Training Report
on
Cultural Heritage Protection

Training Course for Researchers in Charge of Cultural Heritage Protection in Asia and the Pacific 2005 – Fiji –
16 January – 21 February 2006, Nara

Cultural Heritage Protection Cooperation Office,
Asia/Pacific Cultural Centre for UNESCO (ACCU)

Edited and Published by
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Asia / Pacific Cultural Centre for UNESCO (ACCU)

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Preface

The Cultural Heritage Protection Cooperation Office, Asia/Pacific Cultural Centre for UNESCO (ACCU Nara) was established in 1999 with the cooperation of the Agency for Cultural Affairs, Nara Prefectural Government and the Municipal Government of Nara. Since its establishment, the ACCU Nara Office has worked towards the protection and investigation of cultural properties through training courses, international conferences, public symposia and database production.

Training courses on the investigation and protection of cultural heritage form an important part of our activities. These training courses are of two types: group courses of about one month for some fifteen participants and individual training on particular topics for one or two participants. The present course was the second type and was held in association with the National Research Institute for Cultural Properties.

This time we welcomed two specialists from Republic of the Fiji Islands. Republic of Fiji is a new country born in 1998. With the entire area as small as Shikoku Island, it consists of islands containing abandoned archaeological information.

While disclosing information on cultural heritages and extinct organisms with exhibitions, Fiji Museum is engaged in investigation mainly on archaeological sites and architectures. Observation of the ground surface, collection of relics, exact records of sites and features by measurements, and GIS to integrate such results are essential for relevant field works. However, necessary technology and software are not sufficiently obtained.

Regarding the present situation, the training will be implemented for the purpose of mastering various methods of measurements and GIS to integrate those results as technology related to documentation of the entire cultural heritages.

Finally, we wish to thank the Archaeological Institute of Kashihara, Toshodai-ji Office of Cultural Properties Preservation, Nara Prefecture, Chatan-cho Board of Education, Nakijin-mura Board of Education, Okinawa Prefectural Archaeological Centre and Pasco Co. Ltd. for their assistance with this training course.

YAMAMOTO Tadanao
Director
Cultural Heritage Protection Cooperation Office,
Asia/Pacific Cultural Centre for UNESCO (ACCU), Nara

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General Information

Training Course for Researchers in Charge of Cultural Heritage Protection in Asia and the Pacific 2005 – Fiji – (16 January－21 February 2006, Nara)

1. Organizers

Organizers: The Asia/Pacific Cultural Centre for UNESCO (ACCU)
Agency for Cultural Affairs, Japan
National Research Institute for Cultural Properties

2. Background

Republic of the Fiji Islands was "discovered" by Dutch explorers in mid 1600s, colonized by U.K. in the second half of the 19th Century, and became independent as a member of the British Commonwealth of Nations in 1970s. After withdrawing from and reentering the Commonwealth from 1980s through 1990s, Republic of Fiji made a fresh start as a new country in 1998. With the entire area as small as Shikoku Island, it consists of islands containing abundant archaeological information, such discoveries of human bones from rock shelter sites and shell mounds.

While disclosing information on cultural heritages and extinct organisms with exhibitions, Fiji Museum is engaged in investigation mainly on archaeological sites and architectures. Observation of the ground surface, collection of relics, exact records of sites and remains by measurements, and GIS to integrate such results are essential for relevant field works. However, necessary technology and software are not sufficiently obtained.

Regarding the present situation, the training will be implemented for the purpose of mastering various methods of measurements and GIS to integrate those results as technology related to documentation of the entire cultural heritages.

3. Date and Venues

Date: Monday 16 January to Tuesday 21 February 2006

Venues: Cultural Heritage Protection Cooperation Office, ACCU (ACCU Nara Office); National Research Institute for Cultural Properties, Nara; Archaeological Institute of Kashihara, Nara Prefecture, Okinawa

4. Objective of the Training Course

Presently, Fiji Museum is investigating and recording cultural heritages including wooden architectures development stricken, using GPS and GIS. For this purpose, training on the actual operation of GPS and GIS used for sites in Japan presently will be carried out. Furthermore, aiming at contributing to utilization of cultural monuments in Fiji in future, this training will be also an opportunity to study the relationship between remains/historic sites and tourism in Japan.

5. Training Curriculum

The training curriculum consists of three primary foci:

- Introduction to the Measuring Survey Method of Archaeological Site
- Practical Training on Measuring Survey Methods in Archaeological Site
  i.e. Traverse survey with total station, Plane table surveying method, GPS use
- Introduction and Application of GIS System
- Introduction and Practical Training on 3D Laser Scanner Measuring Survey Method
- Exhibition and Collection Storing of Museum
- Preservation and Utilization of the Archaeological Sites and Monuments

6. Participants

Praveena CHARAN (Ms.)

Field Research Officer, Division of Historical Archaeology, Fiji Museum

Elia Robert Francis NAKORO (Mr.)

Field Research Officer, Division of Pre-Historical Archaeology, Fiji Museum

7. Certificate

Each trainee will be awarded a certificate upon completion of the course.

8. Language

The working language of the course will be English.

9. Expenses

Expenses for participants for the training course shall be borne by ACCU and comprise the following:

(1) Travel expenses:

Participants shall be provided with an economy-class return air ticket between the international airport nearest to her residence and Narita International Airport / Kansai International Airport, and domestic transportation costs / to and from the airports and

between the training venues in Japan.

(2) Living expenses:

Participants shall be provided with a daily subsistence allowance during the training course, beginning from January 10 (Tuesday) to 22 February (Wednesday), 2006. Arrangements for accommodations will be made by the ACCU Nara Office.

10. Correspondence

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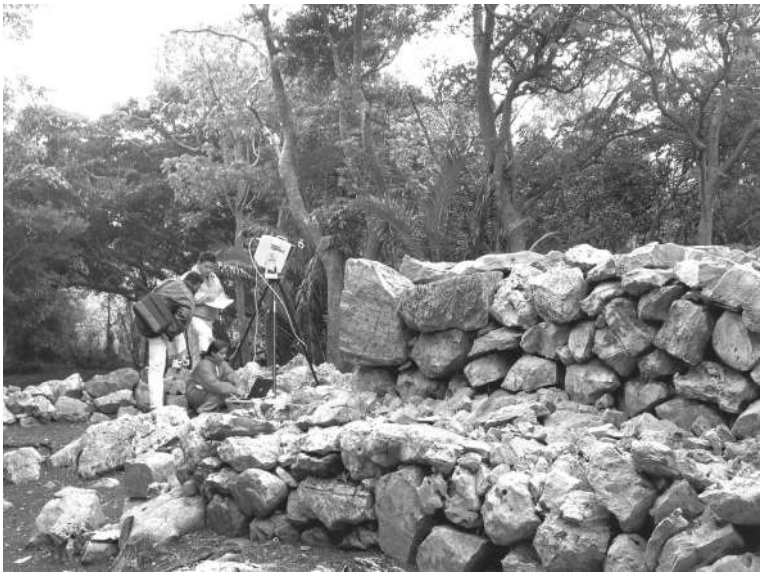
Programme Schedule

	Date		Venue
January	13 (Fri)	***Arrival to Nara***	
	14 (Sat)		
	15 (Sun)		
	16 (Mon)	Measuring Survey Method : Traverse survey by Total Station 1/ Introduction to Measuring Survey	NRICPN
	17 (Tues)	Measuring Survey Method : Traverse survey by Total Station 2	NRICPN
	18 (Wed)	Measuring Survey Method : Traverse survey by Total Station 3	NRICPN
	19 (Thu.)	Measuring Survey Method : Traverse survey by Total Station 4	NRICPN
	20 (Fri)	Visiting the World Heritage Sites 1	Ikaruga Town
	21 (Sat)		
	22 (Sun)		
	23 (Mon)	Plane Table Survey 1	ARIKNP
	24 (Tues)	Plane Table Survey 2	ARIKNP
	25 (Wed)	Plane Table Survey 3	ARIKNP
	26 (Thu.)	Plane Table Survey 4	ARIKNP
	27 (Fri)	Visiting the World Heritage Sites 2	Nara City
	28 (Sat)		
	29 (Sun)		
	30 (Mon)	Trip from Nara to Okinawa	
	31 (Tues)	GPS Survey 1:Introduction of Survey for Archaeology / GPS introduction	Naha City
February	Feb 1 (Wed)	GPS Survey 2: GPS field work / GPS Data processing	Chatan Town
	2 (Thu.)	GPS Survey 3: Digital Photogrametry	Chatan Town
	3 (Fri)	Archaeological Operation in Okinawa	Nishihara T.
	4 (Sat)		
	5 (Sun)		
	6 (Mon)	3-D Laser Scanning Survey Method 1	Nakijin Vil.
	7 (Tues)	3-D Laser Scanning Survey Method 2	Nakijin Vil.
	8 (Wed)	3-D Laser Scanning Survey Method 3	Nakijin Vil.
	9 (Thu.)	3-D Laser Scanning Survey Method 4	Nakijin Vil.
	10 (Fri)	Investigation of Heritage Preservation Methods 1	Nakijin Vil.

February	11 (Sat)		
	12 (Sun)		
	13 (Mon)	Integration of Archaeological Data Set (GIS) 1	Naha City
	14 (Tues)	Integration of Archaeological Data Set (GIS) 2	Naha City
	15 (Wed)	Integration of Archaeological Data Set (GIS) 3	Naha City
	16 (Thu.)	Integration of Archaeological Data Set (GIS) 4	Naha City
	17 (Fri)	Investigation of Heritage Preservation Methods 2	Okinawa
	18 (Sat)	Trip from Okinawa to Nara	
	19 (Sun)		
	20 (Mon)	Evaluation of the Training Course and Final Report Submission	ACCU
	21 (Tues)	Closing Ceremony	ACCU
	22 (Wed)	***Departure to Fiji***	

NRICPN National Research Institute for Cultural Properties, Nara

ARIKNP Archaeological Research Institute of Kashihara, Nara Prefecture



Shinigun-Ni Ritual Site, Okinawa

Closing Ceremony

Summary of Lectures

January 16 (Mon.)

Measuring Survey Method : Traverse survey by Total Station 1

<KANAI Ken/ NRICPN>

Introduction to Traverse survey.

- What is the "Benchmark"
- How to set a tripod

Introduction to measuring survey

Lecture: Introduction to Measuring Survey

<NISHIMURA Akira, Kokusai Kogyo Co.Ltd. / NRICPN>

- Navy Navigation System Survey (NNSS)
- GPS
- Purpose of the measuring survey in Archaeology
- How to calculate distance by law of sines

Learning how to handle the level

January 17 (Tue.)

Measuring Survey Method : Traverse survey by Total Station 2

<KANAI / NRICPN>

- Practical training: Levelling Survey
  - How to set the level
  - Transfer of height from one point to another
  - Calculation of the result
  - Error limit in a levelling survey
- Practical training: Setting of a Total Station (EDM)
  - How to set a Total Station
  - Measuring of the distance with Total Station

Setting the reflector for the Total Station

January 18 (Wed.)

Measuring Survey Method : Traverse survey by Total Station 3

<OZAWA Tsuyoshi / NRICPN>

- What is the "Measuring Survey Method"?
- Theory of triangle division method
  - Calculation procedure using triangle division method
- Practical training: traverse survey

Fixing the Total Station on the benchmark, at Heijo Palace Site

Calculation of survey data

Observing a painted member, at Toshodai-ji Temple

Horyu-ji Temple, Yumedono HAll

At the room for artefacts treatment and arrangement, AIKNP

- Angle and distance survey by total station using four points（two known points and two unknown points）laid out in a quadrangular shape in the field.

January 19 (Thu.)

<OZAWA / NRICPN>

Measuring Survey Method: Traverse survey by Total Station 4

- Calculation method of traverse data
  - Calculation of traverse data obtained the day before by observation of included angle and distance
- Evaluation of measuring survey carried out on previous days
- Classification of traverse types: it is necessary to choose an adquate traverse type for the specific purpose.

Visiting the World Heritage Sites: Toshodai-ji Temple and Yakushi-ji Temple

<OZAWA/ NRICPN; MATSUI, Toshodai-ji Office of Cultural Properties Preservation / Toshodai-ji>

- Visit to Toshodai-ji Temple under restoration for observing the preservation project of the Main hall as an example of wooden structure preservation in Japan. Explanation by Mr. Matsui
- Yakushi-ji Temple: Observation of reconstruction of temple complex introduced by Mr. Ozawa

January 20 (Fri.)

Visit the World Heritage Sites 1: Horyu-ji Area (Fujinoki Tumulus, Horyu-ji, Horin-ji and Hokki-ji)

- Outline of cultural heritages of Horyu-ji Temple area
- History of Horyu-ji Temple and explanation of the temple premise
- Short lecture about the date of the accidental fire gave serious damage on temple. The day was designated a disaster drill day for preventing disaster involving

cultural heritages.

- Overview of the current situation of parking lots, bicycle hire service, information centre, etc. in Horyu-ji Temple Area

January 23 (Mon.)

Plane Table Survey 1

<TERASAWA Kaoru; HASHIMOTO Hiroyuki: KOBAYASHI Chika / AIKNP>

Interview on the situation of survey in Fiji

- Engagement in measuring survey mainly using a handy GPS
- No particular recording method is applied. Measuring surveys are usually carried out by research project teams from foreign countries.
- Desire for learning every measuring method including topographical drawing with contour lines by the trainees themselves

- Inspecting tour of facilities of the institute
- Observation of the practice site: Asuka-Itabuki Palace Site
- Explanation about the plane table survey and practice of set up in the building

January 24 (Tue.)

Plane Table Survey 2

<MATSUDA Shin'ichi; HASHIMOTO/AIKNP>

- Observation of the Museum
  - How to exhibit archaeological artefacts in the museum
  - Special storage room for wooden tablet
- Practical training of plane table survey at Itabuki Palace Site, Asuka
  - Determination of the setting place of the plane table (Due to snow in the training field, the training programme was moved indoors.)

Learning how to set up the plane table for surveying

Looking the small model of imaginary reconstruction of the ritual site at the museum

Practicing the plane table survey at AIKNP

Practical training of plane table survey at Itabuki Palace Site, Asuka

Practical training at Niizawa Senzuka, group of mound tombs.

January 25 (Wed.)

Plane Table Survey 3

<HASHIMOTO/ AIKNP>

- Practical training of plane table survey at Itabuki Palace Site, Asuka
  - Resetting of the plane table on the control point
- Visit to the Ishibutai Tumulus

January 26 (Thu.)

Plane Table Survey 4

<HASHIMOTO; IRIKURA Norihiro; KOBAYASHI/ AIKNP>

Practical training on plane table survey at Niizawa Senzuka, Kashihara City

- Practical survey of topographical map by drawing contours at 25cm intervals.

January 27 (Fri.)

Visit the World Heritage Sites 2: Nara Area

Kasuga Shrine Main hall

Todai-ji Temple

Shoso-in

Nara National Museum

Lecture on GPS by Mr. Kiguchi

January 30 (Mon.)

Trip from Nara to Okinawa

Visit Mr. Kiguchi and had a brief introduction to the training programme in Okinawa

January 31 (Tue.)

GPS Survey 1: Introduction of Survey for Archaeology /GPS introduction

<KIGUCHI Hiroshi / PASCO>

- Drawings for Archaeology
  - Topography map
  - Distribution map
  - Drawing of features
  - Drawing of artefacts
- What is GPS?
- How to use GPS
- Lecture review

February 1 (Wed.)

GPS Survey 2: GPS field work / GPS Data processing

< KIGUCHI / Chatan Town, Urasoe City>

- How to draw artefacts: use of the 3D Degitiser for drawing a stone coffin
- GPS observation
  - Marking movement locus
  - Training on how to use "TO GO" command of GPS at the Irebaru Site, Chatan Town
- Review of the lecture
- How to restore, reconstruct and show the historic site: Urasoe Gusuku Castle, *Youdore* or royal graveyard and museum

Practical training: how to use GPS

February 2 (Thu.)

GPS Survey 3: Digital Photogrametry

< KIGUCHI / Chatan Town>

- Process of Digital Photogrametry
  - Setting of the control points and figuring out the coordinates of each point
  - Taking photos of the artefacts with a digital camera; a bamboo basket of Jomon Period found in Ireibaru Site of Chatan Town
  - Data processing by computer

Assisting data taking for digital photogrametry. Recoding the coordinates of targets set on the object

February 3 (Fri.)

Visit: Okinawa Prefectural Archaeology Centre

< KINJO Kamenobu / Okinawa Prefectural Archaeology Centre >

- Archaeological operation in Okinawa
  - Storage room for artefacts
  - Scientific conservation rooms
  - How to make records of or reports on historical information brought from archaeological site investigations
- Visit Naka Gusuku Castle –World Heritage Site
  - Observation of how the castle site is maintained and restored

At the workshop room of Archaeology Centre, trying a zig-saw puzzle of a modified artefact found in Okinawa

Museum of Culture and History, Nakijin

At Nakijinjo Castle site: observing the panel

Lecture at the former Kaneshi Junior High School: Nearby is THE small scale model of the castle

February 6 (Mon.)

Visit: Nakijin Village Museum of Culture and History

<MIYAGI Hiroki, Board of Education, Nakijin Village>

- Introduction to the history of preservation and restoration project on Nakijinjo Gusuku Site
- Tour of Nakijinjo Gusuku Site for observing the undergoing preservation and reconstruction work

3-D Laser Scanning Survey Method 1: Introduction to 3D Laser Scanning Method and Equipments

< KIGUCHI / Nakijin Village>

- Observation of Shinigun Ni Site: pratical survey site from the following day
- Two of applicable equipments: terrestrial and airborne mounted stations
  - ADA40: 100 percent overlapping 3 lines image sensor.
  - AISA: 4-band spectra sensor from satellite.
  - Airborne laser measuring system using two different frequencies.

February 7 (Tue.)

3-D Laser Scanning Survey Method 2: 3D Scanner fieldwork

<KIGUCHI / Shinigun Ni Ritual Site, Nakijin Village>

- How to establish a survey schedule
  - Scanning point cloud density and location for shoots
- Practical training by using 3D scanning equipment (Cyrax) at Shinigun-Ni Ritual Site in Nakijin Gusuku Castle

February 8 (Wed.)

3-D Laser Scanning Survey Method 3: 3D Scanner field work

<KIGUCHI / Nakijin Village>

- Continuation of practical training on 3D scanning at Shinigun-Ni Ritual Site using cubic and flat round structures

- Topographic survey using a total station (EDM) with a reflecting staff and a non-prism laser pointer to obtain 3D data for drawing a map

3D Laser Scanning Equipments

Topographical Survey by Total Station

Imadomari Village

Lecture by Mr. Miyagi

February 9 (Thu.)

3-D Laser Scanning Survey Method 4: 3D Scanner data processing

<KIGUCHI / Nakijin Village>

- Lecture on 3D scanning and total station survey data integration by Mr. Kiguchi at former Kaneshi Junior High School.
- Supplementary survey at Shinigun-Ni Ritual Site, using a total station
- Processing of the 3D scanner data obtained on the previous days
  - Image matching method according to the common control points in every image
  - Drawing a topographical map from the data measured by digital camera image
  - Data integration and processing for presenting the final results
  - Drawing a topographical map using the total station data

February 10 (Fri.)

Investigation of Heritage Preservation Methods 1

<NAKAMINE Seiji, MIYAGI / Nakijin Village>

- Visit Nakijin Gusuku Castle guided by Mr. Nakamine Seiji, a volunteer guide of the area
  - Visit the buffer zone of the castle site: the role and problem of the buffer zone
  - Observation of the excavation site in front of the castle gate
  - Medieval approach path for the castle
  - Imadomari Village cultural landscape
- Lecture on the process of registration for the World Heritage Site in Okinawa by Mr. Miyagi Hiroki at former Kaneshi Junior High School

Software and Data Acquisition from web Sites.

- Buffer zone should be guaranteed permanently under the Nakijin Village regulation.
- Every alteration of nature within buffer zone should be controlled under the law.
- How and who monitors the sites after registration in the World Heritage list
- Problem of authenticity and reconstruction among the cultural heritages in Okinawa

February 13 (Mon.)

Integration of Archaeological Data Set (GIS) 1: GIS introduction

<KIGUCHI / Naha>

- Lecture on GIS by Mr. Kiguchi
  - What is located where? (Basic Data)
  - Why are they there? (Analysis)
  - Why do I care (Management)
- What is GIS
  - GIS consists of hardware and software. For preventing data exchange problems, a transforming software SHP (Shape) is applied to create compatible format data. Data format is applied in GIS.
  - Raster - Point data in grid coordinate. Aerial photographs and images from satellite
  - Vector - Line (Linear) data. Feature, line, polygon etc., that classifies size and character
  - Practice of downloading GIS software from the internet into individual computers
  - Kashimir - Software originally produced for enjoying mountain scenery. It is applicable to derive a Locus data obtained by GPS navigation. The route of transferring GPS data from Naha to Chatan site was drawn on a map.
  - Data drawn on a map can be exported as points for BL (Breit, Länge = Longitude, Latitude), Date, ALT (Altitude=height) and description are divided by comma.

Introduction: Recent GIS application

- Virtual image example and Google Earth.

February 14 (Tue.)

Integration of Archaeological Data Set (GIS) 2: Using GIS / What can we do?

<KIGUCHI / Naha>

- Preparation of topographical map data and GIS database (DB)
  - Example: BHN (Basic Human Needs) research on a village in Cambodia. Evaluation of acquired data is a basic task of satellite images.

- METADATA
  - JPG, XML, TXT formats, etc., consisting of names executor, date, contents, quality and other elements as indice that are applied to GIS are called Metadata.
- Software applicable to GIS analysis
  - ArcView, Adobe Illustrator, ArcInfo etc　Most recent "Arc Map8" consists of ArcView and ArcInfo.
  - Practice using software ESRI&Maps to import and export example data from an internet web site.
- Introduction to IKUTOKO Service opened to the general public by PASCO Corp.

February 15 (Wed.)

Integration of Archaeological Data Set (GIS) 3: Making GIS data

<KIGUCHI / Naha>

- Introduction to application study in Japanese archaeological investigations
  - Distribution map of archaeological sites
  - Cultural properties navigation system an example from Chiba prefecture
  - Prefecture-based archaeological DB accessible from local public body
  - Cultural properties database drawn on maps created by Illustrator instead of GIS
- GIS Projects in the World
  - Time Map - Animated presentation of a country's history.　It can be downloaded in SWF（Shock Wave Flash）format.
  - Archaeological DBs are based on old and new maps, urban area divided into layers

Visit to Kimoto (Grafica) Company to Observe Digitalization for Map

- How to digitalize analogue topographical map into digital format archive
- Flat bed scanner and computer-supported editing software

February 16 (Thu.)

Integration of Archaeological Data Set (GIS) 4: GIS on web

<KIGUCHI / Naha, Chatan Town >

- Recapturing of lectures and practical surveys carried out in the previous lectures
- Simple topographical survey method using a single measuring tape

Flat scanner and computer control

Nakabaru Jomon Site

Reconstruction of houses

Closing ceremony

February 17 (Fri.)

Investigation of Heritage Preservation Methods 2: Visiting Katsuren Gusuku, Nakabaru Site and Zakimijo Gusuku

- Katsuren Gusuku – One of the world heritage sites in Okinawa.
  - Observation of the reconstruction procedure of stone wall and method covering a slope with lawn
- Nakabaru Jomon Site Park
  - Jomon pitdwellings area found in an excavation is preserved as a park with reconstructed houses.
- Yomitan Historical Arts Museum and Zakimijo Gusuku
  - An exhibit of human skeleton with shell ornamentation on head, which looks similar to Fijian
- Zakimi-jo Fort
  - Reconstruction of main part of the fortification and an arch-shaped main gate structure has been conducted, depending on the excavation result.

February 18 (Sat.)

Trip from Okinawa to Nara

February 20 (Mon.)

<ACCU Nara Office>

Evaluation of the training course and submission of final report.

February 21 (Tue.)

<ACCU Nara Office>

Closing Ceremony

Certificate was conferred to each participant.

Country Report

Praveena CHARAN
Field Research Officer, History Department of Archaeology
Fiji Museum

The Fiji Museum is a statutory body governed by Board of Trustees, which comes under the Culture and Heritage Department in the Ministry of Fijian Affairs. The Museum has a total of 25 staff members that all report directly to their Heads of Department who in turn report to the Director of the Fiji Museum. The Museum Director is responsible to the Fiji Museum Board of Trustees and the Director of Culture in the Ministry of Fijian Affairs. Apart from the Director, all staff at the Museum is employee of the Fiji Museum Board of Trustees. The Museum is made up of six departments consisting of the Collections, Historical/Pre-history Archaeology, Conservation, Display and Exhibitions, Education and Accounts Administration General and Shop. The Collections, Archaeology, Conservation and Education are the four main departments that work closely with the museum's objectives of preserving and safeguarding Fiji's traditional and cultural values.

Annual Budget:

The Museum receives revenues from three sources.

1. Government
2. Internal Revenues
3. Special Projects

Government's annual grant accounts for one third, which covers existing staff salaries only. The museum manages to generate additional revenues through admission fees, donations, fund raising and shop revenues. These revenues cover the museum's operational costs such as maintenance, electricity, water and stationery requirements. Special Projects revenues generated are used for capital projects and other special programmes such as exhibitions and field trips. The entire museum staff is allotted for the preservation of cultural assets in Fiji. Insufficient financial grant from the government is a major problem faced by the museum.

Under the legislation of Fiji, the Fiji Museum is covered by two acts. These are Chapter 263 of the Fiji Museum Act enacted in 1929, and Chapter 264 of the Preservation of Objects of Archaeological and Palaeontological Interest Act enacted in 1940.

The Fiji Museum is the most concerned organization in regards to the education, preservation and restoration of cultural assets both tangible and intangible.

The Museum currently receives aid from overseas institutions in terms of financial and equipment aid. In 1997, the Japanese Government under its Cultural Aid Fund donated to the Fiji Museum among other items surveying equipment for recording and mapping archaeological sites.

The major cultural assets in Fiji are the pre historic sites, built historic sites, artefacts that were once utilized by our ancestor's tangible and intangible art and oral traditions. Like other Pacific countries, Fiji is where the people relate to one another orally, thus the history is passed on through oral traditions.

At the moment the Archaeology Department has a total of 1000 data entered into the database of both historic and prehistoric sites but out of that only 677 has coordinates of its location, and the rest is still left to be identified or needs to be captured with GPS.

I work as a Field Research Assistant in Historical Archaeology Department. The work that I do in the Museum is in the archaeology department:

- Mapping and recording of old sites,
- Archaeological impact assessment field work and research,
- Collection, storage and preservation of oral traditions,
- Historic site research
- Archaeological site monitoring
- In－house research（local research）

Experience with computer: Microsoft Office-- MS Word, MS Access, MS Excel and MS Power Point

Software：MapInfo

Present Situation and Needs for Surveying Method in Fiji and Duties

At present, surveying method used by the department is mainly plain surveying method with measuring tape, Sunto compass and the Panasonic GPS.

The main aim of using the GPS in the Museum is to gather the coordinates and manually locate the positions on the Fiji map grid layer and to see where it lies on the map. In addition, we use the Map Info software, which enables us to pinpoint the location of the exact points taken by the GPS.

Our future aim is to broaden the use of proper GIS system in the Archaeology Department. At present Museum had converted its old coordinates of the northing and the easting readings by Mike Poidevin of the Ministry of Forestry who designed the software to convert the old coordinates into the current FMG（Fiji Map Grid Coordinates）. We are now hoping to create good maps using those point locations of the old coordinates. Additionally, we intend to process information in as many ways as we can, so that the department and other organisations can use the information effectively.

The current main data processing of the GPS data collected in the field, and processing or merging other information together in the GIS system back in the office are a huge problem. The main problem faced by the Museum is lack of funding. We do not have a good precise GPS, where we can use the data to process into GIS, hence a lack of training in the processing of the GPS data and PC systems to store all the information in one place.

On the whole Fiji islands, there is no professional archaeologist. There is only one local researcher, a lecturer at University of the South Pacific, who works in collaboration with the Fiji Museum on archaeological excavations. As we do not conduct our own research in the country, the department relies heavily on overseas researchers to conduct archaeological research here in Fiji. Some of the overseas institutions that have conducted their work in Fiji include the Australian National University, Auckland University, the University of Hawaii, Simon Fraser University, University of Florida and Institute of Palaeontologie de France with the Archaeology Department of Fiji Museum. Therefore, it is a great opportunity for me to be trained in the archaeological methods of surveying, because I am in the Archaeology Department without having a professional experience in archaeology. In the course of the training, my personal interest in GIS will enable me go thorough the theoretical and practical knowledge of archaeological background, and to learn how other museums use GIS to manage their information.

At the end of the training, I hope to understand better methods of surveying, recording, preservation, and how to best restore artefacts in the Museum. I would also like to have a better knowledge with the modern technology utilised by the developed countries, and how else Museum can improve what the techniques it is using now. In addition, I wish to learn more how to process data relative to the collection using GPS. I hope to gain more from the training course organised by Asia/Pacific Cultural Centre for UNESCO（ACCU and utilise similar method back in Fiji.

Mapping Field Trip Photos:

1. Levuka Workshop Exercise.

Mapping the old Nasova house building (1860's) in Ovalau Levuka

Learning how to capture data using trimble GPS in front of the Church of the holy Redeemer (1870).

2. Nadi Field trip Exercise

Capturing data using Thales mapper in Nadi of the old water tank

GPS reading in Momi gun site of the shelter

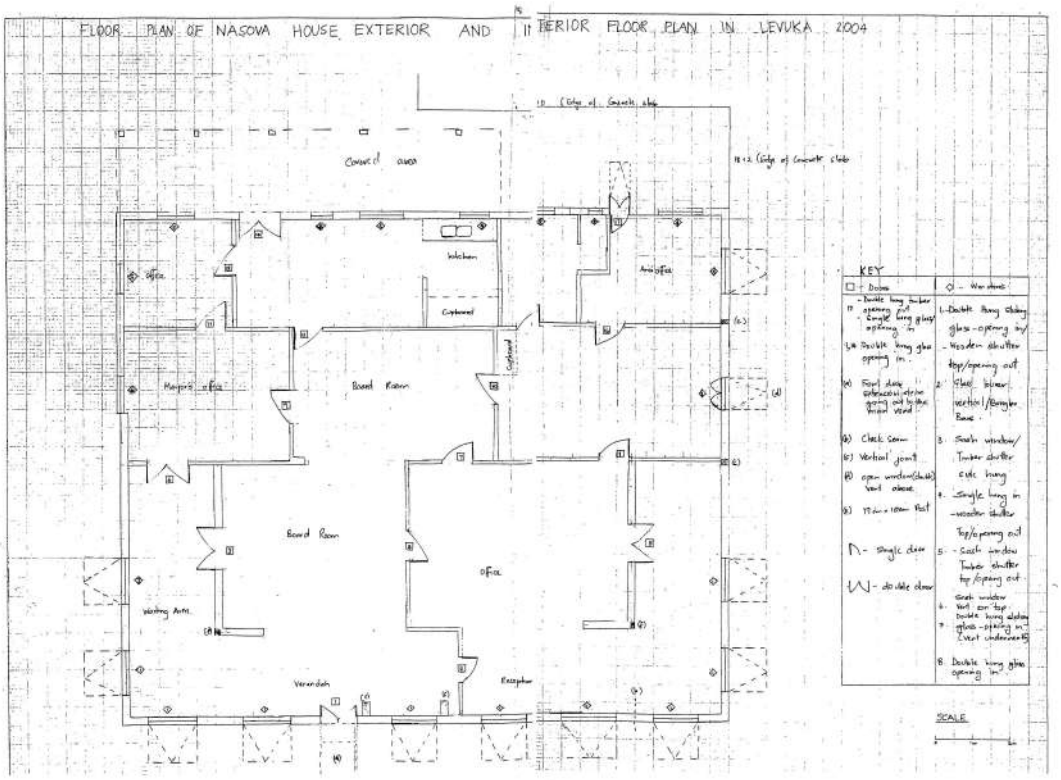


Fig.1 Hand drawn map of Nasova
Final drawing was drawn up by hand using ruler and protector

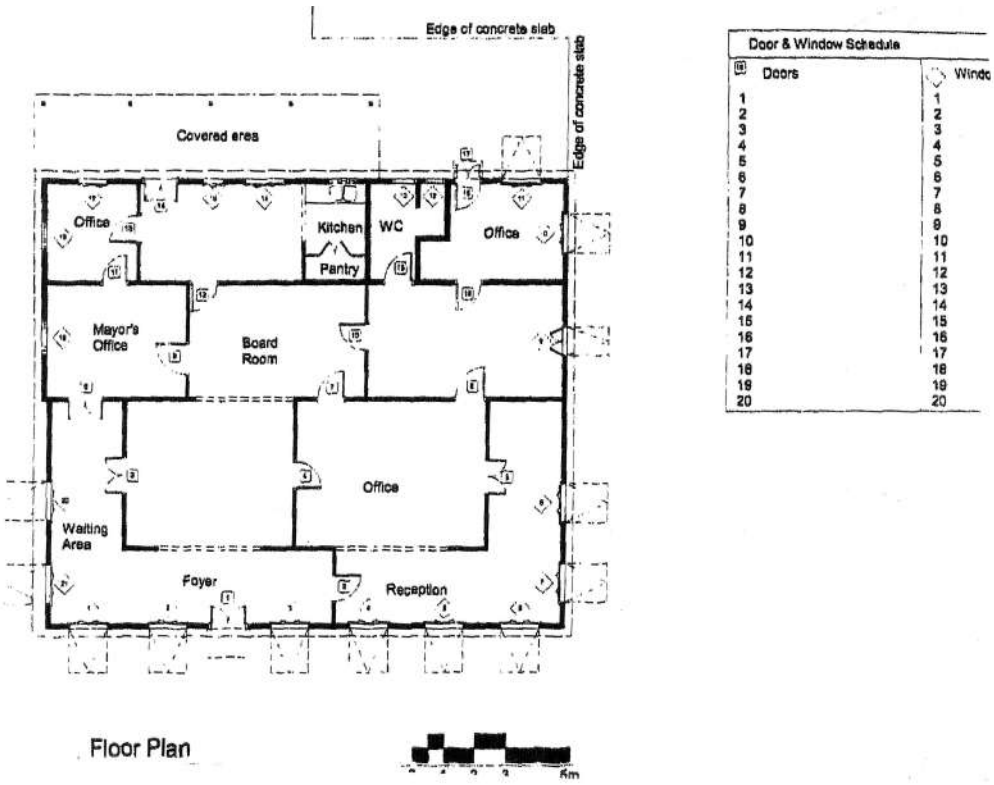


Fig.2 Auto CAD Drawing
Also drawn up one participant who was familiar with Auto CAD software

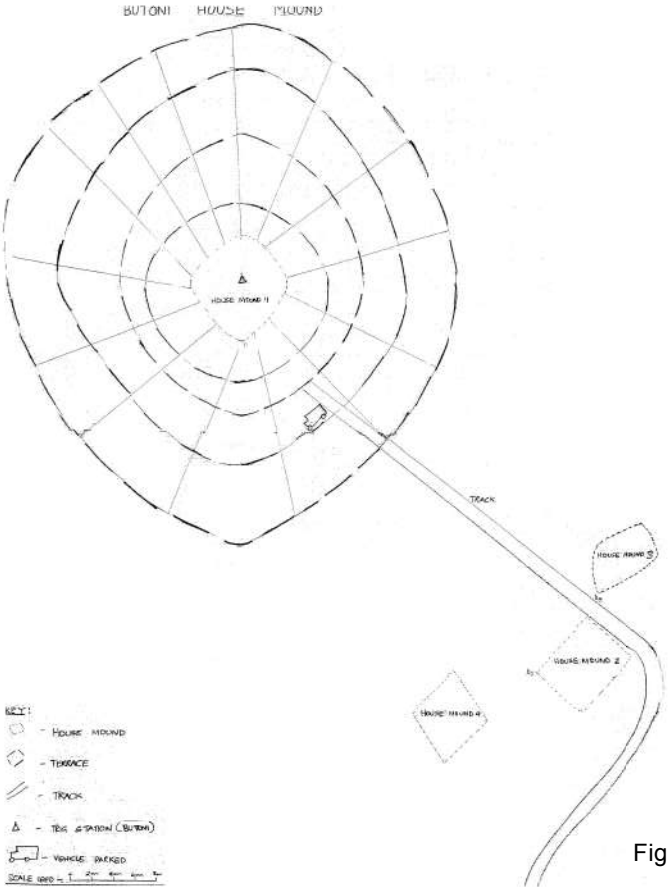


Fig.3 Drawing of Butoni House Mound

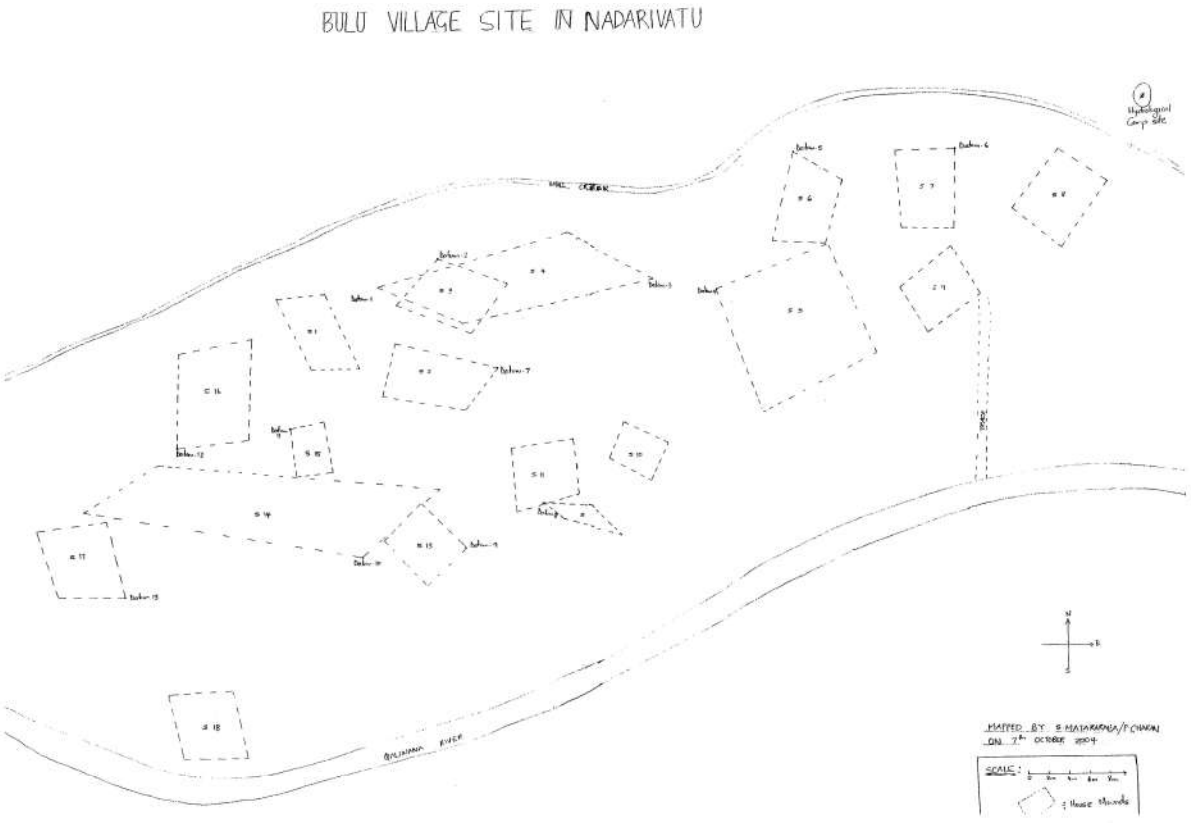


Fig.4 Drawing of Bulu Village Site, Nadarivatu

Country Report

REPORT ON PRESENT SITUATION AND NEEDS FOR SURVEYING METHODS IN FIJI

Elia Robert Francis Nakoro
Field Research Officer, Archaeology Department
Fiji Museum

As a research assistant, part of our research is looking at traditional totems, which is what I have been working on lately. This includes interviews with villagers for creating a database and mapping our sites out of an initiative. As it stands, a survey is conducted on our pilot site along the Coral Coast of Viti Levu, (the biggest island) where their plant totem is the Tahitian Chest Nut (*innocarpes fagifer*). On this trip a team is doing a terrestrial survey on this plant in three villages and comparing the results. Two villages have the plant as their totem and the third village has another plant for its totem. The survey includes identifying, plotting and mapping in a 10 x 10 quadrant of the Tahitian Chestnut forest, and the outcome of this survey shall give us an idea of whether the villagers are looking after and taking care of their sacred plant. This shall also tell us about the density of the tree totems in the two areas under study, those that the totems belong to and those that they do not. The study shall also reveal some indicators for the tree type, whether it is introduced or indigenous, and also the features of area that it grows in. It is believed that these trees indicate signs of old human settlement. Though it is unfortunate for the progress of the survey, it has given me the chance to attend the training course at ACCU/Japan to access more knowledge about survey methods. This research looks at totems as means of conservation, preservation and management of biodiversity.

Yadua Island Site

In 2004, there was an excavation trip to a remote island, Yadua, just off the Western coast of Vanua Levu (the second biggest island). It was led by Professor Patrick Nunn, a lecturer of Geoscience at the Geography Department of the University of the South Pacific. The excavation was a joint effort by my University and the Fiji Museum. It was just a plain excavation trip where we dug 1 x 1 pits and recorded everything we found, such as ceramics, shells and stone tools. Orientation of the pits was confirmed using a compass and measurements were done with steel tape measures and levels to keep the floor of the pits level. The outcome of the field research was that we were able to determine the island as one of the first settlements of the Lapita people. From the two weeks of excavation we managed to find only one piece of the type of ceramic ware that we were expecting

to find, which is a piece of decorated Lapita pottery believed to have been made around 900 BC and a Notched Rim pottery found on the ground during the surface collection.

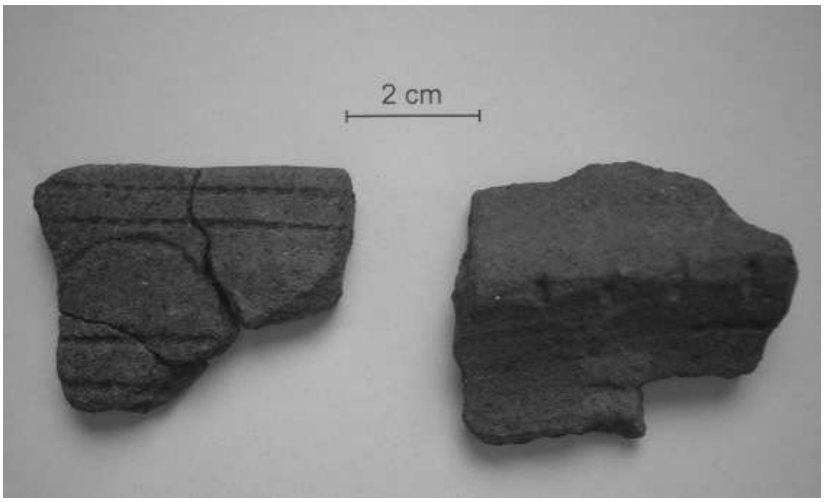


Fig. 1 Right: the post-Lapita notched pot rim found by Stephanie Robinson at Vagairiki, discovery of which led the research team to discover the underlying Lapita site. Left: a decorated piece of Lapita pottery from Vagairiki, thought to have been made on Yadua Island about 900 BC. (Source: http://www.usp.ac.fj/index.php?id=2531&tx_ttnews[tt_news]=71&tx_ttnews[backPid]=331&cHash=1eef928096)

Bourewa Site

The next excavation trip was in 2005 and again it was a joint effort and the site was in the Southwest coast of Viti Levu called Bourewa. It was a two-week research trip and also involved was the mapping of the whole terrain and the relief of the site by using a Total Station. However, the mapping process failed as measurements were not taken from any bench marks or Datum points and measurements could not be positioned with actual coordinates.

In the same year, an excavation of the same site was done in November and December for four weeks. This site is believed to be the earliest site where the first settlers of Fiji, believed to be Lapita people, first settled. The excavation was quite extensive and again it was very important that the mapping of the site was correct. This time a Leveler and a Total Station were used. Accessed by the Ministry of Lands that looks after this field, bench marks and datum points were identified and the mapping process was a success. Looking after the mapping process was a Russian lecturer at the University of the South Pacific. We dug 2 x 2 pits that numbered close to 30, and these pits contained 16 skeletons and a whole collection of beautifully decorated ceramic ware believed to be of the Bismarck Archipelago origin. Some of the pieces of pottery appear to have been imported from Vanuatu and New Caledonia but its analyses is still in its early stage.

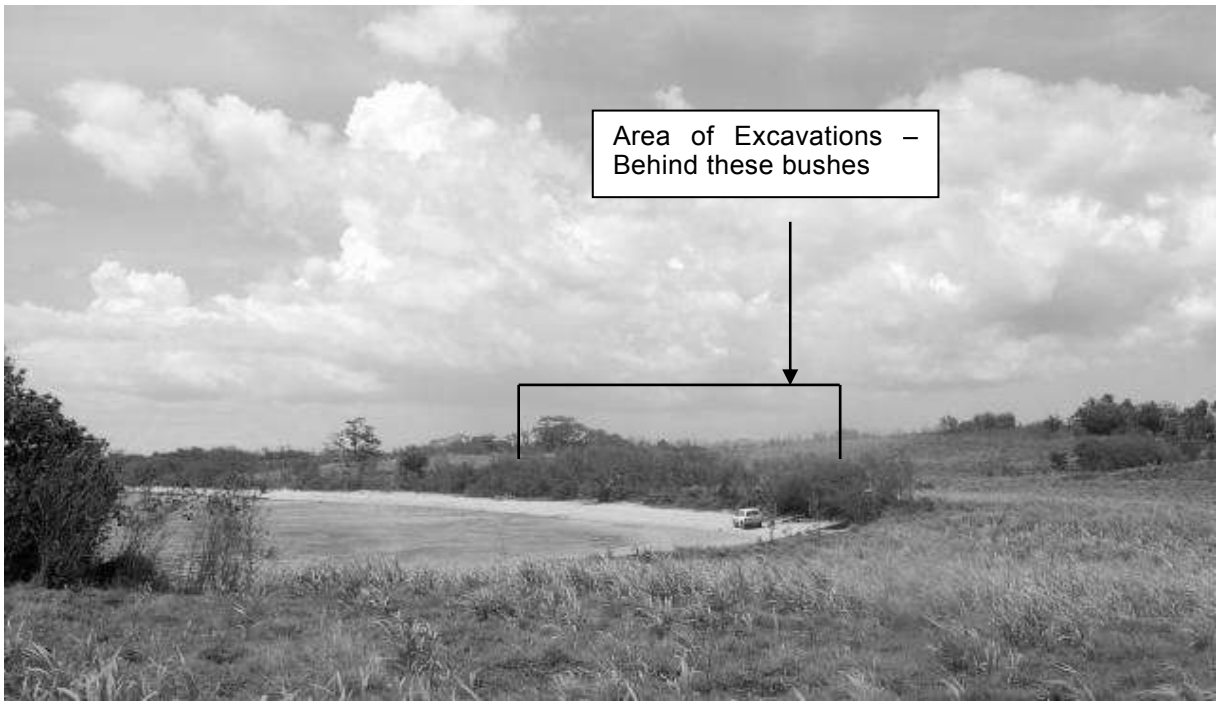


Fig. 2 The site (named Bourewa) was first occupied by people around 3170 cal yr BP (1220 BC), perhaps slightly earlier. It may have been established as much as 1260 BC (3264 years ago) by a group of the Lapita people (Source: http://www.usp.ac.fj/index.php?id=2486)

At the moment, I have been a volunteer at the Fiji Museum and upon my arrival back home, I will become a permanent staff member. While volunteering, part of the work that I carry out is transcribing interview collections by the Museum. These are the interviews on old stories that are being passed down to some of the very old people that are still alive today. They are also stories of how the ancestors of most of the Solomon and Vanuatu peoples got over to Fiji through the Black Birding process in the colonial era. There are also stories and legends of how things are formed, stories of war and cannibalism and how the early Fijians moved from one place to another.

Furthermore, I assisted in cataloguing of human bone samples and also in the database of our archaeological sites using MapInfo.

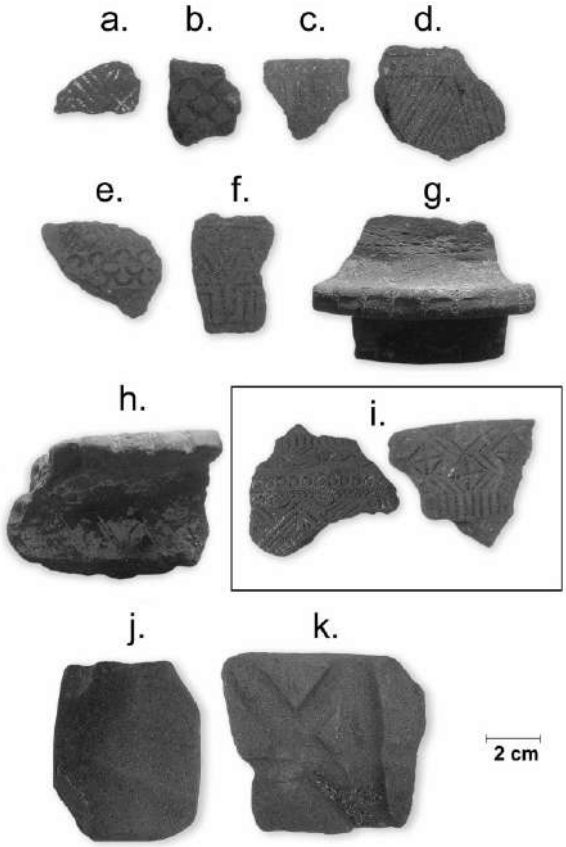
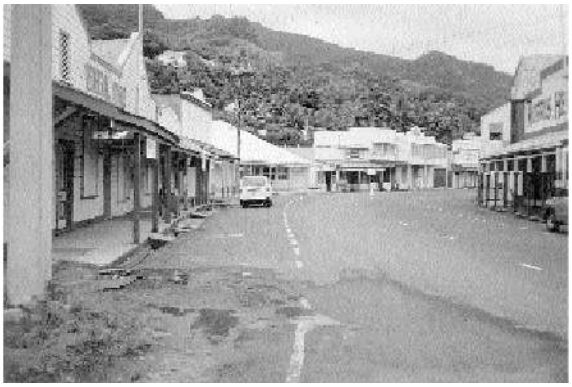


Fig. 3 These are pieces of pottery found during the second excavations. (Source: http://www.usp.ac.fj/index.php?id=2531&tx_ttnews[tt_news]=72&tx_ttnews[backPid]=331&cHash=b080f75b14)

(Source: http://www.fijifvb.gov.fj/activity/listing/levuka.htm)

(Source: http://www.fijifvb.gov.fj/activity/listing/levuka.htm)



(Source: http://crm.cr.nps.gov/archive/19-3/19-3-5.pdf#search)

In late 2005, the Fiji Museum was given the task of managing a project that used to be under the National Trust of Fiji and has been going on for quite a number of years. This is the nomination of Levuka Town to be recognized as a World Heritage historical site. A team was sent to the town to make a preliminary survey. We went to observe the state of the town and also to try and implement efforts for the community to work together, ensuring the safety of the town, since fire is a major threat.

The citizens of the town have lost hope and faith in the efforts of the town to be recognized as a heritage site. Many of the original buildings from the colonial era are made of wood and businessmen desire to replace the old wooden structure for a development project.

Mapping of the area and measurement of building is being done by a Japanese expert of JICA. This is just the first step that we have done and the next step is to map the town and probably to restore the deteriorating buildings and hopefully we will be able to apply what we have learned and seen on this training course in order to help in the nomination of the town as Fiji's first heritage site to be recognized by UNESCO.

The University of the South Pacific offers classes for surveying and Geographical Information Systems. Unfortunately, I was only enrolled in a unit on basic introduction to GIS in 2003 for the software MapInfo. This software is out-dated and it is no longer taught in the university. Instead, the unit now introduces ArcView as new software, which is easier to use and user friendlier.

Most students enrolled in these courses found a position in the government or in private firms and there is a need that museum staff is trained in the surveying methods.

From what I believe, so far the Fiji Museum has been doing the mapping of their historical sites manually and using methods that utilizes equipments such as compasses and GPS receiver,

and the work could be even quicker if staff members are taught the right and modern ways of measurement and surveying. I would like to thank all who are involved in this program that ACCU implements, for smaller nations like Fiji do benefit a lot from their expertise and knowledge, which they are willing to share.

Majority of the sites in Fiji are mostly old village settlements with house mounds and ditches, and many of them are recent. In Fiji, the tourism industry is flourishing, hotel constructions are very evident along the South western coast of Viti Levu and part of the work carried out by the museum is to conduct Archaeological Impact Assessments for the preservation of the old village sites and historical sites of that area.

Since the museum has a curator who also looks at archaeological work, there is also a need to have more young people to work for them, but the only hindrance to this is financial support.

I would like to extend my sincere gratitude on behalf of the Fiji government, Director, Board Members and staff of the Fiji Museum to the facilitators of the program, Asia/Pacific Cultural Centre for UNESCO, Nara, National Research Institute for Cultural Properties, Nara and the Archaeological Institute of Kashihara, Nara Prefecture, for this opportunity to learn about preservation and conservation of our national heritage and our identity.

Vinaka Vakalevu

APPENDIX

Research Project Involvement

2003-Field Research in Matuku and Totoya

2004-Field Research in Yadua Island, Bua on Lapita Pottery
-Field Research in Na Bourewa, Natadola, Nadroga on Lapita Pottery

2004-Field Survey on Poverty and the Nasinu Town Councils Plan to convert Yasiyasi Road: Population Studies and Demography

Publications

Nunn, P.D., Geraghty, P., Nakoro, E., Nasila, A. and Tukidia, S. submitted. Location and palaeogeography of allegedly vanished islands in Fiji. Environment and History. [manuscript: 40 pages, 6 figures, 1 table].

Nunn, P.D., Matararaba, S., Ishimura, T., Kumar, R. and Nakoro, E. submitted. Reconstructing the Lapita-era geography of northern Fiji: a newly-discovered Lapita site on Yadua Island and its implications. New Zealand Journal of Archaeology. [manuscript: 16 pages, 4 figures 1 table].

Chandra, D., Nakoro, E., Batee, J., Fatagogo, S., Musudroka, M., Naviriba, A., Toge,S., Tunisau,V., Uelese, T., Waqairatu, J., Sakitora, P., Tagivetaua, A., Vuiyanuca, V., Kishor, A., Umaima, A., and Bayer, F. Resident's Preception on Commercial Zoning of Yasiyasi Road. [manuscript: 27 pages, 15 figures, 3 tables]

Outline of Survey

NISHIMURA Akira
Kokusai Kogyo Co.Ltd.

0. Target of survey for archaeological site

Possible targets of survey for archaeological site are as follows:

a. Remains, relics

b. Historical buildings

1. Objective of Survey for archaeological site

The objective is to document the target of the survey according to a standard.
Specifically, this involves the preparation of maps, plans and side view of the remains. The survey results can be used when describing the site to a third party and as basic data for archaeological investigations.

2. Outline of Survey

2.1 Objective of Survey

(1) Objective of Survey

The objective of survey is to quantitatively measure (observe) and determine the position and shape of the target.

(2) Use of Survey Results

The survey results can be used to make a map (topographic map) of a specified scale.

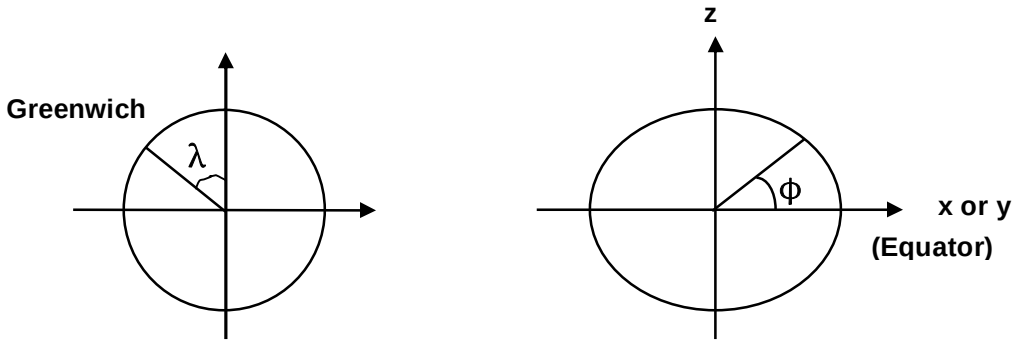
2.2 Survey Standard

(1) Coordinate System

To determine positions, the concept of a coordinate system is introduced.

a. Types of Coordinate System

*Geographic Coordinate System: latitude, longitude



Origin of latitude：Equator

Origin of longitude：Longitude that passes through the Greenwich Observatory

Ex) Suva, Fiji　18 ° 7 ′ 40.02 ″ south latitude

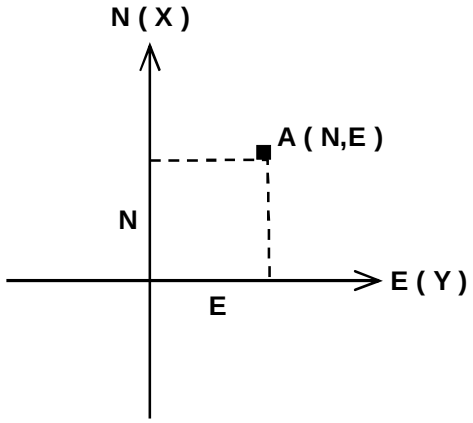
178 ° 24 ′ 44.29 ″ east longitude

*Cartesian Coordinate System (Plane Rectangular Coordinate System)：E(Y), N(X)

The origin can be set at any given point.

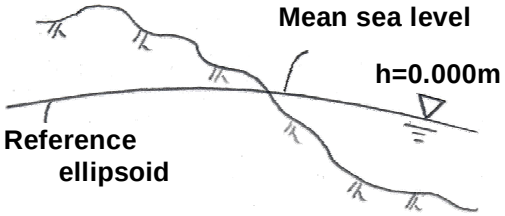
Ex) UTM Coordinate System

The origin is the intersection with the equator every 6 ° of longitude.



(2) Height standard

In general, the mean sea level is brought in line with the surface of the reference ellipsoid described hereafter, and that surface is made the height standard (0.00m above mean sea level).



(3) Projection Method

If the object of the survey is on the Earth's surface expressed as a globe or ellipsoid, the object should be projected onto a plane when a map or plan is made using the survey results.

a. Types of Projections

UTM Projection

Gauss-Kruger Projection

Others

b. Features of Projection System

Each projection system has the following characteristics:

・In the projection, the area remains unchanged.

・In the projection, the angle remains unchanged.

(4) Reference Ellipsoid

Because the earth's surface is not smooth, it is difficult to accurately represent it mathematically. Therefore, an ellipsoid that resembles the shape of the earth and is easy to represent mathematically is defined. This ellipsoid is called a reference ellipsoid.

Example of reference ellipsoid：Clark
Bessel
WGS84
ITRF94, etc

(5) Survey for archaeological site

When making maps and drawings at a specified scale using survey results on national and global levels, consideration needs to be given to the reference ellipsoid and projection system described above.

However, in surveys within a narrow scope such as a survey for archaeological site, the reference ellipsoid and projection system generally do not need to be considered.

2.3 Survey Methods

The five basic survey methods (to determine position) are as follows:

a. Measurement of distance
b. Measurement of angle
c. Measurement of height difference (leveling)
d. Traversing
e. GPS survey

2.3.1 Measurement of distance

The two methods for measuring distance are as follows:

a. Direct measurement of distance
b. Indirect measurement of distance

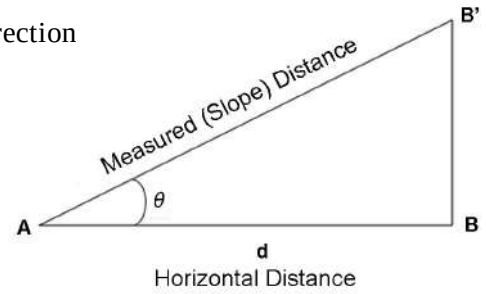
(1) Direct measurement of distance

For the direct measurement of distance, you have the following equipment:

* Eslon tape
* Steel tape
* Tellometer
* Electronic distance meter (EDM)

Of the equipment above, the tellometer is hardly used at present. Also, when measuring a distance using each of the equipment, various corrections must be added to obtain high accuracy results.

＊ Slope correction



$d = d' \cos \theta$

a. Eslon tape

Measuring tape made from Eslon fiberglass, graduated in centimeters. Used for measuring distance when conducting supplementary topographic field surveys for 1:500 and 1:1000 scale topographic maps.

When using an Eslon tape, slope correction is generally carried out.

b. Steel tape

Measuring tape made from steel with little expansion and contraction due to temperature, usually graduated in mm. The steel tape constant is indicated.

The steel tape used for measuring distance in control point surveys.

When using a steel tape, temperature, tension and sag correction are generally carried out in addition to slope correction.

＊Example of steel tape constant

50m-6.8mm 15℃： The tape length of 50m at 15℃ is 49.9932m

50m＋2.2mm 15℃：The tape length of 50m at 15℃ is 50.0022m

＊Temperature correction

The expansion of the tape at 15℃ can be corrected with a steel tape constant. However, expansion of the tape at any temperature other than that cannot be corrected. The correction of the expansion at the temperature during measurement is temperature correction.

$Ct = + \alpha (t - t0)d'$

Ct: temperature correction value

α: expansion coefficient of measuring tape

t: temperature at time of measurement

t0: standard temperature

d′: measured distance

＊Sag correction

When measuring distance, the tape is used at a fixed tension. However, the tape may sag. Sag correction is the correction of the measurement error due to sag.

[Remarks]

In general, when measuring distance by tape, slope correction must be carried out.

1) Correction by steel tape constant, 2) temperature correction, and 3) slag correction should be carried out in the order from 1) to 3), according to the required accuracy.

c. Tellometer

This instrument measures distance using radio waves. A tellometer can measure longer distances than an EDM described below, although the measurement accuracy is not as good. They are hardly used at present.

d. Electronic distance meter (EDM)

An electronic distance meter measures the distance from the instrument (point from where the light pulse is sent) to a prism (point from where the light pulse is reflected) using light.

These days, they are often built into total stations.

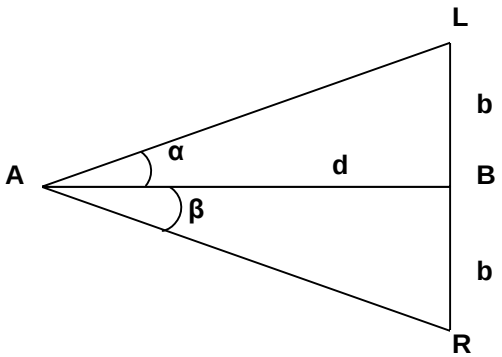
＊Types of corrections of EDM

- As with tapes, slope correction is necessary.
- The discrepancy between the position where the light pulse is sent and the position of the point and the discrepancy between the position where the light pulse is reflected and position of the point are corrected by the instrument constant and reflector constant.
- Atmospheric correction (temperature and air pressure) of the atmosphere through which the light travels is also necessary

(2) Indirect measurement of distance

In the event that the direct measurement of distance cannot be carried out, the distance is measured indirectly by the following methods:

* Method of orthogonal base line
* Subtense bar method
* Stadia method
* Triangulation



d = b cot α or β = b*1/tanα or β

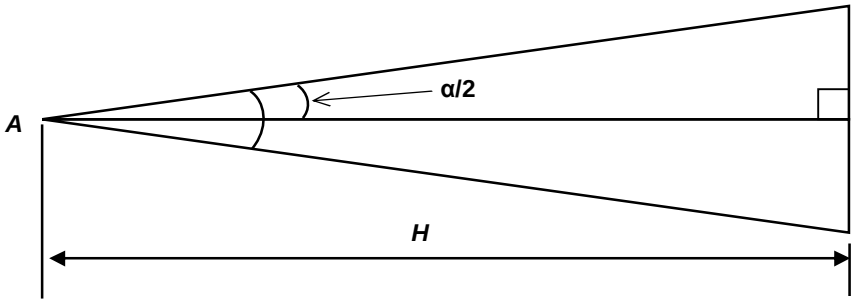
a. Method of orthogonal base line

When measuring the distance AB indirectly as in the figure below, an angle-measuring

instrument (transit, theodolite) is set up at A, and the baseline LR orthogonal with A is set up at B. Then ＜LAB or ＜BAR is measured at A.

b. Subtense bar method

When measuring the distance AB indirectly as shown in the figure on the down, an angle-measuring instrument (transit, theodolite) is set up at A, and a subtense bar of length b is set up on a tripod at B so that it is orthogonal with A. Then, ＜LAR is measured.



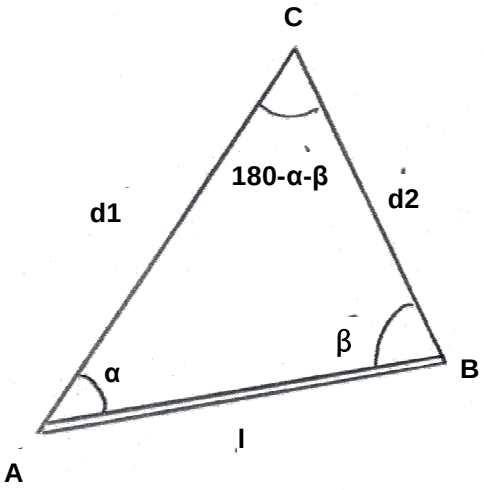
$d = l / 2\tan \alpha/2 = l/2 \cot \alpha/2$

c. Stadia method

This method measures the distance indirectly using the stadia line within the sight of the transit and level. Some stadia surveys also use alidades.

d. Triangulation

This method measures distance indirectly applying the principles of triangulation.



l：Known distance

α、β：Known angle

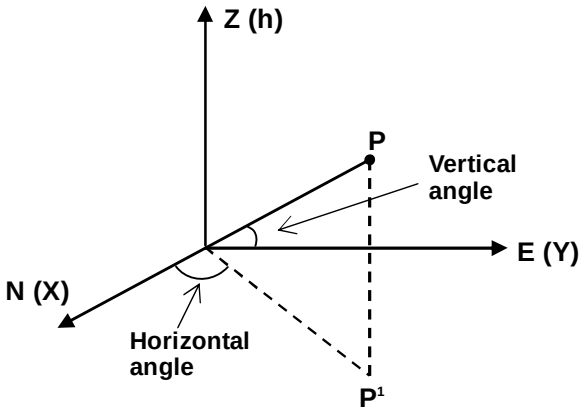
$d1 / \sin\beta = l / \sin(180- \alpha - \beta)$

$d1 = l \sin\beta / \sin(180-\alpha-\beta)$

$d2 = l \sin\alpha / \sin(180-\alpha-\beta)$

2.3.2 Measurement of Angle

In a survey, horizontal and vertical angles are measured with a transit (theodolite) and total station. To remove errors in measurment, various strategies are devised. Methods to verify the accuracy of measured angles are also prepared.



(1) Units of measurement for angles

The following three units of measure for angles are currently used:

- Degree system
- Grad system
- Radian system

a. Degree system

Units： degree (°), minute (′), second (″)

Full circle ＝ 360 °

1 ° ＝ 60 ′

1 ′ ＝ 60 ″

Right angle ＝ 90 °

This is a commonly used unit of measure.

b. Grad system

Units： grad (g), centigrad (c), milligrad (cc)

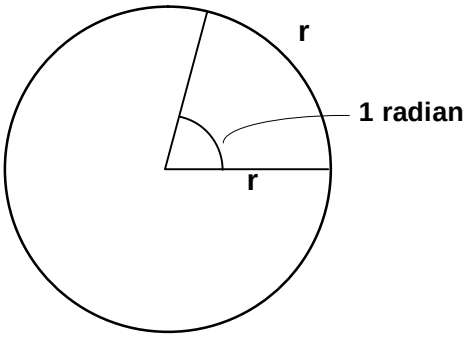
Full circle ＝ 400g

1 g ＝ 100c

1 c ＝ 100cc

Right angle ＝ 100g

Grad system recently used in the field of photogrammetry and in France, Germany and the former Soviet Union



c. Radian system

Units： radian (rad),

1 rad＝angle at the center of the circle that cuts off an arc length equal to the radius

Full circle ＝ 2π rad

Right angle ＝ π/2 rad

Radian system plays an important role in the theoratical calculation of trigomometric functions.

(2) Angle-measuring equipment

In general, horizontal angles and vertical angles are measured by transits (theodolites) and total stations.

With a transit (theodolite), the measured angle on the graduated circle is read by vernier scale, etc., and that value is recorded in a logbook. On the other hand, with a total station, the angle is expressed on the graduated circle as a barcode and is digitally read and indicated in the display, while at the same time recorded in an internal recorder.

1) Types of transits (theodolites)

As with a total station, a transit is classified based on its performance and structure

a. Classification based on performance

The performance of a transit is classified based on the smallest graduation.

Ex) 1-second transit (theodolite)

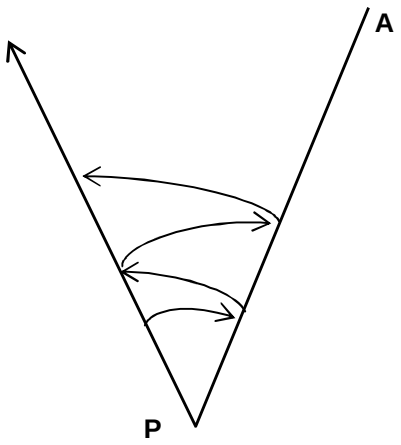
5-second transit (theodolite)

10−second transit (theodolite)

b. Classification based on structure

・Single axis

・Dual axis



2) Observation method

When observing (measuring) an angle, two important matters are as follows:

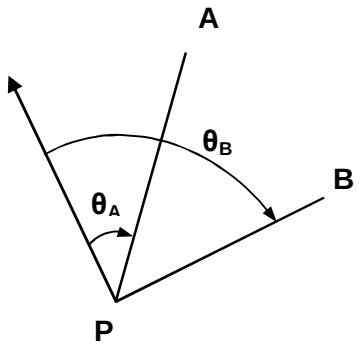
* The transit should be set up so that it is level and centred

* Methods to minimize the various measurement errors should be applied

a. Setting up the transit

When setting up a transit with a tripod, first set up the tripod so that it is firmly in place.

Next, level the transit with the built-in levelling device (use the bubble tube of the levelling device), and centre the transit with the built-in plumbing device. Repeat these actions alternately until the transit is properly levelled and cantered.



b. Observation of horizontal angle

The two methods for observing horizontal angles are as follows:

- Angle method：Each target angle is observed from one standard direction.

- Double angle method：The angle to be observed is cumulatively measured by rotating the graduated circle.

(This can only be done with a dual-axis transit. This method is not commonly used.)

c. Observation error of horizontal angle

Errors in measurement occur even if the transit is properly leveled and centered. Typical errors are as follows:

- Errors due to uneveness of the graduations on the horizontal circle
- Accidental errors in observation

[Errors due to uneveness of the graduations of the horizontal circle]

To minimize the error caused by the uneveness of graduations, measure the angle using the entire circle (application of circle).

[Accidental errors in observation]

To minimize accidental errors, measure the same angle multiple times and adopt the mean value (Application of face left and face right observations).

d. Check of observation of horizontal angle

In order to check the observation of a horizontal angle, the following two values are required:

- Double angle：Obtain the sum of the seconds of the face left and face right observation results.
- Observation difference：Subtract the seconds of the face right observation results from the seconds of the face left observation results.

The double angle and observation difference mentioned above are obtained for the observation results of every circle. The discrepancy (observation error) between the

double angle difference and observation difference in the same direction between each circle is also calculated.

Check that the respective values are within the limiting value indicating the accuracy of observation (Ex: Within double angle difference of 20 seconds, within observation error of 10 seconds, etc.)

e. Observation of vertical angles

The graduations on the circle of the vertical angle are numbered from 0 to 360 degrees. However, there are transits that indicate 90 and 270 degrees and transits that indicate 0 degrees when the telescope is levelled. This point should be noted when using the instrument.

In observing a vertical angle, after sighting the target, level the instrument again using the precise bubble tube in order to maintain the horizontal of that direction more precisely. Then read the observed value.

f. Observation error of vertical angles

Errors may occur in the observation of vertical angles even if the instrument is properly levelled and cantered. Therefore, face left and face right observations in at least two directions should be carried out.

g. Check of observation of vertical angles

The vertical constant is the difference between the sum of the face left and face right observed values and 360 degrees. Check that the difference in the two directions are within the limiting value (Ex: 30 seconds).

To obtain the vertical angle, the face left observed value is subtracted from the face right observed value and divided by two, and added or subtracted 90 degrees depending on the type of transit.

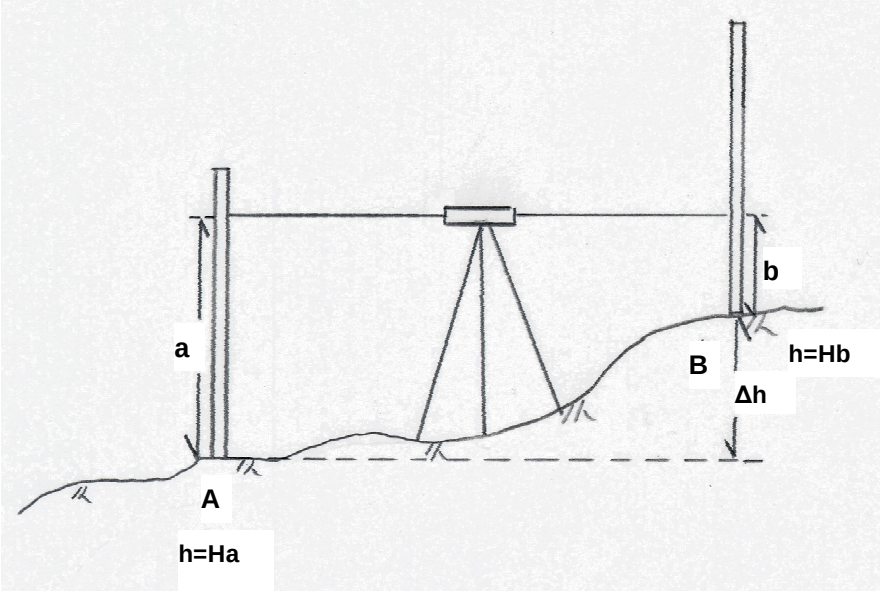
2.3.3 Measurement of height difference

If you measure (levelling) the height difference based on the standard of height mentioned in 2.2, you can establish the height of any given point.

(1) Principle for measurement of height difference

For measuring the height difference between two points A and B, set staffs vertically at points A and B. Next, set up the level in a horizontal position at the point midway between those points and read the observed value a of the staff at point A. Then read the observed value b of the staff at point B. The height difference from A between A and B can be measured from the following equation.

$$\Delta h = a - b$$



If height Ha of point A is known, height Hb of point B can be determined based on the following equation.

$$Hb = Ha + \Delta h = Ha + a - b$$

(2) Error in measurement of height difference

The above principle is based on the following conditions:

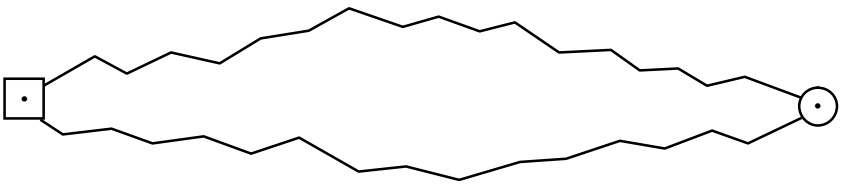
- Staff A and staff B are set up in a vertical position.
- There is no expansion of the staffs
- The line of sight of the level is kept level.
- There is no refraction of light due to weather conditions.
- There is no error in reading.

However, in actual levelling such conditions are not always met and errors occur.

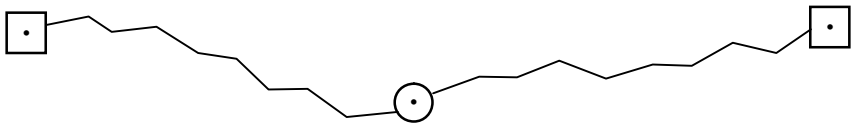
(3) Check of levelling

In order to determine whether the errors mentioned above are permissable, the following checks are applied.

- Carry out duplicate observations and check that the discrepency in the height difference of the forward observations and return observations are within the limit value. (Ex: ： $20mm\sqrt{S}$; S is the distance of observation in km)



・Carry out leveling from one known point of height to another known point of height and compare the height difference based on observations with the height difference based on the heights of the known points. Then check whether that discrepency is within the limit value (Ex：20mm√S)



(4) Equipment used in leveling

1) Level

There are several types of levels. The two types that are commonly used today are as follows:

a. Tilting Level

A tilting level is a level with the capacity to make the collimation axis horizontal for each observation by adjusting the tilting of the level (by the tilting screw).

b. Automatic Level

An automatic level is a level with the capacity to automatically level the collimation axis with an internal compensator.

c. Staff

You have the following staffs based on the material and shape:

- 3m staff
- 5m staff
- High precision invar staff
- Staff for digital level (barcode staff)

d. Turning plate

This plate is used when setting a staff in the ground to prevent it from sinking and/or shifting position.

e. Parasol

The parasol is used to keep the level out of direct sunlight in order to prevent a rise in temperature (horizontal error of collimation axis) of the bubble tube, which is used to keep the level in a horizontal position.

2.3.4 Traversing

Classic methods for determining the position of a point are as follows:

a. Triangulation

b. Traversing

Of the above methods, traversing is still widely used today.

(1) Principles of traversing

The principle of traversing is as follows:

(x, y)：Coordinate value of known point A

(X, Y)： Coordinate value of unknown point B

θ ：The angle from north to unknow point B at a known point

D：Distance from known point A to unknown point B

a. The angle θ at point A from north to the direction of unknown point B is obtained by measuring the angle.

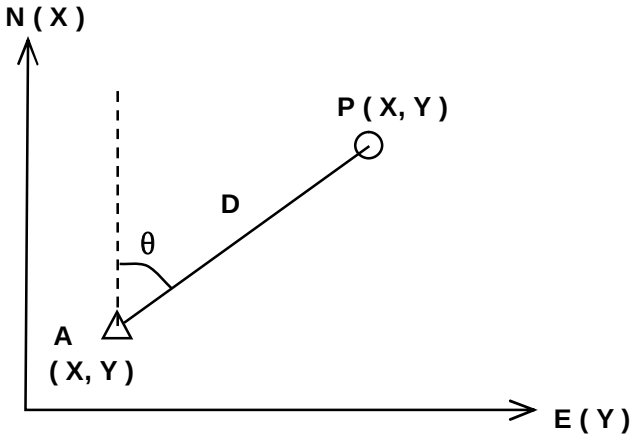
b. The horizontal distance from point A to point B is obtained by measuring distance.

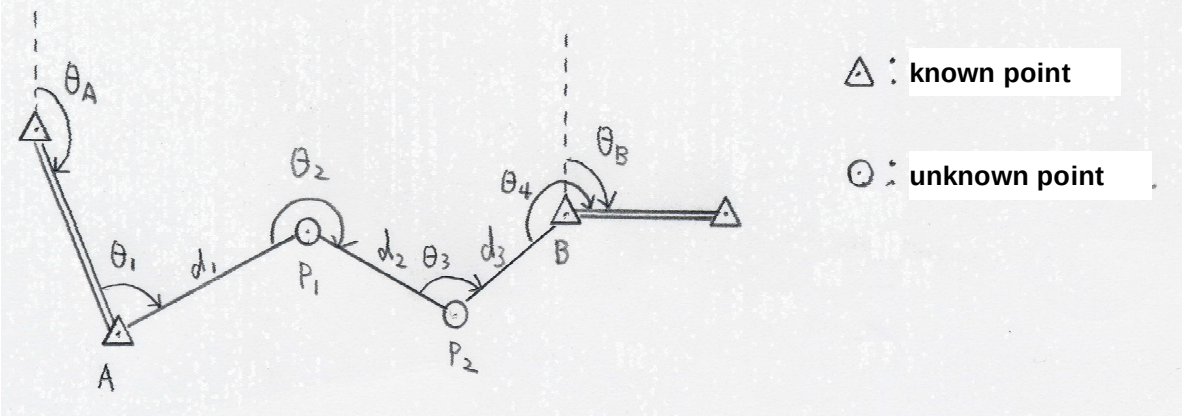
c. The coordinate value of unknown point B is obtained by the following equation:

$$X = x + D \cos \theta$$

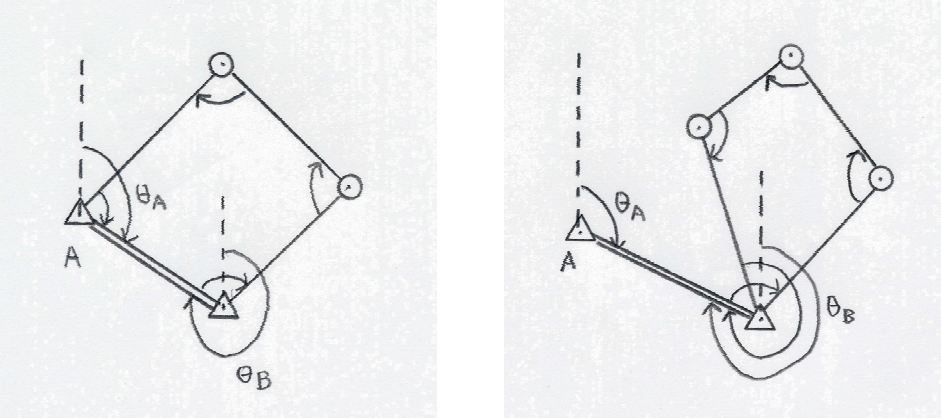
$$Y = y + D \sin \theta$$

In actual traversing, the angle formed at a known point by another known point and an unknown point P1, and the distance from the known point to P1 are measured. Then, the angle formed at P1 by a known point and an unknown point P2, and the distance from P1 to P2 are measured. And this is repeated.





Connected traverse



Closed traverse

(2) Error adjustment of traversing

In actual traversing, tie errors and closing errors generally occur with the angles and coordinates when tying and closing. First, the angle error is adjusted and then the coordinate error is adjusted. Then, the final position coordinates are determined.

Measuring Survey Methods and GIS

KIGUCHI Hiroshi
PASCO Corporation

Chapter 1 : Archaeology and Surveying
Chapter 2 : GPS
Chapter 3 : 3D Leaser Scanning
Chapter 4 : Virtual Reality
Chapter 5 : GIS

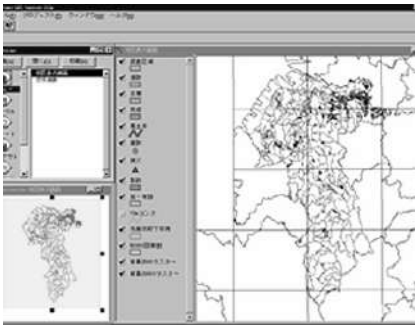
The surveying training at PASCO consists of 4 chapters. Each chapter has a lecture and a fieldwork. We designed this course to be practical for the trainees.

Chapter 1: Archaeology and Surveying

Introduction of Department of Cultural Properties and Technology in PASCO

- Making maps for Archaeologists
- Excavations
- Measurement of cultural properties
- Historical park design
- Construct database and GIS for cultural properties

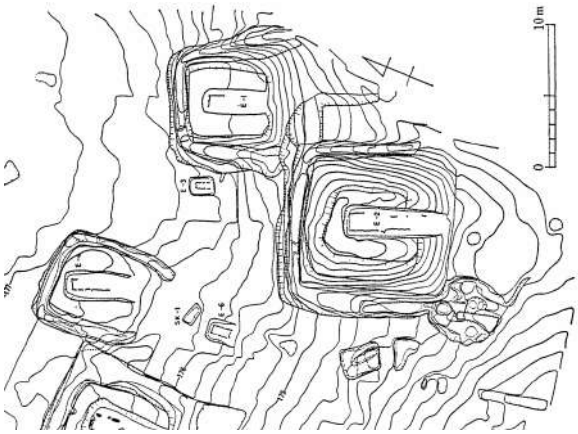




1-1 Drawings for cultural properties

When we study Archaeology or Cultural properties, certain drawings and maps are necessary. List up some examples and discuss, what their purpose is, or what the drawer wants to tell by them.

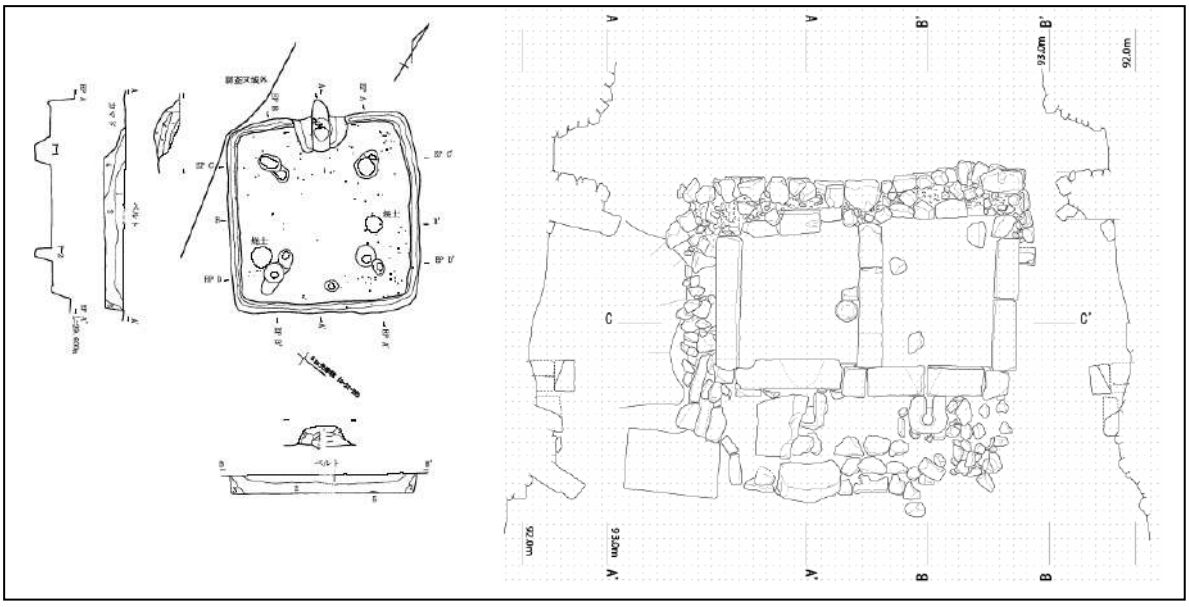
Topography map of a site



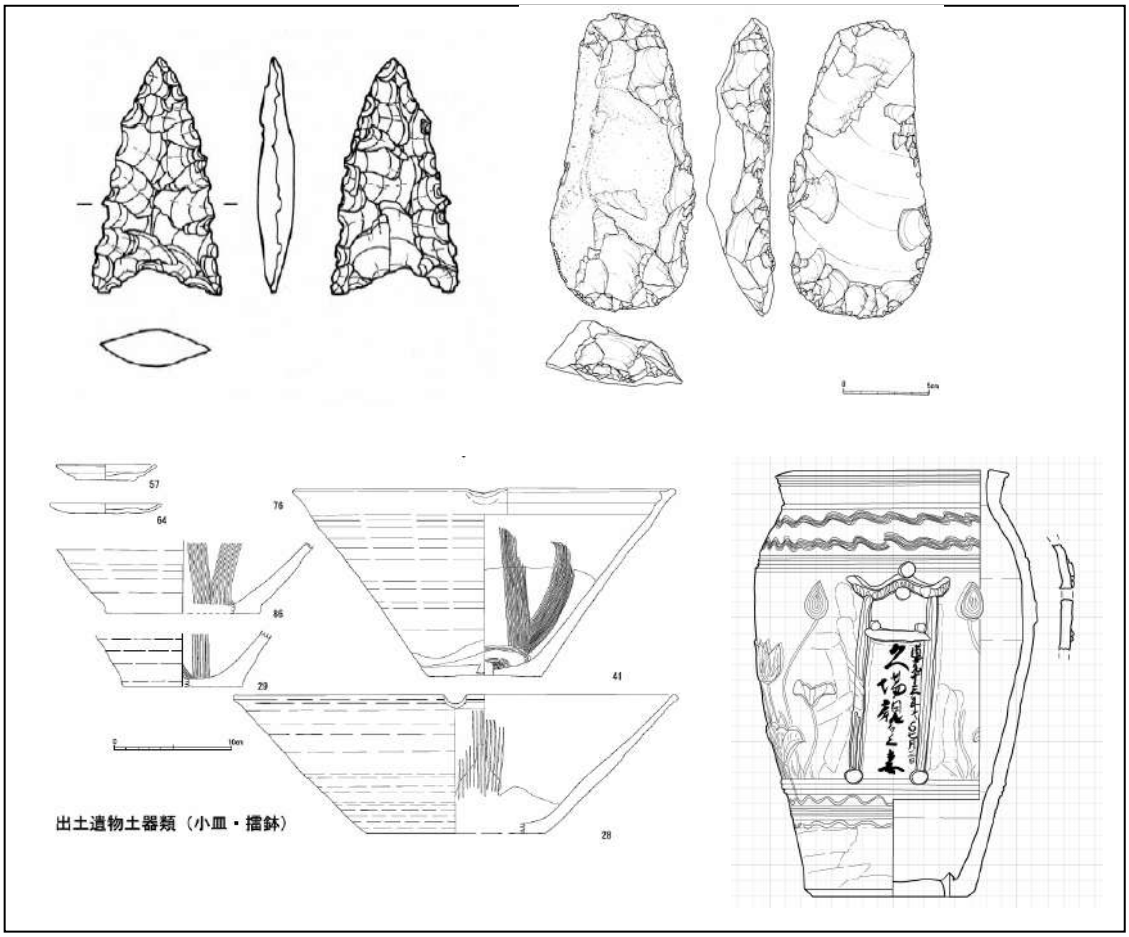
Topography map of tombs

Sites distribution map

Founds distribution map in a site



Drawing of features in a site



Drawing of artefacts

1-2 Handling with New Technology

It takes time to make drawing while excavation is undergoing. It requires “speed” sometimes. So it is a good idea to apply a new technology or process in Archaeology.

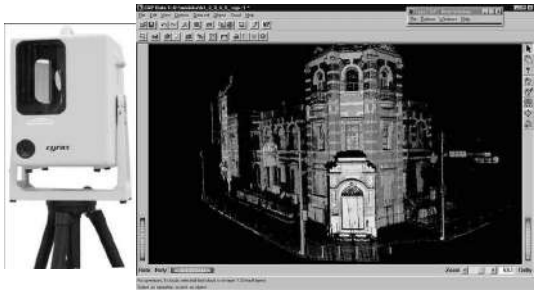
- Speed
- Easy and Convenience
- High accuracy
- Low cost
- Reusability

Of course, there should be deep knowledge of Archaeology and experiences in surveying.

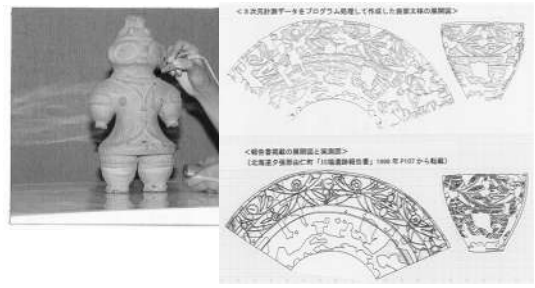
Some methods of Surveying

Total station is well known at excavation sites nowadays. It is used for picking up founds, making drawings and so on.

A radio remote control helicopter with Photogrametry camera is a good way to photograph from the sky.
Use of RC helicopter is more convenient compared to larger aircrafts. Some can monitor the angle from the ground.



3D laser scanner is recently introduced. It is a good method of recording a whole building or complex objects. But there are still some difficulties to overcome.

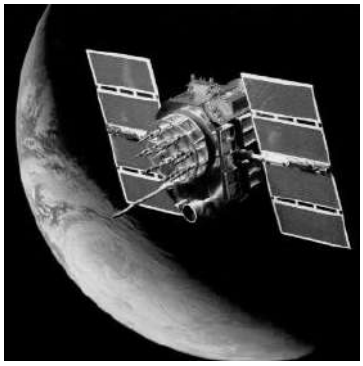


With 3D digitiser for artefacts, 3D data is provided simultaneously by tracing objects with a stylus pen.

Chapter 2: GPS

2-1 What is GPS?

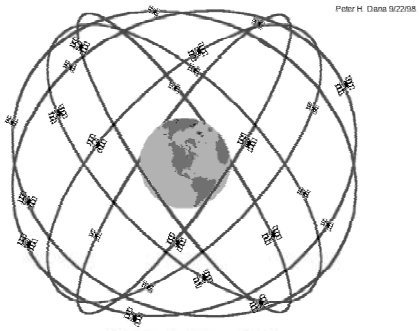
- Satellite based 'measuring' system
  - Consisting of 24 NAVSTAR satellites (28 in place)
  - Navigation Satellite Timing And Ranging system
- Established by the U.S. Department of Defence (1978).
  - $12 billion.
  - It provides rapid, accurate targeting for ICBMs and other military functions.



- It provides accurate location and timing information, nearly worldwide.
  - Difficulty at the poles.
- Worldwide resource
  - Free utility, GPS: Not Free.

2-2 GPS consists of 3 segments

- Space: Launch NASA (Block I), Delta 2 (Block II).
- Control: U.S. Military tracking and maintenance.
- User: Originally military, now civilian and commercial.



GPS Nominal Constellation
24 Satellites in 6 Orbital Planes
4 Satellites in each Plane
20,200 km Altitudes, 55 Degree Inclination

2-3 Accuracy and choice of GPS equipment

Use of an off-the-shelf Garmin eTrex or similar is very useful, especially in the natural resource field and Archaeological fieldwork. (Left)

If it is required high accuracy, when we set up datum base points for field archaeological Survey. (Right)

Low accuracy but cheap

High accuracy but expensive

Chapter 3: 3D Leaser Scanning

3-1 Usage of 3D leaser scanner

MAP
・Digital Mapping

Topographical survey
・Management of land
・Volume analysis

Management
・Registration Book
・Virtual Factory

Cultural Heritage
・3D Digital Archives

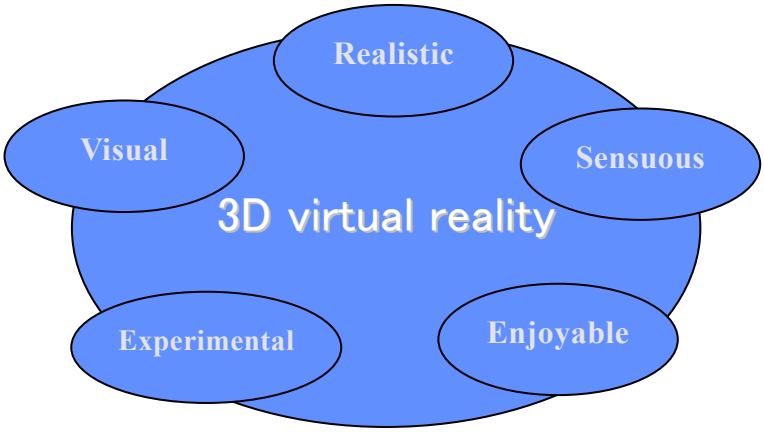
3-2 Choice of 3D leaser scanner

It is necessary to select an instrument for an ideal survey in the field. Each of them has its original features. Some are good for long-distance, others are able to scan precisely.

Long-distance and wide-area scanning system:
LMS-Z210 (RIEGL)
Measurement accuracy 25mm
Measurement Distance 350m
Scanning Range 330 degree

Precise Laser scanning system：Cyrax2500
Measurement accuracy 6mm
Measurement Distance 1.5-100m

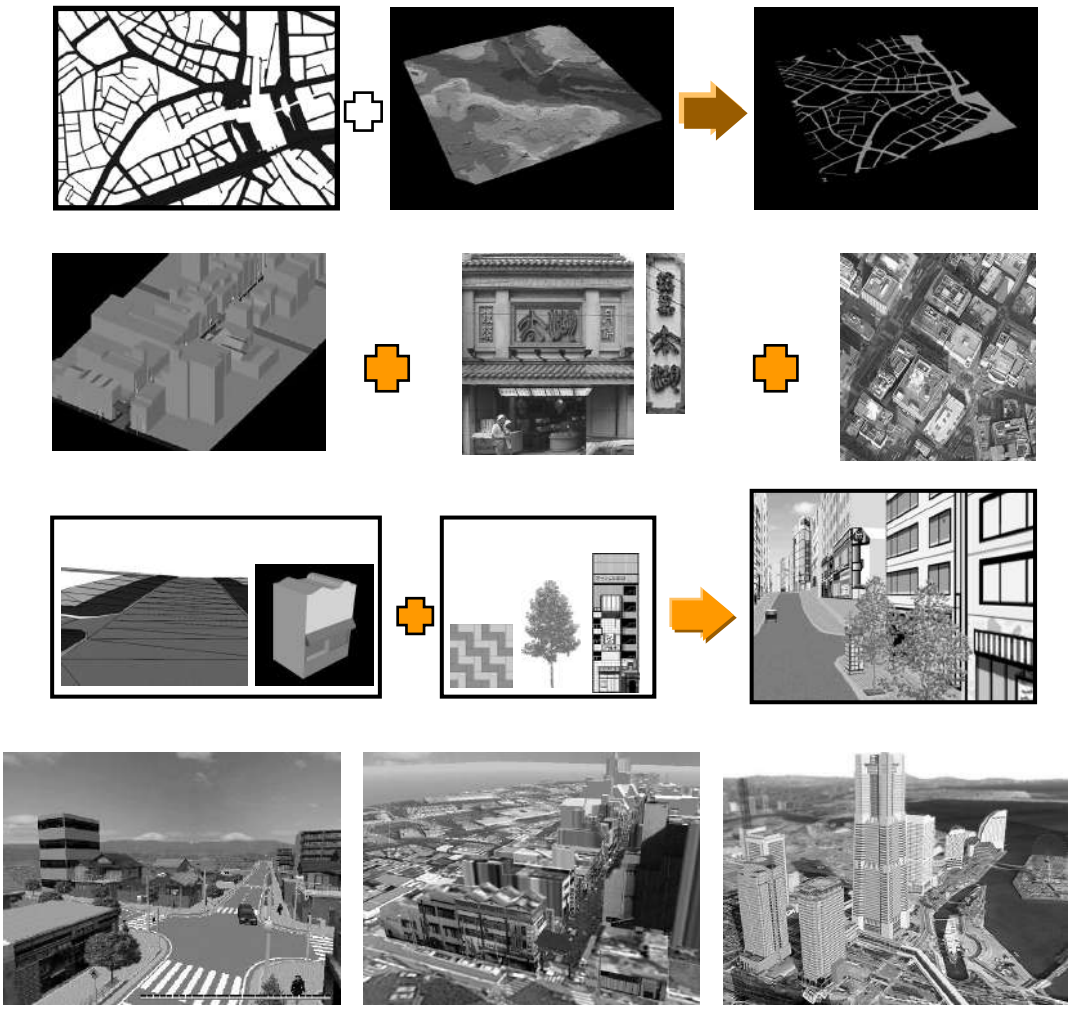
Chapter 4: Virtual Reality



Virtual reality can be defined as something related to three dimensions, or containing three-dimensional information, or as intelligent computer-simulated ecology.When we demonstrate or simulate it is very useful and arouse people's interest.

There are many ways to make 3 dimensional data.

Design process of roads and pavements from a digital map



Chapter 5: GIS

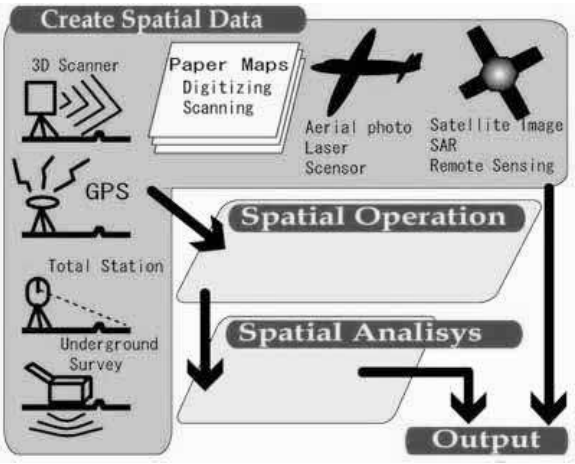
5-1 What is GIS?

GIS is a computer technology that uses a geographic information system as an analytic framework for managing and integrating data, solving a problem, or understanding a past, present, or future situation.

5-2 Data is everything

When we talk about GIS, data is most important. It could be said that data is everything.

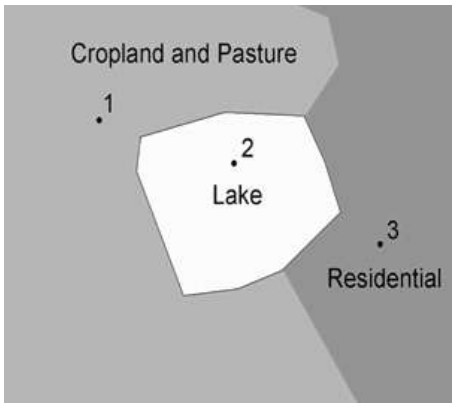
There are a lot of ways to make digital data for GIS.



GIS data are two-fold: raster data and vector data. Each of them has their advantages as well as disadvantages.

1	1	1	1	1	1	1	3	3	3
1	1	1	1	1	1	1	3	3	3
1	1	1	1	1	1	3	3	3	3
1	1	1	2	2	2	2	3	3	3
1	1	1	2	2	2	2	3	3	3
1	1	1	2	2	2	2	3	3	3
1	1	1	1	2	2	2	3	3	3
1	1	1	1	1	1	3	3	3	3
1	1	1	1	1	1	1	3	3	3
1	1	1	1	1	1	1	1	3	3

Raster data



Vector data

5-3 GIS resource in WWW

http://www.gis.com/

http://www.geographynetwork.com/

http://www.timemap.net/

http://data.geocomm.com/

http://www.opengeospatial.org/

http://www.usgs.gov/

Final Report

Praveena CHARAN

I. Introduction

The training programme for Measuring Survey Method of Archaeological Sites was organised by the Cultural Heritage Protection Cooperation Office, Asia/Pacific Cultural Centre for UNESCO (ACCU) in Nara and in Okinawa, Japan from 13th January to 23rd February. I am an Indo-Fijian Field Research Officer and have fortunately been accepted as a participant of the programme titled: "Training Course on Cultural Heritage Protection in Asia-Pacific Region".

The training course was very well organised by ACCU, Nara. It focused on three main topics:

1. Total Station and Leveller
2. Plane table surveying method
3. GPS and GIS

Apart from the topics above, a new method of surveying was also introduced with the use of modern technology called 3D Laser Scan and Digitiser for Photogrametry. In addition to the three main focuses of the training, there was an opportunity to visit museums to see the exhibitions and storage collection. It was also a chance to visit the heritage sites in Japan to observe their preservation and utilisation of the archaeological sites and monuments for the tourists to come and visit such sites from all over the world.

1. Total Station and Leveller

Total station really is very precise equipment in the field of surveying for measuring. In the first practical training, we learned how to set the tripod for the total station and to set the level. We also learned about setting the Electromagnetic Distance Meter (EDM) and how to measure the distance with EDM. The total station with the data collector was also introduced, which makes it extremely easy to process data back in the office.

In theory, we learned about what a benchmark is and how to handle the level and the staff. We also get acquainted with the notion of what an archaeological perspective of a true north and magnetic north is. Thus, calculation of the survey methods was determined by control point without the use of any total station or GPS. These methods are trilateration, triangulation and traversing. These were the real basis for the beginning, which you can then use to determine the angles and distance or even the utilisation of any technological device. But due to the time factor, other alternatives are available, which can determine things very easily, and various software are there to process the data.

2. Plain Table Surveying Method

It is an easy method of surveying with a use of less expensive and portable tool, rather than a total station, which is really expensive equipment. The plain table surveying led by Mr. Hashimoto, an archaeologist of Kashihara Institute at Itabuki Palace Site in Asuka gave us a real experience of how to do a plain table survey. A map of a well at Asuka was drawn and finally the map was adjusted and features were drawn according to its visible design. Also, the combination of the plain table and level can be used to make the contour-line maps. In this mapping, usually three people, the plain table, leveller and staff are required. Mr. Irikura of Kashihara Institute also showed this. Though it is replaced by mainly total station in Japan, this was used before. Most countries have replaced total station too with GPS for its location, but Japan still uses total station.

3. GPS and GIS

What is a GPS and how do you use it? GPS is short for Global Positioning System and it provides accurate location and timing information, depending on the accuracy of the device. It uses the satellite to measure, so this is not suitable in the forests or where the satellite is not available. The GPS utilises four or more satellites to give a good reading and lower Dilution of Precision (DOP), which gives a good measurement. The training led by Mr. Hiroshi Kiguchi of PASCO Corp. used a Garmin Etraxs GPS to navigate for making a distribution maps for its vectors such as lines, points and polygons. It can also be used on the topography maps, drawing of features and finds. The accuracy level of Garmin e-trax is about 10meters and the software to be downloaded onto to the computer for it is Kashmir, which is free software, and it can be used to make maps in GIS (Geographical Information System). It can also be used to set up a base point for observation and it has a “TO GO” function. For a “TO GO” function, you can set a command and you can navigate to the desired location. In addition, the track data is important in the mountains, by which you can determine how people travelled. Hence it can be an imperative in eco-tourism projects for developing a site for the villagers.

GIS is a method to visualise, manipulate, analyse and display spatial data. It can be displayed both as a raster and vector data. It can be used in many ways to display the information for various purposes. The software used in a practical training, Arcview and Kashmir were briefly introduced to us. Another way of getting map information is on the web GIS, which has a number of maps on Google Earth, Geography Network and Clearing House. Google Earth works only online and Kashmir 3D is free software, which can be easily downloaded and used.

II. How Archaeologists uses GIS in Japan:

GIS is mainly used to determine excavation sites for an area. It is also utilized by Boards of Education for the purpose in schools to teach the pupils / students the significance of cultural properties near their school. Further, developers can decide the land price on which the properties are located. For example, the land price will be more expensive for a cultural property area than the

area containing no cultural property. Mostly for web GIS, a latest method called Mofin is used for displaying archaeological information, linking database access information.

Photogrametry

Photogrametry is not only a good method of displaying the 3D image data in the museums, but also a way of showing the images to the public and the tourists. The total station and portable prism was used in mapping the basket in Chatan and 3D dimensional photos were taken to make a 3D dimensional image data. The software used to process the 3D scan data was converted into rapid form 2004 software and AutoCAD -Intellicad 5 basics and Adobe Photoshop. The processing of data in the office takes more time than in the field. The other modern technology introduced was 3D digitiser and 3D Laser scan used to make 3D models. These are becoming popular mainly for the use on the websites or little demonstrations to the public at museums. This 3D scanner is very expensive equipment, so I do not believe it can be implemented at our work, due to the financial problem. Nevertheless, it was really good to learn the new methods of surveying, which might be useful one day.

Museum Visits

Various museums were visited in Nara and in Okinawa to see the exhibits and storage collections. The way the archaeologists display their findings was excellent and it can be displayed in a similar way back in our museum. The only problems we have are the financial strain and lack of space, but on the other hand, we have unique objects in our collection that can be displayed with a similar method. Nonetheless, some of the basic techniques gained through these site visits to several museums can be utilised.

World Heritage Sites

Nearly all the Heritage sites in Nara and in Okinawa visited were well preserved, and seen from the standpoint of their preservation and utilisation of the archaeological sites and monuments for the tourists and the general public. This type of preservation methods of the sites is not as good in Fiji. The support from the people and government is not much, compared to the value the Japanese attach to their cultural properties.

III. Recommendations

1. The total station can now be used to get a precise X and Y coordinates at the Fiji Museum.
2. Our museum can now really use what is learnt in training about the plain table survey for a better surveying method and production of good maps. I thank the Archaeological Research Institute of Kashihara, Nara very much for providing to the Fiji Museum the tripod and table, and ACCU office for the alidade
3. The use of GPS Etraxs taught in our training is another asset given by Mr. Hiroshi Kiguchi

to the Fiji Museum, which can now use it in making good maps.

4. The possibility of a joint research project between the institutes and the professors concerned would be great for preserving cultural properties in Fiji.
5. If it were possible, a research and analysis internship in any university would be greatly appreciated, as we do not have technological facilities available in our country.

IV. Conclusion

Upon completion of this training program, a comparison between various surveying methods of archaeological properties will be possible back in our country. The training overall has shown me various methods of mapping, and which one can be applied to the actual practice of mapping. As a Field Research Officer, it is important for me to have such knowledge, as in our country all the work is done by us due to lack of staff. I had a chance to meet and build network among the professionals with expertise at the institutes for the future use, and also a chance to meet some very important people. Last but not least, I really enjoyed my stay in Japan for six weeks with the training provided by different people and also the various types of food to eat for the first time. I would personally say it was a really good experience for me in a foreign country for the first time.

Acknowledgements

Finally, I wish to express my gratitude in the first place to Mr. Yamamoto Tadanao, Director of ACCU Nara, and to Mr. Nishimura Yasushi and Ms. Ishii Kayoko of ACCU for their assistance and guidance. My thanks are also expressed to Ms. Hata Chiyako, Mr. Kanai Ken, Mr. Nishimura Akira, Mr. Irikura, Mr. Hashimoto, Mr. Kiguchi Hiroshi, Mr. Miyagi and others who have spent their valuable time with us.

This training has been a basis for advancing work in the field of cultural properties mapping, the advanced knowledge that has been gained will be of much use and help to the Fiji Museum. Apart from this, the visits to the museums and to the heritage sites were additional things related to archaeology in storing and preservation methods learnt.

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Final Report

Elia Robert Francis NAKORO

I. Fiji Museum Background

The idea for a museum to display and preserve traditional Fijian culture was first discussed in 1904. Later that year, Sir William Allardyce presented his collection to the Suva Town Board, and it was displayed in the Town Hall.

In 1908 the Fijian Society was formed with the specific aim of researching and preserving the country's history and culture.

The formation of a museum was included in this aim. In 1910 the government approved of an annual grant of £25 to appoint a collection caretaker. With the passing of the Fiji Museum Ordinance in 1929, the museum was formally inaugurated as a government statutory body with a Board of Trustees.

Local residents presented pieces and collections they owned to the Town Board and the Trustees purchased the artefacts. These contributed to a growing collection, which filled the Town Hall.

The collection remained on display in the Town Hall until 1919, when a substantial part of the hall was destroyed by fire. The collection was moved to a variety of venues until the government was persuaded by the Trustees to build a National Museum.

The Governor of Fiji, Sir Ronald Garvey, opened the current museum in 1955. This building was used to house the displays, reserve collection and provide storage. Today the building has two adjoining sections, the first was constructed in 1972 and the second in 1978. Together, these buildings provide a history gallery, masi gallery, art gallery, Indo-Fijian gallery, space for temporary exhibition, storerooms and gift shop. The archives, photographic studio, editing suite, library and administration offices are located in what used to be the Nawela Hostel for Women adjacent to the main museum building.

For a long time the museum served as a storehouse for cultural items and as a centre for a few erudite persons. The majority of local people did not show much interest. In the 1960's, a series of education and craft programmes was initiated by the then newly appointed director, Bruce Palmer. However, a long-term injection of funds to maintain such programmes was not made.

Over the years, directors such as R.A. Derrick, B. Palmer, and F. Clunie built up the museum’s reputation as a research institution. The museum published their work along with that of

other world-renowned scholars, establishing itself as a small centre for academic excellence. Sadly, the lack of funding has restricted its research and publication programs.

The recent employment of key professional staff has enabled the museum not only to effectively fulfil its responsibilities according to the professional museum standards, but also to develop educational programmes aimed at generating greater support from the community. (Source: Internet, Fiji Museum Website)

At present, there are no qualified local archaeologists in Fiji or even in the museum itself. Close to the end of 2005, there were efforts in trying to send four members of the Fiji Museum over to universities overseas for archaeological studies, but unfortunately there were no scholarships available.

The Fiji Museum also has a Total Station and a Leveller. However, there is no one that can operate the machine, so they remained in storage until they were used in a recent excavation by the students of the University of the South Pacific, accompanied by two staff members of the museum.

Archaeological research in the country is carried out by university researchers from abroad, such as Simon Frazer University, ANU researchers and also from New Zealand. These researchers are the ones to write the report including their findings and the survey of their excavation sites. However, the museum staff members accompany them also.

II. What is My Impression on the Training Course?

This training course has been very rewarding, and it has also been an eye-opener for me. The program covered a wide range of activities and most of them were very vital in keeping data of historical monuments and also reporting and maintaining archaeological research survey data.

Not only did the training develop our skills in surveying, it also allowed us to interact with people from a very different, very humble and intact culture. I have learnt about how people lived and some of the basic values of Japanese traditional customs. Also, the taste of the delicious traditional Japanese cuisine will never be forgotten. This exchange in cultural values is important, as we need to be aware of others and not only of our own culture.

I found the review of all the facilitators with different topics were tremendously overwhelming. They were also very helpful, gentle and patient. Especially with the language barrier, they took time to try and share their expertise on what most pacific islanders lack in the field of archaeology.

This training course was as good as one would ever expect. It took the participants to different fields of survey, where it was most suitable to carry out the methods. One would be so inundated with the amount of work that has been carried out with the restoration of historical monuments, the amount of excavations that has been carried out, conservation and preservation of these sites, and it so went in line with the program of survey methods that we were learning.

Not only did we train the survey methods practically but we also observed their application in the field, such as historical site excavation, castle and temple ruins and in museums, and the amount of work and time focused towards constructing such national and world heritage historical sites.

The visiting of the world heritage sites on Fridays during the training also assisted participants on what kind of things that they can take back with them and apply them to their own country such as restoration and preservation of national heritages and historic monuments.

III. What We Have Learned?

All throughout this training program we have learnt a lot. Namely they are:

- Use of Total Stations
- Leveller
- Plane Table survey
- The use of GPS receiver
- Digital Photogrametry
- 3D scanner
- Introduction to GIS

Among different methods of survey, a few of them are applicable and the rest shall take a few more years before implementation back in Fiji. Applicable methods include Total Stations, Leveller, and Plane Table survey, GIS, GPS and most probably Digital Photogrametry.

In this training, we learned how to use the Total Station and the Leveller, and also how to calculate using the Traverse and Triangulation methods, which was a long but necessary process. We were able to locate Datum Points and make new points from the Datum, and the methods used were very crucial in minimizing errors.

Setting up the plane table was simple and going through the method was easy, as it is straightforward and the site is actually drawn at the same time. We have also come to learn that like any other method, each method has its own limitations and so you need to use other techniques as well.

Furthermore, in Okinawa we were taught how to use a GPS receiver together with the software. We were able to mark Way Points and also include track data. This method is simple but the accuracy depends on the type of GPS you have.

Digital Photogrametry and 3D scanner were two methods that I found really astounding, as they are useful in 3D representation of the sites and also huge monuments. Such representation we found also useful in museum displays, but unfortunately, the equipments cost a great deal of money.

Finally, use of GIS for archaeological research is also very important, as one needs to maintain a database of their sites and also such data are kept organized for easy future referencing.

IV. How Can What We Have Learnt be Implemented Back In Fiji?

1. Total Station and Leveller

Although the Fiji Museum is equipped with a Total Station, there is none that understands how it works and even knows how to operate it. However, the University of the South Pacific, in its latest archaeological survey, managed to use this equipment out in the field. It also used a Leveller and a GPS receiver.

With the knowledge that we have gained during this training course, it is possible that this method of survey is enhanced and applied with the existing equipment that we have.

2. Plane Table Survey

During the practical training, we noticed how easy it was to use a plane table survey method and I am sure that there will be of no hindrance in trying to implement it as one of the methods that the Fiji Museum can use during fieldwork. It is one of the suitable methods for most of our sites, as they include elliptical and square house mounds, and in those days Fijian people lived in small communities or villages, thus the area for surveying is not that large. It might be possible to purchase a set of this equipment, provided that the museum tries.

3. GIS

The Fiji Museum uses outdated GIS software called MapInfo to maintain a database of its historical sites, and with the help of a GPS, they were able to locate and give coordinates to their sites. In the field the data is entered manually into the database.

It is also possible that Arcview is used instead, for it is easier and user friendlier and also it has special features that MapInfo does not. And since almost every company in the world uses Arcview for GIS, it is wise to keep up with them.

4. GPS and Digital Photogrametry

The Fiji Museum has been using a GPS receiver out in the field to map its historical sites and monuments. However, the receiver does not have any software that locates the site in the global coordinate system but rather only in the local grid coordination.

It is also possible that these two methods are applied, but the problem is that it would be so much easier if it also comes with the software. The GPS software can be easily downloaded from the web, whereas for Photogrametry, it is expensive and difficult to access with the financial

constraints that the museum faces. However, since it is a very effective and important tool in survey, I am positive that upon our return we will do our best to allocate funds to it, to upgrade the survey techniques that the museum is using, and to implement the ones that we have learnt.

V. Recommendations

The board of education or the advisory committee of the ACCU, Nara needs to screen applicant's recommended field of study, especially when applicants need to study a number of topics in fieldwork.

In the case of Fiji, they recommended five (5) methods of survey to undergo in the training and the advisory committee needs to look at whether those 5 topics are applicable back in the home country of the applicants. If the applicants have the equipments for the particular survey, it will help advising the applicants on which field to focus on and strengthen their skills and knowledge, so that they will be able to fully utilize it, rather than teaching about topics that cannot be practically applied due to absence of equipments.

However, it was good that we could learn about 3D scanning and Photogrametry, because we now know the current situation of survey in terms of modern technology. However, it could have been just a brief lecture on it, so we could focus on methods that we can fully apply back in our home country.

Furthermore, the advisory committee should also have an idea of the current situation in the country of the applicant as to which area to focus on with the required or recommended field of study, which could be achieved if the applicant is asked to update the committee with their current need and situation.

On the whole, most Pacific Island countries speak the English language and most of their technologies are also available in English. During the training course, if they can also read about whatever equipment that they will be using in English, whether it is a computer or a Total Station monitor, it would greatly help them when they go back to their countries. This, I believe, will be difficult on the facilitators' part, but overall, I would like to commend each and everyone that instructed us in every field, even though language was a barrier.

Overall, we have so many European researchers that visit our shores and it would be an honour to have researchers from Japan to collaborate in whatever archaeological research that goes on in the Pacific.

Acknowledgement

On behalf of the Fiji government, the Fiji Museum Director, Board members and its entire staff, I would like to take this wonderful opportunity to thank ACCU, Nara for choosing Fijians as participants to their program of conservation and preservation of national and world heritage

monuments and sites focusing on surveying methods.

I would like to thank the following persons and institutes for the great work and individual effort for bringing this program a success:

- Director of ACCU, Nara – Mr. Yamamoto Tadanao
- Director and staff of the National Research Institute for Cultural Properties, Nara
- Director and staff members of the Archaeological Research Institute of Kashihara
- Members and staff of PASCO Corporation– Mr. Hiroshi Kiguchi
- Education Committee of Nakijin – Mr. Miyagi

And last but not least to Mr. Nishimura Yasushi, Ms. Ishii Kayoko and Ms. Hata Chiyako for their kindness and patience in accompanying us everywhere we went.

Without all their assistance, the Fiji Museum would not be able to have the expertise and skills in order to map, manage and create a database of all its archaeological sites and historical monuments, let alone conservation and preservation of these national treasures.

Once again, VINAKA VAKALEVU (Thank you so much)!

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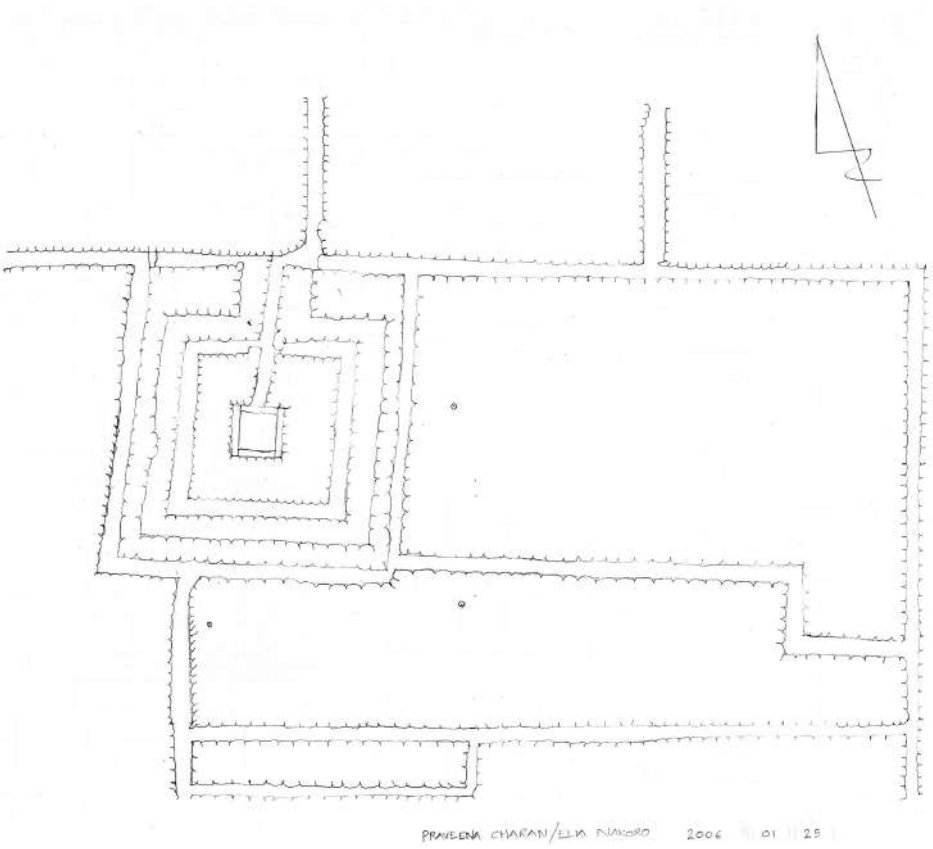
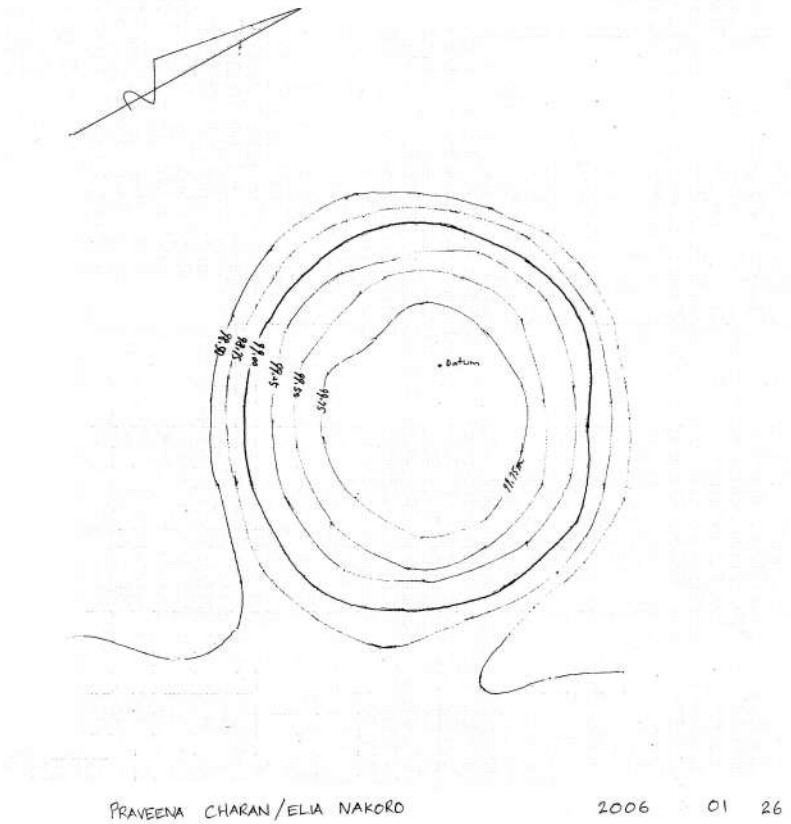
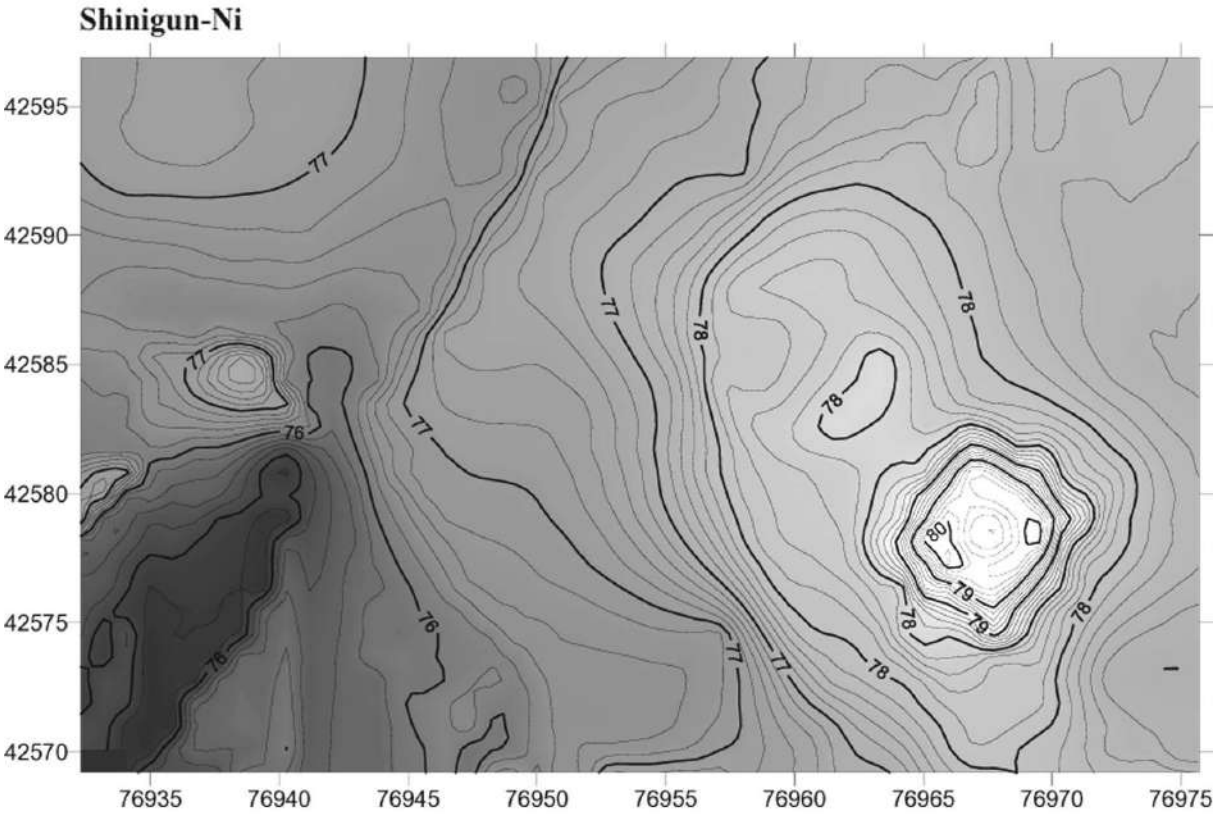


A map of Itabuki Palace Site, drawn with plane table survey method by participants (24-25 January)



A map of tumulus in Niizawa Senzuka group mounds, drawn with plane table survey method by participants (26 January)



Map of Shinigun-Ni, Okinawa, surveyed with total station

Total station survey at Shinigun-Ni Site

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