

# Cryptohunt Journal

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adventures took place 10/15-24/2018  
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## 1 Message in a YOSSCR

Given on 10/15/2018, an encrypted message appeared in group JNK's hands. Many observations were made upon inspection. The first being that the code was not split into blocks of five letters each. This observation allowed us to treat each block of text as its own word. The second observation was that the code was written in lowercase. For the sake of legibility, each encrypted letter will be written in uppercase and each decyphered plaintext letter will be written in lowercase italics. The third, and most crucial, observation was that the entire message followed a familiar format of a letter. We began by decyphering PRIG YISVRYISELEIAU to be *dear mathematicians*. Since this worked, we knew that a simple substitution cypher was to be used. The following observations occurred when We then looked at a few snippets:

RFRDRA IY IAP AOOA became *eleven am and noon*  
QGEAC BOWG UOFWSEOU became *bring your solutions*  
XGOHRUUOG TISVGBA became *professor Kathryn*

We found our keys and associated decypted message to be as follows:

$a \Rightarrow N$	$b \Rightarrow Y$	$c \Rightarrow G$	$d \Rightarrow V$	$e \Rightarrow I$
$f \Rightarrow L$	$g \Rightarrow R$	$h \Rightarrow F$	$i \Rightarrow A$	$j \Rightarrow Q$
$k \Rightarrow J$	$l \Rightarrow C$	$m \Rightarrow Z$	$n \Rightarrow W$	$o \Rightarrow O$
$p \Rightarrow D$	$q \Rightarrow B$	$r \Rightarrow E$	$s \Rightarrow T$	$t \Rightarrow K$
$u \Rightarrow S$	$v \Rightarrow H$	$w \Rightarrow U$	$x \Rightarrow P$	$y \Rightarrow M$
	$z \Rightarrow X$			

*Dear mathematicians, You may be the ones I am searching for if you can decrypt this message. We are in need of someone skilled in cryptanalysis methods. I cannot give details at this time? The project is highly classified. For now, we need to know that you are capable of high level mathematics. Compute the number of possible permutations of six symbols if given a set of thirty eight symbols (without replacement). Bring the last three digits of this number to the next pick up location to verify your qualifications to work on this project. If you are*

*courageous enough to accept this challenge, meet my colleague professor Kathryn Schreiner at her lab in the Large Lakes Observatory on the seventeenth of October between eleven am and noon. Bring your solutions to her and she will give you your next instructions. Very respectfully, Maj. Carter, USAF*

The permutation is  $\frac{38!}{32!}$  and the last three digits are 320. We await Wednesday's meeting for the next clue.

## 2 Over the Street and Through Vacant Lots, to the Large Lakes Observatory We Go...

On 10/17/2018 we visited the Large Lakes Observatory, where we found a kind scientist who gladly accepted 320 in exchange for a 5x8 manilla envelope. Inside the envelope were two large letters along with one encrypted message.

The first letter was a top secret intelligence on an alien species called the Goa'uld. After our team examined its contents, it was destroyed. The information in the letter conveyed the overall story arch of our adventure and also provided crucial information about stargates (see: Stargate Wiki for more explanation). The second letter contained two vital pieces of information: the first being the key for the enclosed encrypted message (HATHOR) and the second being the hint "the key is in the chocolate" (to be discussed later).

The message was initially split into chunks of six, as the key HATHOR has six letters. We determined the letters in HATHOR corresponded to the numbers 7, 0, 19, 7, 14, 17 respectively. Our team employed the Vigenere cipher and miraculously, the decrypted message took form. After many attempts of failed recitation of the alphabet, our team decrypted the message to be the following:

*We have discovered a weapon that is currently on the planet Dakura. It is not well guarded at the moment when you get this message send forces to Dakura to protect the device.*

The bug issue: The letter also contained a bug problem and our group deduced that it would take 10-12 days for the whole state of Minnesota to be infested given the gestation period of 2 days resulting in 10 offspring.

## 3 Free Snacks: an Adventure Through Chemical Engineering

For this portion of the cryptohunt, we were invited to the Chocolate Lab in UMD's Chemical Engineering Dept to talk about the mechanisms used in the creation of chocolate. Throughout the session, we were given names of locations

where chocolate is grown. After connecting with another SGM group, we realized we missed this fact (as well as the the six numbers associated with each country) written on a map that was located in the room. Those numbers are as follows:

Tanzania: 84 6 23 5 17 12

Peru: 3 32 16 8 10 12

Guatemala: 7 25 8 16 32 10

The encrypted message BRETEEDRRWTEOSAHSYX was unable to be decrypted by team SGM-3. We did try several methods, including using the keys 4, 10, 40, 50 (numbers alluded to during the chocolate talk).

The letter we were given depicted a situation which contained the numbers: 3, 14, 15, and 9, and the shapes: triangle, square, circle, and trapezoid. The number sequence appeared to be the first six digits of pi. Our team was unable to deduce the importance of the shapes. After discussing with the group, we decided that the information contained inside the letter was not integral to solving the enclosed encryption, but rather served as a secondary piece of information. *Revised 10/22/2018:* Additional information about the letter's contents was given. Our very reliable source indicated that 15 and rectangles were of great importance. Perhaps this is a hint to solving the problem.

## 4 It All Ended In Runes

Given on 10/22/2018, the message told us the importance of the knitted bits of material strewn about the universe. We now need to see what other teams SGM-1 through SGM-9 have in order to recover the importance of these long-forgotten symbols. The message also detailed a case of body-swapping. We solved the problem as follows:

We begin by denoting each team member, along with the old man Machello, using the first initial of their given name. The first two times the machine was used switched the bodies such that  $M \longleftrightarrow D$  and  $T \longleftrightarrow J$ . We can then use the device two more times to get  $M \longleftrightarrow J$  and  $D \longleftrightarrow T$ . The final two times the device is used will switch the bodies such that  $M \longleftrightarrow T$  and  $D \longleftrightarrow J$ . Thus all the bodies are with their original owners. Notice we can also change the order of these switches so that we do the initial two switches, the last two switches, and the middle two switches and still get all bodies back. So we must use the device four additional times in order to restore the bodies.

The encrypted message was decrypted using a combination of Anglo-Saxon runes and Elder Futhark. Our message came out to be:

*Hope resides in the metropolis of the lost. The eight pattern address was knit into fiber and sent to an underground organization for safety among humans. The organization adored the number fifteen and the shape of rectangles.*

## 5 Knot the Droid You're Looking For

Given on 10/24/2018, team SGM-3 recieved our last clue. Our team consulted with the textbook to find relevant examples to decrypt the following message:

MH BO YX KG RZ PN DU AU LG CP CU AZ UZ XO TZ NK KZ MF  
QU RL BL SP MD BN KH UH UQ ZY

After searching for a while, this message was finally decrypted using the Playfair cipher. We used GOAULDBCEFHMKNPQRSTUVWXYZ in order to get the plaintext message *KnowwhatthexgoauldreallywantxMinnesotaxforfishingmostly*. Replacing the *x* with a space and adding a few finishing touches, the final message becomes

*Know what the Goa'uld really want, Minnesota for fishing mostly*

Revisiting the last clue, we found the importance of the knitted bits. According to the Stargate Wiki, the nine symbols correspond to Milky Way glyphs. On each of the knitted bits there are also dots under each symbol that indicate the position of each symbol. For example, SGM-3 had no symbol and five dots, indicating a zero for position 5. We continue assigning the symbols to corresponding glyphs as follows:

SGM-1: Equilus (17) position 2  
SGM-2: Giza (1) position 8  
SGM-3: Blank (0) position 5  
SGM-4: Capricornus (15) position 6  
SGM-5: Sculptor (20) position 1  
SGM-6: Monoceros (32) position 7  
SGM-7: Perseus (25) position 4  
SGM-8: Norma (8) position 3  
SGM-9: Pisces (21) position 9

Thus we get the sequence **20 17 8 25 0 15 32 1 21**. Note: the symbols are interpreted from a knitted pattern and may not match up to the glyphs given on the Stargate Wiki. We believe that these numbers give a final message, namely the *eight pattern address* decyphered from clue 4. Perhaps the zero at position 5 should be omitted, giving us **20 17 8 25 15 32 1 21**. We can note that glyph 21 correspondes to the stargate on P3R-233.

## 6 References and Thanks

Team SGM-3 referenced the textbook as well as a bounty of Wikipedia articles including (but not limited to): Vigenere cipher, Playfair cipher, glyphs, J.R.R.Tolkien, Elder Futhark, Anglo-Saxon runes and the Stargate universe. Our team would like to thank Professor Beth Kubik for organizing such an involved and enjoyable hunt. We would also like to thank the professors and staff members of UMD for their involvement, and to all the students of the cryptology course for sharing and uploading clues to Canvas.