area, it is quite possible they have been overlooked.

Whatever the cause of animal entrapment in the caves, at some point afterwards the caves were flooded, something that frequently happens in karst terrains either by a regional rise of the water table or by temporary plugging of a subterranean drain. Such episodes were characteristic during the Ice Age (a direct consequence of the Genesis Flood[4]) and especially towards the end of it, when rapid and major oscillations of the ocean level occurred.

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Katrina's splay deposits: a small example of the power of flowing water

Tas Walker

On the morning of 29 August 2005, Hurricane Katrina crossed the Louisiana coastline, creating a massive storm-surge that burst through several levees around New Orleans and flooded some 80% of the city.[1] Water derived from Lake Pontchartrain, located to the north of the city, poured through breached levees transporting sediment and debris, dumping it into adjacent neighbourhoods.

The flooding disaster happened quickly, inflicting much suffering on the people of New Orleans. As well as the human tragedy, there were geological impacts that have implications for interpreting sedimentary strata and our views about the past.

Geologists Stephen Nelson and Suzanne Leclair from the Tulane University in New Orleans documented the geological effects for one neighbourhood associated with a breached levee and subsequent flooding from Lake Pontchartrain.[1]

Description of the event and the deposit

At the southern end of the London Avenue Canal a thick accumulation of sediments splayed outward from a 61-m-long breach, the longest of the splay deposits extending some 400 m.[1] Generally the sediment lobes occupied the open areas, like the streets and the park, indicating that the water flow was obstructed by the alignment of the houses. The deposit had a volume of 26,380 m^3 and covered 54,670 m^2 of the neighbourhood (not including the areas occupied by the houses).

The levee breached between 7 and 8 am, and it was two days before repairs began,[2] by which time water in the neighbourhood had stabilized to the same level as Lake Pontchartrain.

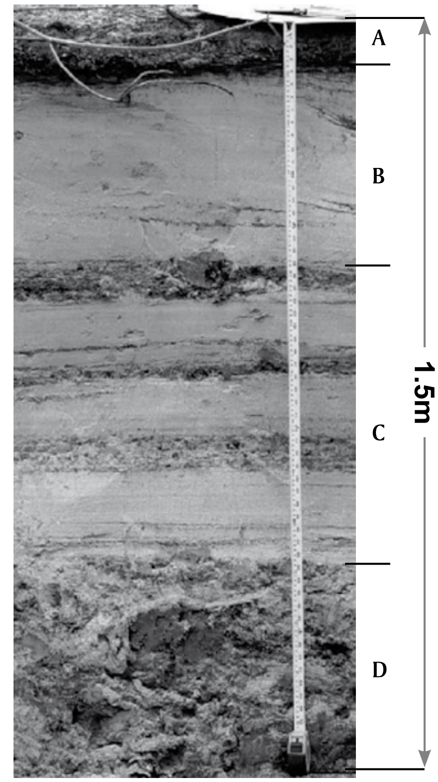

Figure 1. Vertical section through one of the thicker parts of the splay deposit. (From Nelson and Leclair[1]).

The neighbourhood immediately surrounding the breach is 1.0–1.4 m below sea level, and at the time of the levee failure, it was as much as 2.5 m below the maximum water level attained in Lake Pontchartrain.

This difference in elevation meant that the initial torrent of water pouring through the breach was incredibly powerful. The force of the moving water removed a house from its concrete foundation and propelled it 35 m into a tree, rotating it 137 degrees.[1]

Storm water also transported a mixture of sediments as it moved through the open space in the levee. The deposit appeared to be composed of sand but, as the sediment was removed during the clean-up, it could be seen that the sediment lobes consisted of distinct layers. The maximum thickness of the deposit was 1.8 m just north of the breach, and it tapered to less than 0.3 m at the ends. Most of the material has now been removed.

In the vertical section in one of the thicker parts of the deposit

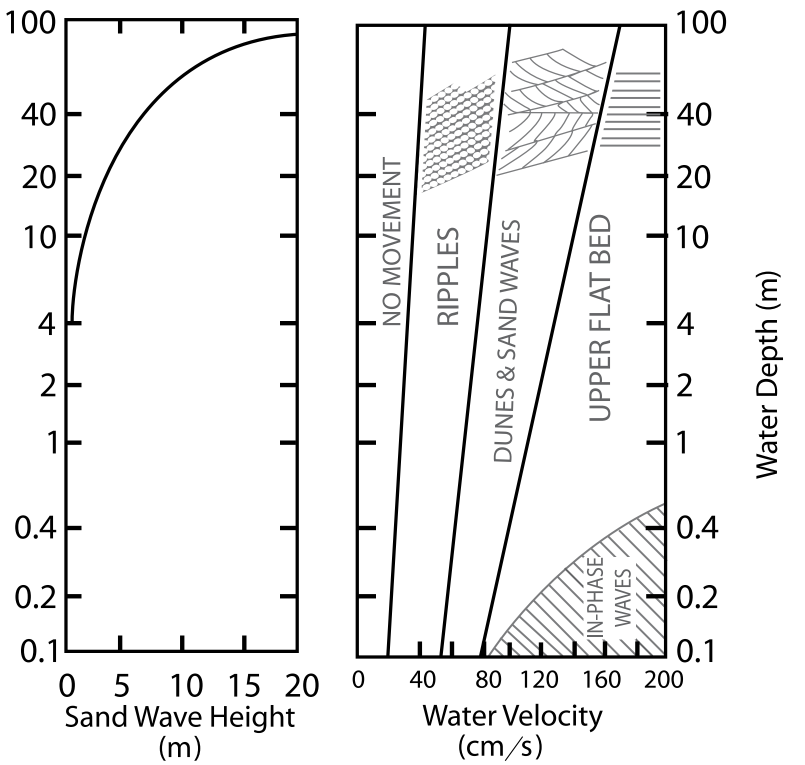

Figure 2. Bedforms expected in fine sand under different water conditions. (After Rubin and McCulloch[3]).

(figure 1) the bottom portion (labelled D) is an unstructured massive sandy layer. This was overlain by several light and dark planar strata (labelled C). Planar strata were dominant and continuous throughout the street exposures. The light strata were mostly sand, and the dark strata consisted of mud, clay balls and organic material. Above the planar strata and extending almost to the surface were several cross-strata sets (labelled B) of medium-scale (~10 cm). Finally, a layer of organic material, consisting of water-logged leaves and twigs, was deposited on top (labelled A).

The sediment section was wholly deposited by one relatively high-energy flow. The absence of small-scale cross-strata formed by ripples suggests that very little deposition occurred from slow-moving currents. Thus the flow velocity must have decreased rapidly, and most deposition probably occurred in a short time, probably less than one day. There was little reworking of sediment.

The sequence of events can be readily interpreted using an understanding of the various depositional flow regimes for sedimentary strata as have been determined experimentally (figure 2).[3] Planar deposits are characteristic of the fastest flow regime, and occur typically when flows exceed about 1 m/s. Since planar strata are dominant throughout the exposure it is clear that an upper flow regime prevailed during most of the deposition.

Cross-strata sets are characteristic of slower flows. The larger cross-strata sedimentary structures tended to be limited to areas near obstacles where the flow was slowed and disrupted.

Effect of changing flow conditions

It is apparent that the whole deposit of sand was laid down quickly as water flooded into the neighbourhood, and the different characteristics observed in the vertical section represent changing flow conditions.

The bottom section represents the first sediments carried into the area by the initial turbulent torrent. The flat layers above were deposited from a continual flow of high velocity water as the water level in the neighbourhood rose. The next section, with the sand dunes, was deposited when the water slowed down. And the organic twigs and leaves were left in a layer on the top.

Application to ancient sedimentary deposits

The deposits at the London Avenue levee provide a small insight into the enormous energy of ancient catastrophic processes. Planar strata are common in the sedimentary record, but there are usually many more strata in a vertical section (which makes the deposit much thicker) and the strata extend much further laterally.

For example, figure 3 shows planar strata inclined along the coast near Wellington, New Zealand. These have been interpreted as turbidites, deposited catastrophically and intermittently, and are typical of the Torlesse rocks that form much of the 'foundations' of those islands.[4] Yet we do not find evidence of multiple time breaks between the layers, which we should expect if these sediments were laid down over millions of years. Such turbidite deposits are often called flysch,[5] which consists of a thick sequence of interbedded marine shales and greywacke sandstones. Examples

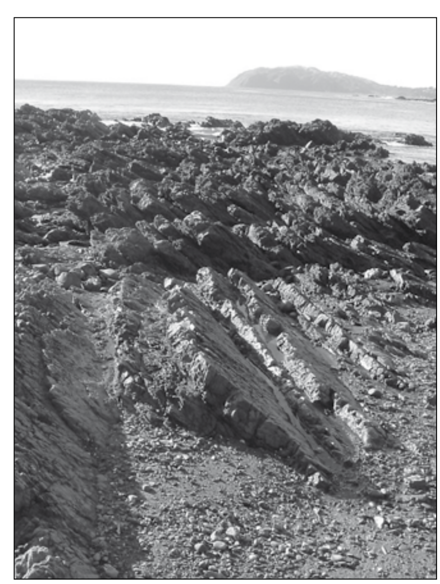

Photo by Tas Walker

Figure 3. Tilted turbidites on the coast near Wellington, New Zealand.

Figure 4. Ashfield shale, west to Sydney, Australia, is a thick formation composed of distinct planar strata.

of turbidites are numerous including ones from Victoria Australia,[6] Siccar Point Scotland[7] and Spain.[8]

Another example of a planar sedimentary deposit is found in the Ashfield Shale west of Sydney Australia, which is composed of distinctly planar strata (figure 4). Layer upon layer of flat beds have been deposited without any sign of a depositional break. In the underlying Hawkesbury Sandstone, Patrick Conaghan has identified flat-bed strata that extend right across the 250-km wide Sydney basin.[9] He concluded they would need a massive catastrophic cause and suggested the deposits are the product of repeated failures of huge natural dams.[10]

From eyewitness reports of the levee failure during the Katrina disaster, we know the sort of sedimentary deposit that a 61-m breach in London Avenue levee can produce. It can stimulate our thinking toward the scale of processes we should envisage for deposits that are 250 km wide. If the width of the catastrophic deposit is 250 km, what sort of thickness should we be looking for as we try to piece together the effects of past processes?

Interpreting past depositional environments

Modern geology, based on the idea of uniformitarianism, is committed to interpret geological deposits in terms of different environments over long periods of time. If we were so inclined, and if we did not know better, we could develop such an interpretation for the deposit at London Avenue.

The bottom section could represent an environment of mudflats along a sheltered shoreline, and the absence of structure attributed to bioturbation by bottom-dwelling marine animals. The next section, the series of plane strata and could represent the intertidal shoreline alongside the mudflats, where the sandy strata with the marine shells could represent a lake deposit, and the dark organic rich strata could represent an estuarine environment. The overlying cross bed strata could represent a beach deposit, and the organic deposit at the top could represent a peat bog as is found in a perched marsh along the coast (figure 5).

Such an erroneous interpretation could easily be developed for the deposit if we did not know the circumstances surrounding its formation. Although the interpretation may seem reasonable it would be wrong because our assumed timescale had led us to wrongly interpret each part of the deposit as a different environment. But because it is known how long the deposit took to form, our interpretation is quite different. The vertical section does not represent a series of different environments over an extended time but a logical flow progression as water entered the area.

Areas covered by ancient oceans

Based on the volume of the deposit and its composition (fine sand, clay balls, organic material and marine shells), Nelson and Leclair concluded that most of sediment was scoured from the *bottom* of the canal as the water rushed into the breach. Sediment was excavated from as much as 7.6 m below the water surface of the canal.

This is different from the classic model of sedimentation, in which erosion is assumed to occur on land due to the weathering action of agents such as rainfall, heat, cold, wind, and gravity. In other words, the environment from where the sediment is removed (subaerial) is different from the environment where sediment is deposited (submarine). From these assumptions, maps are often produced showing areas of a continent that were above water and below water based on the extent of sedimentary deposits.[11]

But for the New Orleans deposit, erosion and deposition both occurred in a submarine environment.

Extending such a model to the global Flood, we can envisage how it could be possible during the Flood for an entire continent to be under water even though sedimentation was occurring in a much reduced area.

This impinges on the issue of the Flood/post-Flood boundary. One argument against the boundary being in the Cenozoic is that there is no evidence of a global inundation in the Cenozoic. However, that conclusion is based on areas of sediment deposition, but it is feasible for the areas inundated to be more extensive than the areas of deposition.

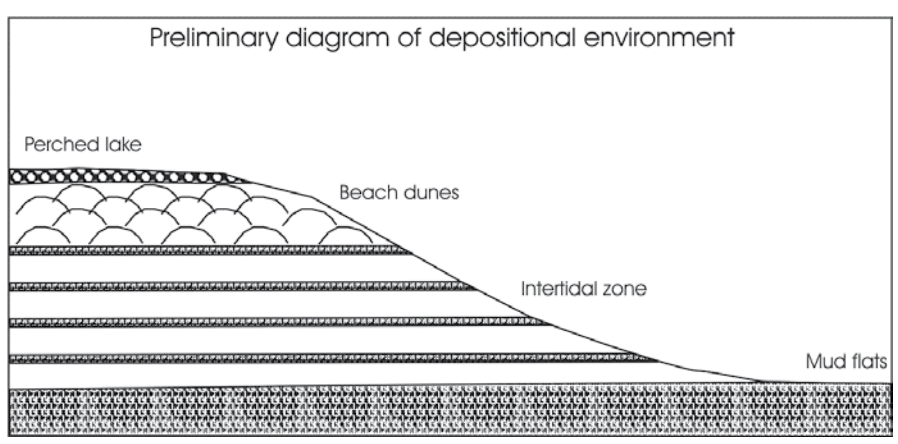

Figure 5. Hypothetical and erroneous depositional environment for the sedimentary section at London Avenue.

Conclusion

The failure of the levee at London Avenue, New Orleans, during Hurricane Katrina illustrates how flowing water can produce geologic changes rapidly. The splay deposits provide insights into the sorts of sedimentary structures that can be created within short timeframes. Extending the limited processes at New Orleans to the global scale of Noah's Flood has implications for the way in which ancient geological deposits are interpreted, particularly the scale of sedimentary deposits, depositional environments and areas once covered by ancient 'oceans'.

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Feathery flight of fancy: alleged 'protofeathers' fail under close scrutiny

Shaun Doyle

Sinosauropteryx prima (figure 1) has been one of the most prominent fossils put forward in the last decade in support of dinosaur-to-bird evolution. It was first reported in *Science* in 1996,[1] and was excitedly hailed (along with certain other fossils) by evolutionists as prime evidence that feathers evolved in dinosaurs, who declared that 1996 was 'a good year for finding fossils that tell us about the origin of birds.'[2] The cause of the controversy and media attention was the presence of hard, bristly fibres in the skin on the back of the neck and on the tail of the *Sinosauropteryx* fossil.

Even then, there was much debate among evolutionists about whether these fossils, especially *Sinosauropteryx*, provided evidence for dino-to-bird evolution. Just a year later Larry Martin suggested that the fibres found on the back of the neck and tail of *Sinosauropteryx* were likely 'frayed collagenous fibers under the skin'.[3] Since then, further research has suggested that the 'protofeathers' of *Sinosauropteryx* were not protofeathers at all.[4]

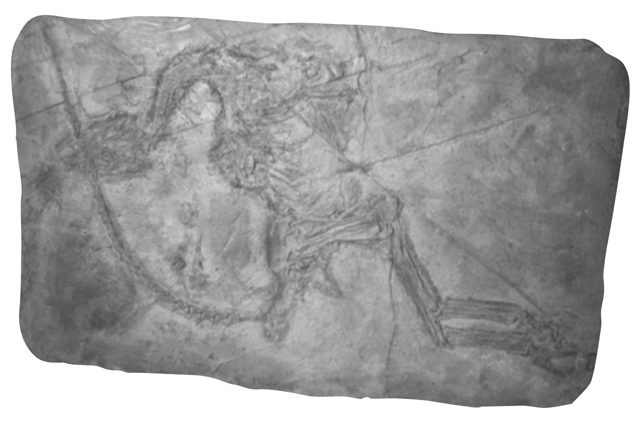

Figure 1. *Sinosauropteryx prima* was a find hailed by evolutionists as evidence for feather evolution in dinosaurs.

Now, a team of researchers led by Prof. Theagarten Lingham-Soliar from the University of KwaZulu-Natal in Durban, South Africa has added to the mounting body of evidence that shows that *Sinosauropteryx* is *not* a dino-to-bird intermediate fossil that possesses 'protofeathers'. The research team also included ornithologist Alan Feduccia, a well known critic of dino-to-bird evolution. They reported in *Proceedings of the Royal Society B* that the filamentous structures in the skin of a recently discovered *Sinosauropteryx*—often touted as 'protofeathers'—are nothing more than structural collagen.[5]

Lingham-Soliar *et al.* are also aware that many evolutionists will be very sceptical of their findings because of a strong attachment to the evolutionary dino-to-bird paradigm. Therefore, they have sought to counter a likely objection: that the method (standard light microscopy) they used to identify the filamentous structures as collagen is inadequate for identifying dermal collagen.[6] They listed in the 'Materials and Methods' section of their paper numerous examples and references of successful identification of dermal collagen in a wide variety of animals, both fossil and modern, thereby demonstrating that standard microscopy was 'more than adequate' for the task.

These findings have sent orthodox dino-to-bird believers into damage control. David Unwin, dinosaur expert at the University of Leicester, UK, is convinced that the work of Lingham-Soliar *et al.* is solid. However, he also said, 'There's no need to panic. This doesn't in any way challenge the idea that dinosaurs had feathers and that dinosaurs gave rise to birds.'[7] This completely flies in the face of the report