

Bird nests and forensic geology

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A recent publication presented mineralogical analysis of bird nests from both rural and urban areas. It was found that the birds use minerals with specific characteristics and that they get them from a significant distance from their nests if these minerals are not found close by such mineralogical analysis of bird nests can have a significant impact on forensic geology and as a result on criminal investigations.

A recent publication was the first to present a mineralogical analysis of bird nests from both rural and urban areas¹. It was found that the birds of the three studied species use minerals with specific characteristics to build their nests. The minerals that they choose are white or colourless, lightweight (low specific gravity), low values of hardness and with a specific grain size that differs for each species. Also, the materials that they choose to use as cement are clay minerals, with a preference for those with high plasticity values like smectite¹, in other words, they choose the clay minerals that are more efficient for cement applications, if they are accessible in the boarder area of the birds nests. The birds can get the minerals from a significant distance from the nests, if these minerals are not found close by. Clay minerals are easily transported in the bird nests crime scenes; they are commonly found in the clothes and tools used in crime investigations.

The mineralogical analysis of bird nests can have a significant impact on forensic geology and as a result on criminal investigations.

Forensic geology is the science that uses geology to investigate crimes. Several cases have been reported in which forensic geology was a critical factor in crime investigations in countries like USA² and Australia³. For this purpose, usually samples from geological materials (commonly clay and dust) are collected from the victims and suspects. The samples are collected from clothing, jewellery, footwear, shovel or other tools, vehicles, etc.⁴. These samples are compared with known samples connected with the investigations, like control soil samples, reference soil samples, etc.⁴. The number of soil samples must be at least five and not less than three samples⁴. Depending on the crime scene, the samples' number may be increased with the main purpose of collecting and

preserving impartial and representative samples⁴. The amount of collected material is very low (probably a few grams), while for the determination of geological location, the selection of samples is critical because only small discrete samples can characterize individual locations and therefore bulk samplings is not ideal⁵. Thus, characterization of individual locations should take into account materials that can be transferred by animals like birds. Bird nests are not rare in rural and urban areas where crimes take place while bird nests are often broken or at least partially damaged over time by weather phenomena or animal actions (including humans). As a result, bird nest materials can end around the nests (e.g. around a house) and it is possible to be found in a crime scene and on or in clothes or bodies of victims or suspects. As it was stated above, the amount of the geological samples collected in crime scenes is low and therefore it is possible not to find bird nest material in the collected samples despite the fact that it could be present. In cities, villages,

suburbs or areas with only coloured rocks like ultramafic rocks (e.g. peridotites), the birds would have to get the minerals (colourless or/and white) for building their nests from other areas. In such areas, if some colourless or/and white minerals are found under a criminal investigation, the hypothesis of the transportation of these minerals via human activities will be done while in fact there is the possibility of the origin of these materials from bird nests. This fact can confuse the researchers if materials of the bird nests of the area are not analysed. As a result, the new data published on bird nest materials¹ raised the question about forensic geology being critical for crime investigations. Can the bird nest materials not be investigated and still have a representative sampling (as is still the case)? We believe that since it has been proven that bird nests are built by minerals that can be transferred from a significant distance and differ from the material close to the nest, this is impossible. Also in open cases where sampling has been conducted ignoring the nests,

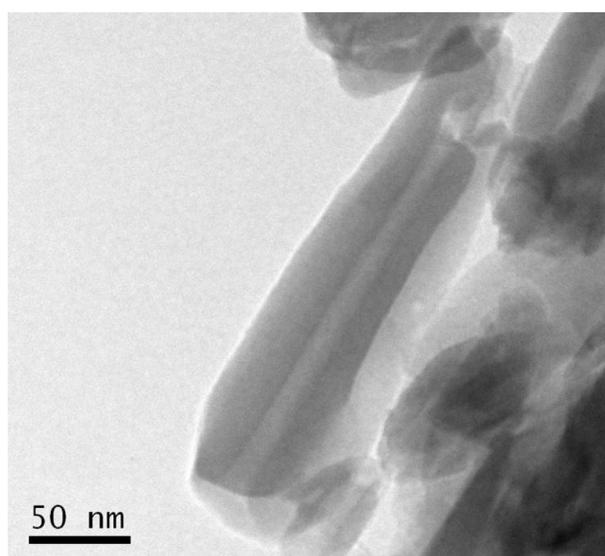


Figure 1. TEM image of halloysite, a clay mineral found in bird nests.

the sampling of bird nests could provide new data to contribute to solving them. In order to conduct a scientifically correct sampling, it is proposed that sampling from bird nests is necessary.

The aftermath of this new approach could be significant in several present and future criminal investigation cases. In forensic science, as times goes by, the scientific data, sampling and analyses are used more and more for the judgment and conviction or the acquittal of a suspect and for this reason new scientific investigations and approaches are developed. The better scientific support of any criminal case makes the justice system more reliable and the decisions more accurate. Therefore, the possibility of improving the methodology, and having more reliable scientific results and conclusions in forensic geology could have a significant impact on the lives of several people. That includes not only the victims or suspects, but also their families as well as potential future victims in

cases where the guilty persons are not arrested and convicted. Even more significantly, innocent people may not be falsely arrested and convicted.

Conclusion

Thus it is evident that bird nest materials should be sampled and analysed in cases where forensic geology could be helpful in crime investigations. In order to not delay the research and have good knowledge of an area in which a crime may take place (e.g. village, city), we propose that maps could be created by collecting small amounts of material from several locations and from damaged or partially damaged nests, and not by destroying nests for obvious ethical reasons. These maps would show the exact positions where bird nest materials consist of minerals that are transferred from different locations and which minerals they are. In this way a database could be created for

use in any criminal case with no delay and no destruction of bird nests.

1. Papoulis, D., Tzortzakaki, O., Avramidis, P., Mentis, P., Lampropoulou, P. and Iliopoulos, G., *Sci. Rep.*, 2018, **8**, 11050.
2. Webb, J. B., Bottrell, M., Stern, L. A. and Saginor, I., *Episodes*, 2017, **40**, 118–119.
3. Barrett, J., Official Magazine of the South Australian Police, 2003, vol. 3, pp. 9–11.
4. Fitzpatrick, R. W. and Raven, M. D., Guidelines for conducting criminal and environmental soil forensic investigations (V10), Centre for Australian Forensic Soil Science, Client Report: CAFSS_076 (version 10.1), 2016.
5. Pirrie, D., Dawson, L. and Graham, G., *Episodes*, 2017, **40**, 141–147.

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