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Analysis of Feces and Hair Suspected to Be of Sasquatch Origin

The authors have examined five specimens of preserved feces and three specimens of animal hair suspected to be of Sasquatch or Bigfoot origin. They find that two of the fecal and two of the hair specimens are definitely attributable to known animals, but the remaining samples are not. Recognizing the limited sample studied, they call for further such analyses to ascertain the origin of the unidentified specimens.

The major problem associated with the phenomenon of Sasquatch is proof of its physical existence. Many types of circumstantial evidence already exist and are used by believers and skeptics alike. Believers consider that the Sasquatch phenomenon results from the existence of a large group of these creatures which have thus far eluded capture. These people also argue that each piece of circumstantial evidence by itself is not sufficient, yet when all the circumstantial evidence is combined, the proof for Sasquatch existence is overwhelming. Likewise, the skeptics argue that since all available evidence for the existence of this creature is purely circumstantial it cannot be used as convincing evidence of this creature's existence.

Our interest in Sasquatch spans a decade of research and effort. As biologists and anthropologists, we feel that the knowledge of these disciplines can bring new insight to the scientific study of certain types of phenomena, especially those for which only circumstantial evidence exists. We also hope that our studies may help to locate and identify some of the first tangible pieces of evidence that might help prove, beyond doubt, whether or not this creature actually exists. Our areas of research expertise pertain to the identification and evaluation of fossil and modern mammal hairs and to the analysis of mammalian fecal samples. These areas have become highly specialized over the past several decades, and we feel that the techniques developed for these disciplines can be applied to the search for the Sasquatch.

Obtaining well-documented fecal and hair samples of suspected Sasquatch origin has been difficult for several reasons. First, not many people who find those kinds of samples realize what they are or realize the important role the samples might play in proving the existence of these creatures. Second, some people believe that every hair or fecal sample found in a region of past or recent Sasquatch sightings must belong to that creature; and, third, even when a suspected fecal or hair sample has been located, few people know where to send it for analysis. In spite of these problems, we have had an opportunity to analyze several suspected Sasquatch hair and fecal samples. Unfortunately, we have not yet been able to achieve the breakthrough we are seeking and thus, for the present, can only provide additional pieces of circumstantial data. However, we hope that this article we will make our research and our willingness to examine well-documented hair and fecal samples of suspected Sasquatch origin known to others. In this way we hope that someday we may find that one piece of conclusive evidence which might help move current Sasquatch research out of the realm of the circumstantial.

COPROLITE RESEARCH

Scientists have been conducting analyses of prehistoric fecal specimens, called coprolites, for more than one hundred and fifty years. Mantell was one of the first to investigate ancient coprolites when he examined specimens of preserved fish (probably shark) feces found in Cretaceous chalk deposits in Sussex, England.[1] His examination of those specimens did not reveal much evidence about the diets of ancient sharks, but he recognized the potential scientific value of those coprolites. For example, he noted that the coprolites could be used as one type of evidence for the past existence of sharks in the Sussex region more than a hundred million years ago when the Cretaceous chalk deposits were being formed.

Other investigations of non-human coprolites followed, many of which are summarized in a recent book on coprolite research.[2] However, it was the later research on preserved human feces that helped to provide the greatest amount of coprolite data and which eventually led to the refined methodology which we are currently applying to our studies of suspected Sasquatch fecal specimens.

Harshberger may have been the first to realize the potential value of prehistoric human coprolites when he suggested that the undigested seeds and bones found in the feces of prehistoric man not only proved man's presence, but also could be used as a clue to the understanding of prehistoric human diets.[3] For the next sixty years few other scientists examined prehistoric human coprolites, mainly because no one had yet discovered a useful method of analysis that would prevent damage to the delicate tissue remains of animals and plants contained in coprolite specimens. Early investigators, such as Jones,[4] employed mortar and pestle to crush dried human coprolites and found that they contained the remains of seeds, acorns, and hickory nuts. Later, Webb and Baby broke open human coprolites recovered from caves in eastern Kentucky and found that the samples contained the remains of seeds and insects which were once part of prehistoric man's diet.[5] The next year, MacNeish noted that he had found broken fragments of ancient human coprolites in Mexico which contained evidence that prehistoric man in that area had eaten a diet of snails, insects, squash, and maguay.[6] Each of these early researchers provided data concerning man's ancient dietary record, but each was unable to derive a complete list of prehistoric diets since they had had to break or crush the coprolite specimens in order or examine the material inside. In doing so they inadvertently destroyed evidence of fragile components.

The real breakthrough in coprolite research occurred in 1950, when two Canadians[7] discovered a new method of coprolite reconstitution which returned the ancient dried specimens to their original moist condition and permitted the careful separation and analysis of all components. This new technique led to an expansion in coprolite work because it provided scientists with a processing technique that permitted a more precise evaluation of dietary components and also allowed researchers to examine for remains of fragile items such as parasite eggs and cysts. Unfortunately, one side effect of the newly discovered technique was that during the processing phase it allowed ancient coprolites to emit a noxious odor similar to the odor of fresh feces.

Another new development in coprolite research occurred when Martin and Sharrock introduced the idea of searching for preserved pollen in human coprolite specimens.[8] This approach not only provided new data on dietary components, but also permitted speculation concerning the season in which individual coprolites may have been deposited.

During the 1960's, Eric Callen became the recognized leader in coprolite research and after his untimely death in 1970, Texas A&M University became the new centre for coprolite research.[9] Since 1970 we have tried to continue the fine example set by Callen.[10]

At the Texas A&M University Anthropology Laboratory coprolite samples, such as those of suspected Sasquatch origin, are initially measured, weighed, and photographed, and their general appearance is described before the laboratory process is begun. Next, the samples are thoroughly cleaned in order to remove any surface contamination which may have adhered after the coprolite was deposited. Once cleaned, coprolite samples are subdivided for analysis and then placed in airtight containers. The amount of coprolite that is actually used for analysis varies. In some cases, where large-size specimens are available, a relatively large portion can be analyzed. In other cases, only a very small fragment is available for analysis.

Once the fecal material is selected for analysis, each specimen is placed in an airtight container, and to each sample is added a 0.5 per cent trisodium phosphate solution. The strength of the solution must be carefully regulated since Callen[11] showed that concentrations greater than 0.5 per cent will destroy the middle lamella of plant cells and thus cause the destruction of delicate plant tissues. Samples are then sealed and allowed to soak for periods ranging from three days to several weeks. The length of time needed to soak each sample is dependent upon a number of factors; however, deterioration does not seem to occur even after prolonged periods in the solution. For example, our studies have shown that there is no detectable sample deterioration even when coprolite specimens are allowed to soak for periods of up to three years.

When the rehydration process is complete, a notation is made of its colour, smell, and whether or not a thin scum appears on the surface. According to Callen,[12] the presence of a thin surface scum is an indication that meat was a part of the diet. Once these data are recorded, the material is processed through a series of clean brass screens. During this process the larger pieces of debris that are trapped on each screen are gently agitated to liberate any trapped pollen grains. The residue on each screen is stored for later analysis. The filtrate is then centrifuged and analyzed for pollen.

It is often difficult to determine the precise identity of a coprolite producer. To solve this potential problem identification is made at three stages of analysis: during the initial examination prior to reconstitution; during reconstitution; and during the analysis of coprolite contents.

Prior to reconstitution, the shapes of coprolites can give clues as to their origins. Fecal pellets from certain types of rodents, such as mice, pack rats, gophers, and moles, and from many herbivores, such as elk, deer, antelope, sheep, rabbits, and horses, can easily be recognized by their shapes. Coprolites from large carnivores are characterized by their hard outer coating of dried intestinal lubricant secreted as protection against intestinal wall perforation by ingested bone fragments. However, it is often more difficult to distinguish human specimens from animal coprolites which may be shaped like those of humans. The problem is compounded when samples have been crushed or fragmented. Another factor that makes fecal identification of samples from humans difficult is the great variety of shapes and sizes found in stools which result from varied methods of consumption or from widely varying human diets.

During chemical reconstitution, additional clues as to coprolite origin can be found. When they are placed in a trisodium phosphate reconstitutive solution, the liquid generally becomes tinted within seventy-two hours. The resulting colour and the degree of transparency are fairly reliable indicators of coprolite origin. Coprolites from carnivores usually leave the trisodium phosphate solution colourless or turn it pale brown to yellow-brown in colour. Transparency of the liquid is unchanged. Herbivores' coprolites turn the reconstitutive solution pale yellow to light brown in colour and do not change the fluid's transparency. Human coprolites, on the other hand, turn the trisodium phosphate solution dark brown to black and render it opaque. There is one additional clue that can be of use at this second level of identification—odor. In our experience, most non-human coprolites generally emit a musty odor during rehydration. Human coprolites, on the other hand, produce an intense fecal odor.

At the final stage, during the actual analysis of coprolite contents, coprolites can be separated based upon probable origin. Since herbivores generally eat a purely vegetal diet of foods such as grasses, leaves, and twigs, coprolite specimens that are composed entirely of these components probably represent the fecal remains of these types of animals. The carnivore diet consist mainly of animal tissues, thus their coprolites almost always contain traces of hair, bone fragments, feathers, scales, and insect exoskeletons. On the other hand, coprolites from omnivorous animals, such as bears and man, often contain the remains of both plant and animal debris. Therefore, knowing the diets of the potential animal sources of coprolites being examined is always useful. Unfortunately, in the case of Sasquatch this is a luxury we do not enjoy, even though some writers do discuss suspected dietary habits.[13]

Eyewitness accounts do offer some indications about the diet of Sasquatch. John Green reported that, based on newspaper reports, personal letters, and eyewitness accounts, Sasquatch is probably an omnivore. Among dietary items which apparently are most favoured by Sasquatch are: tree roots, grass, berries, deer meat, and garbage. Other foods apparently eaten in lesser quantities include: bear, sheep, chickens, cows, horses, rodents and other small animals, grubs, clams, fish, salmon, leaves and evergreen buds, grapes, flour, eggs and bacon, milk, and doughnuts. Green pointed out that nine of the reliable eyewitness reports refer to Sasquatch eating vegetal foods while only four refer to eating of meat.[14]

It is difficult to use the above data to formulate a Sasquatch dietary pattern, yet they do suggest a preference for vegetal foods. However, one fact is certain: if Sasquatch does exist, its primary diet item is not the meat of domestic animals such as cows, horses, sheep, or goats. Modern history shows that animals like the wolf, coyote, puma, cougar, and eagle have been hunted to near extinction because they have occasionally preyed upon domestic animals. If Sasquatch regularly preyed on livestock, then surely one would have been killed by now.

HAIR RESEARCH

The analysis of suspected Sasquatch hair specimens holds more promise of providing conclusive evidence for the existence of Sasquatch than does coprolite research. However, the advantage of coprolite analysis is that it can provide far more data and a greater variety of information than can the analysis of a single hair sample.

Our laboratory has thus far examined a number of suspected Sasquatch hairs. However, we were not the first to search for suspected Sasquatch hair specimens. John Green reported that in 1968 Wayne Twitchell found six hairs on a bush near Riggins, Idaho, near a reported sighting of two Sasquatch.[15] The hair specimens were sent for analysis to Ray Pinker, an instructor of police science at California State College in Los Angeles. His study revealed that the hairs did not match specimens from any known animal species and that they had some characteristics common to both humans and non-humans. In his final report, Pinker stated that he could not identify the hairs until he had had an opportunity to examine some authentic Sasquatch hair specimens.

Other people have collected and, in some cases, have sent suspected Sasquatch hair specimens to various laboratories for analysis. As reported by Green and John Napier,[16] some of the hair samples have been identified as being from known animals, yet others cannot be attributed to any known animal species.

During the past few months, we have spoken with several other scientists who, like us, are involved in the analysis of hair specimens thought to be associated with the suspected Sasquatch. However, to date neither they nor we have yet found a single hair specimen which we can definitely attribute to being of Sasquatch origin. Some of our hair specimens are puzzling and are not yet identified because they show similarities to certain known mammals yet are not identical to known hair samples from those mammals. We hope that as our research continues we will soon be able to determine whether or not these unknown hair specimens are from some as yet unknown animal group.

HAIR ANALYSIS

Mammal pelage is composed of several types of hair which are classified as guard hairs, body or underfur hairs, and bristles. The most useful type is guard hair. These are generally long and spear-shaped. Beneath the guard hairs are the softer, finer body or underfur hairs. They are often short, can be curly or straight, and are usually the same diameter throughout their entire length. It is the body hairs which provide most mammals with insulation and protection against the natural elements. Bristles, when present, are generally long, stiff, and straight, and often serve as sensory organs, as with the whiskers of most mammals.

Hair identification is sometimes difficult since many mammals grow two sets of pelage each year; a thinner, shorter one in summer and a longer, denser one during the winter. In some animal species the problem of hair identification is further complicated by seasonal changes in hair colour. Other identification problems can occur with the hairs of some animal species in which juveniles have hair colouration patterns which differ from those of mature adults. Despite these difficulties, morphological clues remain sufficiently constant so that accurate hair identifications, at least to the generic level, can generally be accomplished.

Typically, the structure of a mammal hair can be divided into three parts: the medulla, the cortex and the outer cuticle.[17] The central portion of a mammal hair often contains a medulla region, yet in some cases, as with man, this structure may be largely absent. When present, the medulla can be categorized as being: continuous (air spaces arranged in the form of a column); intermediate (separate air spaces arranged in a pattern); discontinuous (air spaces present but widely separated in the medulla); or fragmented (air spaces arranged in an irregular manner).[18] Surrounding the medulla is a dense, amorphous layer of keratin called the cortex. It makes up the bulk of a hair and contains most of the pigmentation. Outside the cortex is a layer of flat, overlapping, keratinized cells called the cuticular scales. It is the combined characteristics of these three structures, along with the hair colour, that are used for making identification of mammal hairs. This is possible since each animal species produces hair which contains a unique combination of the above characteristics.

SUMMARY

Thus far, we have examined five coprolite samples of suspected Sasquatch origin. Two of the fecal specimens were found in the Pacific Northwest region. We were unable to use the coprolite analysis to confirm the identity of the animal which deposited these samples. Our analysis showed that in almost every respect these samples were similar. However, some minor differences did exist. One sample did not contain any conifer needles. This could have reflected a slightly different diet preference, sampling bias due to having only one sample from each locale, or it could have meant that these samples reflected the diets of two different animal species. The pollen content of each coprolite was also somewhat different, but that was expected since the samples were recovered from different locales, each of which was characterized by different flora. We consider that the specimens could have been deposited by a cow or by some other large animal which had similar eating habits—a diet composed entirely of plant foods—and which produces large, unsegmented fecal masses. For both specimens we are able to rule out many large animals such as man, moose, elk, deer, and bear as being the organism that produced these samples.

The three remaining coprolite samples we have examined were collected on Mound Key in Florida. Everything about these specimens was radically different from the two coprolite specimens we examined from the Pacific Northwest. All three samples consisted primarily of remains of non-vegetal diets, only one containing a significant amount of any vegetal material (grass stems and leaves). None of these samples contained parasites. The Florida samples were produced by an organism or organisms which ate mainly small mammals, insects, birds, and crustaceans. One sample resembled coprolites produced by owls; however we cannot be certain that it was of owl origin. Two other samples were similar in many respects (smell, colour, dietary components) yet could have been produced by either the same or two different kinds of animals. The origin of these three coprolites remains a mystery. None of the specimens appear to be of human origin and whether or not they were of Sasquatch origin remains unknown.

As is the case with many scientists working with other types of Sasquatch evidence, we have not yet found a hair specimen which could be used as conclusive evidence to prove the existence of this creature. We have received specimens from three locations, each associated with Sasquatch sightings or footprints—two in California and one in Idaho. One set of hair specimens was that originally sent to Ray Pinker for identification. We have now had an opportunity to examine the hairs ourselves and have thus far been unable to match them to the hairs of any known animal. However, we are planning to send these hairs to other scientists and also plan to expand our own hair reference collection before we arrive at any definite conclusion concerning these hairs. Another hair sample expresses its greatest diameter at the base, a rare morphological trait which is typical of the tail hair of domestic cows. Also, the lack of a well-defined medulla region adds further strength to our conclusion that this hair came from the tail of a domestic cow (*Bos taurus*). The remaining samples have a granular medulla like that found in the hair of the black bear and not like the small discontinuous hair medulla characteristically found in anthropoids. On the basis of size, colour, and medulla structure and based upon comparisons with our collections of reference hairs, we conclude that these samples are from the black bear (*Ursus americanus*).

As scientists, we remain open-minded about the possibility of the existence of Sasquatch. A decade of research has shown us that there are many aspects about the Sasquatch phenomenon which cannot easily be attributed to any known animal species or be easily explained as fakery. However, from our studies there remains no conclusive evidence for or against the existence of Sasquatch and, as such, its existence remains an open question.

TABLE: MACROFOSSIL CONTENTS OF UNIDENTIFIED COPROLITE SAMPLES FROM MOUND KEY, FLORIDA

Macrofossil	Sample 3	Sample 4	Sample 5
Mammal hair	A	F	C
Mammal bones			A
Reptile bones	B		
Reptile skin and scales	A		
Grass stems and leaves	A		
Insect chitin	C	A	A
Feathers	B		B
Bird bones			A
Seeds	A		
Diatoms			A
Phytoliths			A
Crustacean fragments	C		A

Key: A = 0–5%; B = 6–25%; C = 26–50%; D = 51–75%; E = 76–95%; F = 96–100%

Notes

1. See G.A. Mantell, *The Fossils of the South Downs; Or Illustrations of the Geology of Sussex* (London, 1822).
2. Walter Hantzschel et al., *Coprolites: An Annotated Bibliography*, Geological Society of America Memoir no. 108 (Boulder, Col.: G.J.A, 1968) pp. 1–132.

3. See J.W. Harshberger, "The Purpose of Ethnobotany," *American Antiquarian* 17, no. 2 (1896): 73–81.
4. See Volney H. Jones, "The Vegetal Remains of Newt Kash Hollow Shelter," *University of Kentucky Reports in Archeology and Anthropology* 3, no. 4 (1936): 147–65.
5. W.S. Webb and R.S. Baby, *The Adena People, No. 2* (Columbus: Ohio State University Press, 1957).
6. Richard S. MacNeish, "Preliminary Archeological Investigations in the Sierra de Tamaulipas, Mexico," *American Philosophical Society Transactions* 44, no. 5 (1958).
7. See Eric O. Callen and T.W.M. Cameron, "A Prehistoric Diet Revealed in Coprolites," *New Scientist* 8, no. 190 (1960): 35–40.
8. See Paul S. Martin and F.W. Sharrock, "Pollen Analysis of Prehistoric Human Feces: A New Approach to Ethnobotany," *American Antiquity* 30, no. 2 (1964): 168–80.
9. Callen's reputation stems from a series of articles: "Diet as Revealed by Coprolites," in *Science and Archeology* (London: [?], 1963), pp. 186–94, "Food Habits of Some Pre-Columbian Indians," *Economic Botany* 19, no. 4 (1965): 335–43, "Analysis of the Tehuacan Coprolites," in *The Prehistory of the Tehuacan Valley: Vol. 1, Environment and Subsistence* (Austin: University of Texas Press, 1967), pp. 261–89, and "Les Coprolithes de la Cabane Acheuleene du Lazaret: Analyse and Diagnostic," *Memoires de la Societe Prehistorique Francaise* 7 (1969): 123–24.
10. Results of this research are published in Vaughn M. Bryant, Jr., "Prehistoric Diet in Southwest Texas: The Coprolite Evidence," *American Antiquity* 39, no. 3 (1974): 250–74, "Pollen Analysis of Prehistoric Feces from Mammoth Cave, Kentucky," in *Archeology of the Mammoth Cave Area* (New York: Academic Press, 1974), pp. 203–9, "Pollen as an Indicator of Prehistoric Diets in Coahuila, Mexico," *Bulletin of the Texas Archeological Society* 45 (1975): 87–106; Vaughn M. Bryant, Jr., and Glenna Williams-Dean, "The Coprolites of Man," *Scientific American* 232, no. 1 (1975): 100–109; and Burleigh Trevor-Deutsch and V.M. Bryant, Jr., "Analysis of Suspected Human Coprolites from Terra Amata, Nice, France," *Journal of Archeological Science* 5 (1978): 387–90.
11. See "Tehuacan Coprolites."
12. Ibid.
13. Such as John Green, *The Sasquatch File* (Agassiz, B.C.: Cheam Publishing, 1973) and John Napier, *Bigfoot: The Yeti and Sasquatch in Myth and Reality* (New York: E.P. Dutton, 1973).
14. John Green, *Year of the Sasquatch* (Agassiz, B.C.: Cheam Publishing, 1970).
15. *On the Track of the Sasquatch* (Agassiz, B.C.: Cheam Publishing, 1969).
16. Green, ibid., and *Sasquatch: The Apes among Us* (Saanichton, B.C.: Hancock House, 1978); Napier, *Bigfoot.*
17. See Martin F. Brown, "The Microscopy of Mammalian Hair for Anthropologists," *Proceedings of the American Philosophical Society* 85, no. 3 (1942): 250–74.
18. See Charles L. Douglas, "Biological Techniques in Archeology," *American Antiquity* 31, no. 2, part 2 (1965): 193–201.