

# Rethinking “Damascus” Steel

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## INTRODUCTION

Historical accounts testify that for thousands of years, in Central Asian, Middle Eastern, and Indian cultures, crucible steel was the most sought-after type of steel because it was used to produce so-called “Damascus” steel objects. Damascus steel objects, particularly swords, were famous for their attractive surface pattern which was said to resemble flowing water. The Damascus pattern was considered a trademark advertising quality, cost, and status, as well as being an important religious symbol with special magical qualities. The crucible Damascus steel sword was not merely a military accoutrement, nor just a decorative fashion accessory. It had the distinctive position of being a secular and sacred object, in addition to being an emblematic one. Having such an important role in society, there is a great deal of historical literature written on the manufacture and trade of crucible steel swords and other objects. Although often associated with Islam, textual and archaeological evidence indicates that it was produced and used in Central Asia and the Middle East before the advent of Islam. The following paper will discuss how cultural aspects may have influenced the production, trade and use of crucible Damascus steel and how we must “rethink” its history.

The methods and materials used for arms products must be understood in their social and historical context. The technology used to produce crucible steel is very different than other pre-industrial methods of making steel and its manufacture appears to be limited to two distinct cultural areas: Hindu India/Sri Lanka, and Pre-Islamic and Islamic Central Asia. Since at least the 3<sup>rd</sup> century A.D., there is both archaeological and textual evidence indicating that Persia, and other areas of Central Asia, were major producers of crucible steel, yet this evidence tends to be disregarded by scholars who are inclined to stress the Indian connection. The long history of crucible Damascus steel production and use in Persia is well illustrated in Khorasani’s tome<sup>1</sup>. Determining technological and ideological differences in production, use and trade are important issues, particularly when attempting to establish an object’s provenance.

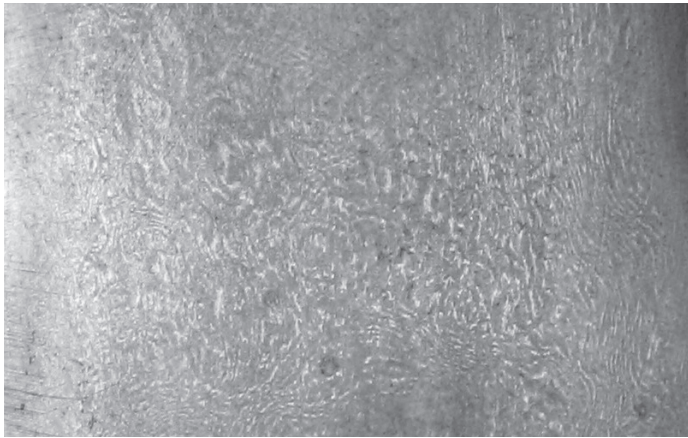
There have been hundreds of papers written on Damascus steel because of its presumed superior qualities and its attractive surface pattern. After all the words which have



been written on this topic, we would think that we would know more about it than we actually do. It is commonly repeated in the literature that crucible Damascus steel was only produced in India and Sri Lanka, from so-called *wootz* ingots, and its appearance in locations outside of this area was due to trade. Secondly, it is commonly believed that the term “Damascus” steel refers to the place of manufacture and that the crusaders coined the term. Furthermore, the secret to the technology was “lost” and had to be “found.” Multidisciplinary research, including scientific research and research into the cultures involved with crucible Damascus steel production is showing that many of these assumptions are simply incorrect, or at best, misleading.

In 2000, I presented to the Society my research on crucible Damascus steel which included archaeological and historical evidence for its production and use in Central Asia. Prior to my research, it was widely believed that crucible steel, or *wootz*, was primarily produced in India and Sri Lanka. The discovery and study of an Early Islamic (800–900 A.D.) crucible steel workshop at the ancient city of Merv, in present day Turkmenistan (for my Ph.D. and research by Papakhristu and Rehren<sup>2</sup> on Uzbek remains from medieval Islamic times), demonstrated that it was also widely produced on a large scale in various locations in Central Asia for centuries using materials and methods distinct from those used in India and Sri Lanka. Despite these observations, most scholars still protest that crucible steel with a strong pattern was primarily produced in India, thus further supporting misleading assumptions. Juleff<sup>3</sup>

also noticed this trend: “As is so often the case, any mention of the term steel in the context of the Indian subcontinent is automatically prefixed with the word ‘crucible’. That Bronson<sup>4</sup> who otherwise is both cautious and extremely perceptive in his review of the subject should fall into the same trap is an indication of how deep-seated this assumption is.” Therefore, it is simply wrong to assume that all objects made of crucible steel were made from ingots imported from India. Furthermore, although it makes enticing headlines, there has never been a “secret” and the technology has never been “lost.” However, the mechanisms involved with its manufacture were not understood by many Western smiths and metallurgists. The previous paper discussed the work of the Russian metallurgist Anosov, and his important research on crucible Damascus steel.



Detail of the characteristic crucible “Damascus” steel water pattern.

#### ARMS IN CULTURAL CONTEXT

The study of arms from cultures of the distant past, or from more recent times, share many common research aims including: understanding the variety of arms styles, where the arms were produced, who was involved with their trade, who used them, how well did they perform their intended function, when did that type of arms first appear, where did the technology come from and where did it go? Aspects which are not always considered in arms research is the cosmology, that is the world view of the producer, trader and user. Basically, different cultures view the world differently. In today’s society we tend to view arms production from scientific, political and economic viewpoints. While these aspects are also important in past cultures, cosmology is a significant, yet elusive, factor to consider, particularly when trying to understand weapons in the context of other cultures, past and present.

It is apparent that the production of arms is more than a mere technological operation; the cosmology of the producers and consumers also plays a significant role in the object’s manufacture. This is particularly true of crucible Damascus steel weapons. It has become apparent that there were distinct dif-

ferences in production, perhaps due to cosmological or religious differences in different regions. The most characteristic feature of Damascus steel is the surface pattern. The pattern is a result of the object’s microstructure, not produced by forge welding, inlay, etching or other surface treatments. Elgood<sup>5</sup> states that the “Hindus in south India have historically shown little interest in watered steel which is particularly Persian art . . .” In contrast, in Islamic lands, Persia, Central Asia, the Middle East, and parts of South East Asia, the pattern is a highly important aspect of the blade because of its religious connotations. The water pattern was highly desired in Islamic contexts because it had these religious connotations. It was thought to represent the waters of Paradise, i.e. the paradise of the after-life. The relationship between the water pattern on a blade, death in battle, and the Waters of Paradise has already been noted by Alexander.<sup>6</sup> Furthermore, the prophet Mohammad is reputed to have said that paradise is found under the shadow of swords. It is significant that this is consistent with both the archaeological and textual evidence which indicate that crucible steel in southern India and Sri Lanka did not produce a strong water pattern (apart from that produced in Hyderabad where Persians were involved in the process). The evidence indicates that in Central Asian lands they did produce objects with a strong water pattern. Although further research is necessary, this difference in patterns may partially be due to differences in the crucible steel ingot’s solidification rate. In Central Asia the ingots were cooled slowly inside the furnace. It seems the slow solidification rate may initially have been more than a practical operating procedure. In Zoroastrianism, the religion of Persia and other regions of Central Asia before Islam, to be burnt makes a person impure and may require the person to undertake a nine day purification process, therefore a Zoroastrian craftsmen would have avoided being burnt for religious reasons as well as the obvious physical concerns.

#### THE TERM “DAMASCUS STEEL”

The term Damascus steel, and related adjectives including Damascene and Damask, are prevalent in the literature.<sup>7</sup> Today the term “Damascus” steel is applied to any type of steel that has a decorative surface. The pattern could be made by etching, inlay or more commonly associated with pattern or forge welded Damascus steel. For decades it has been repeated that the origin of the term “Damascus steel” is attributed to the crusaders, who, as the legend goes, were introduced to these blades in Damascus and brought the word and the legend of the steel back with them upon their return to Europe. The evidence for the crusaders coining the term is weak. While it is highly likely that crusaders did battle against Muslim fighters who used the so-called crucible Damascus steel swords, no one has provided evidence of a crusader stating this. Furthermore, the lack of proof of

Damascus ever having actually been a center of sword production has been argued by Elgood.<sup>8</sup> However, Damascus was an important trading center, and large cities usually had industrial quarters. While there is no evidence that crucible Damascus steel was ever produced there, it is possible that blades were forged from crucible steel ingots or bars, or were forged elsewhere and traded in the market. It should not be forgotten that other types of steel would have been available for making blades and other iron and steel objects.

There are more credible roots for the origin of sword names than crusaders. The Islamic writers al-Kindi and al-Beruni name swords based on surface appearance, place of production or forging, or the name of the smith. Al-Kindi, for example, refers to al-bid (white swords), to Khurasaniya swords produced and forged in Khurasan, and swords called “Zaydiya (that) were forged by a man called Zayd, and hence they were attributed to his name.”<sup>9</sup> In addition, al-Beruni describes swords named after locations of workshops and mines. It appears that during the early Islamic period people were uncertain of the origins of sword names, for al-Beruni states that swords with the provenance of Mashrafiyah may refer to the name of the ironsmith Mashraf or the village called Mazarif.<sup>10</sup>

There are three likely sources for the term Damascus in the context of swords. The 9<sup>th</sup> century A.D. writer, Al-Kindi, called swords produced and forged in Damascus “Damascene.”<sup>11</sup> Additionally, al-Beruni (10<sup>th</sup> century A.D.) mentions a swordsmith called Damasqui who made swords of crucible steel.<sup>12</sup> The term “Damascus steel” is also found in the writings of al-Jaubari (died 1232). He reported that “. . . a prescription for a (good) cutting sword: Indian steel or Damascus steel is taken and a sword is made . . .” Ibn-al Ukhwwa (d.1329) also used the phrase Damascus steel.<sup>13</sup> However, the most likely origin for the term stems from an old Arabic word for water, *damas*.<sup>14</sup> The so-called water pattern is the most striking feature of the blade and is most often noted in Arabic writing specifically because the water pattern represents the Waters of Paradise.<sup>15</sup> Any or all of these may have inspired the term “Damascus steel” but it certainly was not crusaders who coined the term. These references indicate that the adjective “Damascus” was being used to describe the steel centuries before the term “Damascus steel” was reportedly used in Europe.

Allan and Gilmour state<sup>16</sup> that the French traveler Bertrandon de la Brocquiere in 1432 first acquainted Europeans with the term “Damascus steel” and the use of various forms of the adjective “Damascus” is recorded in English from the late 16<sup>th</sup> century. According to the Oxford English Dictionary (CD), the term was used in 1562 to describe how a certain man was like a Scimitar. Jean Chardin traveled through Persia from 1673–1677 and in his accounts he clearly defines the term “Damascus” steel when he wrote that “the Persians call the product Poulad Jauherder, washed steel<sup>17</sup> or wavy steel,

which we call Damascus steel, to distinguish it from the steel of Europe.”<sup>18</sup> In the 17<sup>th</sup> century, Joseph Moxon stated that Damascus steel rarely comes into England unwrought but Turkish Symeters (*sic.*) are made from it.<sup>19</sup> However, Moxon also notes that when people were sent to Damascus to find the source of the steel, they were told that it comes from further East,<sup>20</sup> thus suggesting that even in the 17<sup>th</sup> century, crucible “Damascus” steel was not being produced in Damascus, Syria.

A dispute which commonly arises is, which type of steel is the “true” Damascus steel—the pattern welded or crucible steel variety.<sup>21</sup> A review of the historical literature points towards an answer. Above it was demonstrated that the term “Damascus steel” was used during the 17<sup>th</sup> century and before, to denote steel with the characteristic pattern that was associated with Persia and Turkey. However, during the 18<sup>th</sup> century it begins to be confused with other types of patterned steel. In 1771 Perret used a pattern welding technique to make what he termed “imitation” Damascus blades, which he claimed to closely imitate “natural” Damascus.<sup>22</sup> Prior to the mid 19<sup>th</sup> century, Crevelli also made so-called “imitation” Damascus steel<sup>23</sup> by forging iron wire. It is important to note that they use the term “imitation,” thus indicating that they knew the difference. It seems that sometime during the 18<sup>th</sup> century, use of the term “Damascus” steel becomes confused in the literature with pattern or forge welded “Damascus steel” and by the 19<sup>th</sup> century there is obvious confusion in the literature, confusion which continues today.

Given that the word “Damas” is an archaic Arabic word for water, the earliest use of the term appears in Islamic literature, and the water pattern was the most notable feature of the blades and has religious connotations, the adjective “Damascus” refers to the pattern, not the place. Furthermore, many early European writers clearly state that the term “Damascus steel” refers to crucible steel, thus confirming that the term “Damascus steel” originally referred to those blades that had exhibited the characteristic crucible Damascus steel pattern. It appears that it was during the 18<sup>th</sup> century when the crucible variety became confused with the pattern welded variety. Today the term “Damascus steel” is inaccurately and indiscriminately used to denote any blade with a pattern no matter how the pattern was produced.

#### WOOTZ, HINDUWANI, AL-HIND, PULAD AND DAMASCUS STEEL

The terms *wootz*, *binduwani*, *al-Hind*, *pulad* and *Damascus steel* are often misleadingly used as synonyms. The term “wootz” first appears in print in 1795 in Pearson’s Lecture to the Royal Academy on Indian steel.<sup>24</sup> This was during a time when Indian crucible steel was being sent to England for laboratory analyses with the purpose of understanding what made it apparently tougher than steel made in Europe. Which word

or words wootz is a corruption of has been argued by numerous scholars.<sup>25</sup> The prevalence of the use of the term wootz in professional and popular literature has led to a number of problems. The first problem is that it is used interchangeably with the term “Damascus steel,” thus implying that the wootz process produces a pattern. Secondly, the term “wootz” implies an Indian or Sri Lankan origin for the steel, and as discussed above this is not necessarily so, thus leading to further misconceptions of the object’s provenance. Furthermore, it is a common claim that the “wootz” process, as practiced in South India, produced steel with the characteristic water pattern. Bronson<sup>26</sup> noted that there is no ethnographic evidence to support this. As noted above, Elgood<sup>27</sup> mentions that the pattern was not important to the Hindus, and moreover, the artifactual evidence indicates that *wootz* steel was not used to produce the bold characteristic Damascus steel blades.<sup>28</sup> Therefore, despite its prevalence in the literature, South Indian steel associated with the term “wootz” is not synonymous with crucible Damascus steel.

Arabic terms, often interpreted by scholars<sup>29</sup> to be referring to Indian steel, are *al-Hind* or *al-Hindi*, and *binduwani* or *bunduwany*. Assuming these terms always refer to crucible Damascus steel is misleading for two reasons. First, the terms are used as adjectives and do not necessarily mean that the steel is from India or Sri Lanka but rather “in the style of” that from India or Sri Lanka.<sup>30</sup> Second, it is apparent that India and Sri Lanka produced more than one type of steel, such as the directly produced steel made using wind power furnaces in Sri Lanka during the medieval period.<sup>31</sup> Furthermore, the documents of the Cairo Geneza mention trade in at least six different types of iron or steel from India during the 12<sup>th</sup> century.<sup>32</sup> Moreover, *binduwany* should not be used as a synonym for *al-Hind*. Juleff<sup>33</sup> points out that *wani* and *waney* are the Sinhalese (Buddhist) terms for “steel” and “to her knowledge” the words do not appear in any Indian language and do not appear to derive from Sanskrit. Generally speaking, the terms *binduwani* and *buduwany*, in the literature might be better understood as steel from Sri Lanka, rather than implying all of India, whereas *al-Hind* is probably referring to Indian lands. However, without supporting evidence it should not be assumed that the authors of historic texts knew with certainty where the iron or steel originated, and therefore assuming that these terms are always referring to crucible steel from India or Sri Lanka is misleading.

The term *pulad* (its transliterations and variations) is often overlooked in the literature, in favor of the term *wootz*. However, an etymological study of the term and its related words gives us new light into the history, movement, and possible origin of this material. In the Near East and Central Asia the term is always used to denote crucible steel. Variations of

the word *pulad* can be found in various languages of Central Asia, the Middle East, Russia and the Caucasus. A variation of the word *pulad* (pwl’wd) first appears in an original Manichean Middle Persian magical text from Chinese Turkistan.<sup>34</sup> The text, possibly written before the 6<sup>th</sup> century A.D., reportedly gives protection against evil spirits and refers to “seven daggers of *pulad*.”<sup>35</sup> The word *pulad* can also be found in the Avesta, the sacred book of the Zoroastrians.<sup>36</sup> *Pulad* was considered to be the metal of gods, kings and heroes.<sup>37</sup> The word *pulad* can be viewed as the conjunction of two words *pu* (also transliterated as *fu*, *phu*) and *lad* (or *ladh*). In Sanskrit *pu* means cleaning or purifying.<sup>38</sup> There is no direct translation of *lad* or *ladh*, however, there are over a hundred words for iron in the various Indo-Aryan branch dialects that use variations of the word *lōhā*, including *lauha*.<sup>39</sup> The similarity between *pu-lauha*, meaning purified iron, and *pulad* meaning refined or purified steel should not be overlooked and strongly suggests a possible etymological origin for the word *pulad* or other transliterations and related terms. It should not, however, be assumed that the word originated in Sanskrit proper. The Avestan language of Central Asia was very similar to Sanskrit and the possible forerunner of the word may equally be found there or in one of the languages which has a similar root.

## CONCLUSIONS

Although not a new topic for research, new multidisciplinary research on crucible “Damascus” steel is shedding light on the history of this special material. While most studies have concentrated on the scientific aspects associated with the pattern or performance of the blade, a broader study of the cultures which produced, traded and used this steel is yielding new information. The evidence is imploring us to rethink the history of crucible “Damascus” steel, who produced it, and what it meant to the warrior whose life depended upon it.

## NOTES

<sup>1</sup>Khorasani, 2006

<sup>2</sup>Papakhristu and Rehren, 2002.

<sup>3</sup>Juleff, 1998, 94.

<sup>4</sup>Bronson, 1986.

<sup>5</sup>Elgood, 2004, 231.

<sup>6</sup>Alexander, 1983.

<sup>7</sup>Sachse, 1994.

<sup>8</sup>Elgood, 1994, 103–108.

<sup>9</sup>Al-Hassan, 1978, 39.

<sup>10</sup>Said, 1989, 217.

<sup>11</sup>Al-Hassan, 1978, 35.

<sup>12</sup>Said, 1989, 219–220.

<sup>13</sup>Al-Hassan, 1978, 39.

<sup>14</sup>Sachse, 1994, 13.

- <sup>15</sup>Alexander, 1983.
- <sup>16</sup>Allan and Gilmour, 2000, 77.
- <sup>17</sup>Note the association with water once again
- <sup>18</sup>Bronson, 1986, 24.
- <sup>19</sup>Moxon, 1677, 56.
- <sup>20</sup>Moxon, 1677.
- <sup>21</sup>Sachse, 1994.
- <sup>22</sup>Smith, 1960, 30.
- <sup>23</sup>see Holland, 1831, 256.
- <sup>24</sup>Hadfield, 1931.
- <sup>25</sup>e.g. Chakrabarti, 1992, 1; Prakash, 1989, 96; Le Coze, 2003; Lowe, 1989.
- <sup>26</sup>Bronson, 1986.
- <sup>27</sup>Elgood, 2004.
- <sup>28</sup>However, the wootz process may have produced fine pattern steel but this has not been proven..
- <sup>29</sup>Bronson (1986) and Craddock (1998).
- <sup>30</sup>Hoyland and Gilmore, 2006.
- <sup>31</sup>Juleff, 1998.
- <sup>32</sup>Goitein, 1980; 1987
- <sup>33</sup>Juleff, 1998, 10.
- <sup>34</sup>Henning, 1947.
- <sup>35</sup>Henning, 1947.
- <sup>36</sup>Allan and Gilmour, 2000, 7.
- <sup>37</sup>Allan and Gilmour, 2000, 7.
- <sup>38</sup>Cologne Digital Sanskrit Lexicon, 2001.
- <sup>39</sup>see Grierson, 1928, 77.

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