary from high to nil, depending on teaching and research style. Pedagogic utility is greatest for: (1) stressing the variable, interactive role of general, non-contingent principles, geographical factors, and time- or path-dependent factors in explaining the occurrence of and development of specific landforms and landscapes; (2) explaining how and why the same laws produce different outcomes in different settings; and (3) as an *aide memoir* for identifying geomorphic processes and controls and distinguishing between contingent and general factors.

The LPH framework is domain-specific, in that the broadly-defined law factors are categorical, that is, they are not necessarily universally applicable to all systems, but to all of a given class (e.g. granitic weathering profiles, aeolian dunes, forested hillslopes, etc.). These classes or categories can further be defined at various levels of specificity (e.g. tropical granitic weathering profiles, unvegetated dunes; temperate forested slopes, etc.). Place and history factors also vary according to domain – wind climatology (and its changes) are obviously important in aeolian systems, but not in most karst environments. The triad is also scale-specific, as the critical controls over process–response relationships, and their relative importance, varies with spatial and temporal scale. This is most obvious when comparing, say, studies of fluvial, coastal, or aeolian sediment transport with studies of river, coastal, or dunefield evolution. Scale contingency in geomorphology has been widely discussed elsewhere (Schumm and Lichty, 1965; Viles, 2001; Phillips, 2016b). It is tempting to expand LPH to a fourth dimension of scale, but this would at least partly defeat the original purpose of a simple heuristic device.

By putting geographically and historically contingent factors on equal epistemological footing with laws, the triumvirate is compatible with long traditions of place-based and historical research in geology and geography. It is also consistent with geomorphological research specifically citing the irreducible influence of singularities, configurational factors, and geographical and historical idiosyncrasies (Simpson, 1963; Kennedy, 1979; Begin and Schumm, 1984; Lane and Richards, 1997; Schumm, 1991; Schumm, 2005; Phillips, 2002). LPH is also compatible with recent calls for more locally-embedded research in geomorphology – not a return to traditional regional and historical studies, but approaches that explicitly acknowledge and confront the complex interactions of general, global controls on one hand and idiosyncratic, local, contingent controls on the other (Harrison, 2001; Phillips, 2007, 2015; Brierley, 2010; Preston *et al.*, 2011; Brierley *et al.*, 2013; Wilcock *et al.*, 2013).

As mentioned earlier, some specific research problems in geomorphology are focused primarily on laws, with little or no concern for landforms in a specific context. The LPH framework has limited direct utility for such work based on laboratory or controlled field experiments or mathematical and theoretical modeling. However, consideration of place and history factors is often crucial when such work is conducted in incompletely or uncontrolled field settings, at the very least for experimental designs and interpretation of data outliers. Place and history are also key considerations when testing the predictions or implications of laws in the protean world of real landscapes.

Historically and geographically contingent factors are most obviously important in geohistorical and place-based work, where laws are generally at least implicitly acknowledged to be part of the context and constraints. The LPH framework can assist in making the identification of relevant laws more explicit and systematic. This, in turn, facilitates the use of case studies in identifying or testing potential laws, and recognizing commonalities between different locations and environments.

Most broadly and importantly, LPH is a tool for generalizing case studies, the ultimate underpinning and test of geomorphological understanding. Most simply, the triad is an uncomplicated, systematic way to identify key similarities and differences among cases. LPH can also be used analytically, as in the examples above, to either tease out or test general trends (which may eventually achieve law status) from case studies, or to explain (or at least explore) explanations for apparently anomalous differences among sites or data sets.

Conclusions

The utility of the laws–place–history triad lies in standardizing the application of a logic that explicitly seeks to differentiate among local and global controls, and to ensure that due consideration is given to geographically and historically contingent, as well as non-contingent factors. The LPH construct is readily utilized as a pedagogic tool and to provide guidelines for research. The framework can also be useful as an analytical tool, as illustrated by the examples given. The key advantage here is in contextualizing case studies. Geomorphic (and other scientific) laws are built and tested on case studies, of course, and in the early going LPH can guide research with respect to focusing on the 'law' aspects of case studies by accounting for the place and history factors. This is the case with the root–regolith work mentioned earlier. LPH also helps in reconciling differences among case studies by providing a systematic way of isolating factors that can explain the variations, as in the avulsion case above.

Acknowledgements—These ideas were originally presented to the British Society for Geomorphology in 2014, as a blog post, and the European Geosciences Union in 2016, in the spirit of informally passing along some potentially useful advice. I had no thought of publication. However, several people thought the law, place, history framework useful enough to convey to a broader audience, and encouraged me to write this commentary. I appreciate that. Comments from Stuart Lane, Bruce Rhoads, and an anonymous reviewer were helpful in improving and expanding the original version.

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