

[galileo.usg.edu/sanborn/](http://galileo.usg.edu/sanborn/)); the Map Library holds the original paper and microfilm versions of the Sanborn maps through 1985. It was also one of the first map libraries to acquire Soviet military topographic map sets after the fall of the Soviet Union, with holdings for most countries in Africa, Asia and the Middle East as well as parts of Eastern Europe. One of the more unusual items in the collection is a Denoyer-Geppert moon globe, ca. 1970, which was borrowed from the Map Library for the 1995 movie "Apollo 13" and used as a prop in an early scene where the astronauts have their official pre-flight portrait taken in their space suits (Figure 3).



Although we see fewer UGA-affiliated users now than when we were on campus, the Map Library still attracts many non-affiliated users who are mostly interested in our Georgia air photos and USGS topographic maps. Because the collection does not circulate, we offer a wide variety of color copying, scanning and printing options,

including large-format scanning and printing, which allows our users to reproduce almost any item from the collection in either paper or digital format. Our current off-campus location compels us to find different ways to make cartographic resources available to our users, particularly those who may not be able to visit the Map Library in person. We maintain an extensive Web site that includes links to a wide variety of online cartographic resources (<http://www.libs.uga.edu/maproom/>). UGA students, staff and faculty can request that atlases in good condition be sent to an on-campus library for in-house use. Several scanning projects are underway to make our historic 15- and 30-minute USGS topographic maps of Georgia and historic USDA soil survey maps of Georgia available online through the DLG; these maps will start appearing there by fall of 2009. Many of our historic Georgia highway maps dating back to the 1920s have also been scanned and are available through the Georgia Government Publications database (<http://www.galileo.usg.edu/express?link=ggpd>). Also, in the interest of publicizing the Map Library on campus over the past two years we have mounted several well-received displays of World War II maps and Sanborn maps and air photos of the UGA campus in various libraries; plans are in the works for a larger display of maps of

Georgia in the coming year that will involve all of our on-campus libraries.

With the completion of the Libraries' new Special Collections building in 2011 the Map Library will move back to campus, taking over space in the sub-basement of the Main Library currently occupied by the Richard B. Russell Library for Political Research and Studies. Upon its return to campus, plans call for the Map Library to be combined with the government documents collection to form a new map and government documents library. This combination promises to be an exciting new chapter in the Libraries that will allow us to provide new and enhanced services such as GIS that take advantage of resources from both collections. In preparation for this move, Map Library staff members are working to purge duplicates from the collection and eliminate the map cataloging backlog that has accumulated in recent years. Souvenirs of the 2006 car intrusion – including a battered supply cabinet, some scratched and dented map cases and a large yellow road sign – will accompany the collection and serve as mementos of its time off campus. But for now we continue to conduct business as usual, safe behind the new guard rail that was installed a year ago after another car driven by a different underage drunken driver sideswiped the building and almost hit the gas main. After more than two busy and rewarding years here I can safely say there is never a dull moment in the UGA Map Library.

## The Maps Collection of the National Library of Australia

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### Introduction/brief history

The National Library of Australia was established at Federation in 1901, when the British colonies merged as a nation with their own constitution. In those days the parliament was located in Melbourne, the nation's interim capital. The Library commenced with a clear national purpose in mind, its primary function to provide politicians with material for speeches. With deliberate intent, the collection grew to record national progress, thus beginning a process of interpreting the nation's particular place in history. National libraries may be distinguished by their maps collections, which encapsulate internal geographic limits and define a nation's relationship with nearby countries and the rest of the world. While map curators have their eyes set

on the present and future trends in cartography, history has an indisputable place in such collections.

The place of Canberra in Australia's history and development was confirmed in December 1909, with the Seat of Government Acceptance Act (Cwlth). Then began a period of intensive planning, surveying, and mapping for the new capital, including an international design competition that produced eighty-one design entries and literally thousands of plans and topographic maps. This culminated in the opening of Parliament in 1927, on the Molonglo Plains in southern New South Wales. It is surprising then, given the importance of maps to the nation's planned origins and the proximity of the Parliament to the Library, that the Maps Collection did not exist as a separate entity until 1962. Its existence owed something to the cartographic self-awareness of the 1950s and 1960s, when new methods in quantitative geography saw the emergence and growth of university geography departments. Neither was its development merely coincidental with the formation of public cartographic societies, including the Australian Map Circle (now the Australian and New Zealand Map Society), with whom it has shared personnel. Above even these external demands, the Library was impelled to face a growing problem-- how to manage all those maps?

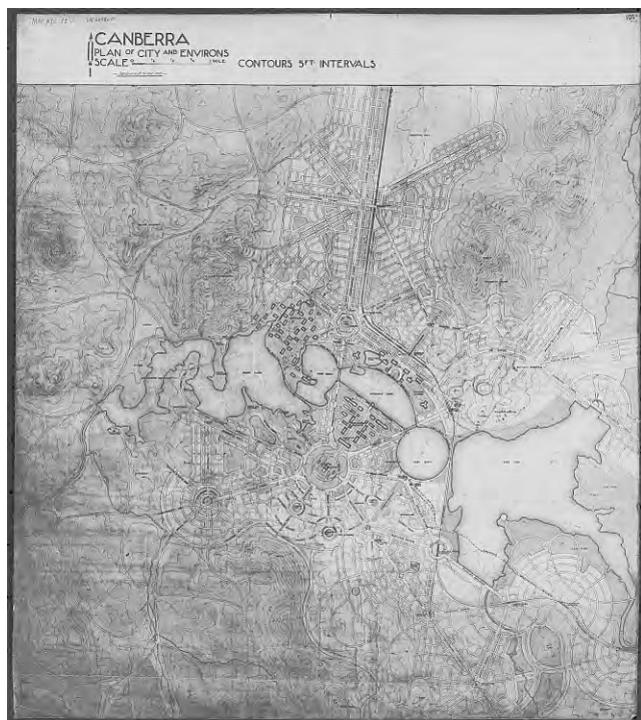


Figure 1. Walter Burley Griffin (1876-1937). Canberra plan of city and environs, part of Eric Milton Nicholls special map collection, 1916. (see page 90 for color version)

### Positioning of Maps within and outside the National Library

The Maps Section is one of six specialist materials collections within the National Library, each an independent entity, though integrated with the Library's mainstream processes. As one of the Library's key research collections, Maps benefits from the Library's promotional opportunities and leverage, but may be subject to tensions when larger book management and other processes are considered. Maps at the National Library, while comparable with other large map collections, has rather less in common with university map libraries, especially those with geography departments to service. The absence of a direct departmental client group to shape collecting or access strategies does not absent Maps from providing resources and services of value to maps users, but it does shape the nature and content of the services provided. The challenge in common with all maps libraries, that of demonstrating value in a competitive administrative environment, is as ever a key driver.

A further dichotomy is evident in staffing arrangements that are spread across the Library's divisional (functional) structures. Maps and other collections, Manuscripts, Pictures, Oral History, and Music and Dance, are positioned within the Australian Collections and Reader Services Division, with acquisition, access, stack management and promotion of the collection the overall responsibility of the Curator of Maps and a small core team. The important cataloguing, digitization and preservation functions are the responsibility of the Collections Management Division. The services of these teams are negotiated through ongoing meetings and annual budget processes and reviews. It is no small point that the interests of Maps are dependent in large measure on good working relationships with each of these functional areas.

Equally, it has been important for successive curators to pay close attention to the Maps' profile both within and outside the Library. The "curatorial model" at the National Library, which has historical antecedents, allows communication with key collecting sectors, makes use of technological partnerships, and is sensitive to opportunities. Some time has been spent on reclassifying and branding staff positions to give better effect to initiatives that are uniquely "Maps" and to enlist support for specialist initiatives in terms of access, information technology, preservation, publications, and events.

One forthcoming opportunity connected to the redevelopment of the Library's Treasures Gallery next year will be a showcase exhibition for the Maps collection, planned for the Gallery in 2012. Online exhibitions, including the National and State Libraries

Australasia (NSLA) initiative *South Land to New Holland: Dutch Charting of Australia 1606–1756* (2006) may be inter-library efforts. Our own occasional “White Gloves,” and other displays and events, are often coordinated with public participation and the involvement of the Friends of the Library. Maps generates its own daytime or after-hours involvements and provides tours for donors, visiting curators and librarians, or genealogical, historical and geospatial organisations. These are high priority events, demonstrating ongoing research value and donor relationships. Further *ad hoc* media work and presentations to groups are generated by corporate Library initiatives, and in the past few years we have had regular contributions to Education and Visitor Services tours. All of these efforts are very time-consuming, and it is necessary to prioritize and measure involvement.

The role of the Curator of Maps also includes a number of *ex-officio* and supplemental roles that accrue ongoing status and networking benefits to the Library. External stakeholder representational work may range from engaging with cartographic societies and support networks to more practical national coordination of data and standards, while each contributes to the profile of Maps in areas of antiquarian, historical, and geospatial research.



Figure 2. Hands on maps Maps, “White Gloves” event, 12 March 2008.

### Building the collection

The aim of the collection, according to the Library’s collection development policy, is to accumulate “Australian and overseas cartographic materials, which form part of the documentary record of Australia and reflect its relationship to the rest of the world.” While this prosaic formula is designed to reflect ongoing acquisition, the National Library has a collecting history pre-dating its existence, thanks to the zeal of individuals who had spent a lifetime acquiring material for their print collections. The Maps Section Collection

owes its strength and diversity to the activities of four individual collectors. The first of these, Edward Augustus Petherick (1847–1917), arrived in Australia in 1852 with his wife and family. Employed by Sydney bookseller George Robertson, Petherick soon developed an interest in Australiana. He collected books, manuscripts, ephemera, and maps, and in 1887 founded the Colonial Booksellers Agency in London.

Petherick’s collection, which he first offered to libraries in the Australian colonies of Victoria and New South Wales in 1895, comprises works on the geography, discovery, exploration, and natural history of Australia and Polynesia. He fervently believed his collection could become the nucleus of an Australian national library and emphasized the need for continuing acquisitions after it had been deposited. His collection of 1220 maps and nearly 300 atlases accounts for a substantial part of the National Library’s rare maps collection, now numbering more than 11,000 items.

Like many collectors and writers of the late nineteenth century, Petherick was preoccupied with the cartographic origins of Terra Australis, a subject of ongoing interest to Australian and other scholars. As a consequence, the Petherick Collection comprises many early maps of importance to the European charting and, significantly, a large component of the relevant output of the Dutch Vereenigde Oost-Indische Compagnie (VOC, or United East Indies Company). In a similar fashion, the New Zealander Rex Nan Kivell (1898–1977) bequeathed more than 1000 sixteenth and seventeenth-century Dutch, French, and British maps tracing exploration in the Indian and Pacific Oceans. The acquisition of a large proportion of the collection of the collector R.V. Tooley (1898–1986) in 1973 added immeasurably to the Library’s holdings of early Australian, Asia-Pacific, and Antarctic maps.

Turning inland, the colonization of Australia was the particular focus of the eminent judge, collector, and bibliographer John Alexander Ferguson (1881–1969). Ferguson’s cartographic interests lay in material relating to church and mission-station history in Australia and the Pacific, and in cadastral maps of New South Wales. Ferguson’s collection of 911 maps and more than 7000 estate sales plans reflects his interest in the processes of subdivision and settlement, contributing an invaluable record of land ownership patterns throughout the nineteenth century.

During the twentieth century, government mapping agencies including the Royal Australian Navy, Australian Army and the Division of National Mapping (later Geoscience Australia), together with many state and territory map producers, have deposited large collections of maps which could not have been easily obtained from other sources. Significant institutional additions, including the aerial photography of

Royal Australian Navy, Australia, and Antarctica, have contributed to a national collection now comprising some 600,000 maps, 20,000 atlases and over 800,000 photographs.

Over time, the Library has also benefited from its agents in Indonesia and London and from the connections that particular curators have managed to utilize when duplicate maps have been offered. A notable example was an extensive collection of topographic series mapping of Southeast Asia, obtained from the British Ministry of Defence's Singapore map collection, hastily removed to Britain as the Japanese advanced through Malaya.

In addition, Maps acquires smaller "formed" collections, comprising sometimes the output of a single publisher, collector, researcher, or organization, where the historical or evidential value derives not only from the information contained in the individual items but also from the context, including the physical connections that existed between some or all of the items. Collections such as those of anthropologists, surveyors or hydrographers, and organisations such as the Australian Antarctic Division may be kept as they were used during their active life to preserve the integrity of the whole collection.

### **Current acquisition**

The Library's broad collecting intention is to continue to collect most of the printed material covered by the legal deposit provisions or by the various arrangements applying to government publications. The result is a comprehensive, though not exhaustive, collection of material capable of supporting in-depth research in Australian studies. As others have observed, a truly national collection of maps is unachievable, at best asymptotic, since the resources available may never approach the sum of all maps. The life cycle of a map housed at the Library begins with its selection on the basis of a collection development policy, a document of long standing with this library, and one that has basic elements in common with the community of Australian libraries, most notably the NSLA. For the National Library, overseas collecting is added to the focus on Australian materials. The policy statement defines the scope and nature of the collecting of Australian and overseas materials within the Library and is reviewed with public input to provide a practical interpretation of the Library's legal obligations under the National Library Act of 1960.

In selecting items for the collection, Library staff members consider how well the item adheres to the collection development policy, taking into account aspects such as subject area, geographical coverage, cost, physical characteristics of the item, its ongoing need for preservation and relationship to the existing

collection, as well as other agencies' collecting responsibilities. Material commercially or privately published in Australia is collected on legal deposit under the provisions of the Copyright Act 1968. The Act requires all Australian publishers to deposit a copy of "library material," including "maps, plans, charts and tables." In fact, acquisition through deposit is dependent on regular communication with publishers, a time-consuming process if left to Maps staff to make personal contacts with government agencies and commercial publishers across the country. Add to this the Library's collecting interest across Asia and the Pacific, where there is no compulsion to deposit, and the available resources are spread thin. Such communications may involve creating a list of map producers in a given jurisdiction, identification of items that should have been deposited, correspondence with map producers explaining why it is desirable or necessary to deposit material in the National Library, and asking for all maps, including the identified missing maps, to be sent. Follow-up is done when time is available to check on material that has not arrived.

In reality, attention to jurisdictions may be patchy, and may rotate over years, and, even where communication is more regular, problems often arise. While the maps cited as examples in the claim letters often arrive, the Library generally receives only a portion of other material from the vendors. Because government departments are frequently restructured, it is substantial work to recreate a list of map producers every few years. And, the follow-up process has rarely been undertaken.

In recent years the Library has supplemented this labor-intensive process with automated prompts generated through the national resource sharing service "Libraries Australia," coordinated by the National Library for Australia libraries and their users. It is used for reference, collection development, cataloguing, and interlibrary lending. The heart of Libraries Australia is the Australian National Bibliographic Database (ANBD), which records the location details of over 42 million items held in most Australian academic, research, national, state, public, and special libraries. Alerts are generated when Maps are received into other libraries that are not held in the National Library and are forwarded to Maps staff. In addition, these alerts are added to its local integrated library management system (ILMS—since 2000 this has been Endeavor's Voyager), and, if not received by a pre-set date, automatic updates are sent to the vendors.

### **Cataloguing progress and projects**

The importance of bibliographic control for maps within such a large, cooperative, and integrated environment as the Australian National Bibliographic Da-

tabase is self-evident. The Library developed its own catalogue interface in the mid-1990s, and it remains the number one entry point for users to the Library's Web site. Increasingly, and as reliance on resource discovery via search engines proceeds unabated, the MARC bibliographic record provides a reliable standards-based venue for information about maps and how to find them.

Where possible, the goal of the maps cataloguing team is to create catalogue records at item level for all incoming maps. Several retrospective projects have addressed gaps in the record. In the Maps Reading Room every second or third enquiry seems to require a cadastral map to provide at least part of the answer. Australians have a great thirst for knowledge of their local communities, family properties, cemeteries, public buildings, and landmarks. Cadastral maps provide a great deal of useful information, usually including lot and section numbers and names of original owners, which form the basis of many family history enquiries. Since the early 1990s, National Library map cataloguers have been systematically working through the cadastral maps of each state and territory to provide simple, straightforward access to all the parish and county maps. At the end of May 2008, the staff completed cataloguing the more than 7000 parish maps and over 100 county maps held of New South Wales, the last of the states and territories in this retrospective conversion project. In addition to providing thousands of parish and county names to the Library's catalogue and National Bibliographic Database, by working closely with our Map Reading Room staff, the map cataloguers have addressed the major barriers to easy access of this set of heavily-used maps.

By contrast with this category of maps, the collection of some 400 rare atlas volumes ranging from several early Ptolemy editions to the beginnings of Australian publishing in the mid 1800s are specialist items. Each contains map sheets otherwise opaque to the end-user. Canberra is blessed with a large community of retired public servants and long-term Library users who express their interest in the Library and other cultural institutions situated on Lake Burley Griffin. The Library has fostered links with the community through its Friends of the Library Group, and many volunteers have emerged to make significant contributions to our understanding and control of the collections. One important project has been the translation and description of individual map sheet titles through a spreadsheet translated to the catalogue following checking by cataloguers. The project has the added benefit of providing the Maps curator with quick information on items offered by vendors that may indeed already have a presence within these volumes.

### Control of series maps

In days of ongoing efficiency dividends, the Library's fiscal base has been discounted annually, heaping pressure on areas to demonstrate worth, increase numbers against annual scorecards, and find new ways to deliver services. Maps is one of the collections for which substantial cataloguing progress has been made over the past ten years; however, it has to be recognized that maps in series continue to present libraries with a challenge beyond means, at least if control at item level is the goal.

At the beginning of 2009, the proportion of the National Library's printed collection estimated to be in the online catalogue was 89 percent, while the figure for Maps (very much an estimation) was 32 percent, of which the vast majority are series maps. Recent attempts to address large series have faltered somewhat, though the Library determinedly presses on with item-level coverage of all Australian maps within series. There is no question that the same could be said of the considerable holdings of Maps for Southeast Asia and the Pacific, for which the Library also has a collection responsibility. The Library holds major topographic series, either partial or complete, for in excess of 100 editions pertaining to the region.

Here the approach can only be to create unified collection records and provide series indexes where these are available. Most recently, these have been added to the catalogue record as a visual aid, beginning with the major Australian series and now progressing into the Asian series.

A similar expedient is applied to the 800,000-strong aerial survey photographs collection in a cataloguing project begun in 2005 and now nearing completion. The aerial photographs far exceeded the resources of the Maps cataloguing team complement. The collection consists of Commonwealth photography flown by the Royal Australian Air Force (RAAF), Division of National Mapping, and other agencies since the late 1920s. They are arranged and indexed according to the Australian topographic sheet numbering system. This near-comprehensive depiction of the Australian landscape is a well-used and valuable record of how the land has changed over time. Geologists, mining and exploration companies, developers, planners, environmentalists, farmers, soil conservationists, and land care groups use aerial photographs as a means of monitoring land clearing and forestry development.

The strategy developed was to seek out short-term staffing as funding allowed, together with volunteers who contributed data via spreadsheets. A spreadsheet was created for each state and territory, prescribing mandatory field information required to generate a bibliographic description at map grid level, so that retrieval would be the same as for the equivalent

mapping (in this case the majority were 1:63,360). The fields then recorded included the grid title and number, dates flown, coordinates, and run numbers covered. Where available, reference was made to print or online flight diagrams maintained by Geoscience Australia embedded in the spreadsheet and ultimately in the catalogue record. Once the particular state was completed, the spreadsheet columns were concatenated and loaded into the appropriate bibliographic fields. The process to date has created approximately 3,000 individual catalogue records, covering access to some 500,000 photographs.

### Access to Electronic maps publishing

Maps libraries have been long aware of the trend from publication of paper-based maps to the provision of map data in digital formats, both in physical form and in databases. Review of Australian government suppliers to the National Library has revealed considerable variety of approaches to making maps and maps data available. While Geoscience Australia lists eleven series of mapping available only in paper format, it is also responsible for a diverse range of products from topographic (GIS) data and digital elevation models to thematic data. In addition, geological and geophysical products available include standard thematic maps, GIS datasets, databases, reports, and publications at both the regional and national scale in support of Australia's resource industries, environmental management, and so on. Geodetic data, fundamental to Australia's geographic coordinate systems and the spatial industry, is of immediate interest to a specialist technical audience.

Though it would be impossible for the National Library to collect and make available these datasets and related software, information provided on CD or DVD-ROMs is less problematic, at least on the surface. Hard format electronic map products are available across all sectors, including primary industries and environmental departments, planning, tourism, business, industry and other agencies, authorities, and map specialist companies.

At present, there is no legislative compulsion in Australia to deposit hard-format electronic media. This has the incongruous effect of adding to the manual burden of contacting suppliers and acquiring such electronic map products. The problem is compounded when cataloguing functions and access are considered. Many producers who supply maps on CDs and DVDs do not include usable metadata that may be related to existing catalogue records.

To some degree the pressure of collecting electronic map products is alleviated by the trend towards custom maps drawn on demand from vendor databases; however, the lack of any agreements securing ongoing

preservation of old or legacy data by agencies has not been comprehensively addressed in the Australian context.

Although the National Library does not see its responsibility to collect or mirror all geo-data and products, it has recently entered into inter-agency discussions with Geoscience Australia with a view to safeguarding Australian geospatial data in digital form.

### Research and copying services

The collection is housed in a single, central repository, at the National Library in Parkes Places by Lake Burley Griffin. The Maps Reading Room is located adjacent to stacks divided into post- and pre-1900 materials, the division allowing the rare maps an additional layer of security and supervision. The all-important map-user will receive a map minutes after making the request. There is a large reference collection, series indexes, gazetteers for most countries, and microform for property mapping in jurisdictions where originals are unattainable.

Concurrent with trends in data management and collecting of electronic map products, over the next few years as part of the Library's building master planning process, we will be examining the role of the Maps Reading Room in the context of other special materials delivery. This has been a recurrent theme among map libraries which have undergone restructuring and will provide a challenge for Maps at the National Library to redefine reading room service in the age of the digital map.

The Maps Reading Room has operated as a separate entity from 1968. It is staffed by the Maps team, with assistance from the cataloguers and other Library staff prepared to undertake client-focused training. The services include staffing the room (forty hours per week), responding to reference inquiries, and supplying image orders through a centralized "Copies Direct" system.

Over the past ten years usage of the Maps Reading Room and related onsite and offsite reference inquiries had been in decline. While user surveys continued to reveal a high level of user satisfaction, it was presumed that the reduction in inquiries was due to the rise of search engines and quantitative and qualitative improvements of online content. Interestingly, our most recent surveys indicate a resurgence in numbers of items requested, possibly linked to a surge in family history interest, and to publicity surrounding the recently published Maps book, *Australia in Maps: Great Maps in Australia's History from the National Library's Collection* (2008).

By contrast, demand for copying services has increased markedly. The proposition that an increase in

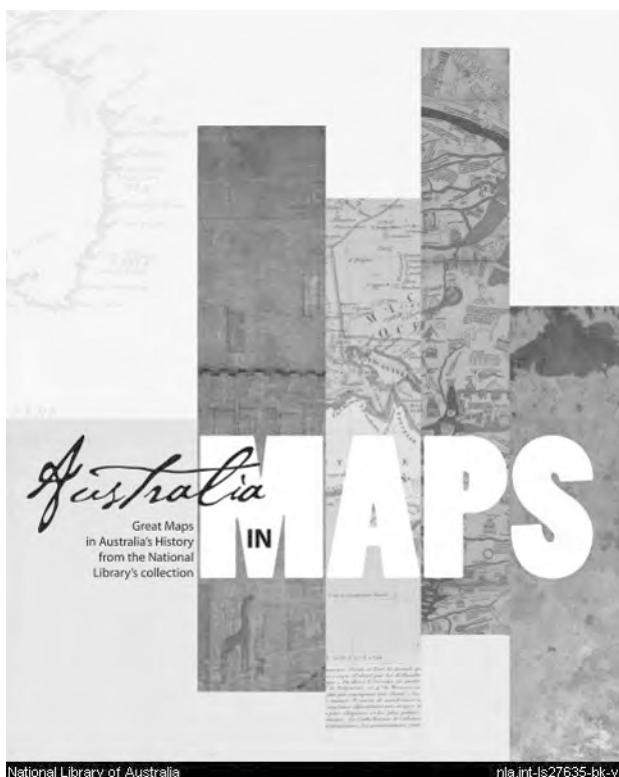


Figure 3. Cover from *Australia in Maps: Great Maps in Australia's History from the National Library's Collection, 2007*. (see page 90 for color version)

online content could potentially reduce staff-mediated inquiries does not appear to be supported. Over the past few years the volume of copying orders requesting maps via the Library's "Copies Direct" service have markedly increased, up 50 percent each year since 2005/6. The increase may be attributed to the addition of over 9,000 digital images of collection items since 2002 and discovery through Google and other Web search engines.

The acquisition in 2006 of a wide-format contact image scanner for archival scanning of cadastral plans and similar property mapping of interest to family historians has also been a contributing factor. The scanner addresses a preservation need—consistent retrieval of items, particularly for some regions nearer Canberra—and has had the effect of introducing more affordable high-resolution imagery, which users have been keen to accept. The scanner provides a high resolution color or grey-scale photocopies or digital files. The images created for clients are also uploaded to the catalogue through the Library's digital collection manager.

In June 2009, offsite requesting from the Maps collection was activated. The introduction of eCallslips for Maps allows users to track their own requests in the Library's catalogue, review their request history, and reserve maps at any time of the day or night. As eCallslips are generated from the online catalogue,

difficulties associated with transcription errors and illegible handwriting are eliminated, while the system also provides improved security through matching user requests and items. Series maps presented the greatest challenge in implementing the eCallslips, with appropriate wording needed to instruct requesters to identify sheet numbers and/or names where there are no item-level records.

The challenge in coming years will be to be more outward looking—to participate actively in provision of cartographic resources, exploiting the potential of the historical collections through stronger ties with independent and university-based expertise.

### Digitization

Digitization of collection materials has had a long genesis at the National Library. A 1999 pilot project to test standards for image capture of the pre-1900 Maps items was based on the Library of Congress rare map digitization project in 1996 and a presentation in Canberra the following year by the former chief of its Geography and Map Division, Ralph Ehrenberg. The National Library of Australia began two trial projects to determine the feasibility of scanning its own rare map collections.

The first project determined that direct scanning of originals with a digital (scanback) camera, rather than scanning of surrogates (such as photographic transparencies previously taken for conservation purposes) provided higher quality images. The second project established the technical requirements of such scanning. In 2001 the National Library embarked on a major expansion of its digitization program. The aim is to provide Library users with increased access to the special collections material through digital delivery. Each type of collection material has different requirements for digitization, as well as the management, storage, and delivery, and the Library developed a



Figure 4. Maps digitisation studio and vacuum board, October 2007.

digital collections manager (DCM) to manage this digital material.

The digital collections manager is used by Library staff and supports the digitization process, the creation of derivative objects for Web delivery (for example, low-resolution thumbnail and view copy JPEG images), and the storage of technical metadata and digital files. DCM currently supports management of images (including pictures, maps, books, sheet music, and manuscript materials) and is being enhanced to support management of audio recordings.

Maps chosen for digitization initially were from Petherick and other early maps collections. While out of copyright, the rare and often very fragile nature of parts of the collection has meant that access to the maps has been restricted to either onsite use or through photographic copies. This has been slow and restrictive for most users. It was anticipated that digitization would improve access for both Australian and overseas users, and it is interesting to see that over 15 percent of copying orders for maps come from overseas clients.

For map digitization, the Library uses a scanner back-mounted on a large-format studio camera. The system is installed on a high-precision, custom-built trolley, which moves backwards and forwards on specially laid tracks. With this device, it is possible to capture maps up to 100cm x 89cm in size (at 300 dpi resolution) producing 24-bit RGB TIFF, version six digital master files, up to 380 Mb in size. Larger maps need to be photographed in parts. For greater flexibility and to speed up the capturing process, the originals are positioned on a vertical vacuum board.

Users can identify maps by first searching the Library's online catalogue and, if the map is in digital form, by following a link to the maps delivery system provided through a highlighted URL address contained in the catalogue record. Users can also link to an "interactive map" which allows them to zoom in to any selected area to examine fine details and then pan or zoom out to surrounding areas of the map. The interactive map facility is provided using MrSID waveless image compression and LizardTech Express Server technology. All map images are named using a persistent identifier, used for both management of the digital map image and for citation and referencing purposes.

Considering the depth of the Library's Maps collection, a unique opportunity arises to enrich the user experience through improved context. It is becoming clearer that increasing use is made of Maps catalogue data with other digital sources in "mash-ups," and our use of GIS in the Maps Library will be a prevailing theme over the next few years. In 2010 the Library will develop access to its comprehensive holdings of the one to a mile Army topographic map series using

GIS. The project will test various approaches, including utilization of licensed software such as ArcIMS versus open-source methods such as MapServer.

### "Maps of Australia" pilot geospatial search

For over twenty years, the Library has been recording latitude and longitude data in its cataloguing records, waiting for the technology to exploit the data. To date, few successful examples of MARC fielded data have led to an area of interest search of catalogue records. This is, in part, a function of the data itself, which in most real library settings can be variable or absent. In 2007 Maps began to develop an interface to test the viability of searching defined by geographic area.

This initiative is being developed with other Australian libraries and currently encompasses the catalogue records, images, and item locations for over 100,000 maps of Australia held in libraries. The basic functionality provides a polygon search to return records and images where available. The search uses map coordinates and other information included in the map catalogue records. Where only coordinates are present, on-the-fly reference is made to Geoscience Australia's place names database to establish the extent of the result set. In cases where there are no coordinates at all in the record, a simple algorithm is applied that compares map sheet size with the scale statement.

The "Maps of Australia" pilot dovetails with and may contribute elements to another prototype service being developed. A unified discovery service focused on items found in Australian collecting institutions is intended to replace multiple entry points and specialized functionality tailored to collection formats such as maps.

The design so far is based primarily on decisions made within the Library to allow rapid development of the prototype. Feedback, ideas for improvement,



Figure 5. National Library "Maps of Australia" prototype search. (see page 90 for color version)



and input into the design of new features based on what is now available are invited.

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*Australia in maps: great maps in Australia's history from the National Library's collection*. 2008. Canberra : National Library of Australia>

"Maps of Australia" prototype: <http://mapsearch.nla.gov.au/>

National Library of Australia Catalogue: [www.nla.gov.au/catalogue/](http://www.nla.gov.au/catalogue/)

## Mapping: Methods & Tips

### A Technique for Encoding Elevation Changes Along a Route

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For many bicyclists and runners out in rugged areas, knowing the character of the route's terrain is critical: where the steep climbs, the downward slopes, and the flat stretches lie. Many bike maps, however, do not encode this information—they focus instead on showing the road network and which routes are safest for bicyclists. These are certainly important, but they do not help readers determine if they should press on to the next hill or stop and rest.

#### Proposed Symbolology

The solution I propose is relatively simple: encode the elevation along the route using line width as shown by Figure 1.

Though simple, the symbology here is quite efficient. By varying the width of the line with elevation, this map allows the reader to access three data sets: the elevation of the path, the slope, and the aspect. When viewing the first variable, the reader's brain can derive the other two, by examining the spatial pattern of how elevation changes. The elevation itself is not particularly useful, but slope and aspect are critical pieces of information for the bicyclist or runner. Both need to be on the map together—knowing the slope of a hill is important, but users also have to know whether, as they head along the road, they'll be climbing up a particular steep slope or coasting down it.

So, the usefulness of the map relies on the reader's being able to determine how elevation is changing from one point on the route to another, in order for

them to derive the slope and aspect. The symbology, then, needs to make this pattern of change as easy to understand as possible. Consider two different techniques for encoding elevation as shown in Figure 2.

The first encodes elevation along the path using color value and the other by varying line width, as I advocate. The slope of the route is much easier to figure out when line width changes than when the color value does. That the color at the left end of the line is lighter than the color at the right is relatively easy to determine. However, quantifying *how much* darker will be a challenge for the reader, when compared to the simpler task of quantifying how much wider the line is at one end than the other. Easy comparison of points is essential for understanding the change in elevation, and therefore the slope and aspect. Speed and simplicity of use is also important on account of the conditions under which such maps will be used. Some bicyclists do not even stop their bikes when reading maps, and so the map must work when they're not looking closely or long at it. Encoding elevation by line width has an additional advantage over any sort of color scheme: line widths are more robust—they won't vary according to lighting conditions as the readers travel in and out of shade of trees and in varying levels of cloud cover.

However, using color value does have two advantages of its own. The first is that by not changing line width, lines don't become too wide (causing crowding) or too narrow (and thus being hard to see). The second advantage is really more of a lack of a disadvantage—the highest elevations are not dominant. In Figure 1 the bottom half of the route stands out the most. Being at the highest elevation, it has the widest lines. But the route here also consists of largely flat stretches, which means that it's not a concern to bicyclists or runners—they want to know about the hills, about how the elevation changes. Encoding elevation