The 'Beetle' Puzzle from 'A Treasure's Trove':
$50,000 Treasure Hunt Solved
David Somers, July 2005.

The book "A Treasure's Trove" by Michael Stadther is a fairy tale that is also a real treasure hunt. "A Treasure's Trove" reached #2 on one of the New York Times bestsellers lists and was featured on the Today show, Life Magazine, CBS Sunday Morning and other national media outlets. The author hid 12 golden tokens around the continental U.S. and hid clues to their precise location within the pages of the book. The prizes are very elaborate jewels formed into forest creatures, such as a dragonfly, a spider, an ant, and a beetle. The total appraised value of the 12 jewels is over $1 million, with some worth much more than others. There is one unique token and one unique puzzle for each of the 12. I solved the puzzle for the Beetle and together with my friend, Mark Moeglein, found the golden token in a knothole up a tree in the Badlands National Park, S.D. in July 2005 at 1 AM on a starless night. The token that we found is shown above. When the contest is over, we will receive the Beetle Jewel shown below, which has an appraised value of more than $50,000.

The main purpose of the present write-up is to explain the solution to the beetle puzzle and to summarize how we found it. There is also a more personal story of friendship and a terrific adventure shared by two families, but most of these details will be discussed elsewhere.

RHINOCEROUS BEETLE

An extraordinary piece that opens to reveal a 9-carat tanzanite surrounded by 12 colorless diamonds weighing 3. 8 carats. The Beetle weighs nearly _ pound. Its body is made of platinum and 18K yellow and green gold. The Beetle's head is covered with black diamonds and its belly is covered with white diamonds. The Beetle features a sophisticated mechanism; when the horns are pushed together, the wings pull back and the tanzanite-diamond setting emerges on its gold plate.

Polybius Code

"A Treasure's Trove" did not explicitly state how to find the tokens, it only stated that the pages of the book contained all of the information needed. Time has shown that the puzzles were hidden in the images of the book and did not utilize the text, but this is certainly not clear upon first reading the book. The images of the book hide a metapuzzle that forms a poem. The poem in turn provides hints as to the general form of solution to be used in each puzzle.

	1	2	3	4	5
1	A	B	C	D	E
2	F	G	H	I	J
3	K	L	M	N	O
4	P	R	S	T	U
5	V	W	X	Y	Z

The central puzzle for each token utilized a unique form of visual cryptography that served to index Polybius code. Polybius code is similar to Morse code or semaphore code in that it is more of a data transmission code than a strong encryption code. In Polybius code, rather than using dots and dashes or flag positions, letters are encoded as pairs of digits between 1 and 5. Decoding then employs a 5 by 5 checkerboard of letters (with one letter excluded, the letter Q in this case – the letter Q appears nowhere in the 100 page story) and then uses pairs of digits to index the letters. So 4,1 would represent D (or alternately P).

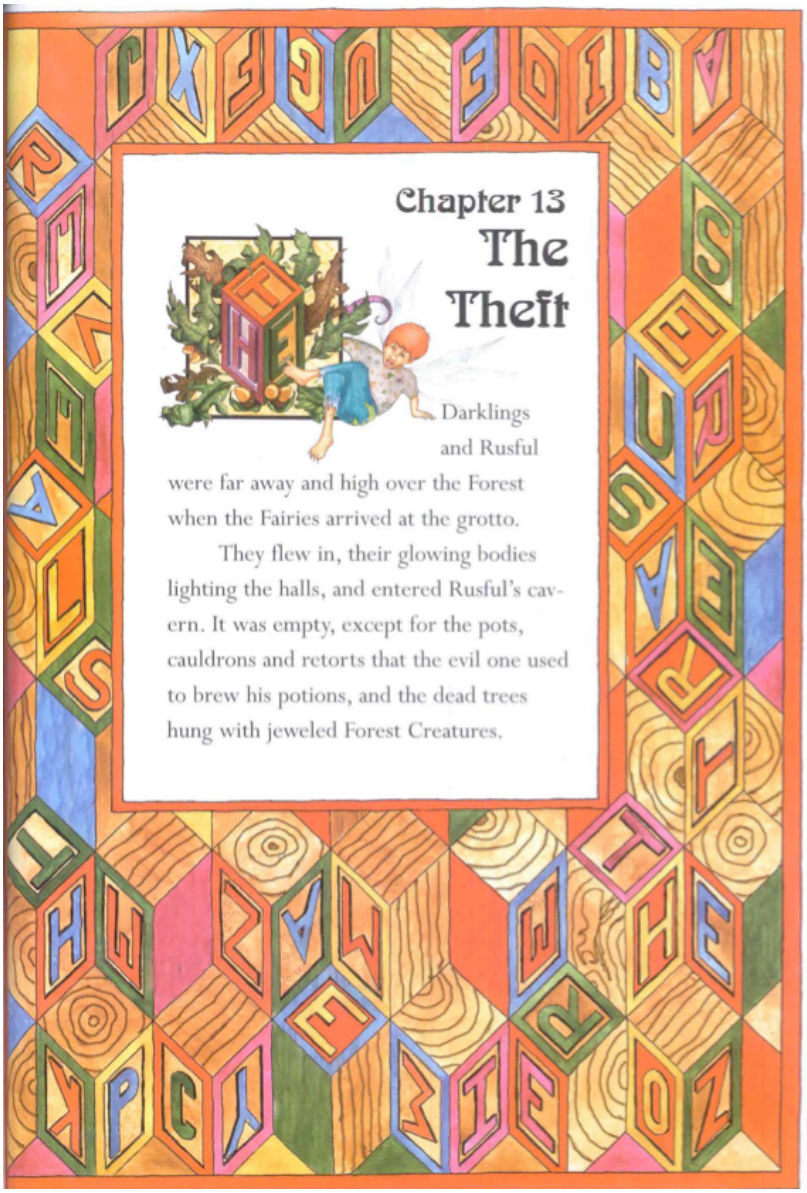
Polybius code is potentially much more devious than Morse code or Semaphores, because the five elements that serve to index the code could be any five distinct things. For instance, one code encrypt a message in Polybius code using a set of cars from five different manufacturers by parking them along a street in a particular order. Such encoded messages can very easily go undetected even when someone is seeking to find encoded messages.

Beetle Solution

The Beetle token was the last of the 12 tokens to be found. Some consider the puzzle to be the most difficult of the 12 puzzles since so many people tried and failed to crack the puzzle for so long. Approximately six months elapsed from the release of the book and the report of the first found token. An on-line community of puzzle solvers determined the general form of the solutions. All tokens were hidden in knotholes of trees located on publicly accessible land, such as city, state or national parks. The same general form of solution was employed for all 12 tokens, although each puzzle was unique. After the first token was found, the others fell like dominos, one after the next, spaced days apart. The rate of token finding slowed and a month elapsed between when the 11^{th} token was found and when we found the Beetle token. During that month, hundreds, if not thousands, of treasure hunters were focused on solving the Beetle puzzle.

All of the codes were visual in nature and did not rely on the text of the story. I believe that my expertise in both visual perception and mathematics were very valuable assets in this contest. The precise location of any token was encoded using only 3 images from the book, a primary puzzle page, a “drop cap” letter illustration (aka “fairy map”), and an illustration of the tree in which the token was hidden. The puzzle page would reveal the name of a park and a specific location within the park, such as an overlook, campsite or picnic area. The drop cap letter illustration included a small map fragment of the location in the park and a fairy pointed on the map to the location of the token tree. The tree illustration helped to identify the correct tree at that location. Each puzzle page and fairy map contained an image of the forest creature that it encoded, so that one could determine the correspondence between the puzzle elements.

The Beetle puzzle was encoded in the "Wall of Blocks" illustration that begins Chapter 13 on page 63, the fairy map is hidden in the "Drop cap" illustration that begins Chapter 15 (p. 69) and the tree illustration follows the drop cap and is on page 71 of the book (shown later). From these three images I was able to determine the exact tree that held the Beetle token, more than 1800 miles away from my home. This is a remarkable accomplishment for the puzzlemaker, Mike Stadther.



An image of a rhinoceros beetle can be seen in the wood grain on a block near the lower right corner of p. 63 and in the thick green vines of the drop cap.

From the "Wall of Blocks" puzzle, sequence of 15 characters can be deciphered:

"BADLANDSWROVRLK."

This was by far the most difficult part of the solution. Once I had found that message, it took me less than 15 minutes to decide to buy a plane ticket and rent a car the next morning to go collect the token. With only those 15 letters, I was quite certain that I knew the location of the tree within 100 yards and I felt extremely confident that when I got to the location that I would find the token within 15 minutes. This proved to be true. Prior to decoding those letters, I knew only that the token was in the continental United States.

Each of the puzzle pages employed a unique visual code to encode the numbers 1-5 in the image. In order to solve a puzzle, one had to determine which visual components held the "code of 5"

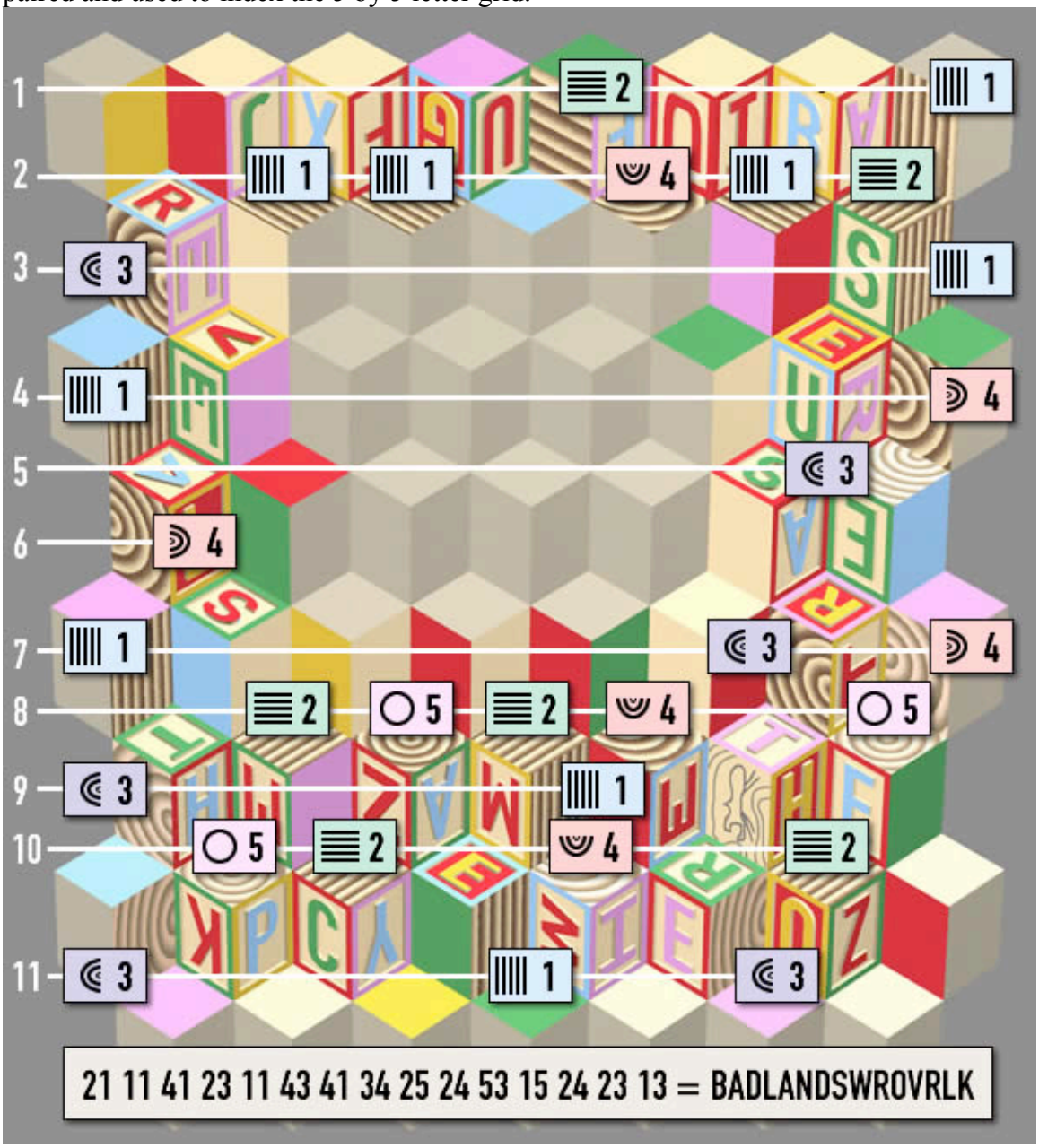
(or Polybius code) and determine which visual element corresponded to which digit. It was also necessary to determine a sequence in which to read out these digits. Finally, the digits were then paired into coordinates (e.g. 3,4), which were used as indices on a 5 by 5 grid of letters. The letter grid was simply the alphabet in order, excluding the letter Q (which appears nowhere in the book).

The Wall of Blocks page appears tantalizingly simple, but this proved to be the most difficult of the images to decode because there were so many possible (incorrect) coding schemes. The actual solution to the Wall of Blocks does not rely at all upon the letters on the blocks or any of the color information; rather the solution is encoded in the pattern of the wood grains on the blocks. However, a priori there was no way to know which component of the image would hide the token location information. Perhaps the fact that the image of a beetle can be seen in the wood grain on a block at the lower right gives us a hint to this, but it might also have simply indicated that this was the beetle puzzle page. Another difficulty in solving this puzzle is that there appear to be 8 types of wood grains shown on the blocks, rather than 5, which seem to make wood grain a poor choice for the "code of 5." In contrast, exactly 5 colors are used in on the woodblocks and thus make an obvious (but incorrect) choice for the code.

My key insight came from visual perception. One needs ignore the 2-D form of the wood grains and view them as parts of 3-D objects. Once one views each block face on, shifting perspective for top faces, right faces and left faces, the wood grains can be seen to consist of only 5 main types: vertical straight grain (V), horizontal straight grain (H), circular grain centered on the right edge (R), circular grain centered on the left edge (L), and a circular grain centered in the middle of the block (C). It must be noted that there are still at least two ambiguities in how to map these 8 face types into the 5 categories, but I was able to resolve this. It is also not obvious which sequence one should follow to read out the code of five. Other puzzle solutions read in clockwise or counterclockwise circular forms. My solution simply read them out as one would read a text, left to right, top to bottom. Thus from the wood grains I read out, as an intermediate step, the following pattern: HVVVLVHRVVLRLVRLHCHLCRVCCHLHRV.

There was the additional problem of converting HVLRC into 12345. There are 5! or 120 possible combinations. In addition, coordinate pairs could be either (col, row) or (row, col). To further complicate matters, most of the puzzles "threw out" a few of the code elements, thus shifting the coordinate pairings. (Here we had to throw out the "beetle" wood grain or the second to last R in the sequence). So it was important to look at both odd and even pairings for coordinates. This yields 480 combinations per wood grain sequence. I built a small computer tool to construct the full set of possible strings. However, this still left me the task of searching the 480 (vertical) letter strings for something sensible – a task that evokes scenes from "The Matrix" and "A Beautiful Mind." The solution was the 246th in my search list. On the first pass, I found only BADLANDS and some other letters that did not make sense, but I soon realized that if I threw out the Beetle wood grain block, I could get BADLANDSWROVRLK. The other 479 codes formed highly nonsensical strings like "HDCNOXVBWIFNCTA." While it is true that an infinite number of monkeys sitting at typewriters will eventually reproduce the works of William Shakespeare, it takes approximately 600,000 monkey years to match even 8 characters of any of his works and billions of billions of monkey years to match 15 characters. It was VERY unlikely that BADLANDS was a fluke result.

The following table and image illustrate the solution. The wood grain code has been converted to a “code of five” and read out as 21 11 41 23 11 43 41 34 25 24 53 15 24 23 13. These digits are paired and used to index the 5 by 5 letter grid.

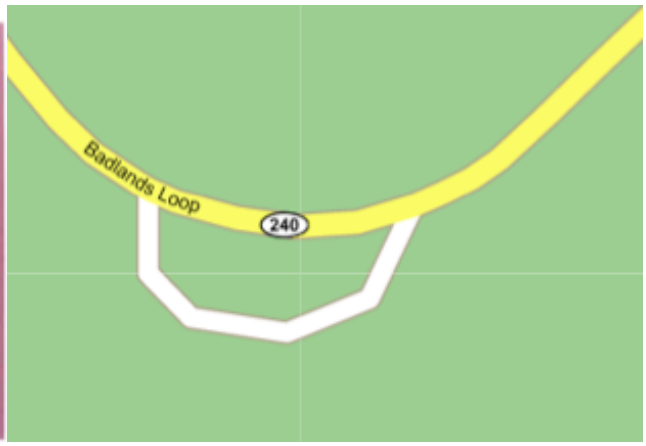


BADLANDS is the name of a famous national park, so that part was easy. The WROVRLK part is less obvious. Overlook locations had featured prominently in other clues and puzzles and one other token location had used the exact abbreviation OVRLK. A quick Googling brought up the park map for BADLANDS.

The park features 13 overlooks. Exactly one fits the WR abbreviation: White River Valley Overlook.

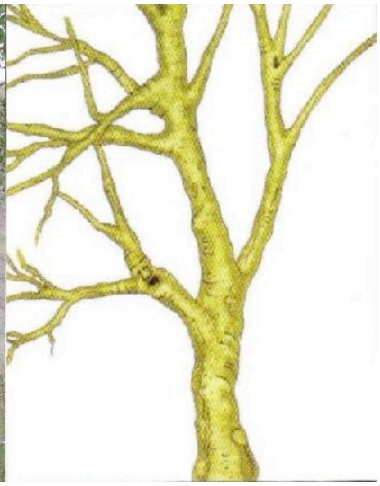
The Wall of Blocks puzzle told me to go to the White River Valley Overlook in Badlands National Park. I attempted and failed to get a close-up view of the roads at the overlook in order to try to get a match to the fairy map. However, I quickly concluded that this solution could not be a coincidence, as the odds against it were enormous. The token HAD to be there. So on the basis just 15 letters, I made the instant decision to drop everything and race to the Badlands. I also made the wise decision to try to convince my best friend, Mark Moeglein, to make the trip from his home in Oregon. Although a month had passed since the last token was found, in several prior cases the token finders beat their competitors by just minutes or hours. In a few cases, several groups were searching the same site simultaneously. We decided to act fast. In fact we were without competition as no one else would independently solve the puzzle, but we could not know that at the time.

I bought a last-minute ticket to fly the next morning Boston-Chicago-Minneapolis and then after several weather delays sped across 560 miles of prairie in a rental car to meet up with Mark in Wall, S.D. at 11pm. We organized our gear and headed off to the Badlands N.P. around midnight. The bad weather left us with a starless and moonless night and we drove the Badlands Loop road with only the occasional glimpse of the stark and stunning beauty of the park.



The overlook had a parking lot pullout from the Loop road so the black lines of the fairy map (at the top of the "T") matched quite well. Using the car headlights we scanned and found exactly one tree in the vicinity where the fairy pointed. I was quite relieved as I had some fear that the Badlands might be virtually treeless. We then headed off on foot about 75 yards from the overlook with a lantern, flashlights and other gear.

We had each traveled about 1800 miles on the basis of just 15 letters and when we got there a simple map fragment allowed us to find the exact tree we sought within about 3 minutes. In the darkness, it was hard to see the tree well enough to match it to the illustration, but it looked about right and besides it was the only tree for a quarter mile. In the light of the next day we could see that the match was remarkably good, although there must be thousands of trees that roughly match the illustration. But only one at the White River Overlook.



I'd assumed that the knothole in the illustration would be the one that contained the token, but this was not quite accurate. The actual knothole (shown right, with token) was higher up, about 8-9 ft off the ground. After about 10 mins of fruitless searching from the ground with flashlights and a lantern in the dark, things were not looking good. Mark made the critical decision to climb the tree to see if he could see anything more. I was convinced that climbing would not be necessary, but fortunately Mark ignored me. Within 30 seconds of climbing the tree, Mark peered down and announced, "Oh, there it is." It really did take us only 15 minutes to find it after our long journeys. Celebratory calls were made before even getting down from the tree, but we were both remarkably low-key given the events. We were also remarkably exhausted. On the back of the token was engraved a phone number and other information to allow us to redeem the token for the prize. The author later admitted that he did not climb the tree to plant the token, but just stood on the fallen limb at the base of the tree.

We spent the next day exploring the Badlands and informing other treasure hunters of our find. The Badlands is a place that I had always wanted to visit, so that was a bonus. But the real treat was to have a great adventure that involved my kids, my best friend, and my best friend's kids.