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The World's Oldest Tattoos

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Highlights

- Although tattooing has been practiced by cultures across the globe and throughout human history, the precise antiquity of the practice is unknown.
- There has been a discrepancy between popular and scholarly sources regarding the identity of the oldest tattooed human remains.
- Through reexamination of radiocarbon data we are able to identify the source of this confusion.
- This research conclusively determines that the oldest preserved tattoos known to date belong to the Tyrolean Iceman, also known as Ötzi.

Keywords

Tattoo; radiocarbon; Chinchorro; Ötzi; mummies

Abstract

The practice of tattooing has been documented in cultures across the globe and throughout recorded history. While there are several lines of archaeological evidence through which to study ancient tattooing, the marks identified on naturally and deliberately preserved human skin provide the only direct evidence of tattooing in antiquity. Until recently there was a discrepancy regarding the identity of the oldest tattooed human remains, with popular and scholarly sources alternately awarding the honor to the Tyrolean Iceman known as Ötzi, or to an unidentified South American Chinchorro mummy. Through a reexamination of the identity of the South American specimen and the associated radiocarbon data, we are able to identify the source of this confusion, and confirm that Ötzi presents the world's oldest preserved tattoos.

1. Introduction

Tattooing, the practice of inscribing the skin with permanent designs and patterns, is a global and indefinably ancient practice. Historical and archeological evidence show tattooing was practiced throughout the world in antiquity, and Indigenous cultures from every continent except Antarctica included tattooing as an essential element of their cultural fabric. Both the body marks and the tattooing process acted to negotiate relationships between individuals and their society, nature, and the spiritual realm. Depending on the culture and time period, Indigenous tattoo traditions have functioned to signal entry into adulthood, reflect social status, document martial achievement, demonstrate lineage and group affiliation, and to channel and direct preternatural forces (see Krutak, 2007, Krutak, 2012 and Krutak, 2014a).

Cultural contacts, exchanges, missionization, acculturation, and the formation of colonial empires had a widespread negative impact on Indigenous tattoo practices. As a consequence of these factors and the relative biases and inaccuracies of early ethnographic and ethnohistorical accounts, many Indigenous tattoo designs and practices have been forgotten, banned, or disconnected from their prior context and appropriated into modern tattoo culture. Traditional tattooing tools, pigments, and rituals that once held strong cultural values have given way to modern technologies, health regulations and the consumer marketplace.

In today's global, Westernized society tattooing has both proliferated rapidly and become less collectively regulated, if not entirely culturally unanchored. Rather than specific marks and the circumstances of their application being mandated by social codes, individuals are now largely free to select what, where, and how they are tattooed according to their own intentions. Nevertheless, there exists interest among the tattoo community in documenting and understanding the history of the practice, particularly in regard to the iconography, techniques, and origins of this ancient art.

Despite increasing scholarly and public interest in ancient tattooing over the past decade, there has been ongoing confusion regarding the identity of the oldest preserved tattoos. Popular texts and online sources typically identify the oldest tattoos as belonging to the naturally-mummified European body known as Ötzi. More scholarly sources have alternatively proposed that the oldest tattoos are found on mummified remains from the Chinchorro culture of South America. Following recent research into the identity of the Chinchorro mummy and reexamination of radiocarbon dates we are now able to identify the cause of this discrepancy and conclusively identify what are, to date, the oldest tattoos in the world.

2. Background

Although written records of tattooing date back to at least the 5th century BC in Greece (Jones, 1987 and Jones, 2000), and possibly several centuries earlier in China (Reed, 2000), the actual antiquity of the practice, both on a regional basis and as a worldwide phenomenon, remain unknown. In an effort to understand the time depth associated with tattooing, scholars must instead turn to the archeological record. There are three principal lines of archeological evidence for tattooing in ancient and pre-literate societies: Anthropomorphic art, tattoo tools, and preserved human skin (Deter-Wolf, 2013 and Tassie, 2003). The first two lines of evidence allow for some conjecture as to the antiquity of tattooing and suggest the practice may have originated at least as early as the Upper Paleolithic. However, interpreting possible permanent body decoration in ancient art is difficult, and methods for differentiating between tattoo tools and similar implements that may have served different functions are not yet refined (e.g., Deter-Wolf, 2013, Piprani, 2010, Renaut, 2004b, Hendrix, 2003, Tassie, 2003 and Zidarov, 2009). Consequently, the best evidence, and only direct archeological proof, for the antiquity of tattooing is found on preserved human skin.

Hundreds of ancient naturally and deliberately mummified tattooed human bodies have been recovered from throughout the world, including the American Arctic, Greenland, Siberia, Western China, the Philippines, Africa, Europe, Mexico, and the Andes. Table 1 presents a selected list of these remains as well as information on associated dates, cultures, and sites. This accounting is by no means comprehensive, as it does not include unpublished and unprovenanced specimens from museums and private collections. In addition, many of the examples included here were collected prior to modern archeological practices, have not been extensively reported, or are from regions with emerging cultural chronologies. In these cases, the approximate ages provided in Table 1 are assigned according to associated artifacts or general culture ranges rather than through direct dating.

Table 1. Tattooed human mummies, with associated cultures, dates, and sites.

Date	Culture	Site	Identifier	Sex	Source
3370–3100 BC	Tamins-Carasso-Isera 5	Tisenjoch	Ötzi	M	See discussion, this article
2600–2400 BC	Catacomb Culture	Temrta III, Russia	Tomb 2, Grave 1	M	Shishlina et al. (2013)
2600–2400 BC	Catacomb Culture	Primorsky I, Russia	Tomb 1, Grave 10	M	Shishlina et al. (2013)
2563–1972 BC	Chinchorro	El Morro	Mo-1 T28 C22	M	See discussion, this article
2300–1500 BC	C-Group	Kubban Cemetery 110, Egypt	Grave 271	F	Firth (1927)
2134–1991 BC	Dynasty XI	Deir el Bahari, Egypt	Amunet, Pit 23, Pit 26 (total 3 individuals)	F	Daressy (1893)
2100–1500 BC	Gumugou	Qāwrighul, China	Loulan Beauty	F	Barber (1999);Romgard (2008)
2055–1700 BC	C-Group	Nekhen Cemetery HK27C, Egypt	Tomb 9, Tomb 10, Tomb 36 (total 3 individuals)	F	Friedman (2004); Pieri and Antoine (2014)
1250 BC–AD 100	Subeixi	Yanghai, China	Multiple individuals?	–	Li (2010) (as cited inPankova, 2013)
1250 BC–AD 100	Subeixi	Shengjindian, China	Multiple individuals?	–	Jiang et al. (2015)
1000–600 BC	Zaghunluq	Zaghunluq, China	Unnamed woman ^a	F	Mallory and Mair (2008);Romgard (2008)
800–550 BC	Qizilchoqa	Qizilchoqa, China	Multiple individuals?	F	Mallory and Mair (2008);Romgard (2008)
400–200 BC	Pazyryk	Pazyryk burial ground, Russia	Burial 2 (two individuals), Burial 5 (two individuals)	M/F	Barkova and Pankova (2005)
400–200 BC	Pazyryk	Ak-Alakha 3, Russia	Princess of Ukok (Tomb 1)	F	Polosmak (2000)
400–200 BC	Pazyryk	Verkh-Kaldzhin 2, Russia	Tomb 3	M	Polosmak (2000)
400–200 BC	Pazyryk	Olon-Kurin-Gol 10, Mongolia	Tomb 1	M	Molodin et al. (2008)
500 BC–AD 100	Paracas	Wari Kayan Necropolis, Peru	M12, M28, M29, M30, M32, M66, M70, M73, M81, M85, M86, M87, M110, M199, M234, M319, M355, M420, M437, M451 (total 20 individuals)	M/F	Maita and Minaya (2014)
332 BC–AD 395	Graeco-Roman Period	Akhmim, Egypt	Multiple individuals	F	Strouhal (1992)
300 BC–AD 300	Khotanese-Saka	Shanpula, China	Multiple individuals?	–	Wang (2001)(as cited inPankova, 2013)
300 BC–AD 400	Meroitic Period	Semna South, Sudan	N-247	–	Alvrus (2001)
300 BC–AD 400	Meroitic Period	Aksha, Egypt	Multiple individuals	F	Vila (1967)
300 BC–AD 400	Meroitic Period	Various cemeteries	Multiple individuals	–	Shinnie (1967)
AD 250	Mixtec	Santa María Camotlán, Oaxaca	Momia Tolteca	F	Leboreiro et al. (2013)
AD 282–405	Old Bering Sea	St. Lawrence Island, Alaska	–	F	Smith and Zimmerman (1975)
AD 372–402	Tashtyk	Oglakhtynsky, Russia	Tomb 4	M	Pankova (2013)
AD 450	Mochica	El Brujo, Peru	La Señora de Cao	F	Franco (2008)
AD 500–1000	Huari	Department of Ica, Peru	Multiple individuals	–	Allison (1996)
AD 700	Sudanese Christian	3-J-23, et-Tereif, Sudan	Grave 50	F	Vandenbeusch and Antoine (2015)
AD 700–800	Mochica	Pacatnamu, Peru	H28 Burial 5	F	Verano (1997)
AD 850–1470	Chimu	Huaura Valley, Peru	Multiple individuals	–	Krutak (2007)
AD 875–1025	Tiwanaku	Azapa 71, Chile	AZ-71 NMT.3	F	Arriaza (1988)
AD 950	Casma	Casma Valley, Peru	Multiple individuals	–	Allison (1996)
AD 1000	Chiribaya Alta	Unknown, Peru	–	F	Pabst et al. (2010)
AD 1000	Ychsma	Cemetery 1, Pachacamac, Peru	Multiple individuals	–	Herrmann and Meyer (1993);Owens and Eeckhout (2015)
1100 AD	–	Ancón, Peru	Multiple individuals	–	Reiss and Stübel (1880–1887); Hambly (1925)
AD 1100–1250	Maitas Chiribaya	Azapa 140, Chile	AZ-140 T.41	F	Arriaza (1988)
AD 1100–1400	Chancay	Cerro Colorado, Peru	El hombre tatuado de Huacho	M	Ruiz (1998)
AD 1100–1400	Chancay	La Centinela, Peru	–	M	Vivar (2008)
AD 1100–1500	Ibaloy	Benguet, Philippines	Apo Anno (multiple additional individuals)	M	Aufderheide (2003);Piombino-Mascalci et al. (2013)
AD 1200	San Miguel	Arica area, Chile	Multiple individuals	–	Allison (1996);Arriaza (1988)
AD 1200–1450	Chancay	Rontoy, Peru	Kiko Rontoy	M	Roach (2008)
AD 1250	Ica	Department of Ica, Peru	17, 25, Cateo 2A, Cateo 12 (total 4 individuals)	F	Allison et al. (1981)
AD 1263–1287	–	Ancon, Peru(?)	La Mexicana	F	Alterauge et al. (2013)
AD 1319–1361	Chiu-Chiu (Solar Phase)	Chiu-Chiu, Chile	–	F	Gill-Ferking et al. (2013)
AD 1350	Chimu-Casma	Casma Valley, Peru	SP 292, SP 293, SP 294, SP 295, SP 296, SP 297, SP 298, SP 299, SP 300A, SP 300B, SP 301, SP 302, SP 303 (total 13 individuals)	M/F	Allison et al. (1981)
AD 1450	Inca	Department of Ica, Peru	53	F	Allison et al. (1981)
AD 1475	Inuit	Qilakitsoq, Greenland	I/3, I/4, I/5, II/6, II/8 (total 5 individuals)	F	Hansen et al. (1991)
AD 1470–1533	Ychsma	Armataambo, Peru	CF 168-2000	F	Diaz Arriola (2015)
AD 1600	Ica Colonial	Department of Ica, Peru	AIM 8, AIM 12, Cateo 2A, Cateo 10, HM5 (total 5 individuals)	F	Allison et al. (1981)

a. Facial markings on “Chärchän Man” and “Chärchän Woman,” (Tomb 2) are popularly reported as tattooing but are likely paint.

Of these numerous finds, by far the best-known example of a tattooed mummy is the naturally preserved remains of the Tyrolean Iceman known as Ötzi. Following his death around 3250 BC (Kutschera and Müller, 2003) Ötzi was entombed beneath an alpine glacier, where a combination of glacial meltwater and extreme cold resulted in the natural mummification of his body and preservation of his clothes and tools. Following his accidental discovery in 1991 Ötzi became an international archeological sensation, and more than two decades of scientific analysis have generated a fantastic body of data on his life, health, environment, and the circumstances surrounding his death (e.g., Capasso, 1998, Ermini et al., 2008, Fowler, 2000, Gostner et al., 2011, Höpfl et al., 1992, Janko et al., 2012, Keller et al., 2012, Kutschera et al., 2014, Maixner et al., 2013, Müller et al., 2003, Murphy et al., 2003, Spindler, 1993 and Spindler et al., 1995).

Ötzi bore 61 tattoo marks across his body (Samadelli et al., 2015), including on his left wrist, lower legs, lower back, and torso (Figure 1). These include 19 groups of lines, ranging from 1 to 3 mm in thickness and 7 to 40 mm in length. The greatest concentration of markings is found on his legs, which together bear 12 groups of lines. As with other aspects of the Iceman, these marks have been extensively examined in regard to their placement, composition, and possible function as therapeutic treatments (e.g., Capasso, 1993, Dorfer et al., 1998, Dorfer et al., 1999, Gaber et al., 1995, Pabst et al., 2009, Sjøvold, 2003, Krutak, 2012 and Renaut, 2004a).

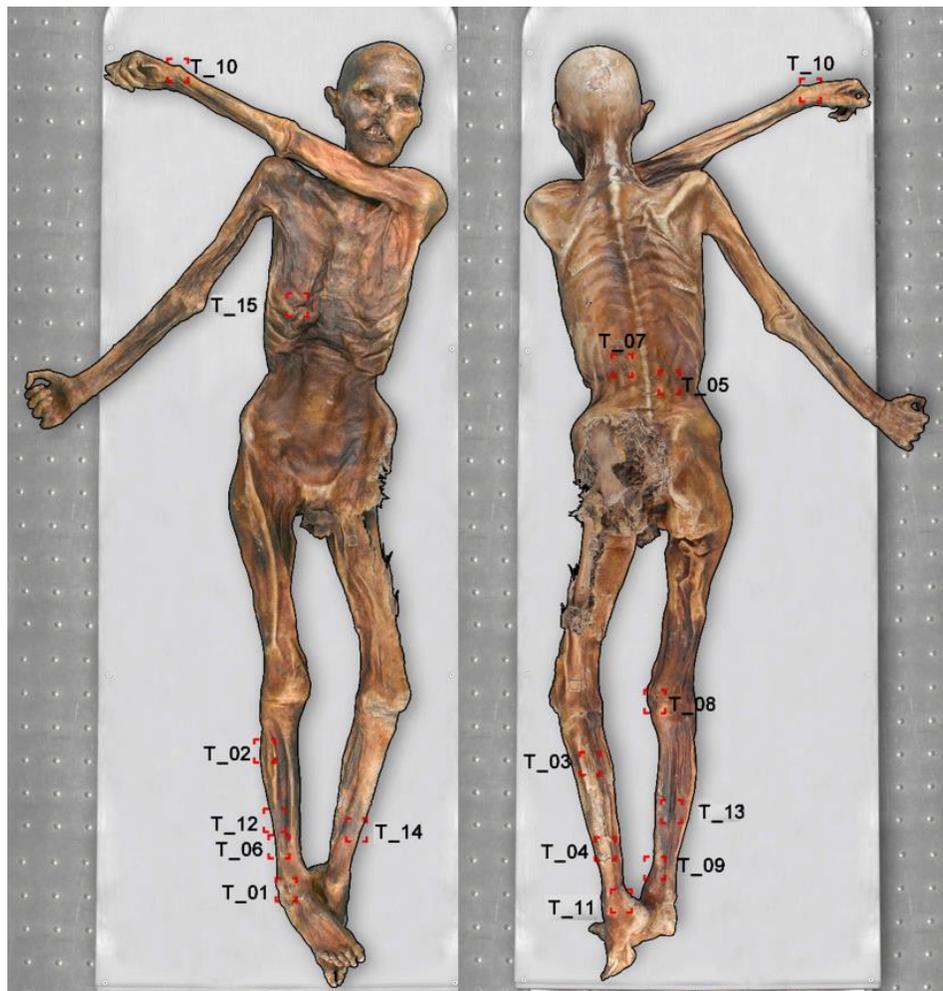


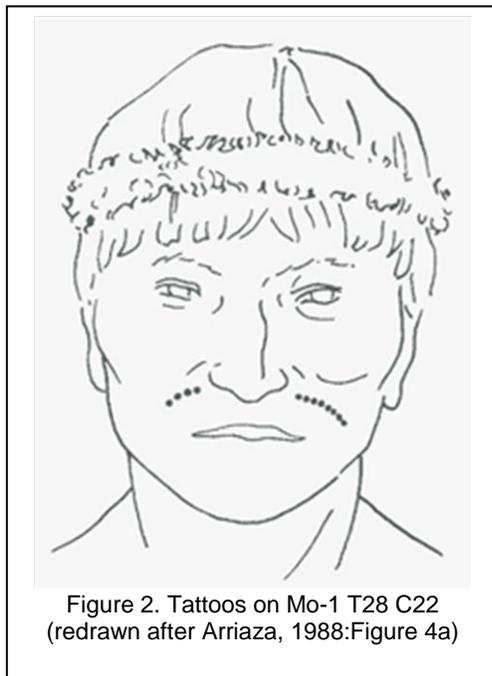
Figure 1. Locations of tattoos on the Iceman (Image courtesy the South Tyrol Museum of Archaeology, copyright South Tyrol Museum of Archaeology/EURAC/Samadelli/Staschitz).

Many popular and online discussions of tattoo history identify Ötzi as exhibiting the world's oldest preserved tattoos (e.g., Gay and Whittington, 2002, Guinness World Records, 2015, Levin, 2009 and Smith, 2011). However, until recently more scholarly studies on the history of tattooing, including works by the authors and others (DeMello, 2014, Deter-Wolf, 2013, Diaz-Granados and Deter-Wolf, 2013, Krutak, 2007, Krutak, 2013, Krutak, 2014b and Pabst et al., 2010) bestowed this title instead on the mummified remains of a man belonging to the Chinchorro culture of South America. This preceramic fishing society inhabited coastal regions of modern Chile and Southern Peru between about 7000 and 1100 BC. Chinchorro burials exhibit both natural and deliberate mummification beginning very early in the cultural sequence, making them the oldest human mummies identified to date (Arriaza, 1995b and Standen, 1997).

In his contribution to the third volume of *The Man in the Ice*, Marvin Allison (1996:126) writes “The oldest tattoo that we have found was from the Chinchorro culture and was a thin pencil mustache tattooed on the upper lip of a male adult probably about 6000 BP.” This find of preserved tattoos therefore appears to predate Ötzi by around 700 years. Although Allison does not specify the identity or provenience of the mummy in question, further research has allowed us to identify the individual to whom Allison refers.

3. The Identity of the Chinchorro mummy

In October of 1983, water line construction in a sandy bluff overlooking the city of Arica, Chile unexpectedly encountered multiple graves containing naturally and deliberately mummified remains from the Chinchorro culture. A total of 96 bodies were subsequently recovered from the site, known as El Morro, by staff from the University of Tarapacá's San Miguel de Azapa Archaeological Museum (Arriaza, 1995c). In the initial analysis of these remains Allison and colleagues (1984:170) identified only a single example of tattooing, which they describe as “un bigotito formado por una serie de puntos con carbón abajo de la piel.” No sex or specific identifying information was reported for the tattooed individual.



In his 1988 examination of social organization among prehistoric populations of Northern Chile, Arriaza reports that only four mummies in the San Miguel de Azapa collection exhibit tattooing. These include a single Chinchorro male recovered from El Morro, and three female mummies from the later Maitas Chiribaya, Tiwanaku, and San Miguel cultures (Arriaza, 1988)(see also Table 1). In the 1988 study and subsequent works the naturally-mummified Chinchorro male is identified as Mo-1 (or Morro 1) T28 C22, and assessed as being 35–40 years old at the time of death (Arriaza, 1988, Arriaza, 1994, Arriaza, 1995a and Arriaza, 1995b). The tattoos Arriaza describes on this individual consist of single lines of black dots across the upper lip to either side of the nose “a modo de bigotes” (Arriaza, 1988:21) (Figure 2).

The lines of discrete dots along the upper lip of Mo-1 T28 C22 initially described by Allison et al. (1984) and illustrated by Arriaza (1988: Figure 4a), do not precisely match with Allison's later description of a “pencil thin mustache” (Allison, 1996:126). However, so far as our research has been able to determine no other similarly tattooed Chinchorro mummies have been recovered to date. In his comprehensive study of Chinchorro mummies, Arriaza (1995a: 120) writes that “Within the natural Chinchorro mummies, only one body was found to be decorated: the face has a dotted

mustache-like tattoo.” It therefore appears that Mo-1 T28 C22 is the tattooed Chinchorro mummy that Allison (1996:126) reported originating “probably about 6000 BP.”

4. Radiocarbon dates

Ötzi has been the subject of extensive radiocarbon dating efforts. In addition to ^{14}C samples from his bones and tissue (e.g., Bonani et al., 1994 and Prinoth-Fornwagner and Niklaus, 1994), investigators have also processed samples from his wooden bow, pannier, ax shaft, quiver, and clothing, as well as mosses, leather, and animal hair recovered from the gully where Ötzi was entombed (Rom et al., 1999). The ^{14}C dates for Ötzi have been extensively reported in these and other sources, and confirm that Ötzi died during the time period ca. 3370–3100 cal BC.

During the 1980s, a sample of lung tissue from the Chinchorro mummy Mo-1 T28 C22 was submitted to Teledyne Isotopes laboratory of New Jersey (lab sample number I-13652) for radiocarbon dating. That sample returned an uncalibrated date reported both as 1880 ± 100 BC and 3830 ± 100 BP (Allison et al., 1984, Arriaza, 1988, Arriaza, 1994 and Arriaza, 1995b). These dates present the radiocarbon age for the sample, the calibrated range for which was reported as 2563–1972 cal BC (Arriaza, 1995b: Table 2)(Figure 3).

Site	Mummy Type	Radiocarbon Date (B.C.)	Calibrated Age (B.C.)	Sample	Lab Number	References
Morro 1 T28 C22	Natural	$1,880 \pm 100$	2563 (2280) 1972	lung	I-13652	Allison et al. (1984)

Figure 3. Excerpt of Arriaza 1995b Table 2 showing the radiocarbon date for Mo-1 T28 C22.

5. Conclusions

The radiocarbon dates discussed above clearly identify Ötzi as the oldest tattooed human remains discovered to date, antedating the Chinchorro mummy Mo-1 T28 C22 by at least 500 years. Previous scholarly misidentifications of the Chilean specimen as the oldest tattooed remains appear to be the result of misreading the radiocarbon data. Specifically, this is the result of confusing the date of 3830 ± 100 radiocarbon years BP obtained from the lung tissue of Mo-1 T28 C22 as instead presenting 3830 ± 100 years BC. The mistaken date is subsequently transposed as 5780 BP, thereby matching Allison's (1996) account of the mummy originating ca. 6000 BP.

This initial error has been compounded by more recent studies that further misinterpret the age of Mo-1 T28 C22. Citing Allison (1996); Pabst and et al. (2010:3259) write that “The oldest known tattoos date from 6000 BC from the Chinchorros [sic] culture. They show a thin pencil mustache tattooed on the upper lip of a male adult.” (emphasis ours). By transposing Allison's mistaken 6000 BP to 6000 BC – effectively 8000 BP – this source and others (e.g., Deter-Wolf, 2013, Diaz-Granados and Deter-Wolf, 2013, Friedman, 2015, Gill-Frerking et al., 2013 and Krutak, 2007) have pushed the date of the Chinchorro mustache tattoo back some 4000 years earlier than the actual radiocarbon date for the mummy. Although naturally mummified remains are indeed present in the archeological record of the Chinchorro culture by around 6000 BC (Arriaza, 1994, Arriaza, 1995b and Aufderheide et al., 1993), Mo-1 T28 C22 appears to be the only documented example of Chinchorro tattooing to date.

Although Ötzi can now be demonstrated to be the oldest tattooed human so far discovered, it is highly unlikely that he represents the first tattooed person on earth. Instead, Ötzi's 61 marks represent physical actions performed on his body as part of established social or therapeutic

practices that almost certainly existed within his culture well before his birth. While other lines of archeological evidence hint that permanent body marking may extend significantly earlier into human history (e.g., Deter-Wolf, 2013, Péquart and Péquart, 1962, Piprani, 2010 and Renaut, 2004b), conclusive proof of the antiquity of tattooing has yet to be uncovered. We anticipate that future research including new archeological finds, reanalysis of existing collections, advanced dating techniques, and the application of new imaging technologies in the study of mummified human remains will provide additional data through which to further evaluate this ancient and global practice, and likely provide direct evidence of tattooing antedating 3200 BC.

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References

- Allison, M.J., 1996. Early Mummies from Coastal Peru and Chile. In Spindler, K., Wilfring, H., Rastbichler-Zissernig, E., zur Nedden, D., Nothdurfter, H. (Eds.), *The Man in the Ice: Human Mummies, A Global Study of Their Status and the Techniques of Conservation* Vol. 3. Springer-Verlag, Vienna, Austria, pp.125–130.
- Allison, M.J., Focacci, G., Arriaza, B., Standen, V., Rivera, M., Lowenstein, J.M., 1984. Chinchorro, Momias de Preparación Complicada: Métodos de Momificación. *Chungara* 13, 155–173.
- Alterauge, A., González, M., Rosendahl, W., Begerock, A., Gill-Ferking, H., Vallis, A., Veselovskaya, E., 2013. Two Mummies with Crossed Legs from the Central Peruvian Coast: Their History and Scientific Investigation. Poster presented at the 8th World Congress of Mummy Studies, Rio de Janeiro, Brazil. Electronic document: https://www.academia.edu/5616617/2013_Two_mummies_with_crossed_legs_from_the_Central_peruvian_coast_Their_history_and_scientific_investigation_Posterpresentation_8th_World_Congress_of_Mummy_Studies_Rio_de_Janeiro (accessed October 23, 2015).
- Alvrus, A., 2001. Examination of Tattoos on Mummified Tissue using Infrared Reflectography. *J Archaeol Science* 28, 395–400.
- Arriaza, B., 1988. Modelo Bioarqueológico Para la Búsqueda y Acercamiento al Individuo Social. *Chungara* 21, 9–32
- Arriaza, B., 1994. Tipología de las Momias Chinchorro y Evolución de las Prácticas de Momificación. *Chungara* 26, 11–47.
- Arriaza, B., 1995a. *Beyond Death: The Chinchorro Mummies of Ancient Chile*. Smithsonian Institution Press, Washington, DC.
- Arriaza, B., 1995b. Chinchorro Bioarchaeology: Chronology and Mummy Seriation. *Lat Am Antiq* 6(1), 35–55. DOI: 10.2307/971599.
- Arriaza, B., 1995c. Chile's Chinchorro Mummies. *Natl Geogr* 187(3), 68–89.
- Aufderheide, A.C., 2003. *The Scientific Study of Mummies*. Cambridge University Press, Cambridge.
- Aufderheide, A.C., Muñoz, L., Arriaza, B., 1993. Seven Chinchorro Mummies and the Prehistory of Northern Chile. *Am J Phys Anthropol* 91, 189–201. DOI: 10.1002/ajpa.1330910205.
- Barber, E.W., 1999. *The Mummies of Urumchi*. Macmillan, London.
- Barkova, L.L., Pankova, S.V., 2005. Tattooed Mummies from the Large Pazyryk Mounds: New Findings. *Archaeol Ethnol Anthropol Eurasia* 22(2), 48–59.

- Bonani, G., Ivy, S.D., Hajdas, I., Niklaus, T.R., Suter, M., 1994. AMS ¹⁴C age determinations of tissue, bone and grass samples from the Otztal Ice Man. *Radiocarbon* 36(2), 247–250.
- Capasso, L., 1993. A Preliminary Report on the Tattoos of the Val Senales Mummy (Tyrol, Neolithic). *J Paleopathol* 5, 173–182.
- Capasso, L., 1998. 5300 years ago, the Iceman used natural laxatives and antibiotics. *Lancet* 352, 1864
- Daressy, G., 1893. Notes et Remarques, LVI, *Recl de Trav Relatifs à la Philologie et à l'Archéol Égyptiennes et Asyriennes* 14, 166–168.
- DeMello, M., 2014. *Inked: Tattoos and Body Art Around the World*. ABC-CLIO, Santa Barbara.
- Deter-Wolf, A., 2013. The Material Culture and Middle Stone Age Origins of Ancient Tattooing. In Philippe Della Casa, P., Witt, C. (Eds.), *Tattoos and Body Modifications in Antiquity: Proceedings of the Sessions at the Annual Meetings of the European Association of Archaeologist in The Hague and Oslo, 2010/11*. Zurich Studies in Archaeology 9. Chronos-Verlag, Zurich, pp. 15–26.
- Diaz Arriola, L., 2015. Preparation of Corpses in Ychsma Funerary Practices at Armatambo. In Eeckhout, P. Owens, L.S. (Eds.), *Funerary Practices and Models in the Ancient Andes*. Cambridge University Press, New York, pp.186–209.
- Diaz-Granados, C., Deter-Wolf, A., 2013. Introduction. In Deter-Wolf A., Diaz-Granados, C. (Eds.), *Drawing with Great Needles: Ancient Tattoo Traditions of Eastern North America*. University of Texas Press, Austin, pp. xi–xv.
- Dorfer, L., Moser, M., Spindler, K., Bahr, F., Egarter-Vigl, E., Dohr, G., 1998. 5200-Year-Old Acupuncture in Central Europe? *Science* 282, 242–243. DOI: 10.1126/science.282.5387.239f.
- Dorfer, L., Moser, M., Bahr, F., Spindler, K., Egarter-Vigl, E., Giullén, S., Dohr, G., Kenner, T., 1999. A Medical Report from the Stone Age? *Lancet* 354, 1023–1025. DOI: 10.1016/S0140-6736(98)12242-0.
- Ermini, L., Olivieri, C., Rizzi, E., Corti, G., Bonnal, R., Soares, P., Luciani, S., Marota, I., De Bellis, G., Richards, M.B., Rollo, F., 2008. Complete mitochondrial genome sequence of the Tyrolean Iceman. *Curr Biol* 18(21), 1687–1693. DOI: 10.1016/j.cub.2008.09.028.
- Firth, C.M., 1927. *The Archaeological Survey of Nubia: Report for 1910–11*. National Print Dept., Cairo.
- Fowler, B., 2000. *Iceman – Uncovering the Life and Times of a Prehistoric Man Found in an Alpine Glacier*. New York: Random House.
- Franco, R., 2008. La Señora de Cao. In Makowski, K. (Ed.), *Señores de los Reinos de la Luna*. Banco de Crédito del Perú, Lima, pp. 280–287.
- Friedman, A.F., 2015. *World Atlas of Tattoo*. Yale University Press, New Haven.
- Friedman, R., 2004. Seeking the C-Group: Excavations in the Nubian Cemetery, 2003. *Nekhen News* 16, 24–26. <http://www.hierakonpolis-online.org/nekhennews/nn-16-2004.pdf> (accessed October 23, 2015).
- Gaber, O., Künzel, K.H., Sjøvold, T., 1995. Die Tätowierungen des Eismannes aus Klinisch-anatomischer Sicht. *Berichte des Naturwissenschaftlichen-Medizinischen Verein Innsbruck* 82, 347–354.
- Gay, K., Whittington, C., 2002. *Body Marks: Tattooing, Piercing, and Scarification*. Twenty-First Century Books, Brookfield, CT.
- Gill-Frerking, H., Maria Begerock, A.M., Rosendahl, W., 2013. Interpreting the Tattoos on a 700-year Old Mummy from South America. In Philippe Della Casa, P., Witt, C. (Eds.), *Tattoos and Body Modifications in Antiquity: Proceedings of the Sessions at the Annual Meetings of the European Association of Archaeologist in The Hague and Oslo, 2010/11*. Zurich Studies in Archaeology 9. Chronos-Verlag, Zurich, pp. 59–66.
- Gostner, P., Pernter, P., Bonatti, G., Graefen, A., Zink, A.R., 2011. New Radiological Insights into the Life and Death of the Tyrolean Iceman. *J Archaeol Science* 38, 3425–3431. DOI: 10.1016/j.jas.2011.08.003.
- Guinness World Records, 2015. Oldest Tattoos. Electronic document, <http://www.guinnessworldrecords.com/world-records/oldest-tattoos> (accessed July 23, 2015).

- Hambly, W.D., 1925. *The History of Tattooing, and its Significance*. H.F. & G. Witherby, London.
- Hansen, J.P.H., Meldgaard, J., Nordqvist, J. (Eds.), 1991. *The Greenland Mummies*. Smithsonian Institution Press, Washington, DC.
- Hendrix, E.A., 2003. Painted Early Cycladic Figures: An Exploration of Context and Meaning. *Hesperia* 72(4), 405–446. DOI: 10.2307/3182012.
- Herrmann, B., Meyer, R.-D., 1993. *Südamerikanische Mumien aus vorspanischer Zeit : eine radiologische Untersuchung*. Staatliche Museen zu Berlin, Preussischer Kulturbesitz, Berlin.
- Höpfel, F., Platzer, W., Spindler, K. (Eds.), 1992. *Der Mann im Eis, Band 1. Bericht über das International Symposium 1992 in Innsbruck*. Veröffentlichungen der Universität Innsbruck 187.
- Janko, M., Stark, R.W., Zink, A., 2012. Preservation of 5300 Year Old Red Blood Cells in the Iceman. *J R Soc Interface* 9:2581–2590. DOI: 10.1098/rsif.2012.0174.
- Jiang, H., Zhang, Y., Lu, E., Wang, C., 2015. Archaeobotanical Evidence of Plant Utilization in the Ancient Turpan of Xinjiang, China: A Case Study at the Shengjindian Cemetery. *Veget Hist Archaeobot* 24: 165–177. DOI 10.1007/s00334-014-0495-6
- Jones, C.P., 1987. Stigma: Tattooing and Branding in Graeco-Roman Antiquity. *J Roman Stud* 77, 139–155. DOI: 10.2307/300578.
- Jones, C.P., 2000. Stigma and Tattoo. In Caplan, J. (Ed.), *Written on the Body: The Tattoo in European and American History*. Princeton University Press, Princeton, pp. 1–18.
- Keller, A., Graefen, A., Ball, M., Matzas, M., Boisguerin, V., Maixner, F., Leidinger, P., Backes, C., Khairat, R., Forster, M., Stade, B., Franke, A., Mayer, J., Spangler, J., McLaughlin, S., Shah, M., Lee, C., Harkins, T.T., Sartori, A., Moreno-Estrada, A., Henn, B., Sikora, M., Semino, O., Chiaroni, J., Rootsi, S., Myres, N.M., Cabrera, V.M., Underhill, P.A., Bustamante, C.D., Egarter-Vigl, E., Samadelli, M., Cipollini, G., Haas, J., Katus, H., O'Connor, B.D, Carlson, M.R.J., Meder, B., Blin, N., Meese, E., Pusch, C.M., Zink A., 2012. New insights into the Tyrolean Iceman's origin and phenotype as inferred by whole-genome sequencing. *Nat Commun* 3, 698. DOI: 10.1038/ncomms1701.
- Krutak, L., 2007. *The Tattooing Arts of Tribal Women*. Bennett & Bloom, London.
- Krutak, L., 2012. *Magical Tattoos and Scarification: Spiritual Skin. Wisdom. Healing. Shamanic Power. Protection*. Edition Reuss, Aschaffenburg.
- Krutak, L., 2013. Myth Busting Tattoo Art History. Electronic Document, <http://larskrutak.com/myth-busting-tattoo-art-history/> (accessed July 23, 2015).
- Krutak, L., 2014a. *Tattoo Traditions of Native North America: Ancient and Contemporary Expressions of Identity*. LM Publishers, Arnhem.
- Krutak, L., 2014b. The Timeless World of Ink. *Sorbet Magazine* 6:100-101.
- Kutschera W., Müller, W., 2003. "Isotope language" of the Alpine Iceman investigated with AMS and MS. *Nucl Instrum Meth B* 204, 705–719.
- Kutschera, W., Patzelt, G., Wild, E.M., Haas-Jettmar, B., Kofler, W., Lippert, A., Oeggel, K., Pak, E., Priller, A., Steier, P., Wahlmüller-Oeggel, N., Zanesco, A., 2014. Evidence For Early Human Presence At High Altitudes In The Ötztal Alps (Austria/Italy). *Radiocarb* 56(3), 923–947.
- Leboreiro, I., Mansilla, J., de Pierrebourg, F., Moulherat, C., 2013. Momias y Tatuajes: Leopoldo Batres y La 'Momia Tolteca.' *Arqueol Mex* 21(121), 25–29.
- Levin, J., 2009. *Tattoos and Indigenous Peoples*. Rosen Publishing Group, New York.
- Li, X., 2010. Interaction of Cultures in the Turfan Hollow and Adjacent Regions in the Bronze – Early Iron Age. In: *Di san jie Tulufan xue ji Ou Ya you mu min zu de qi yuan yu qian xi guo ji xue shu yan tao hui lun wen ji (Journal of the Turfan studies. Essays of the Third International Conference on Turfan Studies. The origin and migrations of Eurasian Nomadic people)*, pp. 3–20. Shanghai gu ji chu ban she, Shanghai.

- Maita, P.K., Minaya, E.E., 2014. El Trauma en la Piel: El Registro de Tatuajes Paracas Necrópolis. *Jangwa Pana* 13, 14–33.
- Maixner, F., Overath, T., Linke, D., Janko, M., Guerriero, G., van den Berg, B.H.J., Stade, B., Leidinger, P., Backes, C., Jaremek, M., Kneissl, B., Meder, B., Franke, A., Egarter-Vigl, E., Meese, E., Schwarz, A., Tholey, A., Zink, A., Keller, A., 2013. Paleoproteomic Study of the Iceman's Brain Tissue. *Cel Mol Life Sci* 70(19), 3709–3722. DOI: 10.1007/s00018-013-1360-y.
- Mallory, J.P., Mair, V.H., 2008. *The Tarim Mummies: Ancient China and the Mystery of the Earliest Peoples from the West*. Thames & Hudson, London.
- Müller, W., Fricke, H., Halliday, A.N., McCulloch, M.T., Wartho, J.-A., 2003. Origin and Migration of the Alpine Iceman. *Science* 302(5646), 862–866. DOI: 10.1126/science.1089837.
- Murphy, W.A., Jr., zur Nedden, D., Gostner, P., Knapp, R., Recheis, W., Seidler, H., 2003. The Iceman: Discovery and Imaging. *Radiology* 226, 614–629. DOI: 10.1148/radiol.2263020338
- Molodin, V.I., Parzinger, H., Ceveendorf, D., Garkusa, J.N., Grisin, A.E., 2008. Das Skythenzeitliche Kriegergrab aus Olon-Kurin-Gol Neue Entdeckungen in der Permafrostzone des Mongolischen Altaj. *Eurasia Antiqua* 14, 241–265.
- Owens, L.S., Eeckhout, P., 2015. To the God of Death, Disease, and Healing: Social Bioarchaeology of Cemetery I at Pachacamac. In Eeckhout, P. Owens, L.S. (Eds.), *Funerary Practices and Models in the Ancient Andes*. Cambridge University Press, New York, pp.158–185.
- Pabst, M.A., Letofsky-Papst, I., Bock, E., Moser, M., Dorfer, L., Egarter-Vigl, E., Hofer, F., 2009. The Tattoos of the Tyrolean Iceman: A Light Microscopical, Ultrastructural and Element Analytical Study. *J Archaeol Sci* 36 (2009), 2335–2341. DOI: 10.1016/j.jas.2009.06.016.
- Pabst, M.A., Letofsky-Papst, Moser, M., Spindler, K., Bock, E., Wilhelm, P., Dorfer, L., Geigl, J.B., Auer, M., Speicher, M.R., Hofer, F., 2010. Different Staining Substances Were Used in Decorative and Therapeutic Tattoos in a 1000-Year Old Peruvian Mummy. *J Archaeol Sci* 37, 3256–3262. DOI: 10.1016/j.jas.2010.07.026.
- Pankova, S.V., 2013. One More Culture with Ancient Tattoo Tradition in Southern Siberia: Tattoos on a Mummy from the Oglakhty Burial Ground, 3rd-4th century AD. In Della Casa, P., Witt, C. (Eds.), *Tattoos and Body Modifications in Antiquity: Proceedings of the Sessions at the EAA Annual Meetings in The Hague and Oslo, 2010/11*. Zurich Studies in Archaeology 9. Chronos Verlag, Zurich, pp. 75–86.
- Péquart, M., Péquart, St-J., 1962. Grotte du Mas d'Azil (Ariège), Une Nouvelle Galerie Magdalénienne. *Ann de Paléontol* 48, 197–243.
- Pieri, A., Antoine, D., 2014. A Tattooed Trio at HK27C. *Nekhen News* 26, 28–29.
- Piombino-Mascalci, D., Abinon, O.V., Salvador-Amores, A., Beckett, R.G., 2013. Human Mummification Practices Among the Igorot of Northern Luzon. *Bull Soc Suisse d' Anthropol* 19(2),45.
- Piprani, J.H., 2010. How Can the Consciously Constructed Identity of a 32,000 Years Old Human Lion Figurine Contribute to our Knowledge and Understanding of Aurignacian Worldviews? M.A. Thesis, School of Art, Histories and Cultures, the University of Manchester.
- Polosmak, N.V., 2000. Tattoos in the Pazyryk World. *Archaeol Ethnol Anthropol Eurasia* 4(4):95–102.
- Prinooth-Fornwagner, R., Niklaus, T.R., 1994. The Man in the Ice: Results from Radiocarbon Dating. *Nucl Instrum Meth B* 92(1–4),282–290. DOI: 10.1016/0168-583X(94)96020-8.
- Reed, C.E., 2000. *Early Chinese Tattoo*. Sino-Platonic Papers 103. University of Pennsylvania Department of East Asian Languages and Civilizations, Philadelphia.
- Reiss, W., Stübel, A., 1880–1887. *The Necropolis of Ancon in Perú*, Vol. I. Kean, A.H. (Trans.). A. Asher & Co., Berlin.
- Renaut, L., 2004a. Les Tatouages d'Ötzi et la Petite Chirurgie Traditionnelle. *L'anthropologie* 108, 69–105.
- Renaut, L., 2004b. Marquage Corporel et Signation Religieuse Dans L'Antiquité. PhD. Dissertation, École Pratique des Hautes Études, Section Des Sciences Religieuses, Paris.

- Roach, J., 2008. Rare Mummy Found with Strange Artifacts, Tattoo in Peru. *National Geographic News*, <http://news.nationalgeographic.com/news/2008/07/080717-new-mummy-missions.html> (accessed October 20, 2015).
- Rom, W., Golser, R., Kutschera, W., Priller, A., Steier, P., Wild, E.M., 1999. AMS ¹⁴C Dating of Equipment from the Iceman and of Spruce Logs from the Prehistoric Salt Mines of Hallstatt. *Radiocarbon* 41(2), 183–197.
- Romgard, J., 2008. *Questions of Ancient Human Settlements in Xinjiang and the Early Silk Road Trade, with an Overview of the Silk Road Research Institutions and Scholars in Beijing, Gansu, and Xinjiang*. Sino-Platonic Papers 185. University of Pennsylvania Department of East Asian Languages and Civilizations, Philadelphia.
- Ruíz, A.R., 1998. Sobre el Hallazgo de Momias Tatuadas en Huacho. *Bol Museo de Arqueol y Antropol* 1(3), 6–7.
- Samadelli, M., Melis, M., Miccoli, M., Egarter Vigl, E., Zink, A.R., 2015. Complete Mapping of the Tattoos of the 5300-year-old Tyrolean Iceman. *J Cult Herit* 16(5), 753–758. DOI: 10.1016/j.culher.2014.12.005.
- Shinnie, P.L., 1967. *Meroe, a Civilization of the Sudan*. Ancient Peoples and Places, Vol. 55. Thames and Hudson, London.
- Shishlina, N.I., Belkevich, E.V., Usachuk, A.N., 2013. Bronze Age Tattoos: Sympathetic Magic or Decoration? In Philippe Della Casa, P., Witt, C. (Eds.), *Tattoos and Body Modifications in Antiquity: Proceedings of the Sessions at the Annual Meetings of the European Association of Archaeologist in The Hague and Oslo, 2010/11*. Zurich Studies in Archaeology 9. Chronos-Verlag, Zurich, pp. 67–74.
- Sjøvold, T., 2003. The Location of the Iceman Tattoos. In Fleckinger, A. (Ed.), *Die Gletschermumie aus der Kupferzeit 2. La Mummia Dell'età del Rame: 2: Nuove Ricerche Sull'uomo Venuto dal Ghiaccio*. Schriften des Südtiroler Archäologiemuseums, Bolzano, Italy, pp. 111–122.
- Smith, G.S., Zimmerman, M.R., 1975. Tattooing Found on a 1600 Year Old Frozen, Mummified Body from St. Lawrence Island, Alaska. *Am Antiq* 40(4), 433–437. DOI: 10.2307/279329.
- Smith, M.E., 2011. History of Tattooing, HowStuffWorks.com. Electronic document, <http://people.howstuffworks.com/culture-traditions/body-art/history-of-tattooing.htm> (accessed July 23, 2015).
- Spindler K., 1993. *Der Mann im Eis. Die Ötztaler Mumie verrät die Geheimnisse der Steinzeit*. C. Bertelsmann Verlag, Munich.
- Spindler K., Wilfing, H., Rastbichler-Zissernig, E., zur Nedden, D., Nothdurfter, H. (Eds.) 1995. *Neue Funde und Ergebnisse. The Man in the Ice, Volume 2*. Springer Verlag, Vienna.
- Standen, V.G., 1997. Temprana Complejidad Funeraria de la Cultura Chinchorro (Norte de Chile). *Lat Am Antiq* 8(2), 134–156. DOI: 10.2307/971690.
- Strouhal, E., 1992. *Life of the Ancient Egyptians*. University of Oklahoma Press, Norman.
- Tassie, G.J., 2003. Identifying the Practice of Tattooing in Ancient Egypt and Nubia. *Papers from the Institute of Archaeology* 14, 85–101. DOI: 10.5334/pia.200.
- Vandenbeusch, M., Antoine, D., 2015. Under Saint Michael's Protection: A Tattoo From Christian Nubia. *J Can Cent Epigr Doc* 1, 15–19.
- Verano, J.W., 1997. Advances in the Paleopathology of Andean South America. *J World Prehist* 11(2), 237–268.
- Vila, A., 1967. *Aksha II: Le Cimétière Meroïtique d'Aksha*. Librairie Klincksiek, Paris.
- Vivar, J., 2008. Restos Humanos Tatuados Procedentes de Huaura. *Bol de Lima* 30(152), 5–8.
- Wang B. (Ed.), 2001. *Xinjiang gushi: gudai Xinjiang jumin ji qi wenhua (The Ancient Corpses of Xinjiang: The Ancient Peoples of Xinjiang and Their Culture)*. Mair, V.H. (Trans.) Xinjiang Renmin Chubanshe, Ürümchi.
- Winlock, H.E., 1942. *Excavations at Deir el-Bahri, 1911–1931*. Macmillan, New York.
- Winlock, H.E., 1947. *The Rise and Fall of the Middle Kingdom at Thebes*. Macmillan, New York.

Zidarov, P., 2009. Tattooing in the Balkan Copper Age: Bone Needles and Mineral Pigments from Pietrele, Romania. In Gatsov, I. (Ed.), *Saxa Loquuntur: Essays in Honour of Nikolay Sirakov on his 65th Birthday*. Avalon, Sofia, Bulgaria, pp. 327–330.