BRIDGE STALACTITES

YOUNG EARTH CRITIC CLAIMS CREATIONISTS can't argue that rapid formation of stalactites on bridges proves that cave formations can also happen quickly because: "Stalactites that form on bridges are formed in totally different conditions and are chemically distinct from stalactites that grow in limestone caves. Formations found on bridges are made up of gypsum, which is a salt of calcium sulphate and unlike calcium carbonate is moderately soluble in water, which means that it recrystallizes much more rapidly. Anyone with even a basic knowledge of chemistry can appreciate the properties of calcium carbonate when compared with gypsum."

ED.COM. To test this criticism, we asked three of our researchers to visit a bridge, collect stalactites and stalagmites and run chemical tests. Comments on the tests came from a Chemistry professor at Tennessee Technical University, Cookeville, Tennessee USA.

The basis of this gypsum stalactite criticism seems to be a paper by Loftin, Robert W. 1988 "Caves and Evolution" p21-28 in Creation/Evolution Issue XXIII Spring 1988, published by the National Center for Science Education USA (NCSE) which further refers you to a paper by White W.B. 1976 on 'Cave minerals and Speleothems' in T D Ford and C H D Cullingford "The Science of Speleolgy (Academic Press).

BRIDGE LOCATION:
Old hwy 111 south out of Cookeville, Tennessee USA.

BRIDGE AGE:
Approximately 60 years.

CEMENT CHEMISTRY: current formulation uses about 5% gypsum in the mix, and this has been common practice for the length of time that concerns our bridge.

METHOD AND RESULTS

Robert Rowe MSc reported (Dec 04): "We have had heavy rain over the past few days, so I had to go on the North side of the bridge because the river was overflowing its banks. On this side there were plenty of stalactites and a couple of good size stalagmites, which I collected. When the stalactites were dropped into Muratic Acid (31.45% HCl) all produced an immediate bubbling reaction and complete dissolving of the stalactite. There was no odour with the reaction and an absence of any insoluble residue, which probably indicates there was no other substance involved in the reaction.

Geologist Robert Stewart reported (Dec. 04): "Stalactites on the south side of the bridge range in size from newly forming ones 6mm (¼") to mature examples 25cm (10") long. All showed violent reactions to 10% HCl and even effervesce in vinegar (about 5% acetic acid, a very weak acid). These results are a key indicator for calcite or $CACO_3$.

The Chemistry Professor confirms "the test indicates the stalactites must be made up of $CaCO_3$, since CaSO4 would not have the reaction described. In addition the solubility of $CaCO_3$ is 0.0014g/100g water and $CaSO_4$ is 0.204g/100g. Said in another way, on a molar

basis, the solubilities are 0.0015 mol/L and 0.00014 mol/L respectively, so $CaSO_4$ is about 10 times more soluble than $CaCO_3$. The significance of this to stalactite formation is that the less soluble something is, the easier it is to precipitate and the harder it is to dissolve. Since $CaCO_3$ is harder to dissolve in H_2O than $CaSO_4$, then it will precipitate first from an aqueous solution. Also $CaCO_3$ solubility is dependent on pH, which $CaSO_4$ is not. The lower the pH (more acidic), the more $CACO_3$ dissolves." All of which ads up to gypsum being unsuitable for stalactite formation as it will stay in solution and drip off the bridge, but $CACO_3$ is very suited to stalactite formation.

Calcium carbonate dissolves in the mildly acidic water produced by runoff over decaying leaf accumulations in bridge crevices, gutters etc, yet its low solubility means it can still precipitate as a stalactite/mite, when the solution is exposed to an evaporative source, and/or it loses CO_2. In addition, any lime based cement will form $Ca(OH)^2$ during production, which when poured in place, will react with CO_2 in air to form a surface coat of $CaCO_3$ or calcite, which is a major source of the calcite in bridge stalactites and stalagmites. Therefore the process of stalactite/mite formation on bridges is identical to that in caves which are solid limestone.

In addition, the conditions on open space bridges are far more hazardous for the growth of stalactites due to the possibility of damage from storm winds, ice/hail, bird impact, heat/cold contraction etc, so the rate of formation on bridges is likely to be slower than that in actively growing caves.

John Mackay has encountered many calcite stalactites up to 60cms (2') long, in abandoned man-made caverns in limestone quarries that are less than 100 years old. He has also visited many gypsum deposits and mines and finds gypsum exhibits little tendency to form stalactites in dry or wet caverns (or anywhere) and mostly a tendency to form small claw like crystalline growths.

CONCLUSION

The process of stalactite formation on cement bridges is identical to that in caves which are solid limestone, hence the rates of bridge stalactite formation provide good evidence that cave stalactites can also accumulate rapidly and as such are no evidence that long time spans are necessary for cave formations.

The gypsum stalactite chemistry claims made in the paper by Loftin, Robert W 1988 "Caves and Evolution" p21-28 in Creation/Evolution Issue XXIII Spring 1988, published by the National Center for Science Education USA (NCSE) is provably false.

We trust this is helpful to our readers and leads you to realize that anti--creation sources such as the NCSE USA, which is a leader in the fight to keep/get creation out of USA Public Schools, is not as reliable, scientific or unprejudiced as it would like us to think.