



WHAT IF? WHAT NEXT?

SPECULATIONS ON HISTORY'S FUTURES

SESSION 3B

COUNTERING THE CANON/S

**Activism and Agency in Architectural History:
Migrancy, Gender Diversity, Class**

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THE LANDS BUILDING, SYDNEY: ARCHITECTURE AS INSTRUMENT IN THE COLONIAL PROJECT

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Embedded in the sandstone of Sydney's Lands Building is a brass plug. A plaque above it reads: "The top of this plug is 27 feet $\frac{3}{4}$ inches above mean high tide, and 28 feet $1\frac{1}{4}$ inches above mean sea level." Laden with symbolism and statuary, the building's façade depicts colonial-era explorers and bureaucrats who were significant to the development of New South Wales. Amongst this ornamentation, the brass plug – a height datum – seems a relatively innocuous addition. It is, however, indicative of the fundamental role played by the building itself in the burgeoning colonial project.

This paper will consider the Lands Building, designed by the Colonial Architect James Barnet, as a paradigmatic example of the ways in which architecture, science and infrastructure became intertwined within the operations of the New South Wales Public Works Department in the nineteenth century. The height datum plug, although a later addition, is one of a number of instruments inserted directly into the fabric of the building. These included a domed observatory and a survey baseline embedded into a ground floor corridor.

In its reading of the Lands Building, this paper will argue for an alternative construction of architectural history; one that refuses disciplinary boundaries in favour of acknowledging the specific historic, technical and governmental contexts in which architecture is always situated, and that it in turn affects. Despite its imposing Classicism, the Lands Building cannot be understood outside of the colonial project more broadly, in which the "soft infrastructures" of surveying and map-making, of which the building was itself an instrument, were fundamental to the colony and its future.

Introduction: Architecture and Instruments

Crowning the imposing four storey sandstone façade of the New South Wales Lands Building is a dome designed to accommodate an observatory. (Fig. 1) An unusual inclusion for a building housing a large colonial bureaucracy, the integration of this scientific instrument in the building's most prominent frontage appears symbolically ambiguous, raising questions of authorship, agency and purpose. Who was responsible for its inclusion? What was it used for?



Figure 1. 'Lands Office', Kerry and Co, Sydney, Australia, c. 1884-1917, Museum of Applied Arts & Sciences, accessed 28 August 2020.

The observatory is not the only instrument integrated into the fabric of the Lands Building. A brass datum plug with a plaque reading “The top of this plug is 27 feet $\frac{3}{4}$ inches above mean high tide, and 28 feet $11\frac{3}{4}$ inches above mean sea level,” is embedded in sandstone adjacent to the public entrance (Fig. 2) and a survey baseline for calibrating equipment is marked out in a ground floor corridor. The presence of instruments, datum and standards allude to the complex role the building and the department played in the modernisation of the New South Wales colony and are indicative of a moment in which science, governance and the expansion of capital coincided in the evolution of the colonial project.

This paper will argue that an understanding of the design, operation and modification of the Lands Building presents an opportunity to develop a framework for architectural history that complicates notions of design authorship within an analysis of cross-disciplinary relationships and the role of public works in the organisation and transformation of the landscape.¹ The relationships at play in the Lands Building occurred between agencies, for example between the Colonial Architect, the Surveyor General and the Government Astronomer, and between the government and the public, who included surveyors, squatters, landowners and aspiring farmers. It will be further argued that the period of the building's construction and occupation coincided with a pivotal moment in the transformation of New South Wales from a penal colony to a capitalist state. Integral to this transformation were the “soft infrastructures” of surveying and map making, facilitated by architecture and executed by the bureaucracy.



Figure 2. Datum plug and plaque embedded in the Bridge Street façade. Photograph by the author.

This historiographic approach does not seek to remove authorship from the production of architecture but rather to situate architecture within a complex field of relationships that, as mentioned, are multi-disciplinary but also multi-scalar. The scales at work in the Lands Building range from the microscopic calibration of standards to the civic, the territorial and the astronomical, making it a paradigmatic subject for such a study. Each of these scales will be addressed in terms of the broader issues implied in the progress of the colony.

An Instrument Wrapped in a Civic Skin

Designed by the Colonial Architects Office headed by James Barnet, the Lands Building is situated on Bridge Street in the centre of Sydney, adjacent to Macquarie Park. Macquarie Park, significantly, contains one of the earliest standards of measurement in the colony, an obelisk designed by Francis Greenway in 1818 from which “all the public roads leading to interior of the colony” are measured. Scattered along Bridge Street are a number of other sandstone government buildings including the Chief Secretary’s Office, also by Barnet. The Lands Building occupies an entire city block and was constructed in two stages. The Bridge Street frontage was built between 1876 and 1881, containing offices and the domed observatory. The second stage was completed between 1888 and 1891 adding more offices, a fire protected storage strong-room, a plan room for map drafting, a gallery and a clock tower.



Figure 3. 'Spring Street and Lands Office', Kerry and Co, Sydney, Australia, c. 1884-1917, Museum of Applied Arts and Sciences.

The building's exterior has received substantial attention from architectural historians for its urban form and civic role.² Wendy Thorpe observes that, in the design of the Lands and Chief Secretary's buildings, Barnet was "intending to produce a cohesive and monumental streetscape that dignified and accentuated the pre-eminent "government" precinct in the city."³ The Lands Building is unusually sophisticated in addressing the scales of the site, its civic context and the establishment of an urban precinct (Fig. 3), however the building's symbolic representation of the expansion of the New South Wales territory, also inscribed in the façade, has often been overlooked.

Arrayed on each of the building's four facades are forty-eight niches intended by Barnet to be occupied by sculptures of persons involved in the settlement and exploration of the country. The list of candidates to be represented preoccupied Barnet well into his retirement. In a letter dated 1898 he noted that only seventeen of the niches had been filled and suggested that Flinders, one of his first choices should be added. (Fig. 4)



Figure 4. Occupied and empty niches. Photograph by the author, 2020.

This says more, perhaps, about the architect's imperative for completion than it does about the colony's perception of its history and future, a sentiment captured in an 1890 letter to Barnet from Philip G. King, a close friend of Henry Parkes:

I do not think I can quite agree with you in appropriating, once and for all, the whole of the forty eight niches referred to. There may be men to follow who for eminent services in the great question of 'the land', may deserve places far more than some whose names are on your list.⁴

For King and presumably others in government, the organisation of the land and the evolution of the colony was an ongoing concern, a view clearly expressed by King:

I cannot however see why the niches should be reserved for explorers only. The Land Office has been the means by which the executive has carried out the whole of the laws and regulations by which the Crown Lands have been converted into private holding whether freehold or leasehold. The office heads since Sir Thomas Mitchell's time might well be represented down to and including 'Adams'.

King suggested that Barnet himself might also be included, an honour that appeared certain to eventuate when a sculptor was approved to execute a statue of the architect in 1891. The order was cancelled, however, and Barnet's statue was substituted for one of John Robertson, the architect of the 1861 Lands Acts legislation.⁵ It perhaps fitting that Robertson should replace Barnet as, through legislative agitation, he more than any other, was responsible for the incredible growth of the Lands Department in the second half of the nineteenth century, the very reason behind the need for a new building, frequently noted at the time as being the largest public building in the city.⁶ This episode is a striking illustration of a colonial government simultaneously projecting its historic legitimacy and aspirations for future development. Leaving niches unfilled may have offended Barnet's classical tendencies but the ongoing conquest of territory and progress of the colony were of greater consequence than the totalising impulse of architecture.

The Expansion of the Territory: Free Selection and Laissez-Faire Capitalism

In drawing Barnet's attention to the Lands Department's true mission, the leasing and transfer of Crown Land to private ownership, King reveals an additional dimension of the evolving colonial project: the territorial conquest by capital. This, combined with the generation of government revenue, directly through land sales and indirectly through the "improvement" of land, was the intention of the 1861 Lands Acts.

The two Acts, the Crown Lands Alienation Act and the Crown Lands Occupation Act, were significant in shaping the colony for a number of reasons. Following the establishment of responsible government in 1856, the Land Acts were the first land laws governing the use of Crown Land to be legislated by the New South Wales Parliament.⁷ As argued by Don Baker and Bill Gammage, the land laws were instrumental in the process of dismantling the monopolistic power of the squatters in districts beyond the Limits of Location set by Governor Darling in 1826 and instituting a more laissez-fair, if not democratic system of land alienation.⁸ It is not within the scope of this paper to address the complexities of the Land Acts and their fallout; however, two critical and connected elements were key to the growth of the Lands Department and the subsequent construction of the building: the principle of free selection and revenue from the sale of Crown Land.

The importance and consequences of the principle of free selection were not lost on subsequent governments. At the feet of John Robertson's Lands Building statue is a scroll bearing the inscription: "FREE SELECTION BEFORE SURVEY, LAND ACT 1861". (Fig. 5)



Figure 5. Detail of John Robertson statue by the author, 2020.

Selection before survey, in essence, allowed for anyone to select between 40 and 320 acres of land for purchase (under conditions specified in the act) prior to an official survey being conducted to establish the boundaries. The purpose of free selection was clear: to alienate as much land as quickly as possible.⁹ Robertson, a freehold landowner (not a squatter) had a vested interest in the sale of crown land. By introducing a floor on the price of land sales, set in the Act at £1 per acre, his own land would increase in value and it was indeed the freeholders that led the charge for land reform. For the middle and working class men that supported them, newly imbued with the power to vote, it was the development of a “liberal capitalist society” for the former and equal access to property for the latter that drove the desire to end the squatters’ monopoly.¹⁰

The effect of free selection in the 1861 Acts on the workload of the Department of Lands was exponential. The number employed by the Surveyor General’s Department, tasked with surveying land following selection, increased more than five-fold between 1861 and 1881. (Fig. 6)

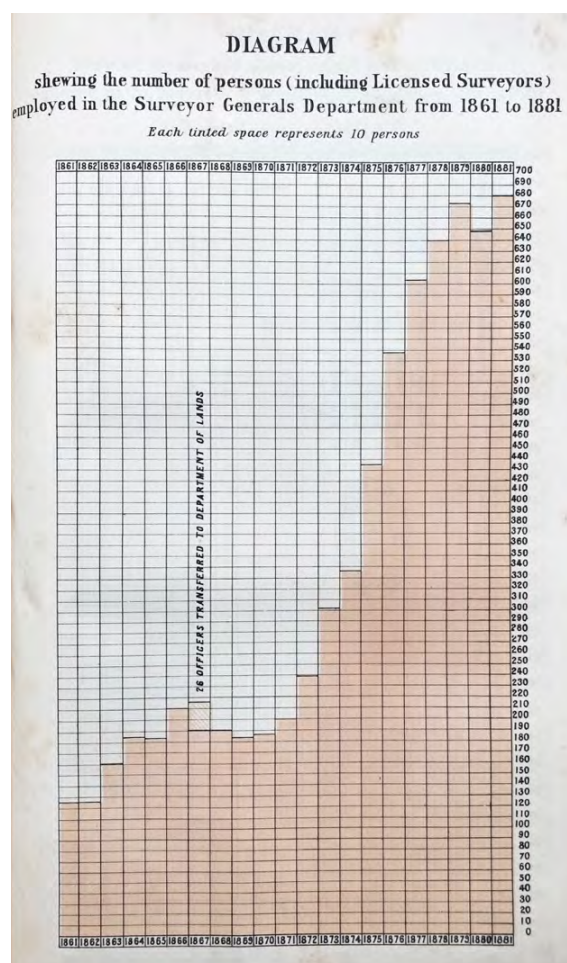


Figure 6. Diagram showing the number of persons (including Licensed Surveyors) employed in the Surveyor Generals Department from 1861 to 1881, The Department of Lands Annual Report 1881.

The efficiency of disposing of Crown Land through free selection generated inefficiencies in bureaucracy and planning, an issue that continued to cause angst among surveyors in decades to come. The chaotic distribution of land selected was bemoaned by E. Herborn in *The Surveyor* journal as late as 1889:

For 28 years New South Wales has been suffering from the disadvantages, and has been encumbered with the difficulties, which have been imposed by the adoption of the pernicious principle of selection before survey.¹¹

Aside from blatant corruption associated with loopholes in the Act, Herborn noted that “The country is dotted over here and there with solitary selections, greatly increasing the cost of administering other departments of the state besides the Lands Department.”¹² Education, policing, postal service and road construction were all affected by the unchecked decentralisation and diffusion of land occupation. But orderly development was not Robertson’s priority. Alongside the ideological and political motivations for free selection was the need for a reliable stream of government revenue. As Gammage observes, “An act meant simply to put small men on the land would have read more like the 1862 *Homestead Act* in the United States...The most immediate effects of the New South Wales acts were to open to exploitation a major source of government revenue...”¹³ The revenue drawn from the sale of Crown Land was initially underwhelming, but by the 1870s it had become the single most lucrative source of funds for a government caught up in a spending frenzy on education, railways and other public works.¹⁴ As the primary conduit for this revenue, the Lands Department was also a beneficiary and, in essence, supplied their own funds for the new building to accommodate their growing bureaucracy.

Rationalising the Territory: Surveying and Astronomy

The combination of accelerating selection and increasing land values over the second half of the nineteenth century created technical difficulties as well as work for the Surveyor General. The challenge of maintaining order over the progress of free selection was a problem for the department regardless of whether it concerned the government. In 1865 then Deputy Surveyor General, Philip Francis Adams tabled a letter in parliament outlining the challenge of producing accurate maps of the colony in the absence of a large scale survey of the territory. A drawback with selection before survey was that selectors rarely had sufficient information available to choose high quality land, largely due to poor quality existing maps. Adams opined that “little satisfaction can be expected from the present system, under which reliable maps can only be obtained after the whole of the land has been alienated, or at least measured; in fact, reversing the order in which they should come before the public, who are more interested in learning what land there may be still for sale than what has been sold.”¹⁵ To rectify these problems, Adam’s recommendation was for the department to embark on a full trigonometric survey of the colony which would create a highly accurate framework to which existing general, parish and plot surveys would be aligned.

Although couched in practical language for the politicians, the trigonometric survey would be as much a scientific endeavour in the rationalisation of the colonial territory as an exercise in bureaucratic efficiency. The argument for scientific advancement was made by the Government Astronomer George R Smalley in a report tabled the same year. In asking how the Sydney Observatory could be made most useful, Smalley stated that “I cannot in my scientific capacity, serve the interests of the Colony better than by the measurement of an arc of the meridian, to serve as a sound basis for the future operations of the surveyor, in carrying out a new and complete triangulation of New South Wales.”¹⁶ In 1868 Adams assumed the role of Surveyor General with full authority to implement the trigonometrical survey.¹⁷

The most technically complex aspect of the trigonometrical (trig) survey was the accurate measurement of a baseline from which the survey would extend. Smalley selected a site at Lake George in 1867 which shortly became flooded and in 1870 Adams personally selected a site on higher ground and commenced the measurement of a 5½ mile baseline.¹⁸ The baseline measurement was established using two methods: the length was determined using specially constructed ten foot pine bars which, when laid end to end would have the alignment checked using a double microscope of Smalley’s design. (Fig. 7)¹⁹ The extremities were then established astronomically against a base point at the Sydney Observatory²⁰ with a temporary canvas observatory erected at each end.

Proceeding from the baseline, the trig survey triangulated stations across the territory categorised as first, second or third order. The first order stations were the most important, constituting the primary skeleton of the survey.²¹ Many of the first order stations also had latitude and longitude

coordinates recorded. The trig survey was a monumental undertaking that extended over decades. By 1914 approximately a quarter of the state had been surveyed (Figure 8 shows the extent in 1923).²²

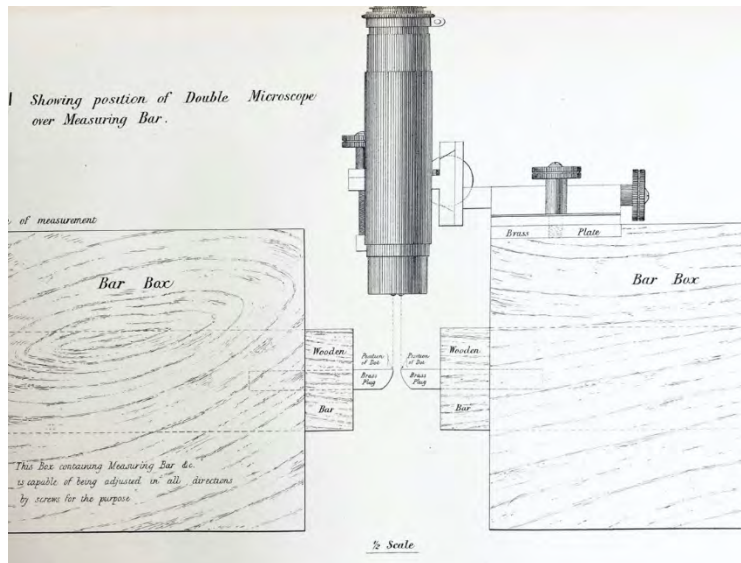


Figure 7. Detail of trigonometrical survey baseline measuring apparatus, Lands Department Annual Report 1881.

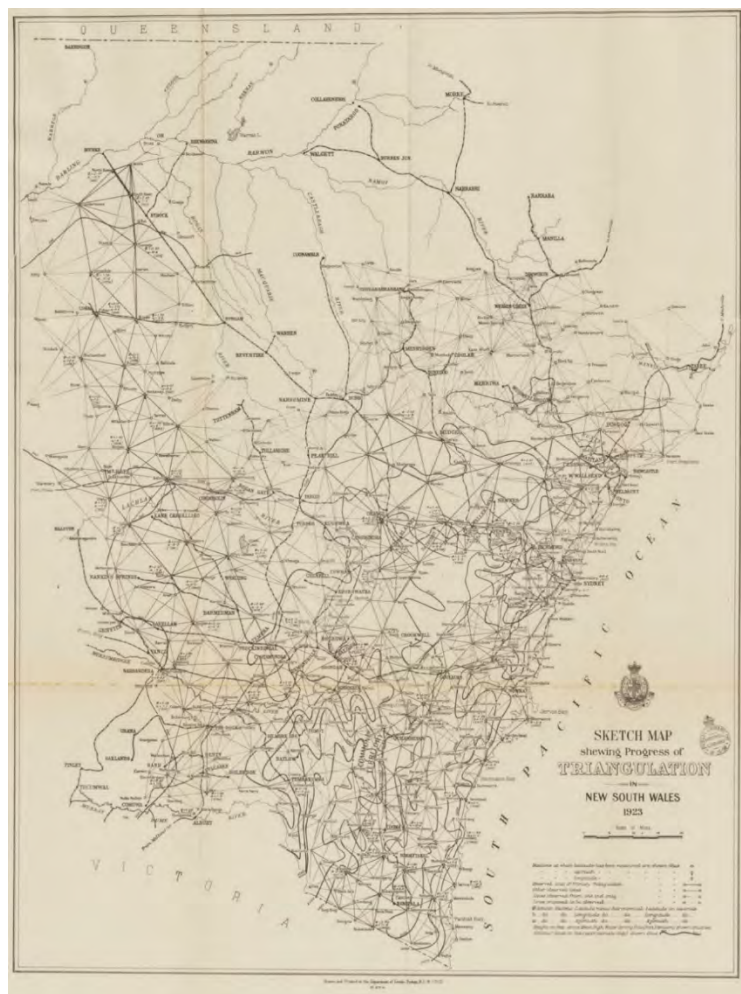


Figure 8. A Sketch Map Shewing Progress of Triangulation in New South Wales 1923, NSW Department of Lands.

The trig survey required a significant level of cooperation between the Sydney Observatory and the Lands Department in the 1870s, a period coinciding with the design and construction of the Lands Building. In a report to parliament in 1876, the Government Astronomer H. C. Russell, Smalley's successor, notes that "The Surveyor General is now actively carrying on the trigonometrical survey of the Colony, and has asked me to take the oversight of the calculations. To do this would require a considerable portion of my time, and my duties to the Observatory occupy all my working hours."²³ The relationship between the Survey Department and the Observatory extended beyond the trig survey, however and over the course of the 1870s may even have become competitive. Aside from the requirement to have professional astronomy knowledge (the official position of Field Astronomer was created in 1886), Adams and a number of other members of the Survey Department were keen amateur astronomers.²⁴ In 1874 Russell organised a major expedition to observe the transit of Venus from four stations across the colony with Adams leading a team located at Woodford in the Blue Mountains.²⁵ (Fig. 9) The transit of Venus was an important event in the development of science in New South Wales and was deemed significant enough for Russell to gain leave to travel to England to present the results. It is worth noting that on this trip he also took time to "select instruments and instrument-makers for the Surveyor General and to obtain information generally about trigonometrical surveying, testing of instruments &c."²⁶



Figure 9. Observatory at Woodford, Blue Mountains, to observe the transit of Venus 1874, Museum of Applied Arts and Science.

The addition of the observatory to the Lands Building is therefore indicative of a number of contemporaneous concerns — political, scientific and economic — in the New South Wales bureaucracy. While there is as yet no concrete evidence as to the precise reason for its inclusion in the design, there are a number of plausible explanations. It has been suggested that the 1882 transit of Venus prompted its construction²⁷ but given the proximity to the Sydney Observatory this seems unlikely. It may have been used for training surveyors involved in the trigonometric survey, a hypothesis bolstered by the implementation of the Field Astronomer position in the 80s. It is certainly also possible that Barnett was the driving force, having completed the design of an additional observatory dome at the Sydney Observatory in the early 1870s. Adams' growing bureaucratic power as Surveyor General may have given him enough influence to have it included as both an instrument and symbol of the scientific prowess of the Lands Department. In any case the observatory certainly represents an ambition for a modern, scientifically and technically driven bureaucracy and projection of colonial capability.

Datum and Baseline: Surveying Standards, Precision and Value

The desire for map-making precision at the scale of the colony was soon followed by a need for precise standards at the scale of the city and lot. The Lands Department installed a height datum plug in the sandstone of the northern façade in 1882, shortly after the new building was completed. (Fig. 10)



Figure 10. Photograph of the Lands Building entrance probably in 1891 by Joseph Bischoff. The plug and plaque can be seen in the lower right-hand part of the façade. New South Wales State Archives.

For nearly a decade the inscription above the plug indicated that it was “27ft. above mean high tide, and 28 ft. 9 ½ inches above mean sea level.” In 1891, D. M. Maitland the surveyor in charge of the Detail Survey of Sydney was tasked with checking the accuracy of the inscription as a number of large-scale works depended on reliable data:

For drainage purposes, and a great number of engineering works, it is also important, nay, absolutely necessary, that the tide levels should be determined with as great accuracy as possible, and for reference purposes carefully connected with some fixed datum or bench mark.²⁸

The inscription was duly altered in 1891 to read, 27ft. 3 ½ in. above mean high tide, and 28 ft. 11 ½ in. above mean sea level.²⁹ The need for a uniform datum was an issue that also occupied the Institute of Surveyors as various government departments were utilising their own bench marks. In 1896 a conference was held that determined to adopt the Lands Building plug as the bench mark for New South Wales.³⁰

Of more concern, and the subject of considerable debate amongst Institute members was the need for an accurate survey baseline. The increasing value of property, and in particular urban land had raised the stakes for survey accuracy in the 1880s and 90s. The possibility of litigation over incorrectly located boundaries had become a stark possibility. Up until the 1870s the standard tool for surveying was the Gunter's Chain which was subject to wear and could supply significantly variable measurements from tool to tool. Surveyors could check their chains against markings set up on Bridge Street in front of the old Lands and Survey Office but the accuracy of this “standard” was questionable.³¹ The introduction of the steel tape, rendered the Gunter's Chain obsolete and with the increase in precision and reliability of measurement came calls from licensed surveyors for a common standard against which their equipment could be calibrated.

Following the demolition of the Survey Office, standards of 66 and 100 feet were established in the grounds of the Observatory which were vastly superior in accuracy but inconvenient to access and still lacked a high level of precision. Beginning around 1890, a growing chorus of surveyors implored the Lands Department to lay down a baseline in the new building that would be accessible and accurate enough to constitute a standard.³² Following an Intercolonial Survey conference in 1892, the Lands Department committed to constructing the baseline which was installed in the eastern corridor of the newly completed wing of the building between 1893 and 94.³³ (Fig. 11)



Figure 11. Survey Baseline installed in the Lands Building, photograph by Noni Boyd, 2015.

Conclusion: Contingency and Scalar Fluidity in Architectural History

The Lands Building appears to the casual observer as a solid and perhaps somewhat staid example of classical revival architecture. A closer examination, however, reveals it to be a contingent and contested technical device of governance: empty statue niches implying an unfinished and ongoing conquest of territory, an observatory signifying the scientific rationalisation of that territory and a height datum and baseline standard that allowed for the division of the territory into quantifiable commodities. The Lands Building is not a totalising architectural work, but an instrument for scalar compression. This interpretation rejects the hegemony of “the city” in recent architectural history and theory. What is described here is a building that addresses the urban and the territorial simultaneously. It synthesises scientific precision and the expansion of capital. While the Lands Building provides a paradigmatic example of architectural scalar compression, this historiographic framework is widely applicable. It suggests an understanding of disciplinary boundaries as fluid and contingent, where the work of architecture is positioned as part of complex assembly of artefacts from the scale of state and urban infrastructure to the instrument or tool. That the Lands Building was adapted to become a device for measurement is in itself a compelling reason to question the overriding importance of architectural authorship in the building’s contribution to discourses of colonial power and development.

Endnotes

¹ This framing builds on a growing body of scholarship typified by the work of the Aggregate group in *Governing by Design: Architecture, Economy, and Politics in the Twentieth Century*, ed. Aggregate (Pittsburgh: University of Pittsburgh Press, 2012).

² See Peter Kohane, "James Barnet and the Classical Ideal: Architecture in Sydney," in Chris Johnson, Peter Kohane, and Patrick Bingham-Hall. *James Barnet: the Universal Values of Civic Existence*, (Balmain, NSW: Pesaro Publishing, 2000) 10-20 and Chris Johnson, *Shaping Sydney: Public Architecture and Civic Decorum* (Sydney: Hale & Iremonger, 1999).

³ Wendy Thorpe, *Lands Building Development Archival Resources*, unpublished, 1996. Thorpe's history of the Lands Building has been incorporated into several subsequent Conservation Management Plans. See also Peter Bridges, "James Barnet 1827-1904," in *Architects of Australia*, ed. Howard Tanner (South Melbourne: Macmillan, 1981), 72.

⁴ Philip G. King to Barnet, 8 July 1890, *James Barnet Papers, 1852-1898* MLMSS 726, State Library of New South Wales: 1.

⁵ Letter from Philip G. King to Barnet, 8 July 1890, *James Barnet Papers, 1852-1898* MLMSS 726, State Library of New South Wales: 1-3.

⁶ "The New Lands and Mining Offices," *Illustrated Sydney News and New South Wales Agriculturalist and Grazier*, August 19, 1876, 14.

⁷ D. W. A. Baker, "The Origins of Robertson's Land Acts," *Australian Historical Studies*, 8:30, 166.

⁸ Baker, "The Origins of Robertson's Land Acts," 180, and Bill Gammage, "Historical Reconsiderations VII: Who Gained and Who was Meant to Gain, from Land Selection in New South Wales?" *Australian Historical Studies*, 24:94, 112.

⁹ Gammage, "Who Gained and Who was Meant to Gain," 112.

¹⁰ Baker, "The Origins of Robertson's Land Acts," 173-177.

¹¹ E. Herborn, letter to the editor, *The Surveyor*, No. 6, Vol II (December 7, 1889): 6.

¹² Herborn, *The Surveyor*, 1889, 6.

¹³ Gammage, "Who Gained and Who was Meant to Gain," 112.

¹⁴ P. N. Lamb, "Crown Land Policy and Government Finance in New South Wales, 1856-1900," *Australian Economic History Review* 7, No. 1 (January 1967): 52-53.

¹⁵ P. F. Adams, "Public Surveys: Report from Deputy Surveyor General Respecting State of," *Votes and Proceedings of the Legislative Assembly New South Wales 1865-6*, III, 2.

¹⁶ George R. Smalley, "Geodetic Survey: Report from Government Astronomer Recommending," *Votes and Proceedings of the Legislative Assembly New South Wales 1865-6*, III, 9.

¹⁷ Terry Kass, *Sails to Satellites: The Surveyors General of NSW (1786-2007)* (Bathurst, N.S.W: NSW Dept. of Lands, 2008), 187.

¹⁸ T. F. Furber, "The Trigonometrical Survey of New South Wales with Mention of Similar Surveys in the Other Australian Colonies," *Report of the Seventh Meeting of the Australasian Association for the Advancement of Science, Held at Sydney, 1898*, ed. A. Liversidge (Sydney: The Association, 1898), 178.

¹⁹ P. F. Adams, "Base Line for Triangulation of New South Wales," *Votes and Proceedings of the Legislative Assembly 1870-71*, IV, 1188.

²⁰ Furber, "The Trigonometrical Survey of New South Wales," 209.

²¹ Pietro Baracchi, "Astronomy and Geodesy in Australia," *Federal Handbook, Prepared in Connection with the Eighty-Fourth Meeting of the British Association for the Advancement of Science held in Australia, August, 1914*, ed. G. H. Knibbs (Melbourne: Commonwealth Government, 1914), 378.

²² Baracchi, "Astronomy and Geodesy in Australia," 378.

²³ H. C. Russell, "Government Observatory, Sydney: Report of the Astronomer for 1874 & 1875," *Votes and Proceedings of the Legislative Assembly New South Wales 1875-6*, VI, 937 (P 3 of the report).

²⁴ Wayne Orchiston, "Contribution of the Lands Department to the Development of Astronomy in New South Wales During the Nineteenth Century," *Australian Journal of Astronomy* 2, no. 2 (October 1987): 72.

²⁵ Baracchi, "Astronomy and Geodesy in Australia," 363-64.

²⁶ Russell "Government Observatory, Sydney: Report of the Astronomer for 1874 & 1875," 935 (P 1 of the report).

²⁷ Graeme L. White, "The Observatory at the Lands Department Building Sydney," *Publications of the Astronomical Society of Australia*, 5(4), 608.

²⁸ D. M. Maitland, "Notes Upon Recent Tidal Observations," *The Surveyor* No. 4, Vol IV (October 6, 1891): 66.

²⁹ W. D. Campbell, "An Intercolonial Datum Level System," *The Surveyor* No 2. Vol VII (February 9, 1894): 40.

³⁰ John D. Lines, *Australia on Paper: The Story of Australian Mapping*, (Box Hill, Vic: Fortune Publications, 1992), 239.

³¹ R. V. Bayliss, "The linear standards of the Department of Lands, New South Wales," *Australian Surveyor*, 16:5, 312-317 (1957): 312.

³² E. Herborn, "Linear Standards," *The Surveyor*, No. 8 Vol. II. (February 4, 1890): 8.

³³ See *The Surveyor* (August 1, 1893): 208 and *The Surveyor* (July 9, 1894): 155.