

# GOLD

---

**PROCEEDINGS OF THE  
SOCIETY OF ARCHITECTURAL HISTORIANS  
AUSTRALIA AND NEW ZEALAND  
VOL. 33**

Edited by AnnMarie Brennan and Philip Goad

Published in Melbourne, Australia, by SAHANZ, 2016

ISBN: 978-0-7340-5265-0

The bibliographic citation for this paper is:

**John Ting** "Who built Fort Alice? An Analysis of Subaltern Involvement in Nineteenth Century Institutional Architecture in Sarawak." In *Proceedings of the Society of Architectural Historians, Australia and New Zealand: 33, Gold*, edited by AnnMarie Brennan and Philip Goad, 678-688. Melbourne: SAHANZ, 2016.

All efforts have been undertaken to ensure that authors have secured appropriate permissions to reproduce the images illustrating individual contributions. Interested parties may contact the editors.

## **WHO BUILT FORT ALICE? AN ANALYSIS OF SUBALTERN INVOLVEMENT IN NINETEENTH CENTURY INSTITUTIONAL ARCHITECTURE IN SARAWAK**

*The first buildings established in Britain's Southeast Asian colonies were adapted from vernacular architecture, and implemented with local builders and labour. Metropolitan architecture was later adopted there, and was central to consolidate colonial authority and influence. Vernacular colonial structures were replaced with facsimiles of masonry European examples, which deliberately masked the crucial contributions of indigenous groups and regional migrants. Like Penang (1786) and Singapore (1819), Sarawak (1841) was acquired by a colonial agent who indigenised himself to negotiate with native leaders. James Brooke (1803-1868) got his Borneo state from the Brunei Sultanate, but his colonial ambitions for Sarawak were not shared by Britain. Instead, he formed a complex and precarious network of negotiated collaborations with indigenous and regional migrant groups to govern, expand and modernise the state. While Sarawak's institutional buildings were intended to contrast architecturally and programmatically with indigenous types, their timber construction and detailing demonstrate this collaboration. Most period and architectural publications, however, do not acknowledge the locals who produced those buildings. Using conservation approaches, this paper aims to give a voice to those who contributed to the design, procurement and implementation of institutional buildings in mid-nineteenth century Sarawak. Fort Alice (1864) in Sri Aman, Malaysia, will be used as a case study.*

James Brooke was a romantic colonial figure as he had the indigenous title of 'Rajah,' jurisdiction over an underdeveloped territory, and the rule of uncivilised groups. Like much colonial historiography, the elitist, Orientalist published accounts of Brooke's Sarawak until World War II have generally valorised his (and his successors') individual achievements, his victorious struggles and his civilising mission in Northwest Borneo.<sup>1</sup> In these publications, the government's architecture is often imagined as the product of the Rajah's individual genius.<sup>2</sup> Within this schema, Sarawak's Malay, Iban and Chinese groups can be considered subaltern, as their voices are not heard in period publications or imperial politics.

This approach can also be seen in conservative architectural historiography, where colonial (or modern) architecture is understood as the result of the individual genius of the architect. Modern colonial architecture is set against 'primitive' vernacular or indigenous buildings in a binary way, or as two individual segregated consciousness' that never meet or intertwine.<sup>3</sup> This binary persists in modern mainstream Malaysian architectural history,<sup>4</sup> where only 'pedigreed' architects have the authority to create and develop architecture.<sup>5</sup> The tendency is to see colonial architecture in Malaysia a developing modernism, with named creators, as opposed to unchanging indigenous and vernacular models.

More recent research that employ modern interdisciplinary historiographical approaches have demonstrated that Brooke's government was only possible due to the political and military coalitions he negotiated and formed with indigenous and regional migrant groups, and that these groups were crucial to his ability to govern.<sup>6</sup> These multidisciplinary approaches have begun to influence Malaysian architectural history, resulting in expanding architectural knowledge to include the voices of subalterns.<sup>7</sup> This paper aims to continue the trajectory from the author's PhD research to write indigenous and regional migrant groups back into Sarawak's architectural history.<sup>8</sup> Fort Alice will be used as a case study to this end, within the context of the institutional architecture implemented during Rajah James Brooke's rule, from 1841 to 1868. The aim is to map the contributions of groups that collaborated with the government by analysing data that has been collected during the conservation of the extant building between 2012 and 2014, and PhD data that was not employed in the thesis.

### **Governance and Sarawak in the Mid-nineteenth Century**

Contrary to period publications, James Brooke's tenure as Rajah of Sarawak was characterised by the careful maintenance of complex, negotiated collaborations he entered into with local and colonial groups, without which his governance would have been impossible. These hybrid approaches began with his dialogue with the Sarawak River's Malays, which resulted in a settlement of their dispute with their Bruneian overlords.<sup>9</sup> This led to Brooke gaining jurisdiction over the four river systems that made up Sarawak at that time, (and the associated title of Rajah), from the Brunei Sultanate.<sup>10</sup> Trade in Northwest Borneo was minor and dominated by Malays, but Brooke began to encourage Chinese migrants to develop it. The Rajah's modernising colonial governance strategies were tempered by his sensitivity to indigenous power structures.<sup>11</sup> This approach was repeated when the government established itself in the Skrang, Lupar and Saribas River basins, which it later acquired by treaty with Brunei in 1853. When threatened in the early 1840s by Iban groups from outside his state on the Skrang and Saribas Rivers, he collaborated with their Malay and Iban enemies to attack them in 1844 and 1849.<sup>12</sup> He used his colonial connections to call on H.M.S. Dido to assist. Within this broad coalition, the militia was made up mainly of different Iban groups, who were led by their own leaders under the Rajah and his aristocratic Malay collaborators. The Dido and its crew provided significant modern firepower, but the bulk of the fighting men were locals.

In 1849, a fort and outstation was established at the confluence of the Skrang and Lupar Rivers. Apart from being the first government building built outside the state's original area, the Skrang fort is significant as it was relocated downriver to Simanggang in 1864, where it became known as Fort Alice.<sup>13</sup> This first outstation and fort established a methodology for acquiring territory and jurisdiction. After a successful military mission against government enemies, a fort was established to stake a claim within Brunei's territory, before later formal acquisition. The Lupar, Saribas and Rejang Rivers were formally acquired from Brunei in 1853. In 1861, the Rajah used the same approach to expand Sarawak a second time. His successor, Charles Brooke (1829-1917), expanded the state another four times following a similar methodology. Sarawak's borders have not changed since its final expansion in 1905.

### Institutional Architecture and the Sarawak Government

The Skrang fort's architecture was based on the 1844 Kuching fort. Mixed origins can be seen in the Kuching fort's architecture. Its hipped roof was based on Brooke's second house which he designed in 1842, a form that had no architectural precedence in Northwest Borneo.<sup>14</sup> The architectural origins of the fort's continuous latticed strip window employed around the first floor level of the fort were not local, nor regional.<sup>15</sup> As a palisaded timber building, it adopted local materials and architecture. It was built on piles, which conformed to the regional Southeast Asian architectural traditions of Austronesian language groups,<sup>16</sup> including northwest Borneo's indigenous Malays and Ibans.<sup>17</sup> There was no indigenous tradition of masonry construction, and Chinese migrants had not yet introduced brick production. As a defensive compound that could also serve as a residence for a large extended family, it resembled the palisaded, fortified houses of Northwest Borneo's Malay leaders.

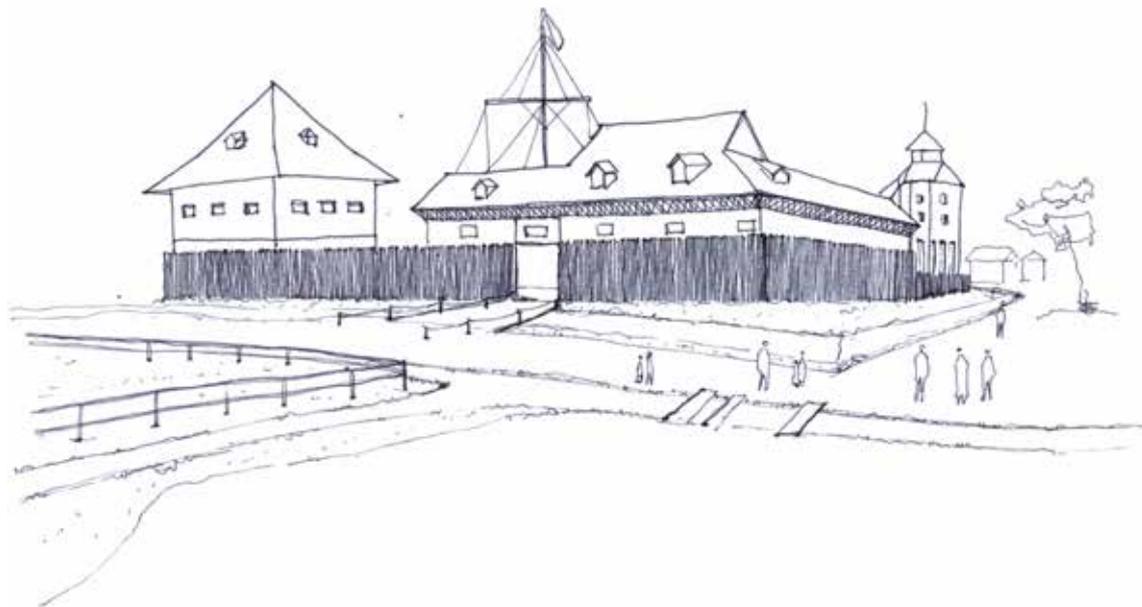


FIGURE 1 The Kuching fort. Drawing by the author from an 1860 image entitled "Fort in Kuching" in Grant and Thomas, *Scenes in Borneo and the East Indian Archipelago*, 1888.

The Skrang fort had many similarities with Kuching fort. It was of pile construction inhabited at the first floor, employed local materials, had a hipped roof and the continuous latticed strip window, and was protected by a high timber palisade. Like the Kuching fort, it was located at the river's edge for surveillance. The Skrang fort's stated functions were to contain the Rajah's enemies to the upper Skrang River, to symbolise the government's support for its local Malay and Iban allies, and to develop the newly-secure area for trade, agriculture and mining.<sup>18</sup> Although not stated, it was also recognition of the crucial role of its military collaborators, and acknowledgement that they were necessary to fulfil the government's aims.<sup>19</sup>

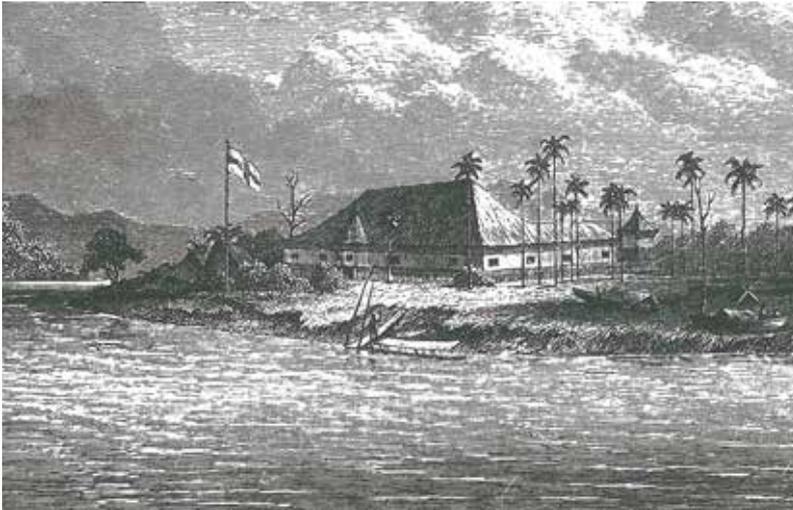


FIGURE 2 The Skrang fort.  
(Frontispiece image from  
Charles Brooke, Anthoni  
Johnson, *Ten Years in  
Sarawak*, 1866)

The Skrang fort's design and the attendance of a European officer during construction demonstrate the government's active involvement in the building's design and implementation. It has been recorded that the government's local Iban and Malay collaborators on the Skrang River erected the fort.<sup>20</sup> What is not mentioned is that, given the challenges of communications at that time, Ibans procured the materials for the construction. The *belian* (ironwood) parts of the fort, including the main posts that later became Fort Alice, were sourced and processed by Ibans, as Malays only ventured upriver to trade. Large *belian* trees no longer existed at downriver Skrang, and Ibans needed to venture upriver in order to find appropriate specimens.<sup>21</sup> *Belian* trees were felled with axes, (and branches removed), before wedges were used to split the logs into more convenient (and suitably straight) sections.<sup>22</sup> These sections were then floated downriver under bamboo rafts, as the species did not float due to a density of more than 1000kg/m<sup>3</sup>. Once on site, these sections were finished to the final shape of the posts with an adze.

It is likely that Ibans provided the majority of the labour to construct the Skrang fort. As they had an egalitarian social structure, all able members of Iban groups, including their leaders, were physically involved in constructing their longhouses as a community. Iban groups would have mobilised quickly to be involved in a community project for their respected collaborator, the Rajah. In contrast, Malay social structure at that time was hierarchical. When the fort was built, local Malay groups would have provided their slaves as their contribution of labour towards the construction. Ibans were skilled in building their longhouses, which were large structures (like the fort) that needed organised implementation techniques. Their carpentry was not refined, however, and longhouses required ongoing maintenance. The need for major renovations in 1856 suggests that the fort did not have the same level of structural upkeep as longhouses.

Three other forts were established within the 1853 expansion, at Kanowit (1851), Lingga (1852) and Betong (1858). They were most likely procured and implemented in similar ways. Period images and descriptions suggest their architecture was similar, although differing in plan. When the Skrang fort was moved to Simanggang to become Fort Alice in 1864, the state had expanded a second time, and a standardised fort design established at Bintulu and Sibul in 1862, and Mukah in 1863. By this time, the Skrang and Lupar Rivers was more secure, and saw Malays and migrant Chinese establish themselves more permanently at this first outpost.

### The Dismantling of the Skrang Fort and its Erection at Simanggang

The entire settlement at Skrang (and the fort building) was relocated downriver to Simanggang, and no evidence of settlement remains at the original location.<sup>23</sup> We know that, at the very least, the large, primary structural components of the fort were moved, due to the negative connotations of abandoning or destroying these elements to the government's Iban collaborators and enemies.<sup>24</sup> It is likely that reusable secondary and tertiary structure was brought to the new site. As with most relocated structures in Borneo, lighter elements, such as the thatch roofing and cladding and structural elements that were degraded or damaged during the dismantling process were abandoned at the site,

to be sourced new at Simanggang.<sup>25</sup> A comparison of images of the Skrang and Simanggang forts indicate that the timber palisade from the former was not reinstalled at the new location, and that the roof was changed from thatch to *belian* timber shingles.



FIGURE 3 Fort Alice in Simanggang. (From Gray Hill Alexander. "Photographs," *Stonyhurst College*, c.1875. Reproduced by permission of the Governors of Stonyhurst College)

The extant Simanggang fort building has provided clues as to who was involved in its procurement and implementation, although the constant maintenance of timber buildings (including the replacement of structural and cladding elements) needs to be taken into account. Generally speaking, visible milling and finishing methods from the nineteenth century, such as steel wedges, axes, adzed and machetes, clearly contrast with modern approaches that employ chainsaws, saws, planes and other contemporary tools.<sup>26</sup> Its 2014 conservation has provided further information about the building's construction, as the process included its dismantling, repair and restoration.<sup>27</sup>

The building's materials and construction details reveal the involvement of at least three groups, indigenous Ibans and Malays, and Chinese regional migrants. As with the Skrang fort, Ibans were involved in sourcing, fabricating and finishing much of the fort's new materials, including its *belian* timber shingles and forged steel nails. They may have provided labour for its construction. The building's pile construction is an Iban method. The existence of an intermediate roof beam in the fort's roof structure suggests Malay carpenters were involved, as it is one of their signature construction details. By 1864, Malays were involved in new activities, such as the procurement of timber from areas close to outstations, which did not include the *belian* that makes up much of the fort. They began to provide paid labour, and Skrang's established Malay community that relocated to Simanggang were involved in re-erecting the fort. Crossed top plates and hand-in-hand scarf joints can also clearly visible in the building, both signature details of migrant Chinese carpenters in Southeast Asia.

**Iban Construction Methods and Materials**

As with the Skrang fort, the government was able to call on its Iban military collaborators to assist in the dismantling of the Skrang fort, and its erection as Fort Alice. By 1964, however, procurement and implementation systems for government forts had developed considerably since the Skrang fort was constructed. As will be discussed below, new labour practices saw construction procured on a commercial basis, which was a move away from the donation of community effort used to build the Skrang fort. Instead, Ibans were employed in specific roles in building Fort Alice, based on their specific construction skills and knowledge.

Fort Alice's main posts were installed as piles, in a traditional Iban manner. No pad footings were used when piles were employed in Northwest Borneo. It was Ibans who had the skills and experience to handle the fort's 7m long posts, as their longhouses were large buildings that often used piles of similar scale. The bottoms of the piles were about 1.2m below the ground level. Malay houses were much smaller structures and did not use such long, heavy piles, nor did they need such deep holes for the main posts. Fort Alice's *belian* roof shingles was another local Iban tradition that saw widespread adoption by the government.<sup>28</sup> Split sections of *belian* logs were cut to length before being split again into long shingles with a *parang* (or machete).

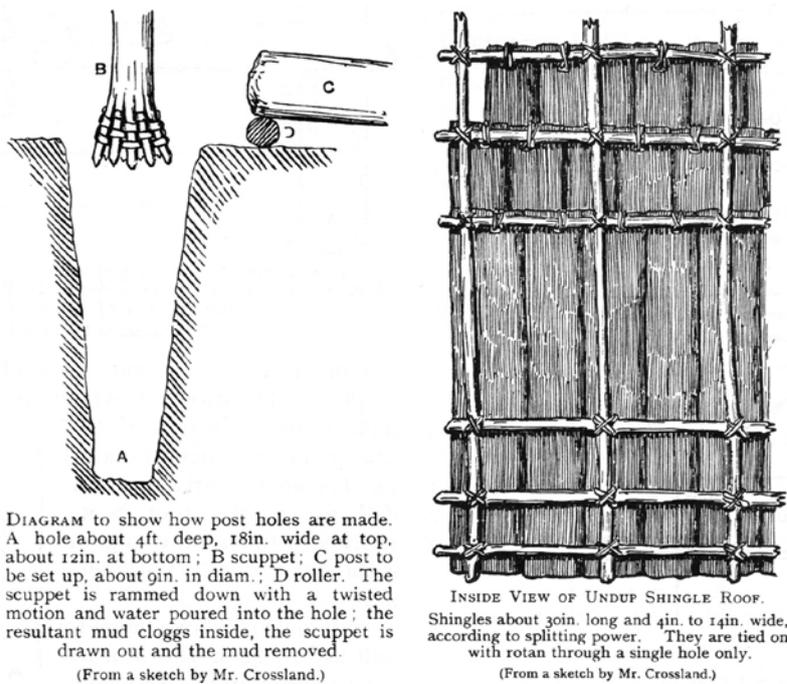


FIGURE 4 "Diagram of how post holes are made" (left) and "Indigenous timber roof shingles" (right). Both images from Henry Ling Roth, *The Natives of Sarawak and British North Borneo*, 1896.

Ibans sourced new *belian* timbers for Fort Alice, to replace some of the elements that had been damaged during the dismantling process. Not all of the fort's components were *belian*,<sup>29</sup> suggesting that some timbers were sourced by Malays. The steel nails that were used to fix Fort Alice's rafters to the primary structure were produced by Iban blacksmiths, who had the skills to forge high grade weapons and tools, including machetes, spear heads, axes, and adzes. Sarawak's Malays did not make weapons. The nails removed from the building during the conservation process are very hard, despite some surface rust, and may have been reused when timber members were replaced. These were not generally produced, with the government likely to have commissioned them. By 1864, machine-stamped (or cut) nails in England had replaced hand-made nails for about 30 years, and were being exported as far as Australia.<sup>30</sup> The reason why the government chose not to use imported nails is not known, but it is likely that they could be produced cheaper locally and more immediately.



FIGURE 5 Fort Alice's forged steel nails retrieved during the conservation, 2013. (Photograph reproduced with the permission of Arkitek JFN)

### Malay Carpentry and Labour

The second group involved in the fort's construction are Malays, who originally provided slave labour. By 1864, however, the government's introduction of laws that effectively banned slavery saw a different procurement practice for labour.<sup>31</sup> The aim of these laws was an attempt to dismantle the Malay system of tribute that did not guarantee payment for work, and therefore to break down the link between social status and slaves. The government's approach was to become the source of social status by giving the Rajah's Malay collaborators salaried roles in government. Their followers and slaves were then incorporated into the state's labour force. Skilled Malay craftsmen, likely to have migrated to Sarawak from other parts of Southeast Asia after Brooke came to power, were involved in building Fort Alice – the intermediate roof beam in its roof structure provides built evidence that Malay carpenters were involved.



FIGURE 6 The intermediate roof beam at Fort Alice, 2011. (Photograph of the author)

The fort's roof structure is a king post system supported on cross beams, with a continuous ridge beam mortised into the posts. While this system was not limited to Southeast Asia, the use of an intermediate roof beam, which runs through the king posts below the ridge beam, has been identified by Miles Lewis as signature detail of Malay carpentry.<sup>32</sup> Lewis was referring to the prefabricated Singapore Cottages that were imported into Australia from the 1830s,<sup>33</sup> some of which survive in the Melbourne suburb of Collingwood.<sup>34</sup> In his work on Malay houses in peninsula Malaysia, Jee Yuan Lim names this intermediate roof beam as an *alang muda tunjuk langit*, and suggests that it was part of the regional Southeast Asian tradition of Malay carpentry.<sup>35</sup>



FIGURE 7 Intermediate roof beam and cross-ties at Fort Alice, 1984. (Photograph reproduced with the permission of the Sarawak Museum)

Neither Lim nor Lewis outlines the function of this intermediate roof beam. At Fort Alice, the intermediate roof beam was used to support collar ties between the rafters.<sup>36</sup> This can also be seen in the 1858 Betong fort. It is likely that the original rafters at Fort Alice were relatively small sections that necessitated the use of collar ties and the intermediate roof beam to stiffen the roof structure. The rafters in the considerably smaller Singapore cottages in Melbourne easily span from the ridge to the top plates, so it appears that the holes in the king post for the intermediate roof beams may have been fabricated by Malay carpenters as part of their construction traditions, but were not used.

Malay carpentry was not isolated to government forts. There was little need for the fine carpentry that Malay carpenters were capable of due to the insecure and politically brittle situation and the relative lack of development generally in Northwest Borneo in the early nineteenth century. This began to change when better security under the Rajah began to attract regional Malay migrants, including carpenters, to Kuching. This security saw local Malays investing in more permanent houses. These carpenters travelled the state to take up commissions from indigenous groups that did not have fine carpentry practices traditionally. One example (among many) is the Iban longhouse, Rumah Matop. After the longhouse community profited from the rubber boom in the 1930s, they commissioned Malay carpenters from the coast to rebuild the secondary structure and cladding, including carved fascia boards and lintels, tongue and groove floorboards and well finished new roof structure. The large primary structure of posts was not replaced.<sup>37</sup>

### The Contribution of Chinese Carpenters

The third group who contributed to the fort's construction was the Chinese. While there were a few Chinese gold and antimony miners in Sarawak before James Brooke's arrival, the establishment of the government began to attract more Chinese migrants. The government was using Chinese migration as a way of diminishing Malay influence in trade in Sarawak. Like colonial jurisdictions in Southeast Asia, Chinese migrants were seen as a means of providing more labour to develop the state. The Chinese, while attracted to the opportunities on offer, relied on the government to keep them safe from indigenous conflict and lawlessness. When the Skrang fort was built in 1849, Chinese migrants had not yet settled in the area. However, the improved security instituted by the government attracted some five Chinese traders to attempt settlement next to the Skrang fort.<sup>38</sup> By 1863, they had expanded in number and were established enough to donate to the rebuilding of a Taoist/Buddhist temple in the capital – a plaque inside Kuching's *Hiang Tian Siang Ti* temple lists the names of the donors who assisted in the rebuilding after the 1863 fire, including eight Teochiew Chinese traders from Skrang.



FIGURE 8 Crossed top plates above a corner post at Fort Alice, 2008. (Photograph by the author, 2008)

Fort Alice's crossed top plates and hand-in-hand scarf joints have been identified by Miles Lewis as being signature details of diasporic Chinese carpenters.<sup>39</sup> Chinese carpenters that migrated to Southeast Asia in the nineteenth century were pervasive. These details can be seen on prefabricated timber houses that were manufactured in Singapore and exported to other colonies, (such as the Singapore cottages in Collingwood, Victoria), as well as on many extant late nineteenth- and early twentieth century timber shophouses and houses in Sarawak. These construction details have been sighted in extant buildings on the Indonesian side of Borneo, (in Sambas, Singkawang and Pontianak), as well as Brunei. Chinese carpenters were invited to reconstruct Iban longhouses – the Buloh Antu Longhouse off the Padeh River in Sarawak shows evidence of this as it has crossed top plates and hand-in-hand scarf joints into which the posts are mortised.<sup>40</sup> These Chinese carpenters generally came through Singapore, although no examples of these details survive there due to the constant redevelopment of most of its buildings.



FIGURE 9 Reassembling a hooked scarf connection during Fort Alice's conservation, 2014. (Photograph by the author).

By the nineteenth century, the use of crossed top plates and hand-in-hand scarf joints were well established traditional carpentry practices in China. Crossed top plates in Zhao dynasty (before C.E.) construction are depicted in a late Qing dynasty publication, the 1911 *Ch'in-ting Shu-ching chuan-shuo* (Official Commentaries on the Book of Documents).<sup>41</sup> The hand-in-hand scarf joint has been codified in the *Yingzao Fashi*, a twelfth century book of building standards.<sup>42</sup> One feature of the use of this detail in Southeast Asia is that it always seems to be used in conjunction with a post, which it is mortised into. This is the case with the scarf detail from the *Yingzao Fashi*, called the 'hand in hand' connection, which positions the scarf specifically over posts under the eaves.<sup>43</sup>

## Conclusion

Fort Alice's architecture is the result of mixed origins, both European, colonial and vernacular; the building is a repository of those who worked on it. As a timber framed building, its construction details and materials clearly show that Ibans, Malays and Chinese were involved in building and maintaining the fort. This is in contrast to other British colonial buildings elsewhere in Southeast Asia, which tend to mask non-European involvement in order to project a sense of authority for colonial governments. In contrast, Fort Alice indicates the opposite, a precarious approach to governance that acknowledged the collaboration of indigenous and regional migrant groups through its physical fabric. In this way, Ibans, Malays and Chinese were less the colonised than crucial partners that the government relied upon to operate.

Like many colonial-era buildings in Southeast Asia, the institutional architecture of nineteenth century Sarawak has been appropriated for the use of the state in the Malaysian period. Often, contemporary governments use colonial buildings to invoke the absolute influence and authority of their colonial predecessors in order to gain and maintain political power. The contribution of subaltern groups is not acknowledged. However, in the case of Fort Alice, (and Sarawak's other timber forts), the contribution of unacknowledged voices can be read in the building's construction, allowing their descendants to engage in a sense of ownership in the building, and therefore, the state. It is also a reminder that political power in Sarawak was not absolute, but negotiated and precarious, where the main local groups were completely embedded in determining the outcome.

## Endnotes

- 1 Examples include S. Baring-Gould, and C. A. Bampfylde, *A History of Sarawak under Its Two White Rajahs, 1839-1908* (London: H. Sotheran, 1909) and Gertrude L. Jacob, *The Raja of Sarawak: An Account of Sir James Brooke, K.C.B., LL.D., Given Chiefly through Letters and Journals*, vols. 1 and 2, (London: Macmillan, 1876).
- 2 Baring-Gould and Bampfylde, *History of Sarawak*, 138, with reference to the Skrang fort.
- 3 Gulsum Baydar Nalbantoglu, "Beyond Lack and Excess: Other Architectures/Other Landscapes," *Journal of Architectural Education* 54, no. 1 (2000): 8.
- 4 For example, Yeang, Ken. *The Architecture of Malaysia*. Amsterdam: Pepin Press, 1992.
- 5 Bernard Rudofsky, *Architecture without Architects: A Short Introduction to Non-Pedigreed Architecture* (Albuquerque: University of New Mexico Press, 1987).
- 6 For example, Robert Pringle, *Rajahs and Rebels: The Ibans of Sarawak under Brooke Rule, 1841-1941* (Ithaca, N.Y.: Cornell University Press, 1970) and John Walker, *Power and Prowess: The Origins of Brooke Kingship in Sarawak* (Honolulu: University of Hawaii Press, 2002).
- 7 For example, in ed.Voon Fee Chen, *Architecture*, vol. 5, *The Encyclopedia of Malaysia*. (Singapore: Archipelago Press, 1998) and Chee Kian Lai, *Building Merdeka: Independence Architecture in Kuala Lumpur*, First ed. (Kuala Lumpur: PETRONAS, 2007).
- 8 John Ting, "Precarious Power, Forts and Outstations: Indigenisation, Institutional Architecture and Settlement Patterns in Sarawak, 1841-1917," PhD thesis University of Melbourne, 2015.
- 9 Walker, *Power and Prowess*, 41-2.
- 10 This included the Lundu, Sarawak, Samarahan and Sadong River systems. S. Baring-Gould and C. A. Bampfylde, *A History of Sarawak under Its Two White Rajahs, 1839-1908* (London: H. Sotheran, 1909), 74.
- 11 Walker, *Power and Prowess*, 47.
- 12 Baring-Gould and Bampfylde, *History of Sarawak*, 134, 136.
- 13 Simanggang was renamed Sri Aman in 1980.
- 14 John Walker, "Culture, Power and the Meaning of Built Forms in Sarawak, 1841-1868," *Review of Indonesian and Malaysian Affairs*, vol. 44, no. 2, (2010): 96.
- 15 Ting, *Precarious Power; Forts and Outstations*, 165.
- 16 James Fox, "Comparative Perspectives on Austronesian Houses: An Introductory Essay," in *Inside Austronesian Houses: Perspectives on Domestic Designs for Living*, ed. James Fox, (Canberra: Dept. of Anthropology in association with the Comparative Austronesian Project, ANU Research School of Pacific Studies, 1993), 13.

- 17 Henry Ling Roth, *The Natives of Sarawak and British North Borneo*. vol. 2 (London: Truslove and Hanson, 1896/reprint, University of Malaya Press, 1980), 21.
- 18 Baring-Gould and Bampfylde, *History of Sarawak*, 138-9.
- 19 Ting, *Precarious Power, Forts and Outstations*, 160.
- 20 Baring-Gould and Bampfylde, *History of Sarawak*, 139.
- 21 Heppell, *May 2013 Communications*.
- 22 Heppell, *May 2013 Communications*.
- 23 Visited January 5, 2011 during fieldwork.
- 24 Ting, *Precarious Power, Forts and Outstations*, 215-6.
- 25 Ting, *Precarious Power, Forts and Outstations*, 217.
- 26 Roth, *Natives of Sarawak*, vol. 2, 21.
- 27 "Pemuliharaan Dan Menaik Taraf Kubu Alice, Sri Aman Sebagai Muzium Warisan: Conservation Report." Kuching: Arkitek JFN, 2012.
- 28 Roth, *Natives of Sarawak Vol. Two*, 12.
- 29 For example, April 1897 Simanggang Report in "Simanggang and Kabong Monthly Reports June 1896 to March 1900," in *Sarawak Archives* (Kuching: Sarawak Archives, 1900).
- 30 Miles Lewis, "8.06a Nails and Screws." <http://www.mileslewis.net/australian-building/pdf/08-metals/8.06a-nails-and-screws.pdf>.
- 31 Baring-Gould and Bampfylde, *History of Sarawak*, 70-9.
- 32 Miles Lewis, "Prefabrication in the Gold-Rush Era: California, Australia, and the Pacific," *APT Bulletin* 37, no. 1 (2006): 14.
- 33 Lewis, *Prefabrication in the Gold-Rush Era*, 10.
- 34 For example, 136 Sackville Street, Collingwood.
- 35 Jee Yuan Lim, *The Malay House – Rediscovering Malaysia's Indigenous Shelter System* (Penang: Institute Masyarakat, 198 May 2009 7), 106.
- 36 "5952/84 [Fort Alice Roof Structure]." Kuching: Sarawak Museum, 1984.
- 37 Visited June 19, 2012 during fieldwork.
- 38 Baring-Gould and Bampfylde, *History of Sarawak*, 155, Benedict Sandin, *The Sea Dayaks of Borneo Before White Rajah Rule* (London: MacMillan, 1967), 64 and Daniel Chew, *Chinese Pioneers on the Sarawak Frontier*. Second Ed. (Shah Alam: Oxford University Press, 2004), 65.
- 39 Miles Lewis, Personal Communications, May 2009.
- 40 Visited June 29, 2010 during fieldwork.
- 41 Joseph Needham, *Science and Civilisation in China*. Vol. 4 Part 3. (Cambridge: Cambridge University Press, 1971), 83.
- 42 Qinghua Guo, "Yingzao Fashi: Twelfth-Century Chinese Building Manual," *Architectural History* 41 (1998): 1.
- 43 Thanks to Professor Qinghua Guo for this translation of the image on 98 from Needham, *Science and Civilisation in China*.