ANCIENT MILITARY TECHNOLOGY AND MATERIEL: CONTINUITY AND CHANGE IN ANCIENT CLOSE-COMBAT WARFARE

Jason Freewalt
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Dr. Leda Ciraolo
American Military University
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The technology and materiel of warfare changed from prehistoric times to the fall of the Roman Empire due to improvements in metallurgy and compounding ingenuity over the millennia. Despite the changes and improvements that spanned the ages from Hammurabi to Hadrian, the basic implements of warfare remained somewhat consistent. The thrusting spears used by Eanatum of Lagash in Mesopotamia c. 2500 BC and the *dory* used by the phalanx armies of Classical Greece at the Battle of Marathon in 490 BC served a similar purpose. The Bronze Age *Naue Type II* sword of c. 1200 BC and the Roman *gladius* of c. 200 BC were roughly the same size and had the same use. The circular or pendular way a particular type or style of weapon gained popularity in antiquity, was superseded by a new innovation, and then returned centuries or millennia later in a slightly modified form indicates that the evolution of ancient weaponry was sometimes an evolution of circumstances surrounding its use as much as the physical substance of the weapon. The evolution of ancient close-combat armaments shows both continuity and change, depending on the given set of military conditions.

Warfare, depending on one's definition, likely began long before recorded history. Archaeological evidence leaves much room for speculation about the point when humans reached the "military threshold," the divide between disorganized raids and coordinated warfare.[1] The earliest humans fought over land, animals, slaves, valuables, and political advantages. Their weapons were sticks, stones, and bones, and there was little difference between hunting tools and the weapons of war. Their tactics likely resembled those of a hunting or raiding party, calling into question whether their conflicts were truly "warfare." In contrast, the military chronicles of Mesopotamia and Egypt attest to highly coordinated attacks, consisting of various types of warriors working together to strategically dismantle enemy armies and assault

[1] William J. Hamblin, Warfare in the Ancient Near East to 1600 BC: Holy Warriors at the Dawn of History (London: Routledge, 2006), 16.

fortified cities. These early civilizations had the resources to produce, rather than simply gather, what they needed. One of the most important items they produced, at least from a military perspective, was metal.

The development of metallurgy radically changed ancient conflict. According to some historians, true warfare was not born until metallurgy progressed to the point that it was possible for soldiers in the middle and lower classes, not just the nobility, to obtain metal weapons. Barton C. Hacker states that the first distinct weapon technology for "warfare" emerged with metallurgy.[2] For example, the copper or bronze mace and axe were military-specific and not simply hunting tools used for a military purpose. Hacker further asserts that the widespread use of bronze for military use was the key to "warfare" among civilizations.[3] It must be stressed, however, that not all weapons employed by civilizations in the Copper Age or Bronze Age were metal. In fact, Iron Age civilizations such as the Macedonians and Romans often employed contingents of soldiers wielding fire-hardened spears and slings in light-armed ranks of skirmishers. Nevertheless, by the time the Greeks and Romans came to dominate the Mediterranean, their premier soldiers were heavy infantrymen with metal weapons and metal armor. The process of shifting from Stone Age weapons to Copper, Bronze, or Iron Age weapons was very slow. As metallurgy spread throughout the region from Anatolia to Mesopotamia to Egypt and beyond, weapon making processes improved and numerous civilizations crossed the military threshold.

In just about every civilization in the Eastern Mediterranean and the Near East, the toolkit of the close-combat footsoldier included weapons such as a club, mace, axe, thrusting spear, and

[2] Barton C. Hacker, "Military Technology and World History: A Reconnaissance," The History Teacher 30, no. 4 (August 1997): 462, http://www.jstor.org/stable/494141 (accessed January 13, 2015).
[3] Ibid.

a dagger or sword. In many civilizations, nearly every part of this armament was made of metal, since metal axe heads and spear points could be mass-produced, unlike their chipped-stone counterparts. A few civilizations also had metal armor, including helmets, greaves, breastplates, and shields.

Sargon the Great of Akkad in c. 2300 BC may have created the world's first standing army and the world's first empire. He did it using a mixture of Stone, Copper, and Bronze Age weapons. This is not surprising given the relative infancy of metallurgy in the region and the lack of access to large quantities of the necessary metals. Equipping an army with metal weapons was very expensive and challenging, even for a conqueror like Sargon. Akkadian close-combat soldiers used the mace, sickle axe, narrow-headed axe, thrusting spear or lance, and dagger.[4] Old Kingdom Egyptian soldiers under Narmer/Menes (reigned c. 3200 BC) wielded the mace, single and double-handed axes, thrusting spears, and daggers.[5] This mixture of weapons from the Stone Age to the Bronze Age was effective on enemy armies with little or no metal armor. The emphasis was on bashing, cutting, and slashing the enemy, with the purpose of damaging or removing limbs or the head. The presence of a thrusting spear and dagger indicate that piercing was also part of the close-combat strategy, though it was not completely necessary due to the lack of armor.

As metallurgy improved and became less expensive, and as defensive armor became more common, weaponry changed. The sickle sword, such as the Egyptian *khopesh*, was likely an evolved form of the broad-headed sickle axe.[6] Another interpretation of the sickle sword is

[4] Hamblin, 98.
[5] Ibid., 324.
[6] Anthony J. Spalinger, War in Ancient Egypt: The New Kingdom (Oxford: Blackwell Publishing, 2005), 17.

that it was an evolved form of club or mace.[7] In the "Stele of the Vultures" c. 2500 BC, Mesopotamian king Eanatum of Lagash wields what appears to be a sickle sword or a club.[8] It may have been a prestige weapon, similar to the mace commonly wielded in the numerous images of Egyptian pharaohs smiting a bound enemy. It may also have been a transitional weapon, mixing the club or mace's ability to bash an enemy with the axe and dagger's ability to cut through clothing and flesh. Sickle swords grew popular in Middle Kingdom Egypt and in Babylonian-controlled Mesopotamia. At the same time, narrow-headed axes grew in popularity, as they could pierce a breastplate or helmet.

The straight sword offers a long-lasting example of weaponry's response to metal armor. With its pointed blade, the sword had the piercing ability of a dagger or narrow-headed axe and the length necessary to contend with an armored opponent. Limitations of early metallurgy kept swords short, making them primarily thrusting weapons. The empires of Egypt, Mesopotamia, Anatolia, and the Aegean region produced longer swords as metallurgical techniques developed, but short swords remained the most common type of sword until just before the Bronze Age collapse c. 1200 BC. A higher percentage of tin in the bronze and, later, the development of iron working, led to longer and stronger swords.[9]

There is little doubt, based on available archaeological and literary evidence, that archers and chariots dominated the Eastern Mediterranean and the Near East during the era leading up to the Bronze Age collapse. The collapse of the chariot era, however, may have in part been the result of long swords. In Ramses III's great battle against the Libyans and Sea Peoples, just

[7] Hamblin, 67.
[8] The "Stele of the Vultures," known as the "Stèle de victoire d'Eannatum, roi de Lagash dite 'Stèle des Vautours'," is located at the Louvre Museum, Paris, France, online at http://www.louvre.fr/en/oeuvre-notices/stele-vultures (accessed January 21, 2015).
[9] See Hamblin, 22 for a discussion of the ratio of tin to copper in bronze.

before the collapse, over 9,000 swords were captured as booty.[10] While some of these swords were probably bronze short swords, the majority were probably stronger and longer iron swords. As iron slowly replaced bronze, swords evolved from short thrusting weapons into longer thrusting and slashing weapons. The *Naue Type II* sword gained popularity c. 1200 BC during what Robert Drews labeled the Bronze Age "Catastrophe."[11] Its use spread from central Europe to Greece, Crete, Cyprus, Anatolia, and Ugarit in Syria.

The increased use of the *Naue Type II* and other thrusting and slashing swords likely contributed to the end of the chariot age as the Great Kingdoms struggled to defend themselves from the Sea Peoples and other invading "barbarians." According to Drews, barbarian runners launched javelins in a swarming tactic against the great chariot and archer armies, killing the horses and making the chariots useless. The barbarians then used their long swords in hand-to-hand combat against the chariot crew.[12] Many barbarians would certainly have fallen to archer fire from the chariots, but any barbarians who survived the initial chariot pass could disable enough chariots with their javelins to create a traffic jam, stopping the additional orderly sweeps characteristic of chariot warfare. This method of warfare allowed the barbarians to negate the effectiveness of the chariot armies of the Great Kingdoms of the Late Bronze Age and set in motion a chain of events that led to a catastrophic collapse, plunging the Eastern Mediterranean region into the Greek Dark Age (c. 1200-800 BC).[13]

The Achaeans of Homer's *Iliad* may illustrate the transition between the Greek Dark Age and the Classical Age. The Achaeans possessed a combination of armaments similar to those of

[10] Spalinger, 237.
[11] Robert Drews, The End of the Bronze Age: Changes in Warfare and the Catastrophe ca. 1200 B.C. (Princeton, NJ: Princeton University Press, 1993), 204.
[12] Ibid., 210.
[13] Ibid., 224.

the Sea Peoples, the Great Kingdoms, and the later Greek hoplites. Achaeans who could afford armor and weapons wore helmets, a corselet resembling those in the Near East, greaves, and they carried a sword.[14] They also carried throwing spears, according to Homer's description of Agamemnon's armament.[15] Agamemnon's throwing spears, while possibly a Homeric anachronism, is comparable to the Sea Peoples' use of the javelin as a key weapon against chariot and archer armies. As for Agamemnon's sword, it may have been a *kopis*, a nearly three-foot long sword with a curved blade. Probably derived from the *khopesh*, the Egyptian sickle sword, the *kopis* and a related curved sword known as the *makhaira* may have been a combination of the *khopesh* and the *Naue Type II*. The *kopis* may have been a transitional sword between the ancient sickle sword and the *sabre* or *scimitar*. According to Xenophon, the *kopis* and *makhaira* were better suited for cavalry because of their curved blade, thus they likely saw limited use in the age of the hoplite phalanx because of the lack of emphasis on cavalry.[16] It seems plausible that Agamemnon would have had such a sword, since aristocrats during his reign may have ridden horses or chariots into battle.

Swords were important for individual hand-to-hand combat during and after the Dark Ages, but lost their preeminence to the thrusting spear, known as the *dory*, during the age of the Greek hoplite (c. 700-300 BC). Because hoplites marched in the tightly packed phalanx formation, the thrusting spear grew more important than the sword. It is interesting that the most popular Greek sword, the *xiphos*, was only about two feet in length, similar to the *Naue Type II*. This is nearly one foot shorter than the *kopis* or *makhaira*. At some point during the Dark Ages, the combination of the short sword and the thrusting spear won out over the longer swords used

[14] Michael M. Sage, Warfare in Ancient Greece: A Sourcebook (London: Routledge, 1996), 8.
[15] Hom. Il. 11.15.
[16] Xen. On Horsemanship 12.9; H. G. Dakyns, trans., On Horsemanship, by Xenophon (Project Gutenberg, 2008), http://www.gutenberg.org/files/1176/1176-h/1176-h.htm (accessed January 24, 2015).

by the Sea Peoples. One reason for this may have been a backward slide in the procurement of metals during the Dark Ages, necessitating the production of shorter swords. Certainly, the chaos that ensued following the collapse of the Great Kingdoms would have made the trade of metals difficult. The metal-tipped thrusting spear, which had the length of a long sword but required less metal, would have been easier and less costly to produce, thus becoming more popular than the sword. Another reason for the decline of the long sword and the rise of the hoplite *dory* and *xiphos* combination might have been the development of the phalanx itself. The tightly packed and highly trained phalanx of soldiers with a thrusting spear and short sword outmatched what Drews calls the "disorganized hordes of running skirmishers" that toppled the Great Kingdoms of the chariot age.[17]

The hoplite emerged from the Dark Age as the dominant close-combat fighter of the new era. The hoplite was a citizen-soldier, who provided his own armor and worked together with other heavy infantry hoplites in the phalanx. He was a group fighter rather than an individual fighter like Achilles or Hector in the *Iliad*. Hoplites had a panoply named the *hoplon*, but the term *hoplon* is most commonly used to describe only the three to four-foot round shield.[18] The shield, known as the *apsis*, had a wooden core and was rimmed or faced with bronze. It had a central armband, known as the *porpax*, for the left arm and had a handgrip known as the *antilabe*. Controlling the shield with the left forearm, a hoplite could use the shield as both a defensive weapon and an offensive weapon. It also freed the hoplite's right hand to wield a spear or sword. In addition to the shield, the hoplite also wore a Corinthian helmet, which had a t-shaped opening to protect the face from spear and sword thrusts. Greaves sometimes covered the shins and calves, and a bronze corslet protected the trunk.

[17] Drews, 225.
[18] Sage, 26.

By c. 700 BC, the hoplite's primary weapon was the *dory*, a six to ten-foot spear with an iron head and iron butt spike. These spears differed from the javelins of the Sea Peoples, but had much in common with the Egyptian and Mesopotamian thrusting spear. Thrusted overhand at the neck or genitals, the dory was a formidable weapon. If the spear broke, the butt spike could be used as a mace. Again, we see that the mace, one of the most primitive weapons of all, was still useful to Classical Greeks. As the opposing ranks of heavy infantry hoplites clashed after an initial volley of throwing spears and javelins from light-armed troops, the close hand-to-hand fighting that ensued made the long *dory* all but useless. At that point, the compact size of the *xiphos* allowed the hoplite to wreak havoc on inadequately armored opponents. Diodorus Siculus illustrated the usefulness of swords once spears lost their usefulness in his description of the 362 BC Battle of Mantinea.[19] In addition to a sword, hoplites sometimes carried the *cestus*, a precursor to brass knuckles, for the truly hand-to-hand encounter.

Light-armed troops often wore little armor and launched missile weapons, and were not typically close-combat fighters. They used bows, javelins, slings, and threw small stones.[20] Peltasts, on the other hand, used an armament that mixed the flexibility of a long-range light-armed skirmisher with the close-combat usefulness of a hoplite. Peltasts carried a crescent-shaped shield, known as a *pelte*, and wore helmets. They carried two short javelins like their light-armed comrades, and they carried a long thrusting spear and a dagger or short sword like the hoplites. The peltasts, with their javelins and swords, had a panoply similar to that of the Sea Peoples, the Persians, and Roman-era barbarians. The Persians were bowmen, but carried a short spear and a dagger as secondary weapons. Some Persian soldiers also carried a *sabre* or an axe,

[19] Diod. 15.86.2.
[20] Sage, 42.

especially the cavalry.[21] Their *sabre* was similar to the *kopis*, showing a link between cultures separated by great distances, and their axe was similar to those used in Egypt and Mesopotamia millennia earlier. Just as the Sea Peoples toppled the chariot and archer armies of the Great Kingdoms of the Bronze Age, similarly armed peltasts worked in conjunction with Athenian hoplites to defeat the Spartans at the Battle of Sphacteria in 425 BC. This forced the seemingly invincible Spartans to surrender, temporarily turning the tide of the Peloponnesian War. The Goths and other Roman-era barbarians, donning a similar panoply a millennium later, helped to topple the Roman Empire in much the same way.

As Classical Greek civilization weakened, Philip II of Macedon and his son Alexander the Great seized power in the peninsula and modified the armament of the close-combat fighter. The heavy infantry hoplite became a phalangite, a soldier who carried a slightly smaller shield and a very long thrusting spear. The six to ten-foot *dory* of the Classical Age was lengthened into an eighteen-foot pike known as a *sarissa*. Like the *dory*, the *sarissa* had an iron point and a butt spike. The butt spike acted as a counter-weight for the long *sarissa*. The Macedonian phalanx sometimes had deeper ranks than the typical eight-deep hoplite phalanx, likely a lesson learned from Epaminondas of Thebes who defeated the Spartans with a phalanx fifty hoplites deep at the Battle of Leuctra in 371 BC.

In addition to the *sarissa*, Macedonian phalangites carried weapons and wore armor similar to that of hoplites. They used a short sword, probably a *kopis* or other curved sword given the importance of cavalry in Macedonian warfare. Some cavalrymen wielded a long lance, known as a *xyston*, possibly depicted in the famous floor mosaic of Alexander the Great found at

[21] Ibid., 90.

Pompeii.[22] The Macedonian shield was only two feet in diameter, smaller than the hoplite *aspis*, and was slung over the shoulder with a strap to free the hands to wield the long *sarissa*. They wore a helmet, greaves, a breastplate or corselet, and a stomach protector.[23]

Macedonian armies employed light-armed troops regularly. Alexander's elite javelin corps, the Agrianians, were typically used as shock troops.[24] Other types of light-armed soldiers included slingers and archers. Despite his use of light-armed troops, Alexander's infantry and cavalry did most of the close-combat fighting and likely suffered the majority of the casualties. Quintus Curtius Rufus described Alexander's troops in close combat at the 333 BC Battle of Issus by stating, "Forced therefore to join the battle hand to hand, they promptly drew their swords. Then truly there was great bloodshed; for the two armies were so close together that shield struck against shield, and they directed their sword-points at each other's faces."[25] Close combat in Alexander's phalanx was brutal.

Following Alexander's death, Hellenistic successors made few changes to close-combat weaponry and tactics, facilitating an eventual fall to the Romans. Hellenistic rulers lengthened the *sarissa* to twenty-one feet, developed a longer oval shield, and developed a heavy cavalry warrior known as a cataphract. A transitional cavalry force that resembled a heavily armored medieval knight, complete with a lance and an armored horse, the cataphract also employed the bow.[26] Elephants became a part of the Macedonian/Hellenistic heavy cavalry after Alexander encountered them during his conquest of the East. To counter the elephants, the Romans

[22] The Alexander the Great floor mosaic from Pompeii, known as "Alessandro Magno combatte ad Isso contro Dario III re dei Persiani," is located at the National Archaeology Museum (Naples, Italy), online at http://cir.campania.beniculturali.it/museoarcheologiconazionale/itinerari-tematici/nel-museo/collezioni-pompeiane/RIT_RA103/?searchterm=alexander (accessed January 25, 2015).
[23] Sage, 171.
[24] Ibid., 176.
[25] Curt. 3.11.4-5; John C. Rolfe, trans., History of Alexander, by Quintus Curtius Rufus (Cambridge, MA: Harvard University Press, 1946).
[26] Sage, 211-212.

developed the *caltrop*, a small spike device resembling modern police road spikes. These damaged the feet of enemy elephants, camels, and horses.

Antiochus III of the Seleucid Empire used scythed chariots against the Romans at the Battle of Magnesia in 190 BC, a throwback to the ancient chariots of the Egyptians, Hittites, and Mesopotamians. Over a century earlier, Persian king Darius unsuccessful used scythed chariots against Alexander at the Battle of Gaugamela in 331 BC. The Persians may have retained the use of chariots because their ancient ancestors lived inland away from the Mediterranean coast, so did not fall to the Sea Peoples as the Great Kingdoms of the Bronze Age had. Thus, at Magnesia, the Romans encountered a method of warfare that had its roots in the donkey-pulled war-carts of ancient Mesopotamia. Unfortunately for Antiochus, he was no more successful against the Romans than Darius had been against Alexander.

The Romans employed an amalgamation of most of the close-combat strategies discussed above. In many ways, they were the culmination of ancient warfare in the West. The Romans had a propensity to absorb successful strategies and technologies from their vanquished opponents, just as Alexander the Great had done. Because the Roman Republic and Empire lasted such a long time and controlled the territory of the ancient Mesopotamians, Egyptians, Anatolians, and Greeks, Roman weaponry and tactics were descended from all of those ancient civilizations.

The Roman army was divided into legions, which were additionally divided into cavalry, light infantry, and heavy infantry divisions. Cavalry soldiers used a round shield, helmet, body armor, and often carried javelins.[27] Roman cavalry used lances upon making contact with the enemy and a sword or dagger when dismounted for hand-to-hand combat. The sword was

[27] Adrian Goldsworthy, Roman Warfare, Smithsonian History of Warfare, ed. John Keegan (London: Cassell/HarperCollins, 2000), 49.

probably either the common *gladius* or the longer *spatha*, depending on the period. The *spatha* was about the same length as the *kopis*, about three feet long, and became popular for legionaries during the Principate. The light-infantry, known as velites, used a round shield, threw light javelins, and sometimes carried the *gladius*.[28] The Roman light-infantry had much in common with Greek peltasts and the Sea Peoples.

Roman heavy infantry was well armored like the Homeric warrior, the Greek hoplite, and the Macedonian/Hellenistic phalangite. The principle weapon of the legionary in the Republic and the early Empire was the two-foot *gladius*, a probable descendent of the *Naue Type II* and the *xiphos*. Many legionaries transitioned to the longer *spatha* in the later Empire, perhaps to counter the longer swords of the barbarians. In addition to the sword, legionaries also carried a one-foot dagger, known as a *pugio*. Although not a close-combat weapon, a key weapon of Roman legionaries was the *pilum*. The *pilum* was a wooden spear over four feet long, with a two-foot long iron shank. The shank was thin enough that it bent upon impact, making it useless for the enemy. Its spear point was barbed, making it difficult to withdraw. The thin shank and the barbed point kept Rome's superior technology out of the hands of its enemies. In addition to a sword and the *pilum*, some legionaries at different times in Roman history also carried a thrusting sword known as the *hasta*. At about six feet in length, the *hasta* was very similar to the Greek *dory*, yet at the low end of the length range for the *dory*. The *hasta* was the last in a long line of nearly identical thrusting spears from the army of Eanatum of Lagash in Mesopotamia c. 2500 BC to the fall of Rome to the barbarians in AD 476. In fact, the Goths and other Germanic barbarians probably used thrusting spears similar to the *hasta* and *dory* to defeat Valens at Adrianople in AD 378.

[28] Goldsworthy, 51.

There were three types of Roman heavy infantry, each forming its own line in the maniples. Maniples were an evolution of the phalanx wherein groups of soldiers formed a checkerboard formation called a quincunx. The gaps of the quincunx may have allowed one line of soldiers to retreat backward if necessary to regroup. This provided much more flexibility than the phalanx. The three lines of heavy infantry were known as the triplex acies, and were composed of hastati, principes, and triarii. After the front-line of light-armed velites pelted the enemy with javelins or arrows, the hastati, principes, and triarii followed. The hastati, perhaps named after the *hasta* spear they used before the invention of the *pilum*, were the youngest men in the triplex acies. They led the heavy infantry and wielded the *pilum*, the *gladius* or *spatha* sword, and a dagger. As with the other heavy infantry divisions, the hastati wore a bronze helmet, mail or scale armor, a cuirass or breastplate, and carried the long semi-circular shield known as the *scutum*. When an infantryman crouched, his body was fully behind the *scutum*. When soldiers in the maniple, the smaller group of soldiers that helped form the quincunx, positioned their shields in front and above them, they formed a tortoise-shell-like formation known as the testudo. The second line of the triplex acies was made up of the principes. They were men in their twenties and thirties, the prime of life, and they carried the *pilum*, a sword, and a dagger. The last line in the triplex acies was the triarii. They were old veterans who carried the *hasta* spear instead of the *pilum*, as well as a sword and a dagger.[29]

In the Late Roman Empire, the focus shifted from pitched battles to raids. Rome was under attack by barbarians who played by a different set of rules. Like the Sea Peoples before them, the barbarians used longer swords, javelins and darts, and relied on ambushes and raids rather than phalanx or maniple engagements. To counter these problems, the Romans adapted

[29] Ibid.

their tactics and weaponry to match. For the Roman war machine, there were simply too many challenges to overcome. Just as the Great Kingdoms had done nearly two millennia earlier, Rome succumbed to the barbarians and a long Dark Age followed.

The numerous similarities between the barbarians who toppled Rome and the Sea Peoples who toppled the Great Kingdoms of the Bronze Age highlight the continuities that existed in close-combat warfare thoughout antiquity. While there were many innovations, such as the sickle sword and the *pilum*, the innovations were simply variations on a theme. There were great technological advances in catapults and siege engines, but the advances were much less dramatic in close-combat warfare. There is a much greater difference between the self-bow and the *scorpio* than between the *dory* and the *sarissa*. Likewise, there is a much greater difference between a Sumerian war-cart and a scythed chariot than between the *Naue Type II* sword and the *kopis*. This is not to say that ancient close-combat warfare did not change over time or that the changes that occurred were insignificant. On the contrary, the technology and materiel of close-combat warfare changed constantly to meet the needs of the given situation. The changes ebbed and flowed, perhaps giving the impression that nothing much changed at all. For example, the *khopesh* became the *kopis*, which became the *szabla*, the *scimitar*, and the *sabre*. The weapon may seem to have changed very little, but it did change subtlety and gradually to meet the needs of the given period. Consequently, the weapons of ancient close-combat warfare long survived the civilizations that created them.

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