

Geoists in History: Dr John Bradfield (1867 - 1943)

by Karl Williams

John Bradfield embodied the Old School public servant - tireless, incorruptible and dedicated to the public good. He drove the design and building of the Sydney Harbour Bridge in the face of endless obstacles while minimizing the cost to the public purse through land value capture.

John Jacob "Job" Crew Bradfield was born into humble circumstances in Sandgate, Brisbane, the fourth and youngest son of a labourer and Crimean War veteran. In an era of relative meritocracy, his sharp intellect and boundless drive brought him many opportunities. Educated at the North Ipswich State School then Ipswich Grammar School on a scholarship, Bradfield passed the Sydney senior public examination in 1885, gaining the medal for chemistry. Dux of his school, he won a Queensland government university exhibition and in 1886 matriculated at the University of Sydney. From St Andrew's College, he continued his brilliant academic career, completing a Bachelor of Engineering in 1889 (with the University Gold Medal) and later a Master of Engineering with first-class honours and the University Medal in 1896 from University of Sydney.

From 1889 to 1891, Bradfield worked for Queensland



Railways as a draftsman then in 1891 joined the New South Wales Public Works Department. That year he married Edith Jenkins with whom he had six children, most of whom were imbued with his zeal for high achievement.

He had been a founder of the Sydney University Engineering Society in 1895 and president in 1902-03 and 1919-20. In his 1903 presidential address he drew attention to the competition, initiated in 1900, for the design of a bridge across Sydney Harbour. There had actually been agitation for a bridge or tunnel since the 1880s.

It is interesting to note how much the design of the bridge changed over time as the vast span required pioneering engineering concepts. In February 1912 in evidence to the Parliamentary Standing Committee on Public Works, Bradfield proposed a suspension bridge, but in April changed his submission to a cantilever design. Next year the committee recommended acceptance of his scheme for construction of a cantilever bridge from Dawes Point to Milsons Point. In 1913 his title was changed to chief engineer for metropolitan railway construction, as the bridge would have to be closely integrated with the greater railway plans for Sydney.



Bradfield had undertaken broad ranging studies into integrated railway plans. In 1914 he travelled overseas to investigate new approaches to metropolitan railway construction. In early 1915, with the Great War raging, he reported on the proposed electric lines for the city of Sydney including a city underground railway. Aware that a bill was soon to come before parliament, he went to considerable effort to show the practicality of his scheme. He was at his most convincing in this report, combining both the functional and the 'city beautiful' aspects of his plan. In the debates on the bill, his engineering talents were praised by both sides.

But the slaughter on the battlefields of France had thrown all infrastructure plans out the window. During the war, the multi-talented Bradfield helped establish the first civil aviation school where pilots were trained for overseas service.

When the Great War had finished and the dust had settled, Bradfield travelled overseas in 1921 to investigate possible suppliers of a bridge. The trip convinced him a steel arch bridge would have significant advantages over a cantilever bridge. In particular, the arch design was considerably stronger — an important consideration given the heavy loads the bridge would carry.

When Australia had recovered from the exhaustion of war, Bradfield's electrified railway plans were taken up with the first sod turned on the city railway in 1923. Actually, Bradfield's grand vision for Sydney's railway system has only been partly fulfilled. His concept called a network of underground city railway lines in association with the Sydney Harbour Bridge and a new rail terminal, Central. A larger network of lines was proposed for the western, eastern and southern suburbs

however most have never been built. The Depression, World War II, and the advent of the motor car led to passenger numbers in Bradfield's plan being somewhat overestimated.

Bradfield continued to fine tune his integrated rail/bridge plan. In 1924 he received the first doctorate of science in engineering awarded by the University of Sydney for his thesis 'The city and suburban electric railways and the Sydney Harbour Bridge'. One of his examiners, none other than Sir John Monash, wrote "these works are undoubtedly of exceptional magnitude, being in some respects unique in Engineering practice". The opening of the St James and Museum stations and the new section of the Central Station at Chalmers Street in 1926 marked his plan's first result. In 1930 he was abruptly retired by the railway commissioners, however cabinet preserved his status in the Department of Public Works and he continued to represent the government in dealings with contractors and to supervise construction of the bridge.

When the Sydney Harbour Bridge was opened, it was the second longest steel arch bridge in the world, just behind the Bayonne Bridge in New Jersey in the US. This earlier bridge had opened one year before and was 504 metres long, compared to the 503 metres of the Sydney Harbour Bridge. However, the Sydney Harbour Bridge was immediately the largest single arch bridge in the world. It is far higher above the water level than the Bayonne Bridge and considerably wider, with six lanes of road traffic, two rail tracks and two tram tracks, compared to Bayonne's two lanes of traffic each way. It is still the 6th longest arch bridge in the world, only 49 metres short of the longest. The highlight of Bradfield's career was undoubtedly the bridge's opening on 19 March 1932 when NSW Governor Sir Philip Game named the bridge and highway after him.

What does a man do when, at the age of 67, he's realized his greatest dream? Bradfield saddled up and headed to his old stomping ground, Brisbane, to embark on another massive project: consulting engineer for the design, fabrication and construction of a bridge and approaches across the Brisbane River from Kangaroo Point to Bowen Terrace. The Story Bridge was a symmetrical cantilever of 777 metres with a clear span of 282 metres.

Construction began in 1935 and the bridge was opened in 1940 (by which time Bradfield was 73). He was also technical adviser to the constructors of the Hornibrook Highway near Brisbane and helped to plan and design the University of Queensland's new site

"It has almost invariably been forgotten that not the people of Australia nor of New South Wales are paying for the bridge, but the 91,361 taxpayers in the city of Sydney and the Northern Suburbs, who paid the tax last year and will shortly again receive their assessment notices from the shires and municipalities defraying the municipal portion of the cost."

at St Lucia. In gratitude, the university honoured him with a doctorate of engineering in 1935.

Bradfield had advocated land value capture from an early age. In October 1913 he had attended the inaugural meeting of the Town Planning Association of NSW; at the first Australian Town Planning Conference and Exhibition held in Adelaide in October 1917, he argued in his paper, 'The Transit Problems of Greater Sydney', that his scheme of suburban electrification would benefit large property owners, new home purchasers and the general public by opening up new land, with quicker transport and cheaper fares.

Bradfield diligently planned his infrastructure for the long term, and was remarkably forward looking. In his 1917 paper when Sydney's population around 800,000, he predicted Sydney's population would reach over 2.2 million by 1950. At the time this seemed extraordinary; Bradfield was not far wrong, with Sydney reaching this soon after 1960.

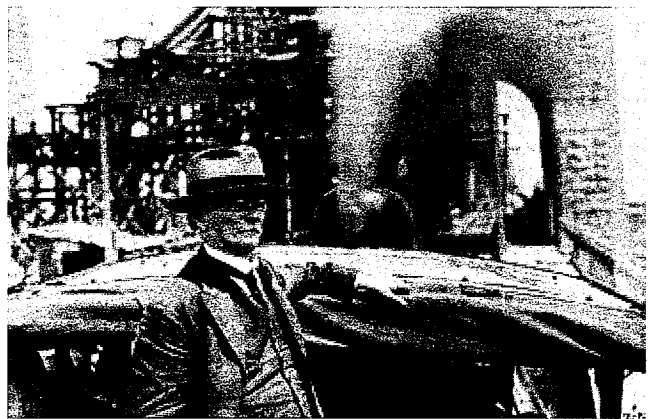
Bradfield maintained—apparently without reprimand from government—an extraordinary barrage of articles and public addresses advocating his plan. A third of the cost of the Sydney Harbour Bridge was to be paid by a betterment tax levied on landholders north and south of the harbour whose plots were likely to rise in value as a result of the bridge. It has been estimated that the uplift in land values that would have occurred on the north shore alone would have paid for the bridge several times over, but engineer Bradfield didn't have the political power to capture more than what was eventually achieved.

And it wasn't as if this betterment tax in Sydney crippled landowners, however loud their howls of protest. The levy was only 0.2 per cent per year on unimproved capital value over 15 years. Bradfield also envisaged value capture being used much more extensively to finance a vast underground rail network in Sydney but his plans were dropped because of the economic disruption of the Great Depression.

Bradfield was small in stature, with a quiet and easy going disposition and wide interests. His life was one of total professional zeal and commitment, which enabled him to become the foremost Australian engineer of his generation. In 1919 he was a founder of the Institution of Engineers, Australia, and as a councillor in 1920-24 and 1927 represented it on the Australian Commonwealth Standards Association. He was a member of the Australian National Research Council. He always maintained close links with the University of Sydney: member of its senate 1913-43, trustee of Wesley College 1917-43, councillor of the Women's College from 1931, and from 1942 deputy chancellor. He was a member of the University Club and from 1922 of the Royal Society of New South Wales.

In recognition for his life of selfless service, the name Bradfield appears all over our fair land. Named in his honour are Bradfield highways in both Sydney and Brisbane, the Federal electorate of Bradfield in Sydney's North Shore, the North Shore Sewerage Bradfield Carrier in West Killara, and Bradfield Senior College which is a school for the creative industries in St Leonards. A prominent footbridge in his home town of Ipswich, Queensland was named in his honour in 2010.

There were also gongs galore. A Fellow of the Senate of the University of Sydney, he was awarded the Peter Nicol Russell Memorial Medal by the Institution of Engineers Australia. In 1933 he was appointed C.M.G. (the lofty imperial title of Companion of the order of St. Michael and St. George). In 1934 he was awarded the Telford Medal by the Publications Committee of the Institution of Civil Engineers of London for his paper The Sydney Harbour Bridge and its Approaches. In July 1936 the Institution of Civil Engineers in London elected Bradfield a member of council representing Australia. In August 1940, a plaque was placed on the Story Bridge recognising Bradfield's contributions. He was awarded Queensland Institute of Engineers lifetime achievement award in 2007.



So recognition rather than riches was the reward for a lifetime's service to the public good, but we can well speculate that his utter dedication would have been offered up even with no hope of acknowledgment. You're an Old School trooper all right, John Bradfield, and you must be turning in your grave at how so many Australian infrastructure projects - natural monopolies ripe for price gauging - have in recent years been handed over to Public Private Partnerships.

While the Donald Trumps of this world might think we're impressed at the size of their fortunes, many trying to bring about the Good Society think just the opposite. So here's an instructive measure of the inner worth of John Jacob Crew Bradfield - upon his death, his estate was valued for probate at the grand total of £13,843.

Next issue: no. 64, Chaim Weizmann, the first president of Israel