Made in Wales, Detonated in the Desert

Port Talbot Steel and the Invisible Arc of Empire

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> *'The volumes tell you everything about an empire that believed it was permanent.*
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> *They tell you almost nothing about the people who made it move.'*
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> — Chris George, The Edwardian Era: Imperial Pomp and Portside Reality (2026)

ABSTRACT

In 1961, two forms of encoding happened simultaneously. Atmospheric nuclear testing deposited elevated Carbon-14 in the tooth enamel of children born that year, making their bodies literal historical documents of the arms race. At Port Talbot's Abbey Works — Europe's largest steelworks at its absolute peak employment of 20,000 workers — a different kind of knowledge was being encoded: the embodied expertise of the blast furnace, the physical intelligence of industrial practice, the Grey Knowledge that lived in hands and eyes rather than in any written record. Both forms of encoding are now approaching the end of their biological window. This paper traces the invisible arc connecting Port Talbot steel to the British nuclear testing programme at Maralinga in South Australia, and to the Aboriginal communities of the Maralinga Tjarutja whose landscape the empire contaminated with the plutonium that Port Talbot's output helped to deliver. The author was born on Christmas Day 1958 at RAF St Athan — a base that serviced the Avro Vulcan, the principal delivery vehicle for Britain's airborne nuclear deterrent. His tooth enamel carries elevated Carbon-14 from the 1961 Tsar Bomba pulse. He is, in the most literal sense, a document of this history.

I. Born at the Bomb

I was born on Christmas Day 1958 at the Royal Air Force hospital at RAF St Athan, in the Vale of Glamorgan. The date is usually the thing people notice. But the location is the thing that matters for the argument of this paper.

RAF St Athan was one of the principal maintenance bases for the Avro Vulcan — the delta-winged strategic bomber that formed the backbone of Britain's airborne nuclear deterrent throughout the Cold War. A 101 Squadron Vulcan B.1 was photographed at St Athan's Battle of Britain Air Show in 1963. A Vulcan B.2, which entered front-line service in 1962, was later preserved at St Athan and remains part of the South Wales Aviation Museum collection. The aircraft serviced there carried Blue Danube, Yellow Sun, Red Beard — the colour-coded weapons of Britain's independent nuclear deterrent. The people

maintaining them knew what they were working on. The families in the married quarters, the nurses in the hospital, the children born there — we were simply inhabitants of a geography whose significance we did not fully understand.

Three years after my birth, on 30 October 1961, the Soviet Union detonated Tsar Bomba over the Novaya Zemlya archipelago — a 50-megaton thermonuclear device, the largest weapon ever detonated by any nation. The atmospheric pulse released quantities of Carbon-14 that circled the globe and deposited themselves in the mineralising tooth enamel of every child in the world born within the relevant window. I was two years and ten months old, in prime tooth mineralisation. My enamel carries the trace of that detonation. My body is a document of the arms race.

> *The hospital where I was born maintained the aircraft that would have delivered the British response to Tsar Bomba. My teeth record the atmospheric signature of its Soviet equivalent. I am, in the most literal sense, a child of the Cold War.*

This is not a metaphor. Forensic scientists now use the Carbon-14 pulse from atmospheric nuclear testing as a precise dating tool for biological material — it allows them to determine birth year from tooth enamel with an accuracy of plus or minus one year. The nuclear arms race, in attempting to obliterate human life, inadvertently created the most precise biological clock in history. The bodies it threatened became the archive of its own activity.

II. The City of Steel, The Year of the Bomb

1961 was the year of Tsar Bomba. It was also the year Port Talbot's Abbey Works reached its absolute peak.

The Abbey Steelworks had been planned in 1947 and opened in 1951 — claimed at its unveiling as the largest single industrial project in the British Isles since the great days of the railway age. By 1961 the works employed over 18,000 workers directly, rising to 20,000 when contractors were included. It was Europe's largest steelworks and the largest single employer in Wales. The Steel Company of Wales had advertised it in the national press with an image of the plant and the caption: 'The City of Steel. Day and night, this city is at work. Its one concern is simple: to make steel.'

The men working those furnaces in 1961 were the sons and grandsons of Welsh industrial communities built across four generations. They were among the best-paid manual workers in Britain. Their children attended new schools on the Sandfields Estate — the second largest council estate in Wales, built specifically to house the steelworks workforce. They had leisure facilities, welfare provision, a sense of collective identity and pride that was inseparable from the work itself.

They also had no idea what their steel was making possible.

> *The furnace keeper who could read the heat of steel in his eyes and his hands — who carried knowledge that no instrument could replicate — had no knowledge of Maralinga. The empire did not require his understanding. It required his output.*

The output of Port Talbot's furnaces fed a supply chain that ran across industrial Wales and beyond. Steel went by rail to Shotton for coating, to Trostre for tinplating, to Ebbw

Vale for rolling, to the Midlands motor industry. It went into shipbuilding. It went into the construction of military infrastructure. It went into the fabrication of the instrument bunkers at Maralinga — some containing three-metre steel cubes weighing thirty long tons apiece — the structures built to withstand and measure Britain's nuclear detonations on the other side of the world.

The Vickers Valiant bombers that dropped nuclear weapons over Maralinga in Operation Buffalo in 1956 were built from British steel. The Royal Navy vessels that transported equipment to the Monte Bello Islands were built from British steel. The towers from which nuclear devices were suspended and detonated were built from British steel. The Avro Vulcan aircraft — the backbone of the V-force, maintained at bases including RAF St Athan — were built from British steel, and what they carried was intended, in the event of the Cold War becoming hot, to produce the same kind of atmospheric contamination that Tsar Bomba had produced: Carbon-14 deposited in the teeth of whatever children survived.

III. The Invisible Connection: Maralinga

Between 1952 and 1963, the United Kingdom conducted twelve major nuclear weapons tests in Australia — at the Monte Bello Islands off the Western Australian coast, at Emu Field, and at Maralinga in South Australia — as well as hundreds of minor trials that ultimately generated more contamination than the major tests.

The Maralinga tests were conducted between 1956 and 1963 on the traditional lands of the Maralinga Tjarutja — a southern Pitjantjatjara Aboriginal people who had lived across the western desert for millennia, maintaining what we might now call Grey Knowledge: the intimate understanding of landscape accumulated over thousands of years and transmitted through language, ceremony, and practice. The knowledge of where water could be found. The knowledge of which plants were edible and which were not. The knowledge of the sky, the sand, the seasons. Knowledge encoded in bodies and in oral tradition, not in written records — precisely because it never needed to be written down.

The British Government did not seek the permission of the Maralinga Tjarutja. Most were forcibly removed from their land and transported to distant missions. The warning signs erected around the test site were written in English, which the local Aboriginal population could not read. Some families remained within range of the detonations. One group witnessed a test from close range, inhaling dust and watching the sky darken, with no protective equipment and no warning. The fallout was later described as 'the Black Mist.'

> *Two communities, one in South Wales and one in South Australia, were simultaneously encoded with the trace elements of the same historical moment — one in tooth enamel, one in contaminated soil. Neither knew of the other's existence. The empire that connected them did not consider it necessary to explain.*

The Vixen B trials at Maralinga in 1960, 1961 and 1963 — the same years of peak Carbon-14 deposition — used explosives to blow apart nuclear warheads on steel structures called feather beds. They produced jets of molten, burning plutonium extending hundreds of feet into the air. The contaminated debris was buried in pits. Eventually there were twenty-one pits containing 830 tonnes of material contaminated with twenty kilograms of plutonium — a quantity that persists in the soil to this day, slowly releasing into the desert environment, absorbed by wildlife, present in the landscape that the Maralinga Tjarutja have now partially reclaimed.

The feather beds were made of steel. The steel was British. Port Talbot's furnaces were burning at full capacity. The workers tending them had no knowledge of Maralinga, just as the Maralinga Tjarutja had no knowledge of Port Talbot. The empire required neither party's understanding. It required only their land and their labour.

IV. The Bay of Pigs, the Cuban Missile Crisis, and the Men at the Furnace

In April 1961 — the same year as Tsar Bomba, the same year Port Talbot reached peak employment — CIA-trained Cuban exiles attempted to invade Cuba at the Bay of Pigs. The operation failed catastrophically. Eighteen months later, in October 1962, the Cuban Missile Crisis brought the world to within hours of nuclear exchange.

During the Crisis, RAF Bomber Command moved to Condition Alert 3 — an increased state of readiness from normal operations. The Vulcans at bases including RAF St Athan were on standby. The crews were prepared for the fifteen-minute scramble to airborne status. The weapons in the bomb bays were ready. The targets in the Soviet Union were already assigned — 108 RAF V-bombers had been allocated targets under the Single Integrated Operational Plan since 1958. The men at the furnaces in Port Talbot, working night shifts in October 1962, had no idea that the aircraft their steel had helped to build were on nuclear alert. They were tending metal. The world was on the edge of the end.

This is the vertigo at the heart of this paper. The profound disconnection between ordinary working life — clocking in, tending the furnace, going home — and the most extreme geopolitical crisis in human history. The two worlds utterly disconnected in the experience of the people living them, utterly connected in material reality.

Ordinary people making ordinary things, and the things themselves part of a system whose consequences were potentially civilisation-ending. Not through malice. Not through choice. Through the invisible logic of empire, which did not require their understanding, only their participation.

> *This is what the empire always required: not complicity, but invisibility. The worker who does not know what his work is for cannot resist it. The community whose land is taken without explanation cannot protect it. Ignorance, in the architecture of empire, is a structural feature, not a failure.*

V. The Parallel Erasure: Two Kinds of Grey Knowledge

The Maralinga Tjarutja elders who had lived on that desert landscape for millennia carried knowledge that no survey, no geological report, no environmental impact assessment could replicate. The knowledge of place accumulated over thousands of years — the location of water sources, the routes between them, the seasonal patterns of plant and animal life, the sacred geography encoded in ceremony and song. Knowledge that existed nowhere except in living bodies and in the oral traditions that transmitted it between generations.

The Port Talbot steelworkers who tended the Abbey Works blast furnaces in 1961 carried knowledge that no technical manual could fully encode. The knowledge of heat — of when

steel was ready — that lived in eyes trained over years to read colour and movement. The knowledge of the furnace's rhythms, its moods, its failures and recoveries. The embodied expertise that the older workers transmitted to the younger ones through proximity and practice, through watching and being corrected, through the long apprenticeship of industrial labour.

Both communities' knowledge was invisible to the systems that used them. The empire did not value what it could not measure. The Grey Knowledge of the Maralinga Tjarutja was incompatible with the surveyor's grid. The Grey Knowledge of the steelworkers was incompatible with the efficiency consultant's spreadsheet. In both cases, the knowledge was present, essential, irreplaceable — and treated as if it did not exist.

The blast furnaces at Port Talbot went cold in September 2024. The last generation of workers who tended them are now in their seventies and eighties. The knowledge they carry — the embodied intelligence of seventy years of Welsh steelmaking — has a biological window of perhaps ten to fifteen years before it is lost permanently. The Maralinga Tjarutja are still recovering their relationship with their contaminated landscape, still mapping the plutonium that persists in the soil, still rebuilding the transmission of knowledge that was interrupted by the Black Mist.

Both communities are engaged in a preservation emergency. Both are working against biological time. Both are trying to rescue from permanent loss a form of knowledge that the empire treated as expendable.

VI. The Body as Archive

I carry Carbon-14 in my tooth enamel from the 1961 atmospheric nuclear tests. The concentration is measurable, specific, datable. A forensic scientist examining my teeth without any other information could determine my birth year within twelve months. My body encodes the history of the arms race at the cellular level.

I was born at RAF St Athan — a base embedded in the V-force infrastructure, servicing the aircraft designed to deliver Britain's nuclear deterrent. The hospital where I arrived in the world was inside a military base whose function was the maintenance of civilisation-ending weapons. I had no knowledge of this. Neither did my parents, in any operational sense. We were simply there.

This is what the body as archive actually means. Not a metaphor for cultural memory. Not an elegant theoretical proposition. A literal, measurable, forensically verifiable fact: the historical events of 1958 to 1963 are encoded in my biological material. The atmospheric tests. The arms race. The moment humanity most seriously contemplated its own extinction. All of it present in my enamel, waiting to be read by someone with the right equipment and the knowledge of what they are looking at.

The Port Talbot steelworkers carry their own form of this encoding. The knowledge of the furnace is not metaphorically in their hands — it is literally there, in muscle memory, in the calibration of the eye, in the reflexes built through years of practice. It cannot be transferred by description. It can only be transmitted through the kind of sustained oral history and close engagement that Quantum Memory is designed to enable.

The Maralinga Tjarutja carry a different kind of encoding: the plutonium in their landscape, the interrupted oral transmission of knowledge, the trauma of displacement and the slow recovery of connection to a contaminated country. Their bodies, like mine,

like the steelworkers', carry the trace of historical events they did not choose and were not warned about.

> *We are all, in different ways, documents of the same history. The question is whether anyone will read us before the archive closes.*

VII. The Preservation Emergency

This paper began with a question about Port Talbot steel and where it went. The answer is: everywhere. Into the ships. Into the military infrastructure. Into the instrument bunkers at Maralinga. Into the feather beds where plutonium was detonated. Into the airframes of the V-bombers that carried Britain's nuclear deterrent across the Cold War. Into the economy of a global empire that was simultaneously dismantling itself and asserting its continued power through the possession of weapons capable of destroying civilisation.

The men who made that steel knew none of this. They knew the furnace. They knew each other. They knew the Sandfields Estate and the working men's clubs and the pride of a community that had built something real and lasting — or so they believed. The lastingness turned out to be conditional. The closure, when it came, was rapid and deliberate, driven by the logic of the same global economic system that had built the weapons the steel had helped to make.

What remains now is the knowledge. The embodied expertise of the last generation of people who worked those furnaces. The oral histories that have not yet been recorded. The Grey Knowledge that exists nowhere except in living bodies and in the memories of communities that were told, for decades, that what they knew did not matter.

It matters. It is, in the most precise sense, irreplaceable. Once the last person who can read the colour of ready steel from the behaviour of the molten metal is gone, that knowledge is gone permanently. No archive, no technical manual, no retrospective study can reconstruct what was never written down because it never needed to be.

Quantum Memory exists because of this urgency. It is not a nostalgia project. It is a preservation emergency — an attempt to document, before the biological window closes, what the empire treated as expendable and what history has since revealed to be essential.

The steel was made in Wales. It was detonated in the desert. The people who made it had no idea. The people whose desert it was had no warning. Both communities carried knowledge the empire could not see and did not value. Both are now running out of time.

> *The archive is closing. The question is not whether to open it — it is whether we still can.*
