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Citation for published version:

MacDonald, F 2008, 'Space and the Atom: On the Popular Geopolitics of Cold War Rocketry', *Geopolitics*, vol. 13, no. 4, pp. 611-634. <https://doi.org/10.1080/14650040802275479>

Digital Object Identifier (DOI):

[10.1080/14650040802275479](https://doi.org/10.1080/14650040802275479)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Geopolitics

Publisher Rights Statement:

The final version was published in *Geopolitics, History, and International Relations* by Taylor and Francis (2008). Available online.

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Space and the Atom: on the popular geopolitics of Cold War rocketry.

This is the author's final draft as submitted for publication. The final paper was published in *Geopolitics, History, and International Relations* by Taylor and Francis (2008).

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Abstract

This paper considers the imbricated domains of space exploration and Cold War geopolitics by following the trajectory of the 'Corporal', the world's first guided missile authorized to carry a nuclear warhead. It examines the popular geopolitics of rocketry as both a technology of mass destruction and as a vehicle for the transcendent dreams of extra-terrestrial discovery. Avoiding both technical and statist accounts, the paper shows how these technologies of Cold War strategic advantage were activated and sustained through popular media and everyday experience. Particular attention is given to such mundane activities as children's play, using the example of die-cast miniature toys of the Corporal. Through such apparently modest means, nuclear weapons were made intelligible in, and transposable to, a domestic context. The paper is also situated within a wider emerging literature on geographies and geopolitics of outer space.

Space and the atom are the two most exciting promises of modern science. Under the pressures of a world at war, the Atomic Age had an unfortunate start. As yet, fear casts a dark shadow that obscures the untold benefits that the atom has in store for us. Space flight, fortunately, will be different. It begins under the auspices of a noble international effort to be carried out in a spirit of peaceful cooperation among scientists of all civilized nations¹.

Heinz Haber

INTRODUCTION

This is an essay about outer space. Although it primarily deals with the journey to the lower Earth orbit rather than further afield to inner planetary space or elsewhere in the solar system, it aims to contribute to an emerging interest in extra-terrestrial geographies by examining the place of rocketry within the cultural, political and geopolitical frames of the Cold War. As other scholars have pointed out, the technology of the rocket evokes that of the ship two centuries earlier²: as both vehicle and instrument, they opened up new territories for science and commerce and inaugurated an entirely new frontier for exploration. The advent of rocketry not only unleashed a new geographical imagination in the mid-twentieth century but it also gave fresh momentum to earlier ideas about the discovery of new worlds. As Peter Redfield has elegantly put it:

Although the airplane opened up the sky, and the radio tower filled the air with waves . . . neither made the limits of the Earth entirely visible or transparent. Space technology closed the sky again, bounded it from above and sealed it whole. Only then could the sky become fully modern in an active, technological sense, and only then could what lay beyond it become meaningful as space, a vast sea of darkness surrounding a blue and green point of human place. At last the world was one³.

Until very recently, geographers in particular have been reluctant to move their 'graphy' beyond the limits of the 'geo'. A geography of outer space might sound like a quixotic enterprise though it is towards this over-ambitious end that the essay is directed. I want more specifically to consider the 'popular geopolitics' of space and this inevitably raises an obvious question about the applicability of a 'geo'-politics to the celestial realm. Everett Dolman has already projected classical geopolitics into space under the guise of 'astropolitics' but this is not the model I want to follow⁴. While there is much work to be done forging an

astropolitics which can critically examine the contested governance and sovereignty of space, this paper is only obliquely concerned with astropolitical dominance. Rather, I want instead to think through the parallel geopolitics of space exploration and Cold War weaponry through some resolutely grounded observations about the place of such technology in everyday civilian life here on Earth.

In what follows, I step back from what is conventionally regarded as the inception of the Space Age: the dramatic launch of the Russian satellite *Sputnik* into a stable orbit on the 4th October 1957. There is no question that *Sputnik* is the pre-eminent milestone in the history of the space race⁵. It is significant for all sorts of reasons, not least as the first in a technological lineage that would subsequently bequeath profound consequences for the nature of social life on Earth, from weather forecasting to telephony to surveillance to navigation to missile guidance and so on. *Sputnik* will doubtless remain an iconic marker of Cold War rivalry in the geopolitical contest for the heavens and the earth. But even before a payload could be placed in orbit, the rival superpowers faced the earlier and more fundamental challenge – which interests me here – of leaving Earth’s atmosphere in the first place.

My concern here is with the evolving rocket programme of the American military from the end of the second world war to the early 1960s. While this study includes a number of different rockets, intended for a variety of strategic, military and research purposes, I concentrate in particular on the development of the ‘Corporal’ (figure 1), an overlooked part of a wider programme which includes its technical variants (such as the WAC Corporal) and immediate precursors (such as the V-2, and the Bumper WAC). If I use the word ‘rocket’ in this context with some hesitation, it is because the word most frequently appended to the name Corporal is ‘missile’⁶. The distinction seems a fine one, but in a sense the entire history of space exploration lies in this slippage between rocket and missile; between a peace time research vehicle and a Cold War weapon of mass destruction. There is little, technically-speaking, to differentiate rocket from



FIGURE 1. US Army training with the Corporal missile, 1954. Reproduced courtesy of Army Ballistic Missile Agency, Redstone Arsenal, Alabama.

missile. The terms are often used interchangeably, even if they each carry a quite different semiotic payload. Rocket is a fairly benign descriptor that simply refers to a vehicle which obtains thrust by the ejection of a fast moving propellant. This is the term most obviously associated with exploration. Missile, by contrast, implies impact and annihilation; an intent to destroy. While this different discursive construction of the technology is worth noting, the vehicle itself is exactly the same: space exploration and perpetual readiness for nuclear war are simply two parts of an identical story. The Corporal programme is therefore the classic embodiment of these seemingly irreconcilable objectives, for it has the acclaim of being the first man-made object to penetrate outer space as well as being America's (and Britain's) first nuclear missile. It was, as David de Vorkin

has described, the tool of science that would prepare the nation for the next war, with both ‘warhead’ and ‘peacehead’ applications⁷.

The Corporal missile has curiously escaped any detailed consideration either by historians of the space age or those of nuclearism⁸. To be sure, it was not the first significant rocket (that notoriety must go to its direct predecessor, the German V-2), nor was it the first nuclear weapon (the free-fall bomb ‘Little Boy’ whose accomplishment was the mass killing of 140,000 civilians in Hiroshima). The Corporal, being a ‘tactical missile’ with a modest range of 75 nautical miles, was also of limited strategic significance compared to subsequent Intercontinental Ballistic Missiles (ICBMs), like the more versatile ‘Atlas’, which could usefully dispatch death to remote peoples as well as place satellites into orbit. While the Corporal was briefly on the front line of nuclear defence, it was never used in conflict. This is perhaps just as well; in the early years, the Corporal had such a terrible record of target accuracy that its most likely casualties would have been its own troop battalions. It was, if anything, a bit of a dud. It was also however the first man-made object to leave the Earth’s atmosphere⁹. And as the first guided missile authorized to carry a nuclear warhead, it arguably has particular significance as the progenitor of contemporary weapons of mass destruction. Moreover, at the time of its development it carried, however fleetingly, a raft of hopes and fears both about the space age and about nuclear war.

What interests me here is what we might call the ‘cultural success’ of the Corporal, an object that sat astride the categories of ‘rocket’ and ‘missile’, drawing on the popular enthusiasm for space to legitimate its underlying military purpose. In this essay then, I want to discuss the place of the Corporal within the popular and political cultures of the era. And in so doing I pay most attention to the ways in which the missile was figured across a diverse suite of cultural forms. I situate my argument within a wider literature on ‘popular geopolitics’, a recent emphasis within critical geopolitics that attends to the circulation of geopolitical power through popular culture rather than through familiar networks of statesmen, generals and ruling elites. To talk, therefore, of the ‘popular

geopolitics' of rocketry is to examine how the technologies of Cold War strategic advantage were activated and sustained through popular media and everyday experience. The essay argues that the power of the Corporal lay less in its technical ability to propel a 20 kiloton nuclear fission warhead 40 km high than in its presence as a flexible narrative prop, able to support popular enthusiasms about space while coyly doubling as a weapon of mass destruction. That the Corporal was 'domesticated' as a die cast children's toy is, I argue, indicative of how the widespread enthusiasm for rocketry and space exploration in the 1950s eased nuclear weapons into the political mainstream.

In the first instance, I try to open up space and its exploration as a research theme which could usefully be considered within the orbit of geography. Drawing on earlier precedents for thinking of space as a sphere of the social, I emphasise the strategic, scientific and geopolitical continuities between space exploration and earlier episodes of imperial endeavour. The history of the Corporal programme is then understood in this light, as a technology variously configured as vehicle, instrument and projectile, that emerged from the ruins of the second world war to become a key weapon in NATO's Cold War arsenal. Lastly, I want to think more closely about the popular geopolitics of the Corporal programme, examining the by no means untroubled passage of the missile through domestic as well state contexts.

TOWARDS A GEOGRAPHY OF THE OUTER EARTH

An historical geography of space exploration has yet to be written. And such a task might only be one part of a broader geographical engagement with outer space which has, to date, been strangely limited. Strange, because it is now over fifty years since humans first cast their instruments into orbit. Our species has lived in space for more or less the last twenty years, and is currently represented by the crew of the International Space Station. The journey through the Earth's atmosphere, once a major obstacle, is now made on an almost weekly basis.

There are over 700 operational spacecraft in orbit and over 35 nations now have payloads in space. In short, the last fifty years has seen the outer-Earth become an ordinary and accessible sphere of human endeavour, with our presence in (and reliance on) space making it one of the enabling conditions for our current mode of everyday life. It would be easy to draw a rather superficial connection here, trading on the commodious meaning of the word 'space' as both the primary analytic for contemporary human geography and as the popular term for the expanse in which solar and stellar systems are located. But I want, in passing, to make the more ambitious argument that geography is the obvious disciplinary home for the study of the cultural, political, economic and strategic contest over the outer-Earth. Such a project is not a search for the new, but rather a boldly going *back* to some of geography's earlier origins. For if outer space is a scale that for the most part feels unfamiliar to human geographers, such limited disciplinary horizons are, paradoxically, a late modern tendency. David Livingstone has shown how, in figures like the sixteenth century scholar-mathematician John Dee (1527-1608), astronomical enquiry and the study of cosmography aimed to connect the workings of heaven and earth¹⁰. It was the planetary scale which formed the background to much geographical teaching in the early modern period, the movements of the stars being afforded significance in the outcome of worldly affairs. As I have explored elsewhere, there are a number of geographical precedents for thinking about outer space¹¹.

A related argument worth mentioning is that a geography of outer space is a logical extension of earlier geographies of imperial exploration¹². Space exploration has used exactly the same discourses, the same rationales, and even the same institutional frameworks (such as the International Geophysical Year, 1957-1958) as terrestrial exploration. And like its terrestrial counterpart, the move into space has its origins in older imperial enterprises¹³. Marina Benjamin argues that for the United States outer space was 'always a metaphorical extension of the American West'¹⁴. When Frederick Jackson Turner argued in 1893 that the frontier was central to American identity and nationhood, his thesis could equally be applied to the US space programme's encounter with the 'final

frontier' in the twentieth century¹⁵. Peter Redfield makes a similar point in relation to the French Arianne space programme which relied on its earlier colonial ties to take advantage of the fuel economies associated with an equatorial launch, rather than sites at lower latitudes. Looking at the imbricated narratives of colonialism and rocketry in French Guiana, he makes the case that 'outer space reflects a practical shadow of empire'¹⁶.

The history of the Corporal missile also stands in this shadow. Not only was the Corporal (as rocket) part of a bid to open up the new empire of space on the part of the United States, but the Corporal (as missile) was also a means of shoring up imperial power back on Earth. When the British government bought the programme from the United States in 1954 it was purchased as means of re-asserting Britain's geopolitical significance in the context of its own imperial anxieties¹⁷. Even before the ignominies of Suez, Britain had 'lost' India and Pakistan to independence movements; surrendered the Palestine mandate to the United Nations; and passed responsibility over Greece and Turkey to the United States. Possessing a nuclear missile was then seen by Winston Churchill as a shortcut back to the international stage at a time when Britain's own home-grown missile programme was in its infancy¹⁸. It is clear then that the imperative of space exploration went hand in hand with terrestrial geostrategic considerations, both of which were extensions of earlier regimes of imperial power. Even if the political geography literature has scarcely engaged with outer space, we can conceive the advent of rocketry as one expression of Cold War (imperial) geopolitics. All of this is to say, then, that a geography of space and its exploration, both in terms of its historical development and its contemporary astropolitics, is not some farfetched or indulgent distraction from the 'real world'; rather, it is constitutive of numerous familiar operations, from international relations and the conduct of war, to the basic infrastructural maintenance of the state and to the lives of its citizenry¹⁹. Space, and how we got there, matters. And this is true not least because thinking about space and its exploration presents a series of challenges to the terrestrial character of geography itself, as well perhaps, as testing some of the basic tenets of social theory²⁰. Moreover, the

ability to leave the atmosphere has profoundly refocused attention on the geographical knowledge of Earth itself; in all sorts of ways, then, attaining orbit has helped remake Earthly geographies. I consider the Corporal programme to be a useful starting point for considering many of these themes. And yet what is ultimately most interesting for our purposes here is to think about how this early unmanned space exploration engaged the popular imagination in ways that legitimated and sustained particular geopolitical logics here on Earth.

‘BULLETS WITH BRAINS’: THE CORPORAL AS PEACETIME RESEARCH VEHICLE AND WEAPON OF MASS DESTRUCTION

The story of CORPORAL's birth, growth and development into a full-fledged guided missile system is one of trial and error, a pattern of devoted human endeavour studded with many failures and fewer heartening successes, acknowledging each failure and profiting from it, and striving towards the goal of providing the Army Field Forces with an efficient deterrent to aggression. The story is one of improvisations, of making do with what was available in materials and components, of feeling the way as explorers into the unknown, uncharted realm of rocketry²¹.

In recounting the history of the Corporal, one must first deal with its name. Why ‘Corporal’? It was a question of rank. In 1944, the US Army had commissioned a new missile programme from a rocketry team at what became the Jet Propulsion Laboratory (JPL) at the California Institute of Technology²². Their first attempt was a primitive test vehicle called ‘Private’, a simple unguided ballistic missile which was launched in December 1944. As JPL engineer William H. Pickering recalled in an interview, ‘when we started out, we said first of all we’d do Private, then we’d do the Corporal, and then we’d do Sergeant, and maybe get up to the General’. Laughing at this point, he added: ‘we had the WAC Corporal too – Woman’s Army Corps ... it was a little one [more laughter]’²³. This was a regular little gag among rocket scientists. More accurately, WAC stood for ‘Without Altitude Control’, a reference to the fact that this simple prototype of a research-based sounding rocket had no stabilisation and guidance system. But ‘Women’s Army Corps’ fitted rather well with the unmistakably gendered assumptions about the (low ranking) place of women in the military and, indeed, about the perceived ‘modesty’ of this particular rocket. In due course, it was succeeded by the apparently more mature ‘Corporal’ proper and eventually by the ‘Sergeant’, both of which were authorised to carry nuclear warheads. But for all these deprecating remarks, the WAC Corporal was a crucial interim stage in the history of rocketry, for many years holding the record, when combined with the V-2, for the highest altitude ever attained by human technology.

The origins of the American Corporal programme lie in Europe. It was German rocket scientists led by the inimitable Werner von Braun, who developed Nazi's Germany's V-2 ('Vergeltungswaffe 2' or 'Reprisal Weapon 2', as Goebbel's called it). As the world's first ballistic missile, it rained terror on London in the last desperate phase of the Second World War. Although 2700 civilians were killed and thousands more were injured, it was the morale-sapping psychological effects of the missile that stand out. Unlike other weapons, its arrival went unheralded by engine noise or sirens. It accomplished terror by travelling in complete silence and at supersonic speed. There was no warning, just instant destruction. Nor was there any defence against V-2 attack. Unsurprisingly, when the end of the war came, rival military commanders were desperate to get hold of the weapon leading to a scramble among the Allies for access to V-2 equipment and personnel. Only then did the full scale of the V-2 production, and its reliance upon slavery become clear: a concentration camp at Mittelbau-Dora had been established – effectively an extension of the infamous Buchenwald – in order to provide labour for the construction of the V-2. In the eighteen months of production, an estimated 20,000 people died: mass destruction was therefore the ancillary outcome of rocketry even from its inception, quite aside from its intended military consequence. The American success in acquiring the V-2 was principally achieved through the auspices of Operation Overcast²⁴, an audacious programme which, under the leadership of Col. Holger N. Toftoy, brought over nearly 500 German scientists and engineers over to the US, many of whom were put to work at the White Sands Proving Ground in New Mexico (figure 1). Foremost among these was von Braun who eventually recruited his old mentor on the V-2, Hermann Oberth, whose book *By Rocket to Planetary Space*, published in 1923, is regarded as one of the founding documents of the Space Age.

The V-2 was a gift to the nascent American space programme. Although not an especially versatile weapon of war, the enormous German investment necessary to develop the science of viable propulsion suddenly became available for a new era of space technology. In the vapour trails of Operation Overcast, the home-

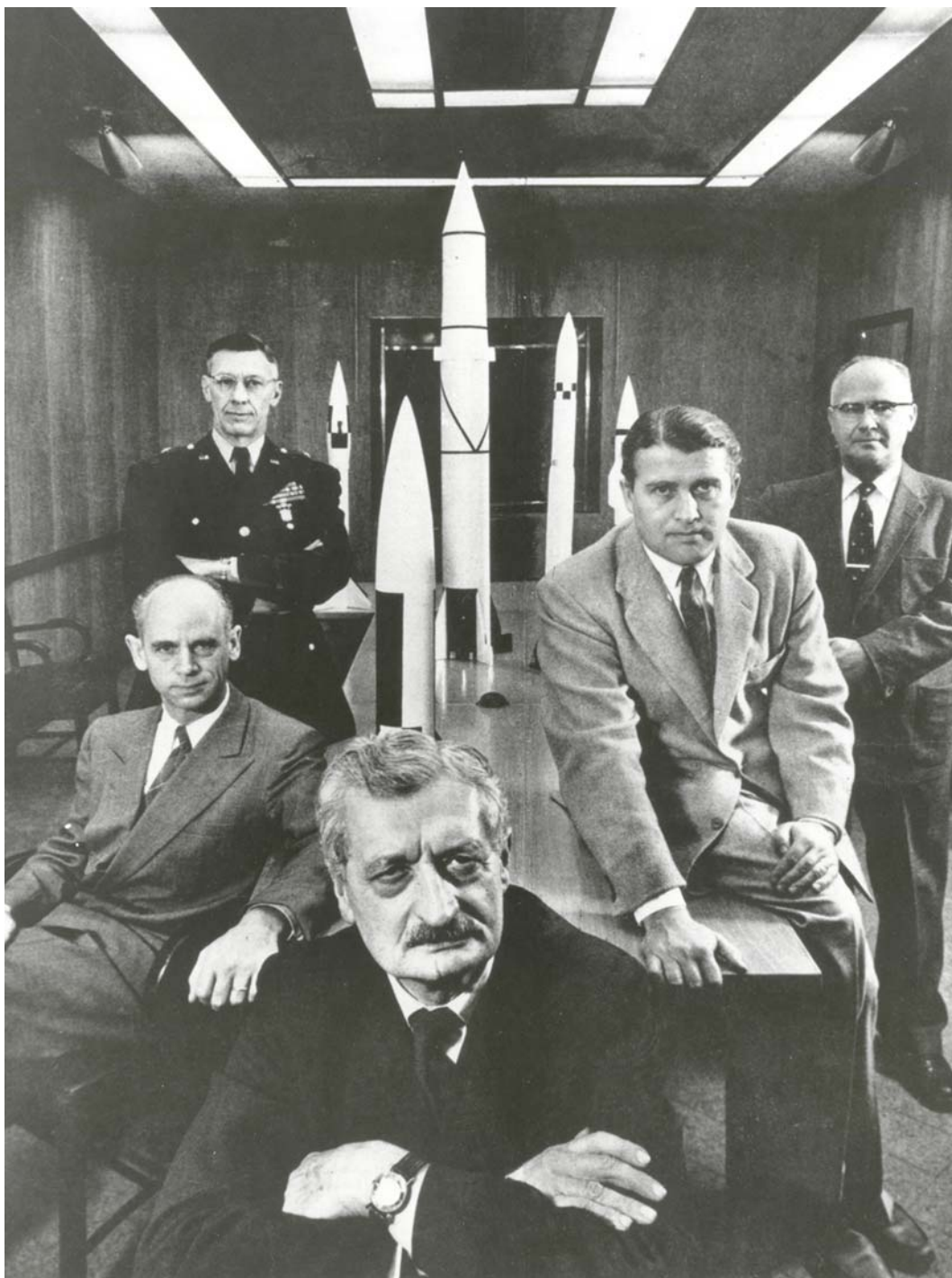


FIGURE 2. Officials of the Army Ballistic Missile Agency with model US rockets, Alabama, 1956. Pictured from left to right, Ernst Stuhlinger, Major General Holger Toftoy, Hermann Oberth, Wernher von Braun, and Robert Lusser. The Corporal missile is the second model from the right; the V-2 is closest to the camera. Image reproduced courtesy of NASA.

grown WAC Corporal was quickly overtaken by the success of the V-2 for high altitude flights. With over one hundred V-2s available for research purposes²⁵, it soon established itself as indispensable for the study of near-Earth space phenomena. In one sense, it was the perfect research vehicle as the weight lost by the removal of the German warhead could be usefully replaced with scientific instrumentation, or, as happened in 1946, with camera equipment. And on the 24th October 1946, launch number 13 produced the first pictures of the Earth from space. Writing in the *National Geographic*, the camera's engineer, Clyde Holliday, claimed that these were the first pictures to show the curvature of the Earth 'from the border of outer space', with 'single views cover[ing] 100,000 square miles'²⁶. Holliday's ability to foresee the profound implications of this episode is truly remarkable:

Results are now pointing to a time when cameras may be mounted on guided missiles for scouting enemy territory in war, mapping inaccessible regions of the earth in peacetime, and even photographing cloud formations, storm fronts, and overcast areas over an entire continent in a few hours, which would be of great benefit to weather forecasters²⁷.

It could, he thought, even 'detect troop movements': 'camouflage would hide little from such an all seeing eye'²⁸. Reaching the heights of the upper atmosphere with his camera allowed Holliday to anticipate the new horizons that would ultimately be opened up by satellite technology. Central to America's later satellite programme was Colonel Holger Toftoy (Figure 1), the Overcast leader, who also oversaw the combination of the V-2 with the WAC Corporal to produce the world's first two-stage liquid propellant rocket. The power of the V-2 would give a 'bump' to the WAC Corporal which could then start its journey from an already high-altitude platform, hence the name the 'Bumper WAC'. It was this vehicle – an important prototype for the Corporal proper – that became, after several attempts in 1948 and 1949, the first man-made object to penetrate space (figure 2). On the 24th February 1949, the Bumper WAC attained a speed of 5,150

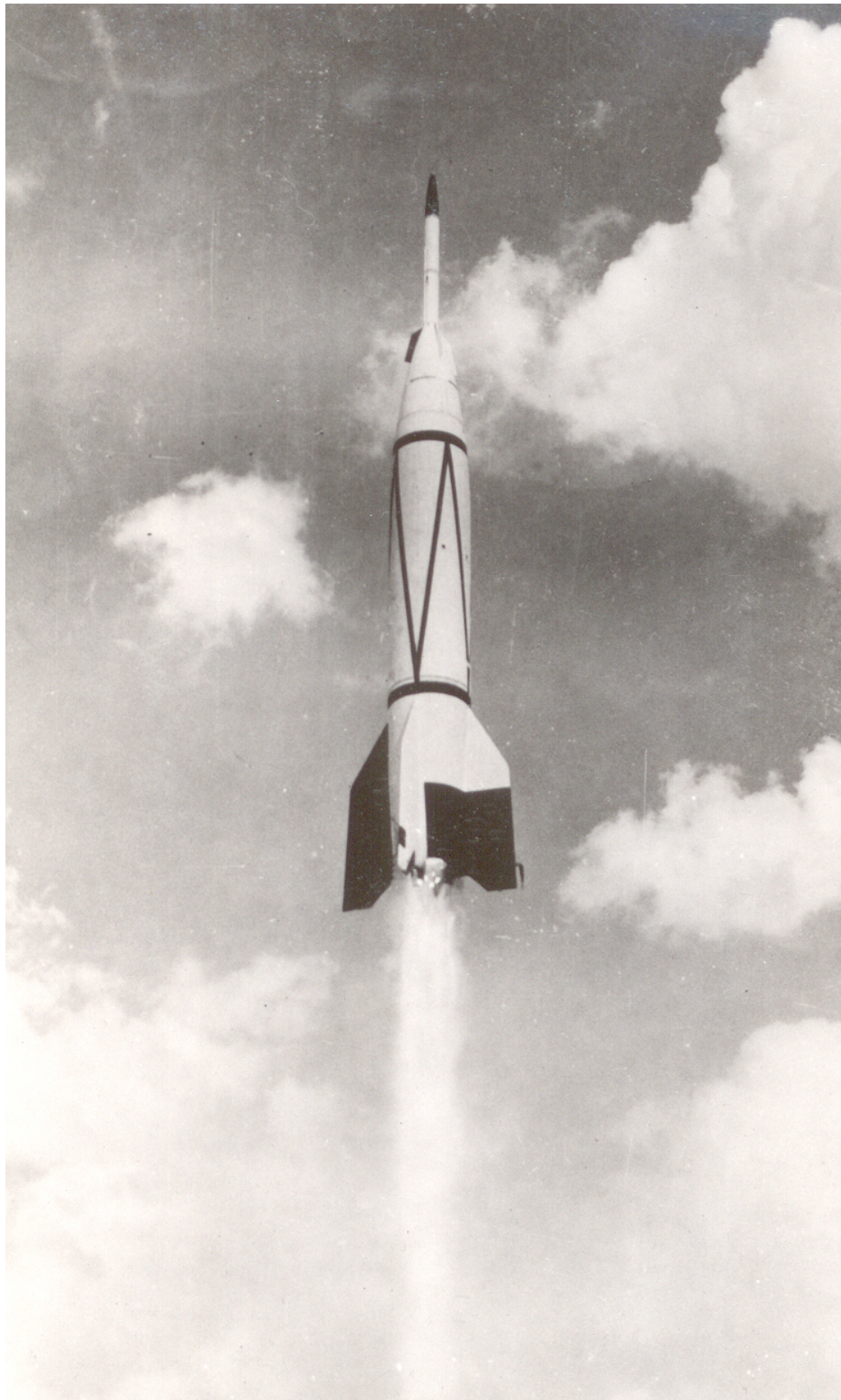


FIGURE 3. The Bumper WAC becomes the first man-made object to penetrate outer space, launched from the White Sands Proving Ground in New Mexico on the 24th February 1949. Image reproduced courtesy of NASA.

miles per hour and an altitude of about 244 miles, a record it kept until it was broken by an Aerobee in 1957. The footage from these V-2 and Bumper WAC flights inevitably generated considerable excitement. To see the Earth receding at high speed gave an altogether more tangible sense of the possibility of space travel. In 1956, Michael Todd's film version of Jules Verne's *Around the World in Eighty Days* opened with a Corporal being launched at the White Sands Missile range, followed by footage from the rocket. It was the first taste of rocketry's accelerated sublime.

Rocketry, however, was not primarily about space exploration. The refinement of guidance systems – initially through the Corporal 'E' test vehicle – had very obvious applications for warfare. John E. Dahlquist, Commanding General of the US Army in the 1950s, argued that 'guided missiles, especially when atomic armed, represent the most radical change in weapons systems since the invention of gunpowder'²⁹. They were, he said, 'bullets with brains'. The Corporal was the first vehicle to warrant this description, being the first tactical surface-to-surface missile authorized to carry an atomic warhead. The Corporal in effect became the earliest nuclear missile, shifting from an experimental vehicle to a practical field weapon. The context for this transition was a wider set of geopolitical maneuvers that had seen America's troop commitment scaled down from their expensive wartime heights while at the same time anticipating a new era of Cold War conflicts. President Eisenhower's 'New Look' policy had replaced conventional defence doctrine with an approach that simultaneously promised 'massive nuclear retaliation' while making peace with the Soviet Union and protecting America's economy. But for the US, like the UK, a compromise had to be found between a policy of massive nuclear retaliation and the doctrine of a 'flexible response', which might include the deployment of conventional forces as well as small-scale 'tactical' nuclear weapons. The changing security environment in Eastern Europe meant that the American policy, and that of NATO more broadly, was geared to the possibility of fighting a 'limited' nuclear war using lower yield tactical weapons such as the Corporal. To the extent that the Corporal had escaped widespread public acclaim in relation to the Bumper WAC high altitude

flights, it had, by the late 1950s, acquired an entirely new public profile as the front line of missile defence. It was the figuratively male soldier, standing sentinel over the feminised nation-state.

Although reconfigured as a field weapon, the Corporal always retained the cumbersome handling of a research vehicle, rather than the versatility required by the Army at war. A single test firing required a battalion of 250 men equipped with 35 vehicles working 7-9 hours to complete preparation for launch in a process that involved handling liquid fuel and an extremely hazardous oxidant, red fuming nitrous oxide (RFNA). Until 1955, its in-flight reliability and accuracy was less than 50 per cent, with only modest improvements in this record thereafter³⁰. So the power of the missile – which was never fired in combat – lay less in its potential for destruction (though this was still considerable – significantly more powerful than what was dropped on Hiroshima) but rather in its status as a monument: as a symbol of power to be seen alike by American citizen and rival sovereign states. The Corporal had a monumental presence in a whole range of public contexts, from a life-size model for use as an Army recruiting prop³¹ to being pictured, as we shall see, in collectors cards in breakfast cereals. Bryan Taylor has argued that the paradoxical conditions of Cold War deterrence ‘effectively *fused* nuclear arms and monuments’³². By this he means that because both superpowers built up sufficient arsenals to ensure mutual destruction, nuclear weapons ‘could only be used as symbols of national capability and intention’. In Jacques Derrida’s famous formulation, missiles thus became ‘fabulously textual’: that is to say that the referent of nuclear narratives could only be realized with the erasure of narration itself³³. And it is in this context that it seems appropriate to examine the popular geopolitics of the Corporal.

THE POPULAR GEOPOLITICS OF ROCKETRY

Geopolitics is not what it used to be. The critical geopolitics agenda, so formatively inaugurated by Gearóid Ó Tuathail in the 1990s, has since broadened the terms of its inquiry, responding to criticism that it had reproduced the narrow focus of classical geopolitics on the state and its governing and intellectual and political elites of ministers, generals and tacticians³⁴. New work on popular geopolitics has sought to redress this balance by looking at how geopolitical power is circulated in and through popular culture, 'ordinary experience' and everyday life. In particular, a few researchers are taking up Nigel Thrift's injunction to attend to how 'the little things' – like the object world, the human body and even words as ordinary as the definite article – matter in the operation of statecraft³⁵. This sort of approach is particularly instructive for thinking about Cold War militarism and space exploration, for in both cases these were sustained by popular movements and expressed through such mundane activities like child's play. Moreover, it is also a useful corrective not only to the state-dominated field of geopolitics but also to the no less state-dominated histories of nuclearism³⁶. Much attention has already been directed at the impact of nuclearism on popular literary cultures³⁷. John Canaday, for instance, has persuasively argued that 'nuclear weapons have exercised their power in the purely literary form of their fictional use in the future'³⁸. But it is worth reiterating an important distinction here, that this is not merely a matter of *representing* the geopolitical power of nuclear weapons through fiction, but that this *is* the power of nuclear weapons: we are dealing with the effect (rather than the referent) of representation³⁹. A similar point might be made in relation to space exploration which has its earliest origins in literary flights of fancy. Popular culture cannot be understood as 'responding' to space exploration as much as being constitutive of it.

All of this supports my argument that popular geopolitics is a suitable perspective from which to think about Cold War rocketry. At the same time, however, I want to avoid some of the more obvious cultural arenas in which rocketry was

popularly figured such as television, film and literature. The Corporal has featured as a narrative prop in all manner of screen and literary contexts, perhaps most famously in Ian Fleming's *Goldfinger*, in which the villain's plan to contaminate the gold reserves of Fort Knox with a stolen Corporal warhead is foiled by the deft (though decidedly straight) maneuvers of 007 and Pussy Galore⁴⁰. But I am a little wary that much of the popular geopolitical literature has settled on film⁴¹ which, while resolutely popular, is hardly in the spirit of the 'little thing' (quite aside, of course, from the embeddedness of Hollywood within wider state-corporate networks). Instead, I want to concentrate on the most ephemeral cultural presences of the Corporal, in order to think about how the geopolitics of militarism and space exploration were enacted in everyday contexts. And in a further departure from the mainstream of popular geopolitics I want to foreground, as far as I am able, the role of mundane social practices working in and through artefacts and representations. I am interested in the geopolitics of two practices in particular, play and collecting, which are in turn examined through the representational forms of toys and cards.

Rocketry as child's play

It has never been clear to me why the perennially stupid question *what do you want to be when you grow up?* often anticipates an answer like 'astronaut'. Arguably, the astronaut is the postwar version of the polar explorer, embodying certain qualities and virtues that adults would like to instill in their children. And yet for children too, space and its exploration have been fertile imaginative resources, even before the advent of rocketry. This last point is important. Play is the *precursor* to space exploration: it would be impossible to separate the serious business of rocketry from various forms of tinkering and toying with the (im)practicalities of propulsion. Hermann Oberth, one of the founders of rocket science, pictured in figure 1, was known to have developed his expertise out of childhood play having been fascinated with Jules Verne from the age of eleven. The same also applies to war games; playing at or with war is a constituent part of warfare itself⁴². So it should not be surprising that a technology like rocketry –

doubling as vehicle of space exploration and weapon of mass destruction – would be such a prominent narrative prop in children’s play in the 1950s. While there were doubtless many instances of rocketry featuring in play without any bespoke toy to facilitate the imagination, I want to think here about some specific forms of toy missile and the games they might have evoked. It is striking that there were very deliberate attempts to reproduce missile technology for the playroom and thus to translate the hardware of nuclear destruction and its wider geopolitical narrative into a domestic setting. My approach, then, is to take seriously the ludic activities of children as a suitable subject for geopolitical enquiry. While this project follows some recent attempts to re-think the status of children in political geography⁴³, it is less aligned with the ‘children’s geographies’ literature⁴⁴ than with a distinct concern with play and its cultural significance⁴⁵.

In a recent paper, Nigel Thrift has examined the rise of the ‘supertoy’, a term borrowed from a short story by Brian Aldiss, by which he refers to a new generation of plaything, such as the *Tamagotchi*, that, as an assemblage of hardware and software, can ‘intelligently’ interact with its environment and users⁴⁶. Thrift is interested in the toy as a form whose character is changing in ways that might reconfigure the sociality of its users. When talking about ‘supertoys’, it seems unlikely however that Thrift could have been aware of Dinky’s series of 1950s die-cast models with exactly the same name. But his claim that ‘the course of interactivity has nearly always been prefigured by the history of toys’, seems to me an important one which would bear consideration in relation to the Dinky Supertoy⁴⁷. The idea of ‘interactivity’ in my example is rather different from Thrift’s, but there are some interesting points of connection nonetheless.

The Dinky Supertoy no. 666 – a Missile erector vehicle with Corporal missile and launching platform – was first advertised on the back page of *Meccano Magazine* in November 1959 (figure 4). Inside the magazine, in an article called ‘Dinky Toy News’ by ‘The Toyman’, the reader is told that ‘this fine new item is going to be one of the most sought for [sic] and popular of all the many fine Dinky Supertoys

already available'⁴⁸. It was, explained The Toyman, 'an accurately modeled miniature of Britain's famous guided weapon' and 'a working model that has lots of play value, for the rocket itself can be loaded on to its launching platform and fired in a realistic manner'. 'Britain's famous guided weapon' was a truth of sorts. Britain had bought the Corporal programme from the US in 1954, and after building a firing range on the islands of South Uist and Benbecula in Scotland's Outer Hebrides, it had tested the first of their 113 missiles in June 1959⁴⁹. The launch of the toy missile therefore coincided, as the advert itself implies, with the public interest in the Hebridean debut of the Corporal. At least the Dinky model was 'Made in England' even if the original was, by urgent strategic necessity, a foreign import. The advert goes on to emphasise agency and control: this is 'the Corporal missile ... a rocket *you* can launch'; 'a realistic model that actually WORKS; 'it's new, it fires'. The toy could be finely manipulated by its child operative, even to the extent of gearing that enabled 'the boom to pick up the missile and swing it to the horizontal traveling position'. In this way, the work of 250 men, 35 vehicles and 9 hours could be accomplished by a child in a few minutes. It is the event of launch in miniature form.

The launch event is integral to the toy; it is part, but by no means all, of its purpose. It achieves a particular experience of time and space, a series of anticipatory preparations followed by a countdown and the moment of launch in which the exact timing and target are established by the player through the symbolic manipulation of the object. The launch works as play in part because it successfully addresses what child psychiatrists John and Elizabeth Newson have called its 'happening-hunger'⁵⁰. As Dan Fleming notes

children need things to happen and are impatient with the adult temper which, from time to time, simply wants things to stop happening. Many things can count as happenings, and in fact playing becomes a way of generating happenings when none are forthcoming from other sources⁵¹.

Children thus become geopolitical agents through their mastery of the missile event. And, characteristically, it must be repeated over and over again. Walter

It's *NEW* .. it "fires"

**The Corporal Missile . . .
a rocket you can launch**

**DINKY SUPERTOYS No. 666 MISSILE ERECTOR
VEHICLE WITH CORPORAL MISSILE AND
LAUNCHING PLATFORM**

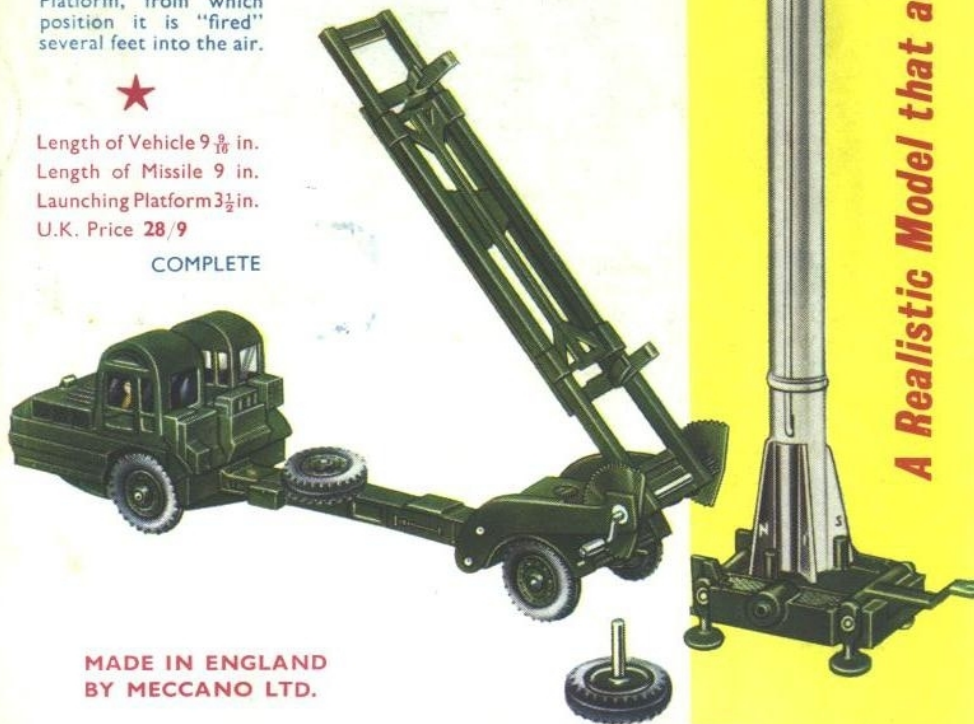
As recently as June 1959 the first guided weapon to be used by the British Army was launched in the Hebrides. It was the "Corporal" missile 45 ft. in length. Now, only a few weeks later, a Dinky Supertoys replica of the Corporal Missile Unit is available. It is a working model too! Time and time again, this Dinky Supertoys rocket (which is spring loaded) can be launched from its platform in a realistic manner. This is a most exciting model, because it actually WORKS.

The Missile is moulded in Nylon, with a harmless soft hollow rubber nose cone to ensure safety. Both the Erector Vehicle and the Launching Platform are die-cast in solid metal. The Erector Vehicle is fitted with gearing which enables the boom to pick up the Missile and swing it to the horizontal travelling position. Then, at the firing point, the boom is operated to raise the Missile vertically on to the Launching Platform, from which position it is "fired" several feet into the air.



Length of Vehicle $9\frac{9}{16}$ in.
Length of Missile 9 in.
Launching Platform $3\frac{1}{2}$ in.
U.K. Price 28/9

COMPLETE



MADE IN ENGLAND
BY MECCANO LTD.



Here are some interesting details about the actual Corporal Missile:

Length 45 ft. 6 in.
Diameter 2 ft. 6 in.
Span of fins 7 ft.
Firing weight 12,000 lb.
Range 75 to 100 miles
Guidance: Radio command and Radar

A Realistic Model that actually WORKS

FIGURE 4. Advert for Dinky Supertoy no. 666, Missile erector vehicle with Corporal missile and launching platform, as it appeared in *Meccano Magazine*, November 1959.

Benjamin recognised that ‘repetition is the soul of play, that nothing gives ... [the child] greater pleasure than to ‘Do it again!’”⁵². For Benjamin, it is a way of overcoming frightening fundamental experiences – a taming of the Real. But what exactly is being repeated? Is this a rocket or a missile, a weapon or a vehicle? Is this about war or peace, space exploration or the Cold War defence of capitalism? Or something else altogether? It is all of these things, of course; the toy is propelled by the ambiguity. Toy theorists like Brian Sutton-Smith have constantly emphasized that toys do not come with overdetermined meanings: they do not dictate play but rather ‘the plans of the playful imagination dominate ... the toys, not the other way round’⁵³. However, as Dan Fleming argues, this endless liminality of the toy is perhaps ‘more in the eye of the critic-analyst than in the reality and materiality of a culture which appears rather more ruthless than this at deciding how things are’⁵⁴. When first introduced, both the Dinky missile and its Corgi rival were relatively open to being either weapon or space vehicle. The Corgi model in particular was marketed as part of its ‘Rocket Age’ series. But by 1961, it had tilted the meaning of the Corporal by introducing a ‘percussion warhead’ (model no. 1480) to be bought separately and ‘easily and quickly fitted to your missile ... loaded with standard caps to give a really authentic explosion on impact’. The centrality of the launch had thus shifted to that of impact.

In Dinky’s advert, details of the toy (with ‘a harmless soft hollow rubber nose cone to ensure safety’) are placed alongside details of the ‘real’ missile, though the advert is shy of noting its nuclear capability. In other respects, absolute fidelity to the original is important. It is, of course, a scale model and the detail included in the miniature was considered to be essential. It was, after all, a competitive marketplace. The early Dinky versions of the 666 vehicle had neither windows nor driver, but both had to be introduced to respond to the rival Corgi’s toy, advertised with the slogan ‘Corgi – the one with windows’⁵⁵. This sluggish attention to detail across Dinky’s range was fatal for its market share and by the time the Corporal was withdrawn, it was in serious financial difficulties. But what does this level of detail mean? Fleming refers to the toy’s degree of representational accuracy and realism as its ‘modality’ which runs alongside

(sometimes in competition with) its mechanical activity⁵⁶. The basic 'toyiness' of the Corporal is achieved through miniaturization, which in turn allows the operative a sense of control and superiority. But detail must still be preserved; it must be 'real enough', not least because the toymaker must satisfy some degree of technical knowledge on the part of the player. Toys like this both assume and impart serious technical competence, not only in terms of fine motor skills but also as an analogue of 'real' military field knowledge. Indeed, the full slippage between the worlds of play and of war are nowhere more apparent than elsewhere in the same issue of *Meccano Magazine* where other adverts by the Army and the Royal Navy encourage boys of 14 to leave school and join up as a trade apprentice. The child-consumer that one day purchases a toy might the next day decide to enlist. There is no doubt other than that these toys assume the meta-context of the Cold War. In Thrift's description of the highly 'mediatized' contemporary supertoy, he notes that 'from *My Little Pony* to *Barbie*, the worlds on offer are a series of micro-ontologies which children can link into'⁵⁷. But in the case of the 1950s Supertoy, the context was quite different: while the child might use the missile as part of a wider set of military toys, it was still within the narrative parameters of Cold War conflict. All of this might seem to be a long way from space exploration but what I am arguing here is that this 'doubling' of the Corporal in 'real life', as weapon and as exploration vehicle, is opened up through play; and moreover, such a mundane practice actually helps sustain these dual geopolitical logics of rocketry in the first place.

Stockpiling and Assembling

I mentioned that the Corporal could be one part of a wider military toyset. Corgi toys marketed its 'Rocket Age Sensations' *en masse*, encouraging the consumer to build up a complete set of the equipment necessary for launching a missile. This included everything from the Erector Vehicle (no. 1113), the International Army Truck (no. 1118), the R.A.F. Vanguard Staff Car (no. 352), the Decca Airfield Radar 424 Scanner (no. 353), the Decca Airfield Radar Van (no. 1106) and the R.A.F. Land Rover (no. 351). The missile was thus part of wider repertoire of toys

that would support the military endeavour of launch. At the same time however, the child collector might want to augment the Corporal with other model missiles produced by Corgi, such as the RAF's 'Bloodhound' – a home-grown British surface-to-air missile in service throughout the Cold War. The Corporal is thus not necessarily a stand alone object but rather it works as part of a collection, either of other ancillary equipment or of other comparable weapons. In this latter case, there is an echo of the strategic state-military practice of stockpiling: the act of creating assemblages of weapons to be seen and thus to be entered into the calculus of geopolitical negotiation. A parallel collection can be seen in the US National Biscuit Company (Nabisco) drive to circulate trading cards published in 1959 in a series of 24 entitled 'Defenders of America', one of which featured the Corporal missile and another which featured the 'FIRST FAMILY of the Nation's big Missiles' (Corporal, Honest John and Nike-Ajax). On the reverse side, it explained how 'each of these cards is a full detailed reproduction of an official United States Army, Navy and Air Force or Marine photograph'. It went on to encourage the child-consumer to 'get the entire set be eating Nabisco Shredded Wheat regularly and trading with your friends'. A Bowman trading card series called 'Power for Peace' also featured the Corporal under the title 'the Corporal stands tough', going on to detail how it could be 'equipped with an atomic or conventional type warhead'. Brian Sutton-Smith talks about collections as 'mixtures of imagination and mastery'⁵⁸. In this case they serve to make stockpiles of military hardware intelligible in, and transposable, to a domestic context.

Most of these versions of the Corporal – in die cast miniature or on trading card – came already complete for use by the child. But in certain instances, the child was cast as rocket engineer and was entered into the labour of building the Corporal in the first place. A variety of mostly American toy manufacturers including Revell, Hawk and Monogram also produced Corporal missiles, pre-assembled in a series of detachable moving plastic parts complete with appropriate stickers from which to build a precise scale model. In this case, the event of play was less concerned with launch or impact than with construction.

But this too is an act of participation in a much wider sphere. Ruth Oldenziel has shown how model construction in mid-twentieth century America was a serious means of developing the technical skill, stamina, patience and initiative of adolescent boys⁵⁹. In one sense, to describe this as 'play' is to risk trivializing an important if informal apprenticeship in the development of space technology. But this is surely a further reminder about the extent to which play and work, toybox and silo, are co-constitutive. It is through such unremarkable means that the space race and the Cold War were enacted.

BRINGING THE HISTORY OF ROCKETRY DOWN TO EARTH

Aside from notable advances in molecular biology, the 1950s saw two unprecedented scientific investigations into the fabric of Earth and Outer Earth alike. The development of space technologies like the BUMPER WAC Corporal and subsequent sounding rockets provided a much more detailed picture of Earth's atmosphere, as well as producing iconic images of the Earth from space. At the same time, however, exploration turned in on itself – an involution – to examine sub-atomic 'spaces' which, through nuclear testing, produced its own peculiar geographies, in laboratory and field and across subterranean and terrestrial realms⁶⁰. These developments are linked by a common military and geopolitical rationale that aimed to cultivate weapons of mass destruction and the means by which they could be urgently delivered to the other side of the globe. In this way, both the Space Age and the Atomic Age are folded into the geopolitical strategies of the Cold War, the ascent into space being, in one sense, merely charismatic evidence of a more sinister capability. And yet the inseparable character of the nuclearism and rocketry is sometimes obsessively denied by the champions of space. 'Space flight, fortunately, will be different' wrote Heinz Haber in 1956, as it 'begins under the auspices of a noble international effort to be carried out in a spirit of peaceful cooperation'. But the ultimate extent of international co-operation manifest in the 1967 UN Outer Space Treaty conception of space as *res communis* ('a thing for all') rather than *res nullius* ('a thing for no-one'), was always more of a Cold War fudge designed to check the territorial and astropolitical ambitions of the superpower adversary. Despite the ongoing presence of the International Space Station (at \$100 billion, the most expensive piece of technology ever built), space exploration has proved to be little different from the technologies of the atom: it remains a matter of competition rather than cooperation, and of weaponisation as much as civilian infrastructure⁶¹. And the current push towards dual use (civilian and military) space hardware⁶² is itself indicative of the abiding indistinction between vehicle and weapon that was apparent fifty years ago with the launch of the Corporal. The story of the Corporal can thus be seen as an early intimation of the fact that

space exploration would primarily be a matter of projecting terrestrial geopolitical power. The aim of this essay, at least in part, has been to bring the history of rocketry down to Earth.

Seen in the light of terrestrial geopolitics, the imperial context of Cold War rocketry, and the wider endeavour of space exploration, becomes ever more apparent. In the annals of exploration, this is plainly not a new story: earlier precedents of exploring the sea and polar ice would likely offer some interesting parallels with the account I have described here⁶³. So it is worth emphasising that the exploration and colonization of space does not represent a radical departure from the past but should be considered as an extension of longstanding regimes of power. As Peter Redfield succinctly observed, to move into space is 'a form of return': it represents 'a passage forward through the very pasts we might think we are leaving behind'⁶⁴. Some recent work on the historical geographies of extra-terrestrial spaces, for instance, has persuasively shown how longstanding geographical practices of naming, mapping and topographical description were instrumental in the construction of planetary bodies such as Mars⁶⁵. All of this supports the idea that space has long been part and parcel of Earth's geography⁶⁶; and that this Earthly-celestial tradition should itself be an inducement for geographers to think more closely about 'the space of space' in its many cultural, historical and (geo)political expressions.

In this essay, I have unapologetically concentrated on the popular place of rocketry within the Cold War, rather than any technical or strategic account. I have done so because it seems to me that this is where the rocket/missile derives much of its geopolitical power. The version of the popular in operation here is of course quite different from much of the work on popular culture. Rather than reproduce the well-worn critique of, say, Hollywood film, I have chosen to focus on more mundane activities such as play and on such seemingly unlikely geopolitical agents as children. It is through these means, I have argued, that space exploration and the Cold War are enacted and made meaningful in domestic contexts. That is to say, through the ordinary rehearsal of defending 'us'

(Western, free, capitalist) from 'them', using technologies that also offer a transcendent future, the child-consumer-player is inducted into a wider geopolitical frame. Not only do toys and play have extraordinary propagandist value, but more importantly, they also bring about an informal apprenticeship in domains that slip very readily into 'real world' technics and activities. Moreover, the play of rocketry naturalises the anxieties of the Cold War and arguably helps make sense of otherwise difficult concepts of leaving home and nuclear destruction. Most importantly of all, such toys bestow in their child operative a proprietary sense of the future: that the realm of space and the technical development of its exploration is something that belongs to them in their impending adult lives.

¹ H. Haber, 'Space satellites: tools of Earth research', *National Geographic* CIX.4 (April 1956), pp. 486-509, p. 494.

² R. Sorrenson, The ship as a scientific instrument in the eighteenth century, *Osiris* 11 (1996) 221-236 (p. 221); See also D. DeVorkin, *Science with a Vengeance: how the American military created the space sciences in the V-2 era* (New York: Springer, 1992).

³ P. Redfield, *Space in the Tropics: from convicts to rockets in French Guiana*, (Berkeley: The University of California Press, 2000), p. 123.

⁴ E. Dolman, 'Geostrategy in the Space Age: an astropolitical analysis' in C. Gray and G. Sloan (eds) *Geopolitics, Geography and Strategy* (London: Frank Cass, 1999), pp. 83-105; E. Dolman, *Astropolitik: classical geopolitics in the space age*, (London: Frank Cass, 2002).

⁵ Bille, M and Lishock, E, *The First Space Race: launching the world's first satellite*, (College Station: Texas A&M University Press, 2004); Asif Siddiqi, *Sputnik and the Soviet Space Challenge*, (Gainesville: University Press of Florida, 2003).

⁶ Following most of the military usage, I will refer to the 'Corporal missile' from now on.

⁷ D. DeVorkin, *ibid*, note 2, p. 154.

⁸ It does not merit a single mention in the Walter McDougall's otherwise authoritative work: W. McDougall, *The Heavens and the Earth: a political history of the space age* (Baltimore: Johns Hopkins, 1985); or in Gerard deGroot's *The Bomb: a life* (London: Jonathan Cape, 2004).

⁹ Strictly speaking, it was the WAC Corporal in combination with a V-2 that held this distinction.

¹⁰ D. Livingstone, *The Geographical Tradition: episodes in the history of a contested enterprise*, Oxford: Blackwell, 1992) p. 77.

¹¹ F. MacDonald, 'Anti-Astropolitik: outer space and the orbit of geography', *Progress in Human Geography* 31.5 (2007) xx-xx.

¹² F. Driver, *Geography Militant: cultures of exploration and empire* (Oxford: Blackwell, 2000); N. Smith and A. Godlewska, *Geography and Empire: critical studies in the history of geography*, (Oxford: Blackwell, 1994).

¹³ The first successful high altitude flight of the German V-2, the progenitor of rocketry, drew comparisons with the voyages of Columbus and Magellan; see DeGroot, p. 17.

¹⁴ M. Benjamin, *Rocket Dreams: how the space age shaped our vision of a world beyond*. (London, Free Press, 2003), p. 46.

¹⁵ F.J. Turner, 'The significance of the frontier in American history', in *The Frontier in American History*, New York, Henry Holt & Co (1920); I am grateful to Innes Keighran for this observation.

¹⁶ P. Redfield, 'The half-life of Empire in outer space', *Social Studies of Science* 32.5-6 (2002), pp. 791-825, p. 795.

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- ¹⁷ F. MacDonald, 'Geopolitics and the vision thing: regarding Britain and America's first nuclear missile', *Transactions of the Institute of British Geographers*, 31.1 (2006), pp. 53-71.
- ¹⁸ I. Clark, *Nuclear diplomacy and the special relationship: Britain's deterrent and America, 1957-1962* (Oxford: Clarendon Press, 1994).
- ¹⁹ F. MacDonald, 'Anti-Astropolitik: outer space and the orbit of geography', *Progress in Human Geography* 31.5 (2007) xx-xx.
- ²⁰ Redfield, *Ibid*, (note 16) p. 792.
- ²¹ J.W. Bragg, *Development of the Corporal: the embryo of the Army missile programme*, Historical Monograph no. 4, (Redstone: Army Ballistic Missile Agency, 1961) p. ix.
- ²² Formerly called the Guggenheim Aeronautical Laboratories, California Institute of Technology (GALCIT).
- ²³ Interview of William H Pickering II, former director of JPL, by Shirley K Cohen, Caltech Archives Oral Histories, <http://oralhistories.library.caltech.edu/86/>, accessed 26 March 2007.
- ²⁴ Subsequently remained Operation Paperclip.
- ²⁵ None were delivered from Germany in flyable condition; General Electric won the contract to re-build and upgrade the V-2s.
- ²⁶ This claim was contested. Earlier high altitude balloons had reached over 13 miles high in 1935; C.T. Holliday, Seeing the Earth from 80 Miles Up, *National Geographic* XCVIII. (4 October 1950), 511-528, p. 511.
- ²⁷ *Ibid*, p. 512.
- ²⁸ *Ibid*, p. 512.
- ²⁹ John E. Dahlquist, Foreword, in: N.A. Parsons jnr, *Guided Missiles in War and Peace*, (Cambridge: Mass, Harvard University Press, 1956) p. 6.
- ³⁰ Bragg, *ibid* (note 21) p. 176.
- ³¹ MacDonald, *ibid* (note 17) .
- ³² B. C. Taylor 'Our Bruised Arms Hung Up as Monuments': nuclear iconography in post-Cold War culture' *Critical Studies in Media Communications* 20 (2003), pp. 1-24.
- ³³ Taylor, p. 2; J. Derrida, 'No Apocalypse, Not Now (full speed ahead, seven missiles, seven missives)' *Diacritics* 14 (1984), 20-31, p. 23.
- ³⁴ G. Ó Tuathail, *Critical geopolitics: the politics of writing global space* (Minneapolis: University of Minnesota Press, 1996).
- ³⁵ N. Thrift, 'It's the little things' in K. Dodds and D. Atkinson (eds.) *Geopolitical Traditions: a century of geopolitical thought* (London: Routledge, 2000), pp. 380-387.
- ³⁶ J. Hughes, 'Deconstructing the b0mb: recent perspectives on nuclear history', *British Journal for the History of Science* 27 (2004) 455-464, p. 456.
- ³⁷ J. Canaday, *The Nuclear Muse: literature, physics and the first atomic bombs*, (Madison: University of Wisconsin Press, 2000); P. Boyer, *By the Bomb's Early Light: American thought and culture at the dawn of the Atomic Age*, (Chapel Hill: University of North Carolina Press, 1994).
- ³⁸ Canaday, *ibid*, p. 223.
- ³⁹ Taylor, *ibid* (note 32), p. 6.
- ⁴⁰ I. Fleming *Goldfinger* (London: Coronet Books, 1959).
- ⁴¹ K. Dodds, 'Screening geopolitics: James Bond and the early Cold War films', *Geopolitics* 10 (2005), pp. 266-289; K. Dodds, 'Popular geopolitics and audience dispositions: James Bond and the Internet Movie Database (IMDb)', *Transactions of the Institute of British Geographers* 31 (2006), pp 116-130; K. Dodds, 'Licensed to Stereotype: Geopolitics, James Bond and the Spectre of Balkanism', *Geopolitics* 8.2 (2003), pp. 125-156.
- ⁴² See for instance: James Der Derian, 'War as Game', *The Brown Journal of World Affairs*, 10.1 (2003), pp. 37-48.
- ⁴³ C. Philo and F. Smith, 'Guest editorial: political geographies of children and young people'. *Space and Polity* 7.2 (2003), pp. 99-115.
- ⁴⁴ S. L. Holloway and G. Valentine, *Children's Geographies: playing, living, learning*. (London: Routledge, 2000).
- ⁴⁵ C. Harker, 'Playing and affective time-spaces', *Children's Geographies* 3.1, (2005), pp. 47-62; D. Fleming, *Powerplay: toys as popular culture* (Manchester: Manchester University Press, 1996);

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- B. Sutton-Smith, *The Ambiguity of Play* (Boston: Harvard University Press, 1997); D. W. Winnicott, *Playing and Reality* (London: Tavistock Publications, 1971).
- ⁴⁶ N. Thrift, 'Closer to the machine? Intelligent environments, new forms of possession and the rise of the supertoy', *Cultural Geographies* 10 (2003), pp. 389-407.
- ⁴⁷ Thrift, *ibid* (note 46) p. 390.
- ⁴⁸ The Toyman, 'Dinky Toys News', *Meccano Magazine*, 64.11 (November 1959), p. 498.
- ⁴⁹ See MacDonald, *ibid* (note 17); F. MacDonald, 'The last outpost of Empire: Rockall and the Cold War', *Journal of Historical Geography* 32 (2006), 627-647.
- ⁵⁰ Fleming, *ibid* (note 45) p. 68.
- ⁵¹ Fleming, *ibid* (note 45) p. 68.
- ⁵² W. Benjamin, 'Toys and play: marginal notes on a monumental work', in M.W. Jennings, H. Eiland and G. Smith (eds) *Walter Benjamin Selected Writings Volume II*, (Cambridge: Belknap Press, 1999).
- ⁵³ B. Sutton-Smith, *Toys as Culture* (New York: Gardener Press, 1986) p. 204.
- ⁵⁴ Fleming, *ibid*, (note 45) p.33.
- ⁵⁵ M. Richardson, *Collecting Dinky Toys* (London: Francis Joseph Publications, 2001), p.6.
- ⁵⁶ Fleming, *ibid*, (note 45) p. 67; p. 90.
- ⁵⁷ Thrift, *ibid*, (note 35) p. 395.
- ⁵⁸ Sutton-Smith, *ibid*, (note 53), p. 192.
- ⁵⁹ R. Oldenziel, 'Boys and their toys: the Fisher Body Craftsman's Guild, 1930-1968, and the making of a male technical domain' in R. Horowitzw (ed) *Boys and Their Toys? Masculinity, technology and class in America* (New York: Routledge, 2001), 139-168.
- ⁶⁰ See S. Kirsch, *Proving Grounds: Project Ploughshare and the unrealized dream of nuclear earth-moving* (New Jersey: Rutgers University Press, 2006).
- ⁶¹ See MacDonald, *Anti-Astropolitik*.
- ⁶² See M. Cervino, S. Corradini. and S. Davolio, 'Is the peaceful use of outer space being ruled out?' *Space Policy* 19 (2003) 231-237.
- ⁶³ D. Lambert, L. Martins, and M. Ogborn, 'Currents, visions and voyages: historical geographies of the sea', *Journal of Historical Geography* 32 (2006) pp. 479-493; J. R. Ryan, "Our Home on the Ocean": Lady Brassey and the Voyages of the Sunbeam 1878-1886', *Journal of Historical Geography*, 32 (2006) pp. 579-604.
- ⁶⁴ Redfield, 2002, p. 814.
- ⁶⁵ K.M.D. Lane, 'Geographers of Mars: Cartographic Inscription and Exploration Narrative in Late Victorian Representations of the Red Planet', *Isis* 96 (2005), pp. 477-506; K.M.D. Lane, 'Mapping the Mars Canal Mania: Cartographic Projection and the Creation of a Popular Icon', *Imago Mundi: The International Journal for the History of Cartography*, 58.2 (2006), 198-211.
- ⁶⁶ D. Cosgrove, 'Moon' in S. Harrison, S. Pile, & N. Thrift (eds) *Patterned Ground: entanglements of nature and culture* (London: Reaktion Books, 2004).