

## Handout 12: The Riddle of the Desert Mummies

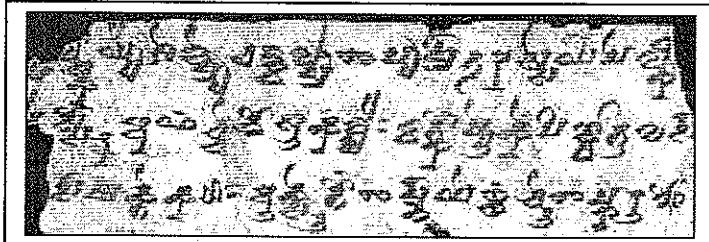


Figure 1: A fragment of an ancient Tocharian manuscript found in Western China.

Tocharian is an extinct Indo-European language (see Figure 1<sup>1</sup> for a sample of the written Tocharian language). This language stands by itself as the sole member of one of the eleven major groups that make up the Indo-European language family<sup>2</sup>. Although an Indo-European language, Tocharian is remarkable in that it was discovered during archaeological excavations in the Xinjiang Province

of Western China during the 1970's and 1980's. (See Figure 2<sup>3</sup> for a location map - these discoveries were made in the region covered by the shaded oval.)

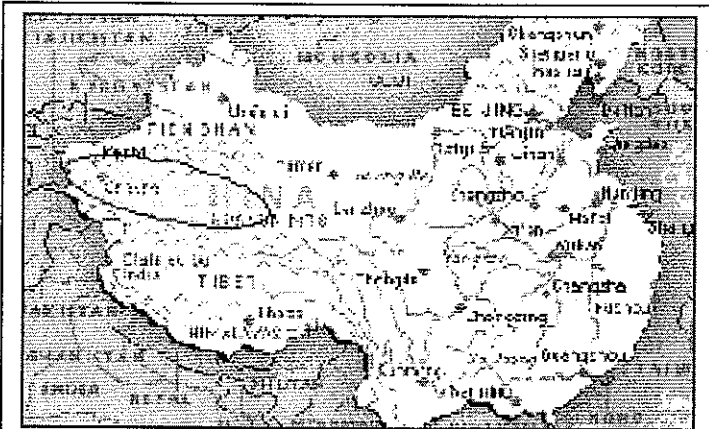


Figure 2: Modern China. Xinjiang province is located in the western part of China. The shaded oval indicates the extent of the Taklamakan Desert.

At least as remarkable as the discovery of manuscripts revealing a lost Indo-European language were the human remains discovered during the excavations. Two examples of these mummified peoples are shown in Figures 3 and 4<sup>4</sup>. Figure 3 shows a mummy that has become known as "Charchan Man," and Figure 4 shows a mummy that is called the "Beauty of Loulon" because the body is so well preserved.

The existence of these mummies was not well known outside of Chinese archaeological circles until the late 1980's, when Sinologist Victor Mair<sup>5</sup> discovered Charchan man in a small

museum in Urumchi, the capital of Xinjiang Province.

When he was finally allowed to view the exhibit Mair was amazed by the mummy's clothing. Charchan man was dressed in a bright red tunic, and a pair of blue and red striped pants. However, what truly astonished Mair (who is an American of European descent) was Charchan man's hair and face. Charchan Man's hair was ginger colored, and his face bearded with typical Caucasian features. As Mair observed, "He looked like my brother Dave sleeping there."

<sup>1</sup> Image source: <http://www.omniglot.com/>

<sup>2</sup> Source: Dickens, M. (1999) "An introduction to the Tocharian language." Available on-line from <http://www.wlc.com/>

<sup>3</sup> Image source: <http://www.ecusd7.org/>

<sup>4</sup> Image source: <http://www.discovery.com>

<sup>5</sup> Victor Mair is a Professor of Chinese Literature in the Department of Asian and Middle Eastern Studies at the University of Pennsylvania.

# SOLUTIONS



Figure 3: Charchan Man.



Figure 4: The Beauty of Loulon.

Because of their Caucasian appearance, and because the mummies were found near the ancient trade route known as the “Silk Road,” the remains were assumed to be the corpses of people who had died while traveling along this route.

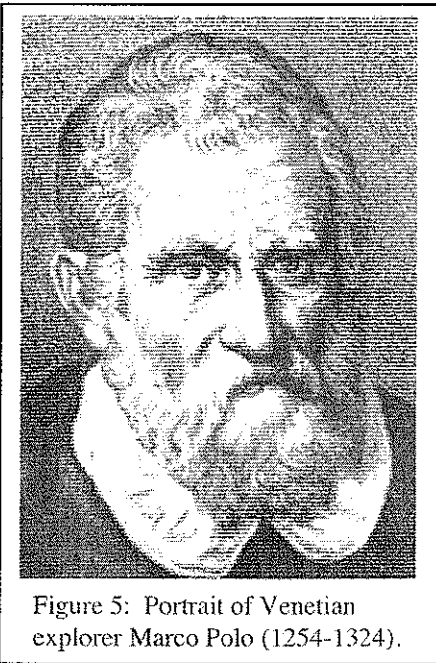


Figure 5: Portrait of Venetian explorer Marco Polo (1254-1324).

The Silk Road served as a major trade conduit between Europe and East Asia, and major portions of it snake their way through Xinjiang Province. Trade along the Silk Road flourished in the centuries following the legendary journey of Venetian explorer Marco Polo (see Figure 5<sup>6</sup>) who lived from 1254 to 1324.

Xinjiang Province has not always been part of China. Chinese historians as far back as the Han dynasty (206 B.C.E. – 220 C.E.) note that the area was occupied by a tribal people known as the Uighurs<sup>7</sup>. By 744 C.E. the Uighurs had established their first true state, with capital city Karabalgasum located in what is now Xinjiang Province. However, by 840 C.E., this Uighurs Empire had disintegrated with the population splitting into two separate groups<sup>8</sup>, one embracing Buddhism and the other eventually embracing Islam. In 1397, the Buddhist and Islamic Uighur kingdoms merged into a single Islamic state, successfully maintaining their independence from the succession of neighboring dynastic empires until 1759.

In 1759, Chinese forces under the Manchu emperor invaded the Uighur-held territory now known as Xinjiang province. For the next 104 years, Uighur militants fought a guerilla war against the occupying Manchu forces, instigating no less than forty-two major uprisings. The last major uprising was staged in 1863 and was finally successful in expelling the Manchu invaders. The Uighur kingdom that was subsequently established was recognized by the Ottoman Empire, Russia and Great Britain. However, fearing Russian expansion into the area, British banks financed a second Manchu invasion of the region in 1876. The region was re-conquered by British-backed Manchu troops, renamed Xinjiang (meaning “new territory” or “new dominion”) and incorporated into the Manchu empire on November 18, 1884.

<sup>6</sup> Image source: <http://www.silk-road.com/>

<sup>7</sup> Cheng, J. 1977. *Sinkiang Story*. New York: Macmillan.

<sup>8</sup> Mackerras, C. 1968. *The Uighur Empire According to the T'ang Dynastic Histories: A Study in Sino-Uighur Relations, 744-840*. Canberra Australia: Australian National University Press.

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In 1911, nationalist Chinese forces overthrew the Manchu emperor and founded the modern state of China, including Xinjiang Province<sup>9</sup>. The Uighur people staged major uprisings against the nationalist Chinese military forces in 1933 and 1944, but in both cases were put down with military assistance from the Soviet Union. In 1949, the Communist Chinese forces under the command of Mao Tze-Tung overthrew the Nationalist forces under the command of Chiang Kai-Shek.

Today, the Muslim Uighurs are a significant minority in Western China, numbering between seven and eight million<sup>10</sup>. Since 1990, the communist Chinese government in Beijing has blamed the Uighurs for more than 200 terrorist incidents, involving the deaths of more than 162 people<sup>11</sup>. The United States recently added several Uighur groups to the list of organizations targeted in the War on Terror, and on August 27, 2001, the U.S. government froze the assets of the Uighur separatist "East Turkestan Islamic Movement" charging that the group may pose a threat to U.S. interests overseas<sup>12</sup>. Other observers have charged that the move is nothing more than a ploy to increase Chinese support for President Bush's War on Terror<sup>13</sup>.

What does this have to do with Charchan Man and the Beauty of Loulon?

The main item on the Uighur agenda (since the second Manchu invasion of 1876) is the creation of an independent Uighur state. (Recently, Uighur political groups have also accused the communist government of severe human rights abuses<sup>14</sup>.) Although the issue is far from simple, an important consideration is the question of which group first occupied Xinjiang province<sup>15</sup>. According to Chinese historians, the Uighurs are descended from the Huns<sup>16</sup>, who invaded the region after it had been colonized by people from the regions that would later form the non-controversial provinces of modern China, during the Han dynasty (206 B.C.E. to 220 C.E.). However, some academics have advanced the idea<sup>17</sup> that the Uighur people are descended from a much more ancient population that is ethnically distinct from other people in modern China, and was established in the area before the Han dynasty.

Why might the communist Chinese government be reluctant to permit the Uighurs to form an independent Uighur state?

According to the U.S. Department of Energy<sup>18</sup>, China's demand for energy will more than double in the next twenty years. By the year 2020, China and Japan will consume more than 20% of total world energy. Fortunately, China has reasonably extensive domestic reserves of coal, oil and natural gas. As China has shifted its industrial and transportation infrastructure away from steam power and locomotives, however, their energy needs have shifted from coal to oil. To minimize their dependence on other nations, Chinese leaders have always sought to develop domestic oil reserves to the greatest extent possible<sup>19</sup>. The largest known, underutilized reserves of oil and natural gas are in China happen to be located in the Tamil basin of Western China, which would be lost to China should the Uighurs be permitted to form a new state.

<sup>9</sup> Forbes, A. D. W. 1986. *Warlords and Muslims in Chinese Central Asia: A Political History of Republican Sinkiang 1911-1949*. New York: Cambridge University Press.

<sup>10</sup> *Beijing Review*, December 12, 1990.

<sup>11</sup> Lev, M. A. Chinese Muslim group on terrorist list. *Chicago Tribune*, August 27 2002. In a more sinister report, Uighur fighters appear to be among the prisoners taken by U.S. troops in Afghanistan.

<sup>12</sup> <http://www.globalsecurity.org/military/library/news/2002/08/mil-020826-164d355f.htm>

<sup>13</sup> Source: MSNBC. <http://www.msnbc.com/news/799300.asp>

<sup>14</sup> Source: CNN. <http://asia.cnn.com/2001/WORLD/asiapcf/east/11/04/willy.column/index.html>

<sup>15</sup> Gladney, D. C. 1998. Whither the Uighur: China's indigenous peoples and the politics of internal colonialism. *Harvard Asia Pacific Review*, 3(1): 11-15.

<sup>16</sup> For examples, see:

- Williams, E. T. 1928. *A Short History of China*. London England: Harper and Brothers Publishers.
- Li, S. and A. Ablimit. 1995. Summary of research on the racial and ethnic origins of China's Xinjiang Uighur ethnic group. In B. Sautman. Ed. *Racial Identities in East Asia*. Hong Kong: Hong Kong University of Science and Technology Press.

<sup>17</sup> See: Dikotter, F. ed. 1997. *The Construction of Racial Identities in China and Japan: Historical and Contemporary Perspectives*. Honolulu HI: University of Hawaii Press.

<sup>18</sup> Department of Energy, Energy Information Administration. 2002. *International Energy Outlook 2002*. DOE/EIA-0484(2002).

<sup>19</sup> Klare, M. T. 2001. *Resource Wars. The New Landscape of Global Conflict*. New York: Metropolitan Books. p. 115.

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In this activity you will use exponential equations and your graphing calculator to see if there is any scientific evidence to support the idea that the Uighurs are descended from a group of people who were living in Xinjiang province prior to its incorporation into China.

- (a) The normal scientific method for dating organic material that is not too old is carbon-14 dating. Living tissue contains a constant, but small amount of radioactive carbon-14. A one hundred gram sample of living tissue normally contains about  $0.0001\mu\text{g}$  of carbon-14. When the living creature dies, the carbon-14 in its body undergoes radioactive decay. The half-life of carbon-14 is 5730 years. Use this information to complete Table 1 (below).

Time after Organism dies (years)	0	5730	11460	17190
Amount of carbon-14 in a 100g sample ( $\mu\text{g}$ )	0.0001	0.00005	0.000025	0.0000125

Table 1: Use the information in Part (a) to complete this table.

- (b) Is the data shown in Table 1 **perfectly exponential**? Give some calculations to support your conclusion.

Yes. The growth factor always comes out to:

$$\left(\frac{1}{2}\right)^{\frac{1}{5730}} = 0.9998790392$$

- (c) Find the formula for the function that does the best job of relating the amount of carbon-14 in a 100g sample of tissue to  $T$ , the number of years since the living creature died.

$M$  = amount of carbon-14 in sample. (in  $\mu\text{g}$ )

$$M = (0.0001) \cdot (0.9998790392)^T$$

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- (d) During the 1990's, the communist government of China sold a 100g sample of organic matter from one of the Desert Mummies to a Japanese company that specialized in dating archeological relics. When tested, the sample was found to contain 0.0000695 $\mu$ g of carbon-14. Set up and solve (see Figure 6) an equation to find out how long ago the Desert Mummy died.

$$(0.0001)(0.9998790392)^T = 0.0000695$$

$$T = 3007.763621 \text{ years.}$$

- (e) Based on your answer to Part (e), is there any scientific evidence to suggest that there were people who were not ethnically Chinese living in Xinjiang province before the Han dynasty? Does this prove the Uighur's case? If not, what else do the Uighurs have to prove?

Yes. The Uighurs need to demonstrate that they are actually descended from the mummified people.

## Solving Exponential Equations on a TI-83 Calculator

During the 1990's, the communist government of China sold a 100g sample of organic matter to a Japanese company. When tested, the sample was found to contain 0.0000695 $\mu$ g of carbon-14. Figure 6 shows how to use a graphing calculator to solve the equation:

$$0.0000695 = (0.0001) \cdot (0.9998790392)^x$$

to find the value of x.

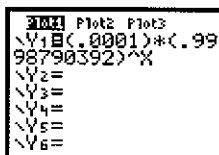


Figure 6a: Press the [Y=] button on your calculator and enter the formula from one side of the equation.

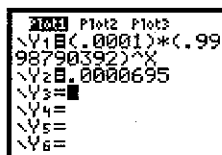


Figure 6b: Enter the numerical value from the other side of the equation. (It will be graphed as a horizontal line.)

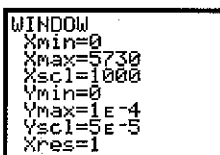


Figure 6c: Press the [WINDOW] button on your calculator. Enter the size of the window that you want to display. (There will be some guesswork here.)

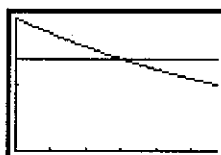


Figure 6d: Press the [GRAPH] button on your calculator to graph the two sides of the equation that you are trying to solve.

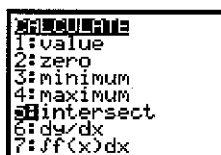


Figure 6e: Press the [2nd] [TRACE] buttons on your calculator and choose the "intersect" capability.

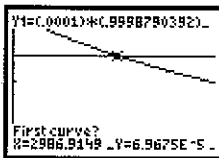


Figure 6f: Press the [ENTER] button to confirm that this is the first of the two curves whose intersection point you are trying to find.

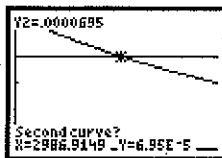


Figure 6g: Press the [ENTER] button to confirm that this is the second of the two curves whose intersection point you are trying to find.

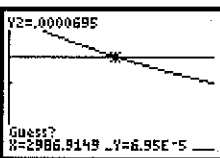


Figure 6h: If needed, use the arrow keys to move the flashing cursor so that it sits over the intersection point on the screen. Press [ENTER].

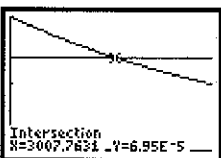


Figure 6i: The calculator will locate the intersection point and display its coordinates.