STRATEGY AND TACTICS IN THE WAR OF THE WORLDS

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Introduction

Part 1 of our series, 'When Was the War of the Worlds?',[1] established the chronology of events in the struggle between the British Army and the Martian invasion force. Part 2, 'The War of the Worlds: An After-Action Report',[2] provided a detailed account of the military action. In this third and final instalment, we discuss the war-fighting capabilities of both sides and analyse their strategies and tactics in employing these capabilities.

i) Strategic Overview

> *[I]ntellects vast and cool and unsympathetic, regarded this earth with envious eyes, and slowly and surely drew their plans against us.*

Martian Strategy

The Martian strategy in the War of the Worlds was simple: strike at the heart of the greatest military power on Earth and defeat it before it could organise against the invasion. The War of the Worlds was thus the first blitzkrieg, or 'lightning war'. From the time of the first landing to the Martian advance into the centre of London was only a matter of 86 hours. The War of the Worlds was also the first chemical war, in that the Martians deployed their most effective weapon, the Black Smoke, to wipe out large areas in and around London. However, it was not the first biological war, and thus neither was it the first war in which weapons of mass destruction were used.

Generally speaking, the invasion of Britain was a two-step process. In the first phase, the Martians established a stronghold in suburban Surrey, at some distance from London. Next, they advanced on their primary target – London – from their staging area in Surrey. This is analogous to an American plan – half a century later – for the invasion of another island nation: Japan. In the first phase, scheduled to be launched in November 1945, Operation Olympic would have established an American stronghold on the island of Kyushu. Once secured, this southernmost of the Japanese home islands would then have been developed as the staging area for the final assault in April 1946 – code-named Operation Coronet – in which American forces would have landed on the Kanto Plain outside of Tokyo. Of course, history took a different turn in August 1945, when the employment of

[1] Thomas Gangale and Marilyn Dudley-Rowley, 'When was the War of the Worlds?', *Wellsian*, 29 (2006), 2-20.

[2] Thomas Gangale and Marilyn Dudley-Rowley, 'The War of the Worlds: An After Action Report', *Wellsian*, 30 (2007), 36-56.

weapons of mass destruction on Hiroshima and Nagasaki made the invasion of Japan unnecessary.

It is interesting to consider that the Martians' stunning military success was carried out by fighting-machines from only the first three of the ten cylinders. Only those fighting-machines that had emerged from the cylinders of the Surrey Triangle participated in this main offensive. How do we know this? The fourth cylinder landed in Bushey Park just before midnight on Monday, 17 June 1907. The Martians entered London a few hours later early Monday morning. Given that the Martians had to wait 20 hours to emerge from their first cylinder whilst the vehicle cooled from its fiery descent through the atmosphere, units from the fourth cylinder could not have taken part on the assault on London. Thus it would seem that only thirty percent of the Martian forces saw action during this offensive.

Was the Martians' plan as meticulous as Wells describes in his opening paragraph? Was their invasion plan flawed from a military standpoint? Should the Martians have remained in their cylinders until all ten of them had landed and were ready to deploy their fighting-machines?

Since the Martians launched only one cylinder per day, they were apparently restricted by launch capacity. There was apparently only one gun for launching these spacecraft. Given this operational constraint, they may have considered the element of surprise using the first available forces more important to the success of their campaign than the concentration of the forces from all ten of their landing craft prior to sallying forth from their cylinders. Had the Martians waited ten days (nine days from the first to last landing, plus another day to deploy the fighting-machines from that last cylinder) before taking the offensive, they would have given the British Army an additional week and a half to react to the sudden Martian threat. In that time, the British would have easily surrounded each of the early Martian cylinders with artillery and destroyed them. By the time the later cylinders landed, the British Army would have concentrated so many guns in the environs of London that any cylinder would have been located and destroyed before it could deploy a single fighting-machine. Still another danger of delaying the offensive would have been the increased probability of inclement weather moving through the theatre of operations, and this would have seriously degraded the effectiveness of the Black Smoke (see the 'Meteorology' section, below, for additional discussion).

But an obvious point has been overlooked. Even more important than the element of surprise in military operations is the principle of concentrating forces in time and space. One needs not only to get to the military objective quickly, one also needs to get assets to the target nearly simultaneously in sufficient force to overwhelm the enemy. To feed one's forces into a battle piecemeal is folly. Why did the Martians not land all ten of their spacecraft on the same night? After all, an earlier discussion pointed out that some spacecraft transited in only 31 days, whilst others took 32 days. Extending this idea of launching their cylinders at different

velocities, and taking into account the need to launch every 24 hours 40 minutes (the length of the Martian day), the Martians could have, for example, launched their forces so that the first cylinder travelled to Earth in 34 days, the second in 32 days, 23 hours, and 40 minutes, the third in 31 days, 22 hours and 40 minutes, etc. According to this scheme, in order to land each spacecraft on the same night, the tenth cylinder would have crossed in 24 days and 18 hours.

As an analogy, the American spacecraft *Mariner 6* was launched towards Mars on 24 February 1969, and its twin, *Mariner 7*, was launched 31 days later on 27 March 1969; however, *Mariner 6* arrived at Mars 156 days after being launched, whilst *Mariner 7* made the journey in only 133 days, arriving a mere eight days behind *Mariner 6*.

We can conclude that the Martians could have simultaneously landed their ten cylinders in a ring around London, then driven that ring inward in a coordinated movement on the following night, leaving no avenue for escape, killing the entire city whilst it slept. But then, this would not have left much of a story for Wells to tell, would it? Later, we will explore some reasons why the Martians may not have wanted to land all ten spacecraft on the same night.

Martian Intelligence

Much has been made of Wells's description of the Martians' preparation for their invasion, that this Earth was 'scrutinised and studied, perhaps almost as narrowly as a man with a microscope might scrutinise the transient creatures that swarm and multiply in a drop of water'. This is obviously a supposition on his part, since he was certainly not party to the Martians' planning. In light of several events in the War of the Worlds, the adequacy of the Martians' military intelligence must be questioned.

How well could the Martians have studied Earth? Unlike the Martians in Kurd Lasswitz's *Two Planets,* there is no evidence that Wells's Martians had any spacefaring capability beyond their planetary assault cylinders. They apparently had no observation platform in orbit around Earth, for instance. Thus their scrutiny of Earth had to have been conducted from Mars itself.

Observing Earth from Mars is much more problematic than viewing Mars from Earth, which is difficult enough, to be sure. Because Mars is further from the sun than Earth, when the two planets are aligned on the same side of the sun (opposition), the entire daylight side of Mars is visible in the midnight sky of Earth. But for a Martian viewing Earth, the situation is quite the opposite. Earth is in front of the sun, which means both that the Earth's night side is turned toward Mars and Earth is in the noon sky of Mars. Under these conditions, there is no possibility of observing Earth, even though it is making its closest approach to Mars. The best time to view Earth from Mars would be several months before or after opposition, when Earth is either in the evening or pre-dawn sky. Even then there would be challenges to observing men as they 'went to and fro over this

globe about their little affairs'. First of all, Earth would be much farther from Mars than during opposition, on the order of a hundred million miles (160 million kilometres). Secondly, only a thin crescent Earth would be visible, so the Martians would be able to surveil only a small slice of human activity, and from a distorted perspective as well, viewing only the illuminated edge of our world. The most favourable view of Earth takes place when this planetary configuration straddles the point of Mars's closest approach to the sun (perihelion) and therefore minimises the distance between Earth and Mars. Such alignments, as with perihelic oppositions, occur only once every fifteen to seventeen years (see 'When Was the War of the Worlds?' for a detailed explanation), and only last for a few months before Earth passes into the daytime sky of Mars and becomes unobservable.

Fortunately for the Martians' invasion planning, such a configuration occurred on 10 August 1894 (see Figure 1), around the time that the Martians were casting the huge gun that later launched the cylinders toward Earth (Stephane Javelle, an astronomer at the Nice Observatory, observed a luminous projection in the region of the southern terminator of Mars on 28 July of that year). Figure 2 shows how Earth looked from Mars during this alignment. This view of Earth represents a trade-off between maximising the illuminated area of the Earth that is visible from Mars, and minimising the distance between the two planets. Even so, the gulf separating Earth and Mars was 109 million miles (175 million kilometres). In this figure, the small circle in the centre of the terrestrial disk, when compared to the size of the terrestrial disk itself, represents the apparent size of Earth as seen from Mars, compared to the maximum apparent diameter of Earth during a perihelic opposition, when the two worlds are as close as they ever can be. The portion of the globe containing lines of latitude and longitude represents the illuminated area viewable by the Martians.

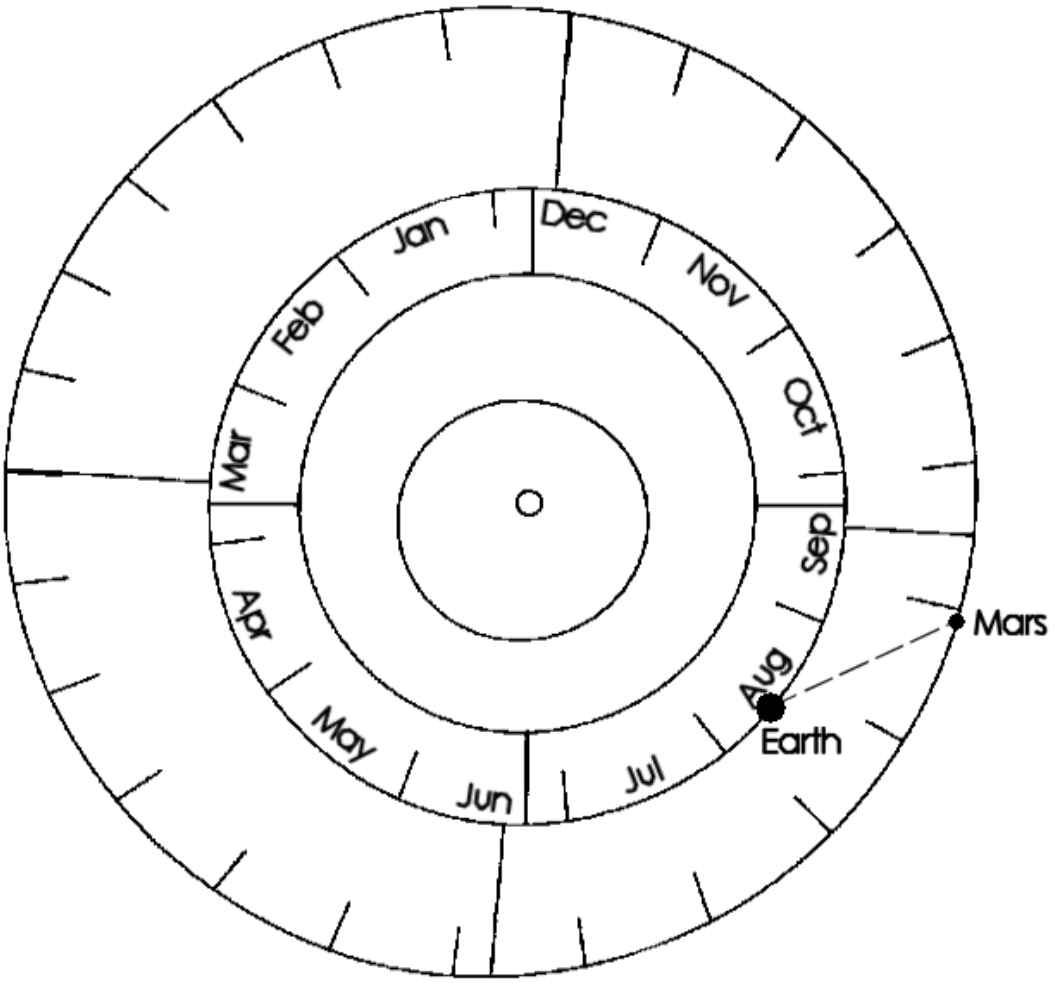

Figure 1: Positions of Earth and Mars on 10 August 1894

The fact that there were some notable Martian intelligence failures in the War of the Worlds does not necessarily mean that their planning was rushed or careless, but only that their means of gathering intelligence were limited.

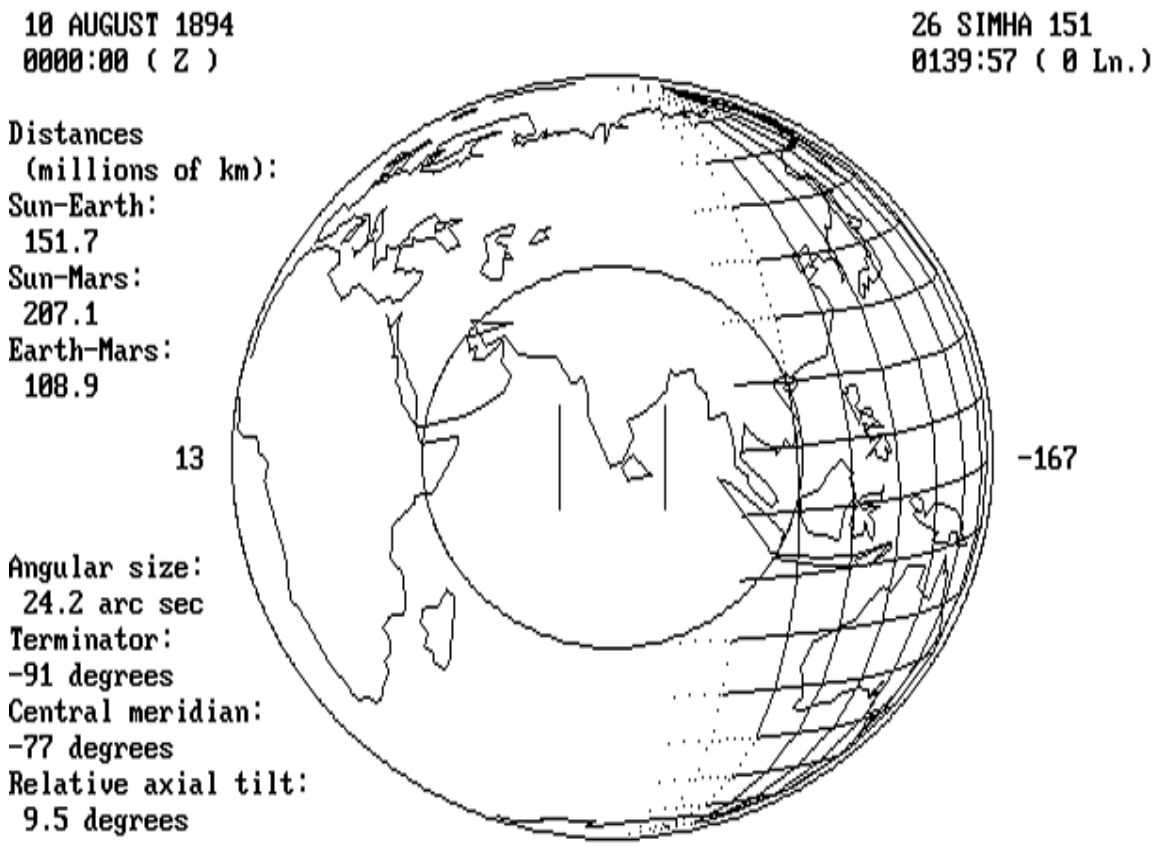

Figure 2: Earth as Seen from Mars on 10 August 1894

To begin with, the invaders' allegedly meticulous planning brought their first cylinder to rest on Horsell Common, near Woking. One might at first think that this was an excellent landing zone, a quiet suburb without immediate military threat, yet at the same time within quick striking distance of London. In fact, it was an egregious blunder when one considers Woking's proximity to Aldershot, a British Army base, only ten miles to the south-west. Given that the Martian cylinders, and even their armoured fighting-machines, were not impervious to Army shell fire, the Martians' choice was far from ideal. In their pit on Horsell Common, they could scarcely have been more vulnerable to artillery if they had tried, nor could field pieces have been brought to bear against them more rapidly. It was perhaps only a matter of a few minutes that separated their spectacular success from utter disaster at the very outset of the war (see the 'Artillery' section, below, for additional discussion).

Secondly, the Martians, despite all their supposed scrutiny of Earth-life and years of planning, were unprepared for, and seemingly oblivious to, the threat of warships. The ironclad *Thunder Child* was able to mow down two fighting-machines at the Battle of the Blackwater in a matter of minutes, simply by driving headlong at them whilst the Martians stood in motionless astonishment (see the 'Naval Forces' section, below, for additional discussion).

Finally, and most fatally, the Martians failed to recognise the greatest threat to their mission, a threat thriving all around and all over them. As Wells stated: 'That they did not bury any of their dead, and the reckless slaughter they perpetrated, point also to an entire ignorance of the putrefactive process'. This ignorance of bacteria is astonishing, given the fact that billions of humans, down the ages, have been killed off by diseases. Our tragic history of pestilence would have been available to the intellectually superior invaders had they scrutinised us as thoroughly and watched us as keenly and closely as Wells surmised (see the 'Biological Agents' section, below, for additional discussion).

It is quite likely that the Martians attempted a reconnaissance mission to Earth in advance of the invasion. The evidence for this is to be found in Wells's story, 'The Crystal Egg' (1897). The egg appears to have been a Martian communication device, transmitting video to and from Mars. A smaller cylinder may have been launched from Mars a couple of years before the invasion and could have landed on Earth undetected. Since the invasion force succumbed to bacterial infection, one may conclude that the reconnaissance mission met the same fate, and so quickly that the members of the expedition were unable to relay to Mars what was happening to them. Indeed, they may not have understood that they were dying, much less why.

Was the flash of light on Mars reported by Javelle and Perrotin at the Nice Observatory in July 1896 the launch of this reconnaissance mission? Probably not. It is doubtful that the Martians would have launched a single mission nine years in advance of the 1907 invasion without following up with additional missions. Equally improbable is it that there were additional missions, for had there been, at some point the Martians would have understood from these successive failures that there was something about Earth that was hazardous to their health. Thus, the conclusion is that the reconnaissance mission occurred shortly before the invasion, and that despite its failure, the Martians were committed to their invasion timetable. The latest launch opportunity for the reconnaissance mission was March 1905.

Since the Martians were physically ill-equipped to travel long distances unassisted in Earth's gravity field, this reconnaissance mission must have been conducted via a small walking machine. The interesting question is where is this machine? Also, is it possible that whoever discovered the Martian walker scavenged other devices from it? Are there other Martian artefacts sitting undiscovered in London's antiquities shops?

Britain's Strategic Posture

The Martians defeated the British forces so quickly that the latter cannot be said to have developed a strategy to counter the Martian invasion. Rather, Britain's reaction to the Martians was entirely on the tactical level. However, an overview of Britain's strategic posture at the outbreak of the War of the Worlds will illuminate why the greatest empire on Earth was defeated in only three days.

Paradoxically, a serious weakness lay in the fact that Britain was such a global empire. Its land forces were distributed all over the Earth, rather than being concentrated in Britain itself. Furthermore, by virtue of being an island nation, it relied on sea power both for the global projection of its forces and for the defence of the home islands. In both respects, the Empire assumed a posture of defence in depth. Since the closest perceived threat would be from the European continent, the most immediate line of defence was the fleet patrolling the English Channel and the North Sea. However, a war against Britain by a terrestrial power would not be simply an assault against the home islands. A conventional enemy would also have to simultaneously attack a number of outlying territorial possessions in order to choke off the war supplies that would enable Britain to fight a protracted war, and it was to these outlying territories that the bulk of British forces were deployed. The British Army units on the island of Britain itself were scattered throughout, confident that it would have plenty of time to concentrate against a specific threat. In the War of the Worlds, however, the British Empire faced a most unconventional and otherworldly foe: an enemy that need not invade from across the sea, an enemy that could strike quickly enough to achieve its military objectives long before logistical support from the overseas colonies could be put to use, an enemy that could drop from the skies and strike at the heart of the Empire. Britannia ruled the waves, but the waves were no barrier at all to the Martians. All previous terrestrial wars had been two-dimensional; this was Earth's introduction to three-dimensional warfare, in which a combatant was able to render irrelevant an opponent's forward deployment of surface forces.

British Intelligence

There were very few facts in advance of the invasion, and taken together, they did not present a clear picture of Martian capabilities and intentions. It is only with hindsight that we can deduce that the flash of light on Mars reported by Javelle and Perrotin in 1894 was due to activities associated with either the construction or testing of the Martian space launch complex. Similarly, the meaning of the ten flashes observed on successive nights in May 1907 could not have been divined until the first cylinder landed in Horsell Common.

The 'crystal egg' was a critical link in this web of information. Its existence here on Earth proved that the Martians were capable of interplanetary flight. It appears that, tragically, the authorities never knew of the egg's existence. If they had, they might have deduced that the May 1907 flashes were the launch of a much larger expedition, whether benevolent or malevolent, and given the egg's location in London, they might have deduced that the south of England was the expedition's likely target. This would have given His Majesty's government a month to make prudent preparations. In the absence of knowing Martian intentions, the British military could at least have been brought to a high state of readiness.

Asymmetric Warfare

Simply put, asymmetric conflict is a strategy by which a weak combatant can overcome a much stronger adversary. Guerrilla warfare is one such strategy that has a long history. More recent is the advent of terrorism against civilian targets, and in the past decade the most spectacular manifestation of this concept has become the suicide bomber. In this, as with so many things, Wells was far ahead of his time.

In a manuscript dating from about a year before the first instalment of 'The War of the Worlds' appeared in *Pearson's*, Wells's protagonist emerged from his fortnight of imprisonment to encounter not the feckless artilleryman, but a cell of determined urban guerrillas bent on destroying the Martians by any means at their disposal. Although the British Army had ceased to exist as an effective fighting force, there were still isolated pockets of resistance to the Martian occupation. It was there that the narrator learned of the incineration of Leatherhead, the last known whereabouts of his wife, and it was then that he resolved to trek to London with a bomb furnished by the guerrillas, with the objective of embracing a Martian in death. The narrator's murderous motivation has become all too familiar to us in our own time: 'If I can die with a Martian dead upon me, then I will die, thanking God'. It is the invocation of the kamikaze, the jihadi, the hero we cheer or the monster we fear, who strikes suddenly out of nowhere to crash a fighter aircraft or a motorboat into a warship, a truck or a commandeered airliner into a building, because he has been deprived of all other means to resist and no longer has a reason to live. Yet this suicide bomber only three weeks earlier had been a civilised Surreyite, a 'recognised writer on philosophical themes'. One can only wonder how this vision would have been received had it found its way to print, to what extent it would have appalled Victorian sensibilities.

Of course, there is nothing so anticlimactic as the Divine Wind that fails to carry to its intended destination with effect, and in this alternate ending to Wells's story, the bomb-laden narrator climbed the hill upon which the Martians had established their headquarters to find that they had already succumbed to putrefactive micro-organisms. Perhaps it is for this literary consideration that Wells devised the second encounter with the artilleryman in place of the narrator's recruitment by a terrorist cell.

ii) Logistical Overview

> *About five o'clock the gathering crowd in the station was immensely excited by the opening of the line of communication, which is almost invariably closed, between the South-Eastern and the South-Western stations, and the passage of carriage trucks bearing huge guns and carriages crammed with soldiers.*

Spacelift

The fact that the Martians gambled their entire enterprise on the roll of ten spacecraft is significant. Because of the relative motions of Earth and Mars, any reinforcements would have had to wait until the next opposition approached, about 780 days later in July 1909.

At least in the short term then, Martian space-lift capability seems to have been limited to only ten non-reusable spacecraft. The cylinders can be assumed to have been non-reusable because they crash-landed on Earth, and there is no evidence that they were intended to return to Mars to transport a second wave of invaders. Logically, they would have had to return to Mars by the same means that they were propelled to Earth – by means of a huge gun. Since Wells's narrator surmises that the barrel of the gun was cast in 1894, and we have established that the War of the Worlds occurred in 1907, it appears that it took the Martians 13 years to complete the other intricacies of the launch complex. How much longer would it have taken the Martians to build a launch complex on Earth, given that the Martians would have had to build from scratch an industrial capability suitable to their level of technology, and given that a far larger gun would have been required to escape Earth's much stronger gravity?

The Martians deployed their spacecraft in several phases. The first three cylinders targeted a small area of Surrey, in a triangle defined by Horsell, Addlestone and Pyrford, about 22 miles (35 kilometres) south-west of the centre of London. As far as we know, the cylinders of the Surrey Triangle transported fighting-machines exclusively. As the fighting-machines emerged from these cylinders and advanced to the north-east, a subsequent spaceborne drop of three cylinders landed in a triangle defined by Bushey Park, Sheen and Wimbledon. This area was behind Martian lines by the time these landings occurred. Nothing is known of the contents of the Bushey Park and Wimbledon cylinders, but it is fairly certain that the Sheen cylinder carried only logistical equipment – handling-machines, aluminium extractors, and digging mechanisms – that extracted terrestrial resources for the war effort. It is possible, but by no means certain, that the mission of the West End trio of cylinders as a whole was logistical support. Certainly the fighting-machines of the Surrey trio were sufficient to defeat British forces. The seventh cylinder landed on Primrose Hill in London, again behind Martian lines, and it was here that the Martians established their forward command post. Nothing at all is known of the landing of the last three cylinders.

It was pointed out earlier that the Martians could have taken London entirely by surprise by landing all ten spacecraft on the same night in a ring around the city. However, it would have made no sense to do this if only the first three cylinders carried fighting-machines, whilst the remaining cylinders had no armament of their own but only transported equipment meant to exploit terrestrial resources and consolidate Martian control of the Home Counties. If this were indeed the case, it

was essential that the latter cylinders land only after the areas around their landing targets were secure from any British military threat. Even so, it still does not make sense for the Surrey cylinders to have landed on three successive nights. Had they landed on the same night, the Martians could have deployed their fighting-machines from all three cylinders simultaneously before British military forces began to mobilise, thereby achieving total surprise.

Railroads

The railroad, along with industrialisation and urbanisation, was very much the child of the Victorian Era. An experimental technology in Queen Victoria's youth, it had come to full flower by the close of the 19th century. It was the pervasive high-tech infrastructure of its age, as airlines would be in the mid to late 20th century and the Internet would be at the turn of the 21st century. It was the railroad that made the massive expansion of London possible, supplying the megalopolis with raw materials for its industries and food for its workers, and distributing the fruits of industry and labour to distant markets. The railroad even transported large numbers of citizens within the great city and its environs, creating a new form of human existence that distanced domestic life from workaday life. It was on the railroads of London that the life of the commuter came into being:

> 'They just used to skedaddle off to work – I've seen hundreds of 'em, bit of breakfast in hand, running wild and shining to catch their little season-ticket train, for fear they'd get dismissed if they didn't… skedaddling back for fear they wouldn't be in time for dinner….'

As the British Government awoke to the Martian threat, the nation's rails were pressed into service as the primary conduit for drawing military resources into Greater London and deploying them to forward positions in Surrey and the West End. By Sunday, 16 June 1907, newspapers reported:

> Guns were in rapid transit from Windsor, Portsmouth, Aldershot, Woolwich – even from the north; among others, long wire-guns of ninety-five tons from Woolwich. Altogether one hundred and sixteen were in position or being hastily placed, chiefly covering London. Never before in England had there been such a vast or rapid concentration of military material.

Wells does not explicitly attribute these military movements to railroad traffic, perhaps taking it for granted, as perhaps his contemporary readers did. An analysis of the deployment of artillery batteries in Surrey and the West End indicates that rail was the preferred mode of transport for these elements of the

British Army. Infantry units may also have travelled on railcars to deploy troops as rapidly as possible.

Wells did however describe the initial reliance on the railway system in the evacuation of London on Monday, 17 June 1907, and the rapid collapse of this backbone of Victorian infrastructure under the sudden demand of London's fleeing millions:

> By ten o'clock the police organisation, and by midday even the railway organisations, were losing coherency, losing shape and efficiency, guttering, softening, running at last in that swift liquefaction of the social body.

Roads

Paved roads were also extensive in the immediate theatre of the conflict, although the military use of these roads seems to have been limited to moving artillery short distances from nearby rail lines, and perhaps as routes of travel for cavalry units. The primary role that roadways served was as escape routes for the fleeing population. Road traffic was mostly pedestrian or horse-drawn, with some mention of motorcars by Wells.

Communication

Wells contradicts himself with regard to the Martians' mode of communication. At first, he claims, 'They communicated with one another by means of siren-like howls, running up and down the scale from one note to another'. However, he later asserts:

> It is commonly supposed that they communicated by sounds and tentacular gesticulations…. I watched them closely time after time, and that I have seen four, five, and (once) six of them sluggishly performing the most elaborately complicated operations together without either sound or gesture. Their peculiar hooting invariably preceded feeding; it had no modulation, and was, I believe, in no sense a signal, but merely the expiration of air preparatory to the suctional operation. I have a certain claim to at least an elementary knowledge of psychology, and in this matter I am convinced – as firmly as I am convinced of anything – that the Martians interchanged thoughts without any physical intermediation. And I have been convinced of this in spite of strong preconceptions.

Within minutes of the Battle of Horsell Common, newspapers reported the loss of telegraphic communication about the area of Woking. Disrupting the

enemy's communications is an important consideration in military operations, for impairing his ability to obtain information on a rapidly changing battle situation and to transmit instructions to his forces is one of the keys to victory. 'They exploded any stores of powder they came upon, cut every telegraph, and wrecked the railways here and there. They were ham-stringing mankind'.

However, the British Army was also able to communicate via heliographs, which being portable devices, had advantages over the fixed assets of telegraph lines and stations. The British forces could use these devices wherever they had an unobstructed line-of-sight, rather than having to locate a telegraph line. Furthermore, heliograph signals could not be disrupted by the Martians.

iii) Tactical Overview

> *'This isn't a war,' said the artilleryman. 'It never was a war, any more than there's war between man and ants.'*

Spaceborne Armour

The Martian blitzkrieg strategy was implemented via a combination of what would several decades later be called airborne units – but in this case were of course 'spaceborne' units – and mobile armour units. The Martian fighting-machine was analogous to the tank that would be developed by terrestrial armies several decades after Wells published his story. However, there were several important differences.

First of all was the Martian logistical capability to deliver these formidable fighting-machines to the theatre of operations. These armour assets were deployed from the space drop vehicles themselves. By the outbreak of the Second World War, it was possible to deploy infantry units from the air behind enemy lines, either via parachute or via glider, and such operations circumvented the Atlantic Wall during the invasion of Normandy in June 1944. However, to this day the deployment of heavy armour from the air into forward positions remains beyond the reach of military technology. Tanks do not drop from the sky onto the battlefield. Such assets must be landed at airstrips and then transported to the front.

Secondly, the mobility of the Martian fighting-machine remains unequalled by terrestrial technology. These three-legged machines dwarfed tracked, armoured vehicles not only in stature, but in their unparalleled ability to negotiate terrain. And not just terrain at that, but also considerable bodies of water, for these machines were not only able to cross the Thames but to wade into nearly a hundred feet (30 metres) of open sea.

Infantry

Infantry showed itself to be entirely ineffective against Martian armour in its single engagement at Horsell Common on Saturday, 15 June 1907. Some artillery pieces

had been unlimbered near Horsell, but unfortunately the first Martian fighting-machine attacked before these field pieces could be brought the bear, and the Heat-Ray destroyed the guns and ammunition. The battalion of infantry from the Cardigan Regiment was then left to face the Martians without artillery support. Bullets from the rifles and Maxim machine guns of the infantry simply bounced off the Martian fighting-machines, and the infantry charge was quickly wiped out by the Heat-Ray. Once the formidable nature of the fighting-machines was realised, the use of infantry disappeared from British battle plans.

Cavalry

Classically, cavalry performs several functions:

- Screen the movements of the main body of the army. The British did not have time to assemble a main body of forces in the theatre.
- Engage enemy cavalry (mounted combat). The Martians had no cavalry.
- Engage enemy infantry (dismounted combat). The Martians had no infantry.
- Cut enemy lines of communication. The Martians communicated by audible signals and by telepathy.
- Capture or destroy enemy supplies. It is possible that cavalry may have been capable of inflicting damage on logistical units such as the handling-machines, aluminium extractors and digging mechanisms; however, Wells cites no attempts at this, possibly because such vulnerable assets were defended by fighting-machines, as at the Sheen cylinder.
- Perform reconnaissance. The Martians were not hard to find. The impact of the cylinders were dramatically noisy and in some cases started fires. Their hundred-foot-tall fighting-machines could be spotted from miles away.

Cavalry was active in the area of the first three landings during the first days of the war, but there is no indication that it was ever committed in an engagement. Its main function appears to have been organising the evacuation of civilians. A squadron of hussars started out from Aldershot on Friday evening, 14 June 1907, and hussars were in the area of Maybury Hill on Saturday evening, 15 June 1907. The hussars were nearby when the Cardigan Regiment of infantry engaged the Martians on Saturday night, but the infantry was wiped out so quickly that the cavalry did not join the fighting. The narrator met three hussars on the road between Maybury Hill and Woking on Sunday morning, 16 June 1907, but they had not seen any Martians. Rather, they were detailed to clear the civil population out of the area. The narrator later saw hussars at Byfleet Station. By Sunday afternoon, flying hussars had been galloping into Chertsey. Whether these gallant horsemen were killed in the destruction of Chertsey is unknown.

Artillery

The one effective weapon that British land forces had against the Martian invaders was artillery, and thus the War of the Worlds was primarily a duel between Martian armour and British artillery. The one exception was at Horsell Common, where the Martians seized the initiative before the field pieces could be unlimbered. However, the remaining two battles of the offensive phase of the war – Weybridge and London – were fought between British artillery and Martian armour exclusively, and it was in these engagements that the British Army drew blood. At Weybridge on Sunday afternoon, 16 June 1907, one of the five fighting-machines in the action was surprised by a hidden battery and destroyed. Another machine was disabled that evening at St George's Hill as the Martians advanced on London. By this phase of the war, however, the Martians were on the move, and their mobility, which did not rely on roads, and to which hills and streams presented no impediment, presented a serious challenge to the British Army's ability to transport field pieces via rail then pull them up into battle array with horses. The problem was that the field pieces were designed to be fired against fixed targets, or at best large, slow targets such as infantry charges. They could not be swivelled around quickly enough to track the rapidly moving Martian fighting-machines, so they were fortunate to be able to get off one effectual volley before being overrun or incinerated. Still, the British were able to mass 116 guns to defend the West End of London. Whether this concentration of firepower would have proved sufficient against seven mobile targets armed with only the Heat-Ray is a matter of speculation. Surely the Martians were unwilling to take the gamble, for they instead silenced the vast majority of theses guns from a distance using their Black Smoke. It was primarily the Black Smoke that sustained the Martian blitzkrieg through this decisive phase of the war, and the Heat-Ray was then directed against batteries positioned on high ground that had escaped the effects of the Black Smoke.

The Army faced the Martians with 12-pounders for the most part (see Figure 3). Although the British Army also possessed heavy guns in the 4-inch to 6-inch range, these were far fewer in number and took much longer to transport (see Figure 4). Additionally, they had to be sited with care on firm ground or they would sink. In any case, the 12-pounders got the job done whenever they were able to score a direct hit to the body of a fighting-machine. Unfortunately, this occurred in only one instance – at Weybridge. The battery at St George's Hill managed only to damage one leg of a fighting-machine, which was quickly repaired. The firepower of British artillery was sufficient; it was its targeting ability that was lacking.

Figure 3: British 12-Pounder Field Gun (source: www.civilization.ca)

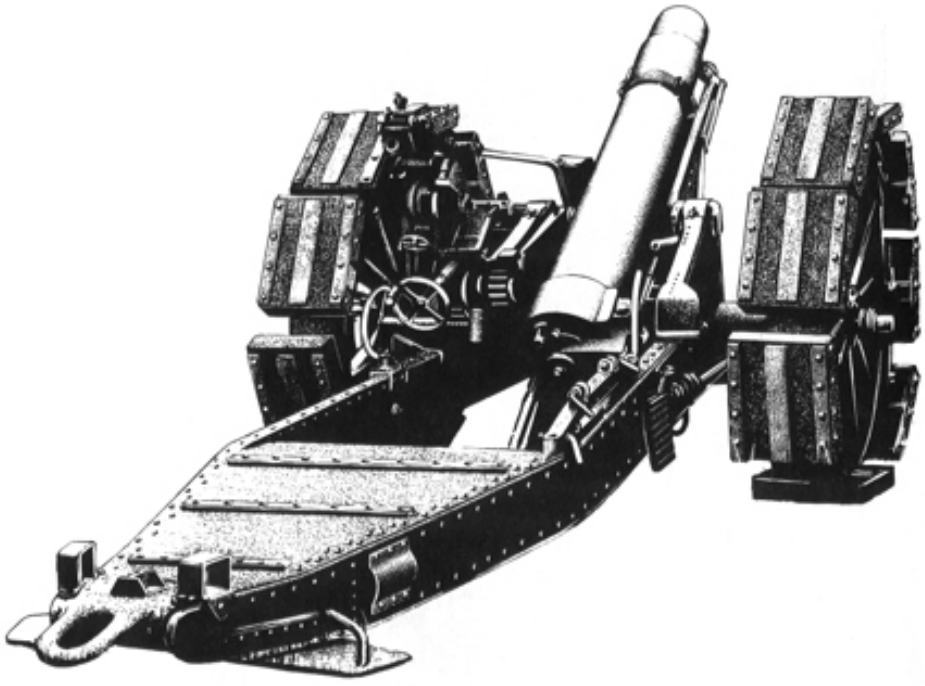

Figure 4: British 6-Inch Howitzer (source: www.britishempire.co.uk)

The downfall of the British was that their most effective weaponry was brought to bear after the cat was already out of the bag. The British brought more than a hundred guns to the war, but the Martians overcame this numerical advantage through superior mobility and their weapon of mass destruction. The Martians' handful of towering tripods simply outpaced the British Army's

multitude of rail-transported, horse-drawn field pieces as they strolled virtually at will across the south of England, carpeting the landscape with Black Smoke.

Nevertheless, Britain's plight still need not have been so dire. It was at Horsell Common, on Saturday evening, 15 June 1907, and for the want of a few minutes, that the Empire was lost. Had the Martians delayed their attack, their entire enterprise might have failed immediately. The artillerymen would have completed their deployment of field pieces and the British Army might well have destroyed the Martian fighting-machines as they emerged from this first cylinder. The British should then have been able to re-deploy their artillery in time to destroy the fighting-machines rising out of the second cylinder at Addlestone, only five miles to the north-east, for the fighting-machines from the Addlestone cylinder did not go into action until noon of the following day. The British could then have dealt with the Pyrford cylinder in turn, five miles south of Addlestone, for the fighting-machines from the third cylinder did not deploy until the advance on London on Sunday evening, 16 June 1907. At this point in time, men and materiel were pouring into the area immediately west of London from all over the south of England, and the British Army would have had sufficient resources to concentrate against the later cylinders.

It has already been noted that 20 hours elapsed from the landing of the Horsell cylinder to the opening of the hatch. Moreover, another 23 hours passed before the first fighting-machine emerged. Fighting-machines from the Addlestone cylinder did not deploy until 36 hours after landing, and the fighting-machines from the Pyrford cylinder did not go into action until about 21 hours after landing. Whilst it can be seen that the Martians were steadily becoming more efficient in deploying their armour, surely 21 hours was plenty of time for the British Army to position sufficient artillery pieces to blast the Martians as they came out of their holes, so to speak. From this perspective, we once again see that the Martian strategy of deploying as rapidly as possible the first forces landed was the proper one, as opposed to waiting for more cylinders to land before launching their offensive.

Wells reflects on the vulnerability of the Martians to an Earth timely alerted to the threat, when at the end of his story he contemplates the prospect of a second invasion:

> In that case the cylinder might be destroyed with dynamite or artillery before it was sufficiently cool for the Martians to emerge, or they might be butchered by means of guns so soon as the screw opened. It seems to me that they have lost a vast advantage in the failure of their first surprise. Possibly they see it in the same light.

On the other hand, the British Army's failure to destroy the Addlestone cylinder is troubling, and casts some doubt on this line of thought. The army began

shelling the Addlestone cylinder at 3pm on Saturday, 15 June 1907, yet fighting-machines from the Horsell cylinder did not reach the Addlestone cylinder until after the Battle of Horsell Common four hours later. Although Wells does not mention it, it can be assumed that these fighting-machines put the batteries above the Addlestone Golf Links out of commission. Nevertheless, these batteries had four hours to destroy the Addlestone cylinder and did not get the job done. Targeting the Addlestone cylinder may have been complicated by the fact that it landed in a wooded area; not only may the woods themselves have hidden the cylinder from view, but the smoke of the burning woods caused by the impact of the glowing cylinder further obscured the situation.

Naval Forces

The last known battle of the war, at the mouth of the Blackwater on Wednesday, 19 June 1907, is ironic in several respects. It was the only naval action against the Martians by the greatest maritime power on Earth, and it was the most effective battle that the British waged against the invaders. In this engagement, a single British ironclad faced three Martian fighting-machines. *HMS Thunder Child* destroyed two of the three fighting-machines it faced before it was destroyed. The greater effectiveness of naval ballistics versus the mixed success of army artillery lay not in larger guns, for the army's field pieces were capable of destroying the fighting-machines when they were able to score hits. Rather, the main advantage that naval guns had was that they were mounted on turrets and were intended to track mobile targets.

Exactly what class ship *Thunder Child* was is difficult to ascertain. Wells describes her as having been a 'torpedo ram', a term that had been used since the American Civil War to describe various classes of vessels, from small torpedo boats up to cruisers. Yet Wells also refers to her as a 'charging leviathan' and a 'vast iron bulk', suggesting a much larger vessel.

The first-class battleship at the time Wells wrote *The War of the Worlds* – the 14,900-ton Majestic class – bristled with four 12-inch wire-wound guns, twelve 6-inch quick-firing guns, eighteen 12-pounders, twelve 3-pounders, a number of smaller guns, and five torpedo tubes. By 1906, however, *HMS Dreadnought* had been launched. This 17,900-ton leviathan brandished no less than ten 12-inch guns, twenty-four quick-firing 12-pounders, and five torpedo tubes.

Let us suppose *Thunder Child* to have been in the Pelorous class, an inventory of 2,135-ton third-class British cruisers launched beginning in 1897 (see Figure 5). The primary armament of this class ship was eight 4-inch quick-firing guns, so even this comparatively modest warship had more firepower than a battery of horse-drawn 12-pounders. But again, the real edge that any warship had was the ability to track a moving target.

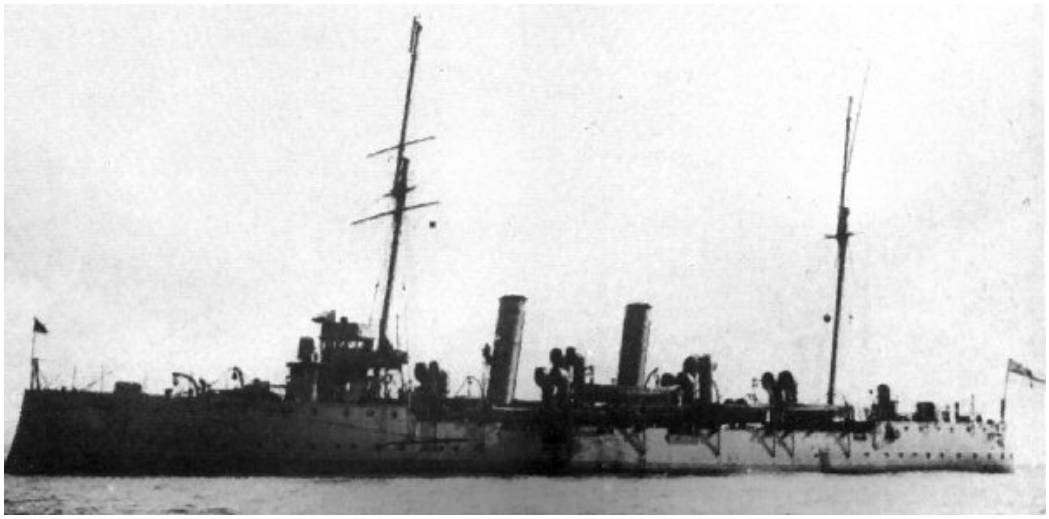

Figure 5: *HMS Pyramus* (Pelorous Class) (source: www.worldwar1.co.uk)

Another factor in favour of *Thunder Child* was that the Martians were not nearly so mobile as the adversaries that the British Army faced on land. The fighting-machines were wading sluggishly in nearly 100 feet (30 metres) of water at the mouth of the Blackwater. Accordingly, the guns of *Thunder Child* had a much better chance of targeting the Martians.

So, would the Navy have fared better against the Martians than the Army in other sea engagements? Probably not. *Thunder Child* was able to destroy the first fighting-machine it faced because the Martians had never before encountered a man-of-war, thus *Thunder Child*'s destructiveness came as a complete surprise. Once the Martian's were alert to the danger, they disposed of *Thunder Child* rather quickly with the Heat-Ray. In reality, naval gunnery scored only one kill at the Blackwater. The second Martian machine was destroyed in the ship's death throes only because the fighting-machines had allowed *Thunder Child* to get in too close before taking appropriate action. Had the Martians encountered any subsequent naval vessels, they surely would have dealt with them before the ships could come within range and bring their guns to bear. The Army could hide its guns in the trees, and did so wherever possible, but naval vessels were open targets. Thus, their superior firepower and rapid targeting ability would have come to naught.

How would submarines have fared against the Martians? Probably not all that well. They would have had to fire torpedoes at periscope depth, of course, and this might not have afforded enough protection from the Heat-Ray. Then again, how well the Martians would have been able to detect and target a submerged vessel is an open question. It can be stated with some certainty, however, that since only the legs of the Martian fighting-machines were in the water, whilst their bodies remained entirely out of the water, they would have been nearly impossible targets for torpedoes to hit.

Airpower

The first reference to a Martian aircraft is a few hours after the Battle of the Blackwater, on Wednesday evening, 19 June 1907, as the narrator's brother steamed away from the Essex coast:

> Something rushed up into the sky out of the greyness – rushed slantingly upward and very swiftly into the luminous clearness above the clouds in the western sky; something flat and broad, and very large, that swept round in a vast curve, grew smaller, sank slowly, and vanished again into the grey mystery of the night. And as it flew it rained down darkness upon the land.

This passage indicates that the flying-machine was discharging Black Smoke as it flew over Essex. As devastating as the fighting-machines' rocket launchers were, the aircraft's ability to blanket the Martian's chemical weapon over large areas can scarcely be exaggerated.

A flying-machine was also spotted by the artilleryman on the night of Monday, 1 July 1907:

> '[I]t was just a matter of lights, but it was something up in the air. I believe they've built a flying-machine, and are learning to fly.'

Finally, the narrator saw a flying-machine in the pit on Primrose Hill at dawn on Friday, 5 July 1907, along with nearly 50 dead Martians.

The Martian aircraft was not observed for the first time until five days after the landing of the first spacecraft. Either it took this long for the Martians to assemble the aircraft that had been brought from Mars in sections within an individual cylinder, or the first cylinders did not contain such an aircraft, or perhaps the aircraft was so large that it required several cylinders to transport the complete set of components. Either the second or third scenarios – or both – are probable. The military objective of the first cylinders was to deliver armour units that would establish a secure perimeter, without which Martian air power probably would have been vulnerable on the ground to British artillery. Thus the delivery of the aircraft in the first days of the war would have been premature and would have displaced a number of more urgently required armour units.

It is interesting to note that although he mentioned Martian flying-machines, Wells failed to envision the use of aeronautics by British forces. The Federal Army used observation balloons extensively during the American Civil War (1861-65), and the use of balloons figured prominently during the siege of Paris during the Franco-Prussian War (1870-71). Of course, these were static vehicles. However, it is unimaginable that Wells was oblivious of the work of von Zeppelin on dirigibles

(i.e., propelled balloons) in the 1890s. Moreover, he could not have been ignorant of the fact that the problem of powered heavier-than-air flight had been worked on since the 1840s and was on the verge of solution. Samuel Langley in the USA and Hiram Maxim in the UK began work around 1889-90 and had working models by 1893-94. True, it was not until after *The War of the Worlds* was published that a number of others, including Clément Ader and Alberto Santos-Dumont in France, Otto Lilienthal in Germany and the Orville and Wilbur Wright and Samuel Langley in the USA, began tackling the problem in earnest, but Wells should have sensed that powered heavier-than-air flight was near at hand (actually, Wells mentions 'Lilienthal soaring-machines', which were unpowered gliders – see Figure 6). By analogy, in the early 1950s one could have written with some confidence about manned spaceflight in the 1960s. Since aerostatic aviation had long since proven its military value by the time of the writing of *The War of the Worlds*, it would not have been much of a stretch for Wells to see the significance of the aeroplane a decade in the future.

Figure 6: Otto Lilenthal in Flight in 1894 (Source: www.first-to-fly.com)

Directed-Energy Weapons

The Heat-Ray was certainly the Martians' most spectacular weapon, as versatile as it was devastating. It was primarily a point weapon in that it could strike specific targets. Additionally, however, it had the quality of a weapon of mass destruction, in that it could sweep a field of fire and lay waste a considerable area, wiping out

an infantry formation in the blink of an eye, and reducing towns such as Woking, Chertsey and Weybridge to fiery wreckage in a matter of seconds. Although other Martian military technologies – airpower, mobile armour, chemical weapons – came to have terrestrial analogues within a few decades of Wells's writing, directed energy weapons remain in the research stage.

Chemical Weapons

Where British field artillery was not outmanoeuvred by Martian mobility, it was rendered combat ineffective by the poisonous Black Smoke, which asphyxiated the gun crews. In contrast to the dual nature of the Heat-Ray, the Black Smoke was unequivocally a weapon of mass destruction. However, this Martian device was not the first weapon of mass destruction ever seen on Earth. Europeans had surreptitiously given blankets infected with the smallpox virus to indigenous peoples of North America more than a century before. However, the means of delivery were crude and there was then no understanding of the cause of smallpox. The knowledge of bacteria was still fairly new to Wells's time and viruses were only on the verge of being discovered. In any case, the Black Smoke was the first use of a comparable weapon in an overt combat environment, and Wells's account presaged the use of poison gas in the First World War.

As devastating as the Black Smoke was, it was not in the Martians' interest to use it indiscriminately. Its widest use was in silencing the dozens of artillery batteries that the British Army had positioned to defend the West End of London. But the primary object of war is neither to destroy the enemy nor to devastate his country, but only to deprive him of the means to resist. The Martians cannot have wanted to poison the population as a whole, since Wells's descriptions of the handling machines document that the Martians valued humans as a food source. Given this, since organised resistance collapsed shortly after midnight on Monday, 17 June 1907, the report of a Martian aircraft raining down darkness upon the land three nights later following the Battle of the Blackwater is somewhat puzzling. It may be that the British Army had deployed units near the Essex coast to menace the Martians.

The Martians discharged the Black Smoke by launching rocket-propelled canisters from their fighting-machines:

> Each of the Martians, standing in the great crescent I have described, had discharged, by means of the gun-like tube he carried, a huge canister over whatever hill, copse, cluster of houses, or other possible cover for guns, chanced to be in front of him. Some fired only one of these, some two – as in the case of the one we had seen; the one at Ripley is said to have discharged no fewer than five at that time. These canisters smashed on striking the ground – they did not explode – and incontinently disengaged an enormous volume of heavy, inky

> vapour, coiling and pouring upward in a huge and ebony cumulus cloud, a gaseous hill that sank and spread itself slowly over the surrounding country. And the touch of that vapour, the inhaling of its pungent wisps, was death to all that breathes.

The Black Smoke had a number of notable properties. First of all, the heaviness of the vapour caused it to flow around hills:

> It was heavy, this vapour, heavier than the densest smoke, so that, after the first tumultuous uprush and outflow of its impact, it sank down through the air and poured over the ground in a manner rather liquid than gaseous, abandoning the hills, and streaming into the valleys and ditches and watercourses even as I have heard the carbonic-acid gas that pours from volcanic clefts is wont to do.

This, heavy, sinking action of the Black Smoke meant that it tended to miss any artillery batteries deployed on hills, and so during their advance on London on Sunday night, 16 June 1907, the Martians were careful to attack such high ground with their Heat-Ray weapon before they came within range of any guns that might be waiting for them in those hills.

Another remarkable property was that the Black Smoke precipitated into a harmless black powder when it came in contact with water:

> And where it came upon water some chemical action occurred, and the surface would be instantly covered with a powdery scum that sank slowly and made way for more. The scum was absolutely insoluble, and it is a strange thing, seeing the instant effect of the gas, that one could drink without hurt the water from which it had been strained.

Defence against the Black Smoke was nearly within reach of the terrestrial technology of 1907. In 1912, Garrett A. Morgan patented a gas mask in the United States for use by fire fighters, and his designs were later improved to protect troops from poison gas attacks during the First World War. Of course, Morgan's invention was almost twenty years in the future from Wells's writing, so it is understandable that Wells did not predict the development of such countermeasures. Had Britain had time to mass-produce and distribute such protective measures, the Martians might well have been stopped at the Battle of London by the concentration of artillery around Richmond, Kingston and Wimbledon.

In 'Soldier of the Queen', Barbara Hambly's contribution to the 1996 anthology, *War of the Worlds: Global Dispatches*, the author offers the intriguing

suggestion that a simpler countermeasure might have been effective. In this story, a young Indian lawyer, identified only as ‘Mr Gandhi’, survived the Black Smoke by breathing through a damp handkerchief.

iv) Order of Battle

> *It was a few minutes past nine that night when these three sentinels were joined by four other Martians, each carrying a thick black tube. A similar tube was handed to each of the three, and the seven proceeded to distribute themselves at equal distances along a curved line between St George’s Hill, Weybridge, and the village of Send, south-west of Ripley.*

Martian Forces

On Sunday evening, 16 June 1907, British military analysts conjectured from the size of the Martian cylinders ‘that at the outside there could not be more than five’ in each. But five what... five Martians or five fighting-machines? In retrospect, analysis of Martian movements on that day suggests that the cylinders that formed the Surrey Triangle carried no more than three fighting-machines each, for a total of nine at the outside. Five machines engaged British forces in the Battle of Weybridge at noon on Sunday. These were undoubtedly from the Horsell and Addlestone cylinders. It is possible that a sixth machine remained inside the Surrey Triangle to protect the cylinders, especially the Pyrford cylinder’s precious cargo of undeployed fighting-machines. Following their retreat from Weybridge, the Martians spent the afternoon transferring materiel from the Pyrford cylinder to Horsell Common. The Martians’ activities also probably included preparing three new fighting-machines from the Pyrford cylinder for battle. That evening, seven fighting-machines participated in the Battle of London. One machine had been destroyed earlier in the day at Weybridge, and again it is likely that one fighting-machine was held in reserve to guard whatever materiel that might still be inside the Triangle from being surprised from Aldershot or some other British military installation in the Martians’ rear. This accounts for nine fighting-machines in all, or three per cylinder. Had the three Surrey cylinders transported a total of fifteen fighting-machines to Earth, surely a great many more than seven would have advanced on London that evening.

It was posited earlier that only thirty percent of the Martian forces may have participated in the main offensive. Actually, this is a bit misleading, for it assumes that each of the ten cylinders carried the same number of fighting-machines. We do not know this for a fact. Indeed, the evidence suggests that later cylinders carried few if any fighting-machines, but instead transported to Earth other equipment important to the Martian war effort.

The narrator found nearly fifty bodies in the Martian pit on Primrose Hill. We know that three were killed in action, one at Weybridge and two at the mouth of the Blackwater. Additionally, on Saturday evening, 4 July 1907, the narrator saw a stationary fighting-machine in Regent's Park and near the Zoological Gardens, and also a wrecked handling-machine between Baker Street and St John's Wood. Presumably their pilots died in these machines. It is not clear whether the fighting-machine on Primrose Hill contained the body of a Martian, or whether it was unoccupied. With three fighting-machines lost in action and three others standing still in London when the end came, there remain three fighting-machines unaccounted for that probably also contained dead bodies. Together with the wrecked handling machine, this accounts for ten dead Martians in addition to the fifty bodies on Primrose Hill. All told then, it appears that there may have been a total of about sixty Martians in the invasion force, or six per cylinder. Thus the Martian invasion force may have consisted of ten combat pilots (nine fighting-machines and one aircraft), with the remaining fifty or so Martians engaged in various support roles, such as operating handling machines. The probable Martian order of battle is:

- Ten spacecraft
- Nine fighting-machines
- One flying-machine

British Forces

Information on British forces deployed in the War of the Worlds is very fragmentary, since Wells relied on eyewitnesses and newspapers rather than military sources:

- Two companies from Inkerman, deployed to Chobham
- One battalion of the Cardigan Regiment from Aldershot, deployed to Horsell Common
- Grenadiers at Weybridge
- A squadron of hussars from Aldershot, deployed to Horsell Common
- 8th Hussars at Woking
- Hussars at Chertsey
- A score of hussars at Byfleet
- 12th Horse Artillery Battery, deployed to Horsell Common
- One battery at Chobham
- One battery at Addlestone
- One battery at Byfleet

- One battery at Shepperton
- One battery at Ripley
- One battery at St George's Hill
- Unknown number of batteries at Chertsey, Richmond, Kingston, Staines, Hounslow, Ditton, Esher and Ockham
- Unknown number of torpedo-boats and destroyers on the Thames
- Torpedo ram *HMS Thunder Child* at the mouth of the Blackwater

v) Environmental Factors

> *For some minutes I lay there in the rain and darkness watching, by the intermittent light, these monstrous beings of metal moving about in the distance over the hedge tops. A thin hail was now beginning, and as it came and went their figures grew misty and then flashed into clearness again. Now and then came a gap in the lightning, and the night swallowed them up.*

Meteorology

Weather is often ignored in war-gaming scenarios such as *The War of the Worlds* CD-ROM game, but is always a factor in real war.

One can speculate that the Heat-Ray operated most effectively in clear, dry air, and that poor visibility and rainy weather would have attenuated the power of the directed energy beam. Probably such meteorological attenuation would have only marginally reduced the combat effectiveness of the Heat-Ray, however. From Wells's description, the Heat-Ray had merely to momentarily touch its target before it erupted into flame or melted. Would destruction have been any less certain had the Heat-Ray needed to dwell on its target a fraction of a second longer? Still, when engaging multiple targets such as massed artillery, the cumulative delay may have resulted in one or more guns getting off an extra shot, thus increasing the probability of destroying a fighting-machine.

The case for the affect of bad weather on the Black Smoke is more compelling.

Under full steam, *HMS Thunder Child* passed through a cloud of Black Smoke so quickly that the chemical agent failed to incapacitate the crew of the ironclad:

> Suddenly the foremost Martian lowered his tube and discharged a canister of the black gas at the ironclad. It hit her starboard side and glanced off in an inky jet that rolled away to seaward, an unfolding torrent of Black Smoke, from which the ironclad drove clear.

From this it can be seen that in land combat under windy conditions, the Black Smoke would have been of doubtful utility. Furthermore, the Martians themselves projected clouds of steam to precipitate the Black Smoke out of the air into an inert powder before moving into stricken areas. Surely, then, the Black Smoke would have been impotent on a rainy battlefield, driven to the ground as a harmless powder before the fatal fumes could be inhaled by an appreciable number of artillerymen. The effectiveness of the Martians' dreaded weapon of mass destruction was thus entirely dependent on favourable weather, a condition for which the British Isles are hardly celebrated. In a protracted war, the British climate would have been the natural ally of the defending forces, and a most effective one.

Although June is a rather fair month in the south of England, Wells describes a brief hailstorm that came up during the War of the Worlds early Sunday morning, 16 June 1907. This was on the night before the Martians broke out of the Surrey Triangle to begin their offensive toward Weybridge, Shepperton and finally London. Had the storm been delayed until the following afternoon and evening, it might have seriously disrupted the Martian offensive, during which their chief weapon against the massive gun emplacements defending the West End of London was the Black Smoke. Wells also mentions a lightning storm passing south of London in the early hours of Monday, 17 June 1907, during the Martians' advance on London. Suppose the path of that storm had instead taken it directly over London? Finally, at the end of Wells's account of the War of the Worlds, he notes 'two days of thunderstorms and rain' which occurred a few days after the Martians had perished from terrestrial bacteria. Had such a lengthy storm started on the day that the Martians were ready to advance out of Surrey, they would have been unable to employ the Black Smoke to suppress the by-then extensively deployed British artillery, which would have therefore given the Martians quite a thrashing. As Napoleon's Grande Armée and Hitler's Wehrmacht perished in the snows of the Russian winter, so might the Martians have been slaughtered in the rains of the English summer.

Biological Agents

War is hardly an antiseptic enterprise. Indeed, throughout history, many times more soldiers have died of disease than have been killed in combat. Only after Wells's penning of *The War of the Worlds* did this begin to change, as humans gained a better understanding of the causes of disease and developed strategies for prevention and cure.

The Martians' great oversight, of course, was not being aware of the invisible bacteria that were to be their downfall. Although Wells states in the first paragraph of his story that the Martians scrutinised and studied this world 'perhaps almost as narrowly as a man with a microscope might scrutinise the transient

creatures that swarm and multiply in a drop of water', the narrator is making an analogy based on earthly experience, and the passage really does not imply that the Martians were cognisant of microbes on their own world. He uses this phrase in the first chapter to illustrate how thoroughly he imagines the Martians might have studied Earth from afar, but in fact could not have (see the 'Martian Intelligence' section, above, for additional discussion), to emphasise how more evolved than us the Martians were as life forms, and also as a literary device to foreshadow the Martians' ultimate doom. Wells explains the Martians' unfamiliarity with microbes thus:

> Micro-organisms, which cause so much disease and pain on earth, have either never appeared upon Mars or Martian sanitary science eliminated them ages ago. A hundred diseases, all the fevers and contagions of human life, consumption, cancers, tumours and such morbidities, never enter the scheme of their life.

If microbes had existed on Mars, the Martians would have been alert to the possible threat of terrestrial bacteria, and would have developed precautions before attempting the invasion of Earth. We can infer that the Martians had long ago mastered their own environment down to the microbiological level, eradicating all disease. One might point out that in the late 20th century, we on Earth began to entertain the idea that all bacterial disease could be eradicated; however, much to our later surprise, a number of resistant strains have emerged. Beyond these new bacterial challenges are the even more frightening crises of new viral diseases such as AIDS, Ebola, and avian influenza. If we could underestimate the microbial challenge on our own world, the Martians could certainly make the same mistake on an alien planet, especially if their own war against disease was a matter of the remotest antiquity. Perhaps the Martians landed on this Earth with the same infinite complacency and serene confidence in their empire over matter that Wells attributed to humankind on the eve of the war.

Wells's narrator first came upon a silent, stationary fighting-machine on Thursday evening, 4 July 1907, and apparently all of the Martians were dead by the following morning. He later stated, 'I have learned since that, so far from my being the first discoverer of the Martian overthrow, several such wanderers as myself had already discovered this on the previous night'. Although this was a very dramatic end to the War of the Worlds, it was also very improbable. All of the Martians should not have died within a single day, since they did not all land on Earth on the same day. Since the Martians from the first cylinder were exposed to terrestrial diseases eight days earlier than those that landed in the last cylinder, they should have died that much earlier.

vi) Final Reflections

> *Dim and wonderful is the vision I have conjured up in my mind of life spreading slowly from this little seed bed of the solar system throughout the inanimate vastness of sidereal space.*

That the Royal Navy was largely left out of the war, that the British Army could not bring effective numbers of artillery pieces into the land battle, that British scientists could not develop and distribute gas masks to the military, and that the British weather did not turn against the Martians, was primarily due to the speed of the Martians' offensive, to their ability to strike precipitously at the heart of the Empire from the sky, and as is often the case in war, also due to several lucky breaks. The precision placement of assets within hours of London, by what were essentially air drops, was the single strategic factor that decided the outcome of military operations. Sea power turned out to be the British equivalent of the Maginot Line, having been circumvented by the Martians at the outset. Britain's scientific and industrial base was unable to gear up against the sudden Martian threat. Likewise, the landing of the Martians in such close proximity to their main target allowed them to achieve their immediate military objectives within a very narrow meteorological window of opportunity. Bad weather might well have ruined their enterprise.

Ultimately, of course, the Martians' enterprise was ruined, not by weather, but by another environmental factor. As with many wars, intelligence decided the outcome of the War of the Worlds; in this case, the Martians' ignorance of terrestrial bacteria.

However, had the Earth itself failed to overthrow the Martians, their defeat might still have come in a matter of days or weeks. Although Wells's narrative paints a picture of swift and complete military victory for the Martians, it must be considered that one fighting-machine was destroyed at Weybridge and two at the Blackwater, and given the probable order of battle, only six of them remained at the end of the war. If elements of the British Army had reconstituted to carry on guerrilla operations, as Wells envisioned in an early manuscript, it is conceivable that the remaining fighting-machines could have been destroyed. Deprived of a secure base of operations, the single Martian aircraft would not have been a threat for very long.

As far as Wells was able to report, when the war came to an abrupt end due to disease, the Martians had only established control over the environs of London and the county of Essex, whilst the remainder of the kingdom remained free. Furthermore, the Continental powers of Europe, not to mention the United States, had yet to bring their considerable military forces to bear. Had the conflict played out, the Martians may well have found themselves in a more difficult situation when faced by an alliance of the major powers of Earth. In a protracted war, the

combined forces of Earth would have had time to develop gas masks against the Black Smoke. Certainly the technology of the time (or even our own, for that matter) almost certainly would not have been able to protect against the Heat-Ray. On the other hand, more effective artillery could have been developed against the armour of the Martian fighting-machines, and anti-aircraft artillery could have been developed to counter the flying-machines.

As we all know, these same major powers of Earth were to meet on the battlefield seven years hence in a war named for a single world rather than two. It is intriguing to ponder whether this World War, and its sequel a generation later, would have been fought amongst allies of a protracted and recently fought War of the Worlds. Might not our world, having been surprised by a mortal extraterrestrial threat, of necessity have found the wisdom and courage to make peace with itself in the face of a common foe? Indeed, had they not fallen prey to contagion, could the Martians have wreaked as much destruction on us as we ultimately brought upon ourselves in the wars of the 20th century? Now, a century after the War of the Worlds, we possess most of the weapons that Wells ever dreamed of, and others besides. It remains to be seen whether the Great Game of geopolitics between nation-states has played itself out, whether we are at the end of history, whether we have passed the phase of global war and destruction that would have taxed even Wells's imagination. We do know, that at the dawn of the 21st century, humanity is far from united, that many threats to peace and freedom remain. We can imagine that some of the destructive capabilities that Wells envisioned for the Martians may eventually be in the possession of, not inhuman aliens, but monsters of our own species who are the enemies of the human race. We live in an age in which we send robotic spacecraft to explore Mars, an age in which we dare dream of sending humans to Mars, of making that world our own, of extending our empire over matter across interplanetary space. Yet we can also imagine that, just as Wells's Martians were, we may someday be slain by disease against which our systems are unprepared, slain by bacteria and viruses, 'by the humblest things that God, in his wisdom, has put upon this earth', yet unleashed by human folly. 'To them, and not to us, perhaps, is the future ordained'.

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