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## Results of C14 analysis [of] Big Room guano deposits

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## Results of C<sub>14</sub> Analysis Big Room Guano Deposits

As visitors tour the Big Room of Carlsbad Cavern, they will walk by one particular interpretative wayside that describes what physical features appear beyond the sign and informs the visitor that bats once roosted in this area of the cave a very long time ago.<sup>1</sup> Earlier audio tour information indicated bat guano was deposited in this area of the Caverns around 17,000 years ago. When the new CD Rom audio tours were being developed and produced, consideration was given to use this information again. But once a literature search was conducted and no information could be found to confirm this date, a decision was made to exclude it. It is now believed that the date given on the old tour guide radio tape may have been based on earlier guano dating results conducted at Slaughter Canyon Cave (New Cave). It is postulated by this principal investigator (PLJ) that the dates assigned to the guano of SCC (New Cave) was extrapolated to Carlsbad Cavern.

There was an abundance of research materials in NPS CAVE Park files regarding guano and dating results for Slaughter Canyon Cave (New Cave). In a research project certification request completed by Dr. Donald A. McFarlane in 1987 (?),<sup>2</sup> he makes reference to a paper by J.M. Good, "Non-Carbonate Deposits of Carlsbad Caverns".<sup>3</sup> Dates mentioned by Dr. McFarlane established an age of the guano to be between 17,000 to 33,000 years old by radiocarbon dating methods. This principal investigator (PLJ) could find no such reference to these dates in this particular document by Mr. Good. In Dr. McFarlane's follow-up report of his research, investigations and samplings conducted in Slaughter Canyon Cave (New Cave) in 1988, he again cites information found in Park Files which discussed SCC (New cave) fossil guano and assigns ages of the guano to references dating back to 1954. In this report he states Park files indicate three previous attempts at radiocarbon dating of the SCC (New cave) fossil guano with each providing an "infinite" age, meaning that the true age of the deposit exceeded the limits of the radiocarbon dating techniques (approximately 35,000 years) at that time.<sup>4</sup>

This principal investigator (PLJ) was unable to locate reference materials that could substantiate this afore mentioned information. Either the NPS Park files are incomplete or there were files misplaced between Dr. McFarlane's files search and this principals investigator's search.

In a NPS handout on New Cave, written in 1989, it indicates that dates assigned to the age of the guano in New Cave was between 28,150 and 32,500 years BP.<sup>5</sup> In this same handout, other samples collected and dated were mentioned. The first sample was collected just inside the cave entrance and a date was assigned to it of 38,100 +/- BP. The other sample was collected approximately 100 yards into the cave and its date was assigned to 27,100 +/- 1500 BP. These assigned dates would appear to be quite plausible but no references (lab results, etc.) were found that could substantiate or confirm the information, therefore could not be considered reliable.

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<sup>1</sup>Carlsbad Caverns National Park, Interpretative sign, Big Room, Carlsbad Cavern.

<sup>2</sup>McFarlane, Donald, A. (1987) Research Project Certification Request, Carlsbad Caverns and Guadalupe Mountains National Parks unpublished report, pages 1-8.

<sup>3</sup>Good, J.M. (1957) "Non-Carbonate Deposits of Carlsbad Caverns", *Bulletin of the National Speleological Society* 19:11-23.

<sup>4</sup>McFarlane, Donald, A. (1988) "Preliminary report of Research on Modern and Fossil Bat Guano Deposits from New Cave and Carlsbad Cavern, Carlsbad Caverns National Park", unpublished report, pages 1-5.

<sup>5</sup>Baldino, T., Roth, J., Cordero, David and Ann (1989) "New Cave Handout", Carlsbad Caverns National Park unpublished report, pages 4-5 and 11-12.

One report did appear in the NPS files that proved credible. W.F. Libby of the Institute of Nuclear Studies at the University of Chicago, wrote a report/article that appeared in *Science*, 1954.<sup>6</sup> Radiocarbon analysis of guano deposits in New Cave resulted in an age of 17,800 BP or older. The samplings were collected 2 feet below the flowstone cap rock well beyond the entrance of the cave. In addition, the article mentions that the date would appear to be contemporaneous with the same stage of bat activities in adjacent Carlsbad Caverns, five miles to the east. Lloyd C. Pray, California Institute of Technology supplies this information to Dr. Libby. Dr. Pray (1998) was still teaching at the University of Wisconsin in Madison.<sup>7</sup>

Since documentation of a viable date and specifically a date given to the guano in the Big Room could not be located in a reference search by this principal investigator (PLJ), it became clear that new analyses of the guano in the Big Room would be useful. Therefore, in 1998, a grant proposal was submitted to Carlsbad Caverns National Park and the "Adopt A Bat" program (which provided funds) for a request to study and collect for analysis, guano from the Big Room of Carlsbad Cavern. At the same time, permission was given to provide dates to bat remains found in Lower Cave (mummified bat remains). C<sub>14</sub> analysis of the bat remains was established to be 2,060 years BP.<sup>8</sup>

A date of 44,680+/- 1200 BP was assigned to the Big Room guano.<sup>9</sup> This resultant date provided by Beta Analytical Laboratory, Miami, Florida, had not been anticipated. In light of this date of 44,680+/- 1200 BP, it was suggested that additional sample be collected and sent to additional laboratories to collaborate this first date. Therefore, two additional geographically separated laboratories were contacted and the additional samples of guano were collected from the original collecting site and sent for analysis. The new analyses were conducted by Stafford Research Laboratories, Inc. of Boulder Colorado and the University of California at Riverside, Department of Anthropology, Radiocarbon Laboratory. Stafford Labs assigned a date of 42,510+/- 700 BP.<sup>10</sup> The University of California at Riverside, assigned a date of 50,300+/- 2200 BP.<sup>11</sup> It is normal procedure to average the three dates assigned. Therefore, averaging the three dates assigned to the guano deposits in the Big Room of Carlsbad Cavern, the age is **45,830+/- 1,366 BP**.

Now that this valuable information has been collected, such information can be given to the Carlsbad Cavern visitors and to other researchers. The new dates also pose some interesting questions about what it was like biologically and climatically in this region of the United States at the time bats were contributing the deposits of guano to the Big Room.

The last major subdivision of the Pleistocene Epoch was the Wisconsin Age. Between ice advances in the early Wisconsin Age, terminating around 60,000 BP, and major renewal of glacial activity in the late Wisconsin Age, around 32,000 years BP to 27,000 years BP, there was a long span of less severe climatic conditions known as the mid-Wisconsin, full glacial advancement receded, leaving southeastern New Mexico with conditions similar to present conditions found in southern Idaho.<sup>12</sup> During this period, many species of plants and animals (including bats) flourished or were able to hold their niches from invading species.

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<sup>6</sup>Libby, W.F.(1954) *Science*, "Chicago Radiocarbon Dates V", November, vol. 120, pages 733-742.

<sup>7</sup>.Pray, Lloyd C (1998), verbal communication with PLJ, information supplied to Dr. Libby

<sup>8</sup>Jablonsky, P.L. (1999). "14Carbon Analysis of Chiroptera Specimens and Guano Deposits", Carlsbad Caverns National Park, unpublished report 1-48.

<sup>9</sup>Jablonsky, P.L. (1999) "Final Report on Guano Analysis of the Big Room", Carlsbad Carlsbad, Carlsbad Caverns National Park, unpublished report, pages 1-7.

<sup>10</sup>Stafford, Thomas, (2001) Stafford research Laboratories, Inc. Boulder, CO, written communication.

<sup>11</sup>Selsor, Karen A. (2000) University of California, Riverside, radiocarbon Laboratory, Riverside, CA., written communication.

<sup>12</sup>Harris, Arthur H. (1987) "The New Mexican Late Wisconsin, East Versus West", *National Geographic Research*, 5 (2): 304-317.

Within recent years, staff and researchers at Kartchner Caverns in Arizona, collected samples of guano and sent samples for <sup>14</sup>Carbon analysis. Dating results assigned were between 40,220 and 49,340 +/- BP.<sup>12</sup> These dates fall into the same range of dates assigned to the guano of the Big Room in Carlsbad Cavern. Additional research data on the Pleistocene Epoch shows that abundant vertebrate remains were deposited in other caves including Dry Cave and U-Bar Cave, both located in close proximity to Carlsbad Caverns National Park.<sup>14</sup>

Now that valid and comparative dates have been established for other regional caves, plus firm dates established in Carlsbad Cavern, maybe it is time to re-examine deposits of guano found in other caves in Carlsbad Caverns National Park, especially Slaughter Canyon Cave. With the more accurate dating methods available today, and the lack of comparative data in Park files, a new and thorough study would seem appropriate.

Submitted by Patricia L. Jablonsky

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<sup>13</sup>Buecher, Robert. (2000) Dates assigned to guano of Kartchner Cave, Arizona, e-mail correspondence.

<sup>14</sup>Harris, Arthur H. (1989) "Reconstruction of Mid-Wisconsin Environments in Southern New Mexico", *National Geographic Research*, 3 (2): 152-163.