This article discusses statistical means of controlling for the Holland effect in paleontology. When a stratigraphic series is truncated, the true last occurrences of taxa will be lost and their last occurrences will appear to be at the unconformity. This may lead to paleontologists misinterpreting the unconformity’s significance, seeing it as the signature of an extinction event rather than as normal variability in the fossil record. In this article, Shanan and his colleague first de-trended the raw data by examining the difference in extinction rates between adjacent stages; they then created a model to test whether poor stage preservation predicts high observed extinction rates. They found that it does, indicating that either that gaps in the rock record are a side result of extinction mechanisms, or (more likely) that vagaries of deposition and uplift are responsible for the “short term volatility” seen in extinction rates.

I was engaged by the authors’ discussion of their results, particularly their assessment of the model’s applications. In concise language, they conveyed how their findings related to trends observed in the fossil record, and warned against drawing oversimplified conclusions. I was interested in their assertion that a common cause for mass extinctions and age-correlative poor preservation was unlikely; unconformities and their ilk are conventionally thought to represent the same event in the fossil and rock records. Although the authors don’t rule out this hypothesis, their reasoning against it is solid. I’m curious, though, as to how rising sea levels would have a “deleterious” effect on sedimentation (but of course, that falls outside the scope of this paper).

I tend to get lost in statistically-based scientific papers because the thought process is typically excluded in favor of the results and discussion. Though I recognized most of the mathematical processes referenced here (like the extinction rate equation from class), I had a tough time understanding where the conclusions sprang from and what, exactly, their significance was. Figure 2, for example, was puzzling to me. What is meant by a smooth extinction rate? Minimal noise? What is meant by a constant extinction rate? Does this mean the model was based on the assumption that background extinction was the dominant signal? Though I expect most of this paper’s readers are already familiar with the math involved, some definition of terms would have gone a long way for me.

Was there any way to factor in the amount of time over which each formation was exposed? Given that prolonged exposure is known to exert an effect on the fossil record, it would be an important variable to consider. For example, Pennsylvanian-age marine sediments that have been exposed for 100 Ma are more likely to exhibit reduced diversity compared to Ordovician-aged sediments only uplifted since the Eocene. However, it is possible that I misinterpreted the role of exposed sediment in their model; perhaps the conclusions are of the sort where duration of exposure is irrelevant.

Figure 1 was very interesting. 1a graphed the number of named formations against extinction rates over the Phanerozoic (excluding the Cambrian), and, interestingly, only the Permian displayed a negative correlation between amount of marine sedimentation and extinction rate. All the other “big five” showed no apparent trend that would have supported a common cause. 1b and 1c

Figure 2 showed how the two scenarios yield results on entirely different scales. 2a had a y-axis scale that went to 0.16, while 2b’s y-axis scaled to 1.2. So, the magnitude of changes in extinction rate were suppressed in a world where formations represent the same amount of time and extinction rates are largely unchanging.

Figure 3 was somewhat inscrutable. I gathered that it was comparing the

I found the table to be difficult to decipher without some understanding of the scale. Though I understand the metric, I’m unsure of what a “large” R would look like, and how significant the decimal points are. Is the table saying that the Rs are clustered, or is the point to show how they vary after the decimal points? Of course, someone with experience in the field would understand the table far better than I did.