

# What Is Passive Design?

Lecture One: September 19, 2011

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# What Is Passive Design?

- Fundamentally it is design independent of all non-renewable energy sources
- In application it is often solar focused though wind and the technical development of the building envelope play important parts
- It is technically aware, not technically dominant
- The best examples beautiful and dignify human existence as all good architecture should

# We will focus on four basic themes

- Daylighting
- Temperature
- People
- Poetry

This is not passive design...



...but this is...



...is this?



Example One: The White Hall, Schloss Charlottenburg, Berlin

# **DAYLIGHTING**





























Example Two: Bowali Visitors Centre, Glenn Murcutt

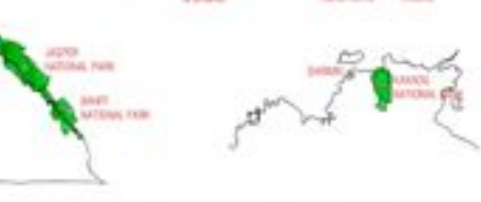
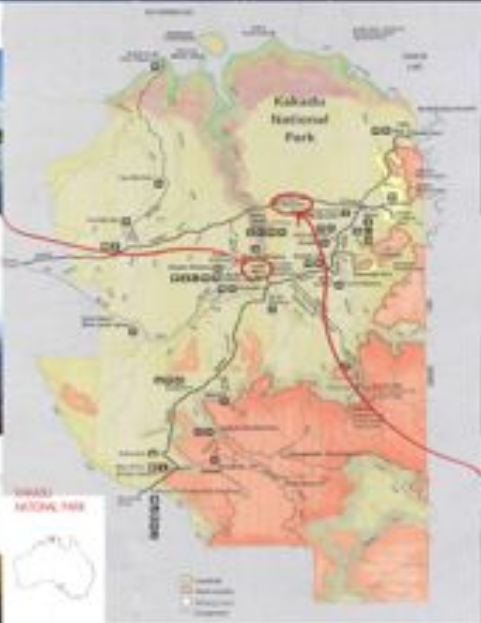
# **TEMPERATURE**

# PARK MAP

# FLORA & FAUNA

BOWALI VISITOR CENTRE

BOWALI VISITOR CENTRE



6 1.98 MILLION HECTARES  
 SIX MAJOR LANDFORMS  
 - ESTUARIES & TIDAL FLATS  
 - FLOODPLAINS  
 - LOWLANDS  
 - STONE COUNTRY  
 - OUTLIERS  
 - SOUTHERN HILLS & BASINS

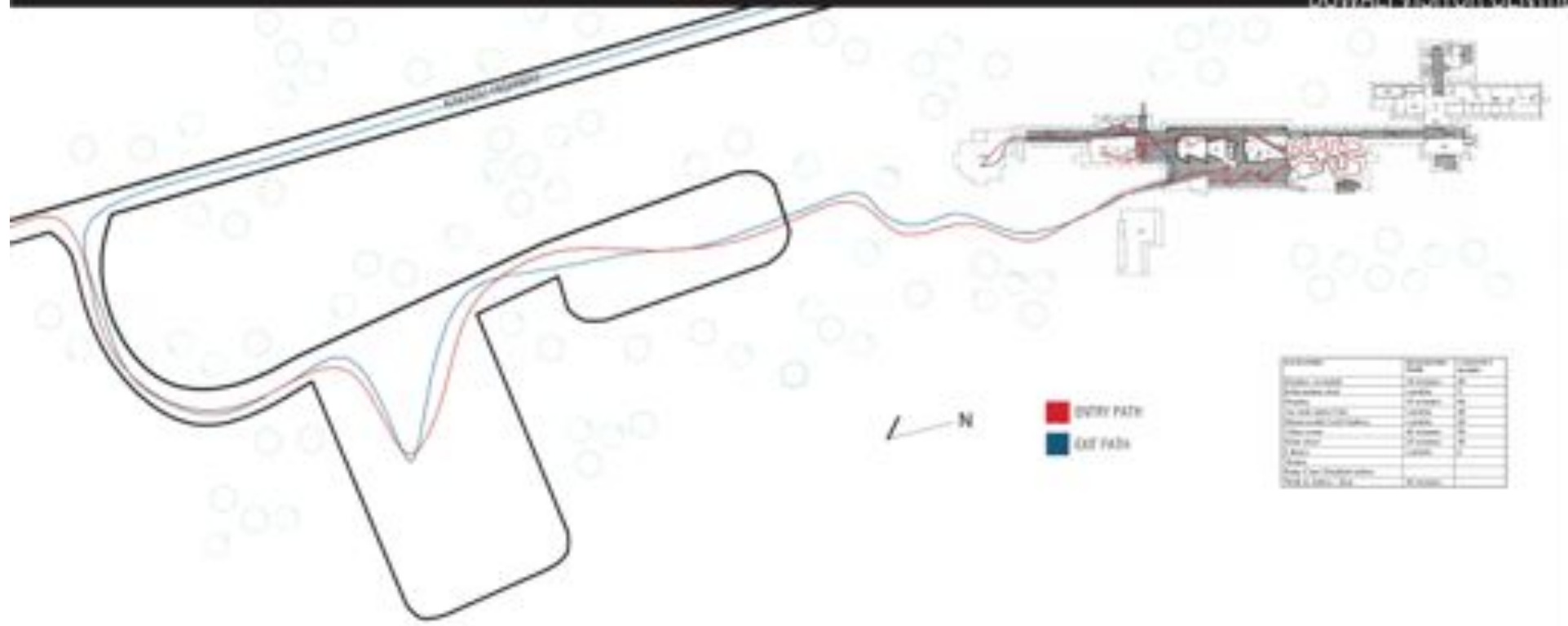
UNESCO HERITAGE SITE  
 SIX SEASONS  
 - GUNMELING: PRE-MONSOON SEASON  
 - GUDJEWI: MONSOON SEASON  
 - BANGGERWENG: STORM SEASON  
 - MEGGE: COOL TIME  
 - MURRIBING: COLD WEATHER

SEASON  
 - GURRING: HOT DRY WEATHER  
 - RENOWNED FOR EXAMPLES OF ABORIGINAL ROCK ART  
 - VARIETY OF WILDLIFE  
 - 700 BIRD SPECIES  
 - 40 MAMMAL SPECIES  
 - 50 FRESH-WATER SPECIES

- 10 000 INSECT SPECIES  
 - 1600 PLANT SPECIES  
 - FOUR MAJOR RIVER SYSTEMS  
 - EAST ALLIGATOR  
 - WEST ALLIGATOR  
 - WILDMAN RIVER  
 - SOUTH ALLIGATOR

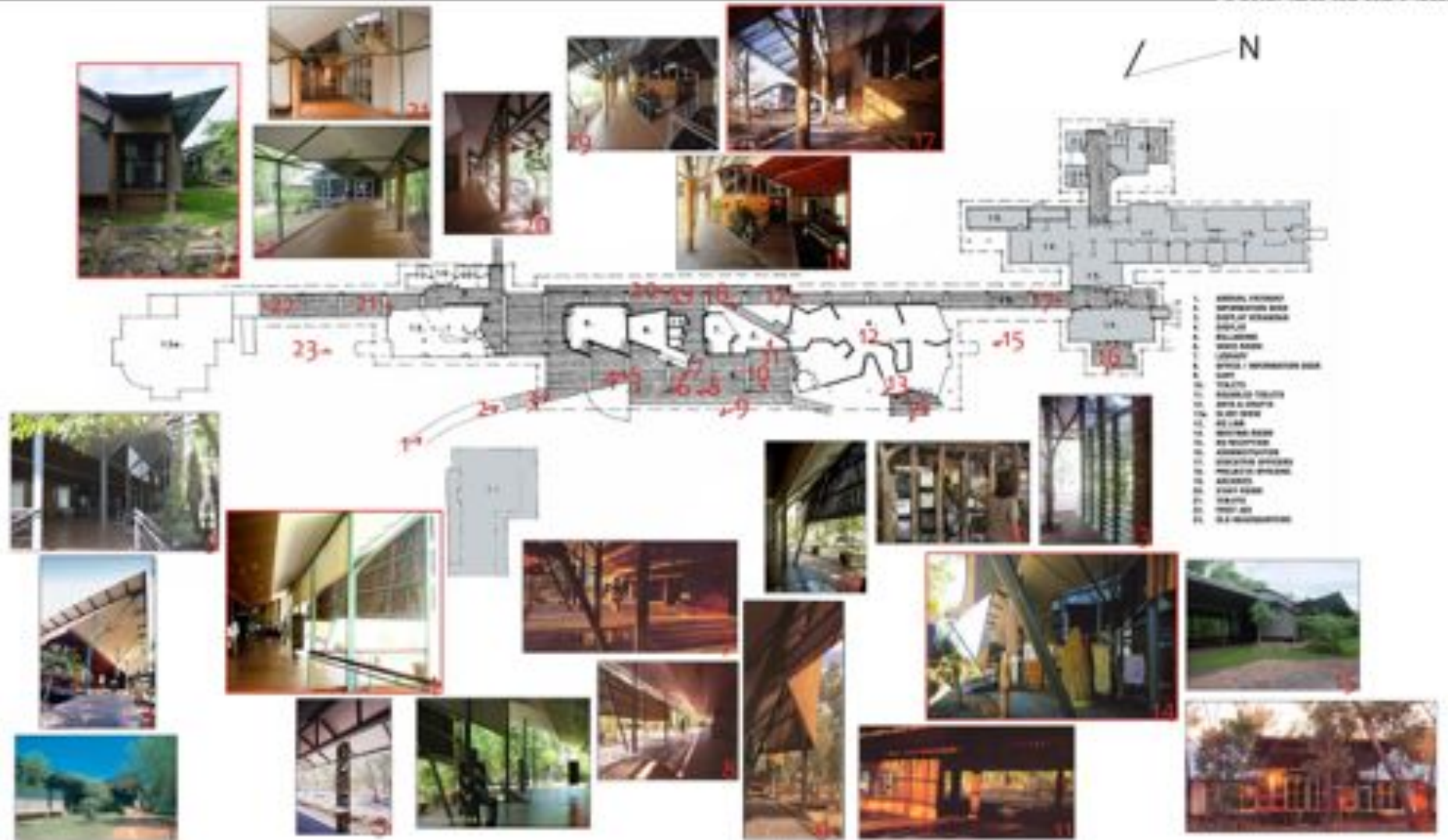
# SITING & ENTRY MAP

ROWALL VISITOR CENTRE



# IMAGE MAP

BOWALL VISITOR CENTRE



# PRECEDENTS

BOWALI VISITOR CENTRE



EUCALYPTUS TREE



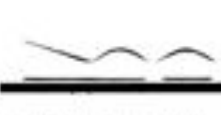
SIMPSON LEE HOUSE - STRUCTURE



BOWALI VISITOR CENTRE - STRUCTURE



MARIKA RESIDENCE SCHEMATIC SKETCH



BOWALI - TYPICAL CROSS SECTION



TRADITIONAL CHINESE STRUCTURE



MARIKA HOUSE GUTTER



BOWALI VISITOR CENTRE GUTTER



TRADITIONAL JAPANESE SCREEN



MARIKA RESIDENCE SCREEN



BOWALI VISITOR CENTRE SCREEN



MINERALS AND MINING MUSEUM RAMMED EARTH



BOWALI VISITOR CENTRE RAMMED EARTH



WARM SHELTERING ROCK



MARIKA RESIDENCE



FARNSWORTH HOUSE



BOWALI - TYPICAL CROSS SECTION



INFORMAL BILLIARD ROOM



SIMPSON LEE WATER RESERVOIR



BOWALI FORMAL BILLIARD ROOM

TROPPO FIRMLY BELIEVES IN EVERYTHING SUSTAINABLE. PROJECTS MUST TAKE FULL ADVANTAGE OF PASSIVE DESIGN USING SUPPLEMENTARY SOURCES ONLY IF NECESSARY. LOCAL MATERIALS ARE USED MORE OFTEN THAN NOT, RESTRAINING USE OF IMPORTED MATERIALS. THIS COMES TO THE FACT THAT LOCAL MATERIALS AND TRADE-SKILLS ARE PART OF THE BUILDING AS A VERB CONCEPT. PROJECTS ALSO INVOLVE LOCAL ARTISTS AND COMMUNITY RESOURCES. **UNIQUENESS** OF PLACE, PEOPLE AND DAY IS A MAJOR INFLUENCE FOR PROJECTS. THE BUILDINGS MUST POSSESS TRAITS SUCH AS FUN, FRIENDLY, ADAPTABLE, ADJUST, BUILDABLE, AND FINALLY **ECONOMICAL**, PRESENTING A SENSE OF PLACE THROUGH **DYNAMIC** ARCHITECTURE THAT RESPONDS TO CLIMATE AND THE LOCAL SETTING. TROPPO TAKES A "NO BOW TIES HERE!" APPROACH TO THEIR DESIGNS, TAKING THE **TRADITIONAL** AUSTRALIAN LIFE STYLE TO HEART. THEY ALSO BELIEVE THAT, "LESS IS MORE", LESS WASTE, LESS TRANSPORT, LESS EXTRACTION AND LESS PRODUCTION. TAKING THIS TO THE NEXT STAGE, THE FIRM BELIEVES THAT BUILDING IS A VERB, THEREFORE INCORPORATING **LOCAL** COMMUNITY AND LOCAL ECONOMY IN THEIR PROCESSES AND PAST THE BUILDING OF THE PROJECT. BUILDING A STRONGER COMMUNITY WITH EACH PROJECT.

# ROCK, VERANDAH & PAVILLION:

BOWALI VISITOR CENTRE

## ROCK



THIS ROCK FORM FROM THE PARK, AND OTHER LIKE IT, WOULD HAVE PROVIDED SHELTER, SHADE, A HEAT BASE AND A SENSE OF PLACE AND PRIVACY FOR THE NATIVES.

THE CENTRE IS DESIGNED TO HAVE THE CHARACTERISTICS OF A NATIVE ROCK SHELTER



THE RECEPTION DESK THE WELCOME MESSAGE IS USUALLY ROCK



NATIVE ROCK ARE DISPLAYED ALL OVER THE CENTRE



THE WALLS TAKE IRREGULAR SHAPES LIKE ROCKS TO PROVIDE PRIVATE SPACE FOR DISPLAYS



THE RAMMED EARTH WALLS AND STRUCTURE STORE HEAT LIKE THE ROCK SHELTERS



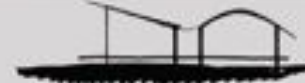
THIS SCREEN TAKES ON THE FORM OF A "ROCK" BUT ALSO SHAD AND SHELTERS. UNLIKE ONE TO

## PAVILLION



PAVILIONS ACT LIKE STAGES

THEY CAUSE THEIR INHABITANTS TO BE VULNERABLE AND REFLECT ON THEIR SURROUNDINGS



THE PAVILLION FORM TO CREATE A COOL, THERMAL BUFFER BELOW THE FLOOR PLATE AND TO KEEP OUT ANIMALS AND INSECTS.



IS IT MORE APPROPRIATE FOR AN ECOLOGY CENTRE BE GROUNDED?

## VERANDAH



FOR THE AUSTRALIAN, THE IN-ROOF VERANDAH IS AN ICON OF OUTBACK CULTURE AND AN IMPORTANT TRANSITIONAL SPACE



MURCUTT'S DESIGNS NEVER HAVE SPACE DEDICATED AS VERANDAH. THE BUILDING IS VERANDAH



THE BOWALI VISITOR CENTRE WAS DESIGNED WITH THREE STRONG FORMAL INFLUENCES. THE FUNCTION OF THE NATIVE ROCK SHELTERS HELPED INFLUENCE THE NECESSARY CLIMATIC RESPONSE. THE FORM OF THE MODERN PAVILLION WAS USED TO ISOLATE THE CENTRE FROM THE HOT EARTH AND WILDLIFE. IN THEORY, THE PAVILLION ALSO CREATES AN ELEVATED STAGE WHICH MAKES THE CENTRE'S PATRONS FEEL THEIR PRESENCE AS SEPARATED FROM THE SITE AND BECOME BOTH SELF-CONSCIOUS AND CONSCIOUS OF THEIR SURROUNDINGS. LASTLY, THE CENTRE IS A VERANDAH AS OPPOSED TO CONTAINING A VERANDAH. THE VERANDAH HAS BECOME A BUILDING TYPE FOR MURCUTT WHICH CAN BE HIGHLY TUNED TO ITS CLIMATE. IT CREATES DYNAMIC SPACES WITH HIGH TRANSPARENCY AND CONNECTION TO THE SITE. THE THREE INFLUENCES ALL INFORM THE ENVIRONMENTAL RESPONSE OF THE BUILDING, WHICH IS PARAMOUNT FOR MURCUTT.



# JUXTAPOSITION OF FORMS:

# PLANS

BOWALI VISITOR CENTRE



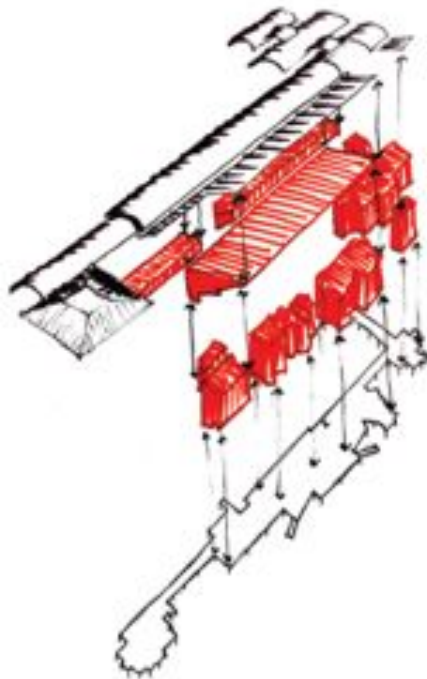
BOWALI VISITOR CENTER



PLAN WITH SOLAR PATH AND WIND DIRECTIONS



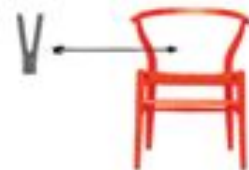
PRIVATE VERSUS PUBLIC



WHY ARE THE BUILDINGS TWO COMPONENTS  
-CLEAN SHELL AND MESSY GUTS-  
SPEAKING SUCH A DIFFERENT LANGUAGE?



LINEAR ROOF PLAN COVERING 'MESSY' GUTS



THE WISHBONE CHAIR HAS DISTINCT MATERIAL PROPERTIES  
-ENGINEERED AND NATURAL-  
YET THE PRODUCT IS AN HONEST CLASSIC.



SHADOW STUDY - DECEMBER 21

9AM



SHADOW STUDY - JUNE 21



SHADOW STUDY - DECEMBER 21

NOON



SHADOW STUDY - JUNE 21



SHADOW STUDY - DECEMBER 21

3PM



SHADOW STUDY - JUNE 21



BUILDING FOOTPRINT



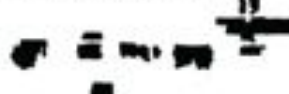
AIR CONDITIONED SPACES



CIRCULATION WITH COVER BEING DRY



WIND AMONGST THE BUILDING FORMS



BUILDING AS ROCK FORMS



LINEAR PART

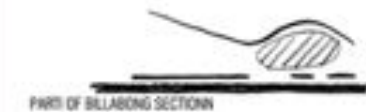
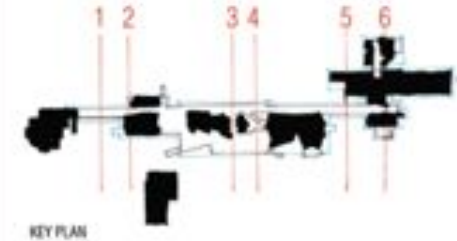
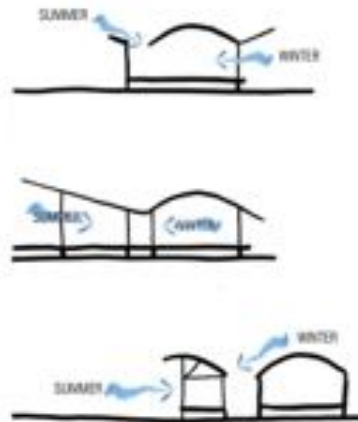
A SHARP TENSION EXISTS BETWEEN THE BUILDING FORMS. THE FORMS SEEM FOREIGN. LINEAR CIRCULATION AND ROOF FORMS SANDWICH WALL AND CEILING. THE UNIQUE POINT OF THIS BUILDING IS THAT IT'S ORIENTATION IS THE LARGEST REASON THAT IT ENGAGES SO MANY PASSIVE DESIGN STRATEGIES. THE ORIENTATION FORMS WHICH SPEAK ABOUT NATIVE ROCK FORMATIONS AND THEIR FUNCTIONS. THE JUXTAPOSITION OF THE CLEAN SHELL AND MESSY GUTS SEEM TO BEG FOR RE-MAXIMIZES THE COOLING WINDS BY FORCING THE WIND THROUGH THE VOIDS BETWEEN THE FORMS AND OVER THE BILLBOARD, PROVIDING FURTHER COOLING BY OCNCLATION. AT LEAST AN EXPLANATION. THE CLEAN VAULTING ROOF FORMS AND THE LINEAR SPINE RAISED ON THE PILES AND NOT NEW FORMS FOR MURCUTT. HEYVAPORATION. PRIVATE SPACES OF THE PROGRAMS IS SEGREGATED FROM THE PUBLIC SPACES VIA RAISED WALKWAYS AND VERANDAS. THE EXPLORATION OF THE HAS OFTEN USED THESE FORMS AS A LAUNCHING POINT IN HIS DESIGN OF OTHER BUILDINGS IN THE AUSTRALIAN CLIMATE. THE STRONG SPLIT IN THE LANGUAGES SHADOW STUDY REVEALS THE DIVERSITY OF THE QUALITY OF SPACE THROUGH THE DIFFERING SHADOWS. SKETCHING A FOOTPRINT FORCES YOU TO THINK OF THE USED IS SIMILAR TO THE VARYING MATERIALITY IN THE WISHBONE CHAIR. IN THE CHAIR, ONE MATERIAL IS DISTINCTIVELY ENGINEERED, YET THE OTHERS ARE CLEARLY BUILDING AS A COMBINATION OF THE LINEAR ROOF FORMS AND THE RAP-HAZARD MASSES. THE ONLY AIR CONDITIONED SPACES ARE THOSE THAT ARE CONSTANTLY NATURAL, YET THE PRODUCT IS AN HONEST CLASSIC. MURCUTT AND TROPPO ARE SIMILARLY UNASHAMED TO BE LESS RIGOROUS WITH THEIR FORMAL LANGUAGE OCCUPIED OR THAT ARE ACCESSORIZED WITH ELECTRICAL EQUIPMENT. CIRCULATION IS COMPOSED OF LINEAR PATHS WITH AREAS OF DISCOVERY.

# CLIMATIC STUDY

BOWALI VISITOR CENTER

# SECTIONS & MODULAR PARTS

BOWALI VISITOR CENTRE



AS WITH ALL OF TROPIC AND MURUJIT PROJECTS PASSIVE DESIGN STRATEGIES ARE ENTIRELY EXPANDED. WE SEE HERE THAT SUN AND WIND EXPERIENCE DIFFERENT SUN ORIENTATION AND ANGLES, CHANGING THE MOOD OF THE SPACES DRAMATICALLY. AS WITH THE EUCALYPTUS-LEAF THE PLAN PRESENTS ITS THINNEST PROFILE TO THE SUN THE PART OF THIS PROJECT IS A BEST REPRESENTED IN A SERIES OF SECTIONS. THE BUILDING'S ESSENCE IS SEEN IN FOUR IMPORTANT FORMS: A RAISED PAVILION DURING THE HEIGHT OF THE DAY PREVENTING THAT THE SUN DOES NOT COME INTO CONTACT WITH THE FLOOR PLATE DURING THE HEIGHT OF THE DAY. ON THE OTHER HAND FORM, WALKING AND WING-LIKE ROOF FORMS, A SECTIONAL FORM OF A THE VERANDAH AS A BUILDING TYPE AND LASTLY INTERIOR PARTITIONS WHICH SPEAK WIND MUST BE HARNESSSED TO COOL THE SPACES, EVEN IF THE SUN IS NOT SHINING ON THE FLOOR PLATE, THE AIR IS WARM ENOUGH THAT THE SPACES CAN GET UNCOM-FORTABLE ABOUT THE NATIVE ROCK SHELTERS IN THE PARK AND THEIR FUNCTIONS. IN ADDITION TO DESCRIBING THOSE FORMS, THIS SERIES OF PARTS SPEAKS ABOUT THE PORTABLY WARM. THEREFORE THE BUILDING BENEFITS FROM THE CONSTANT WINDS THAT ARE THE PRIMARY COOLING SYSTEM IN THE BUILDING. MODULARITY OF THE BUILDINGS: THE PRIVATE SPACE IS ARRANGED IN A SERIES OF SIDE-BY-SIDE VAULTS WHICH LEADS TO CLEAN LINEAR CIRCULATION.

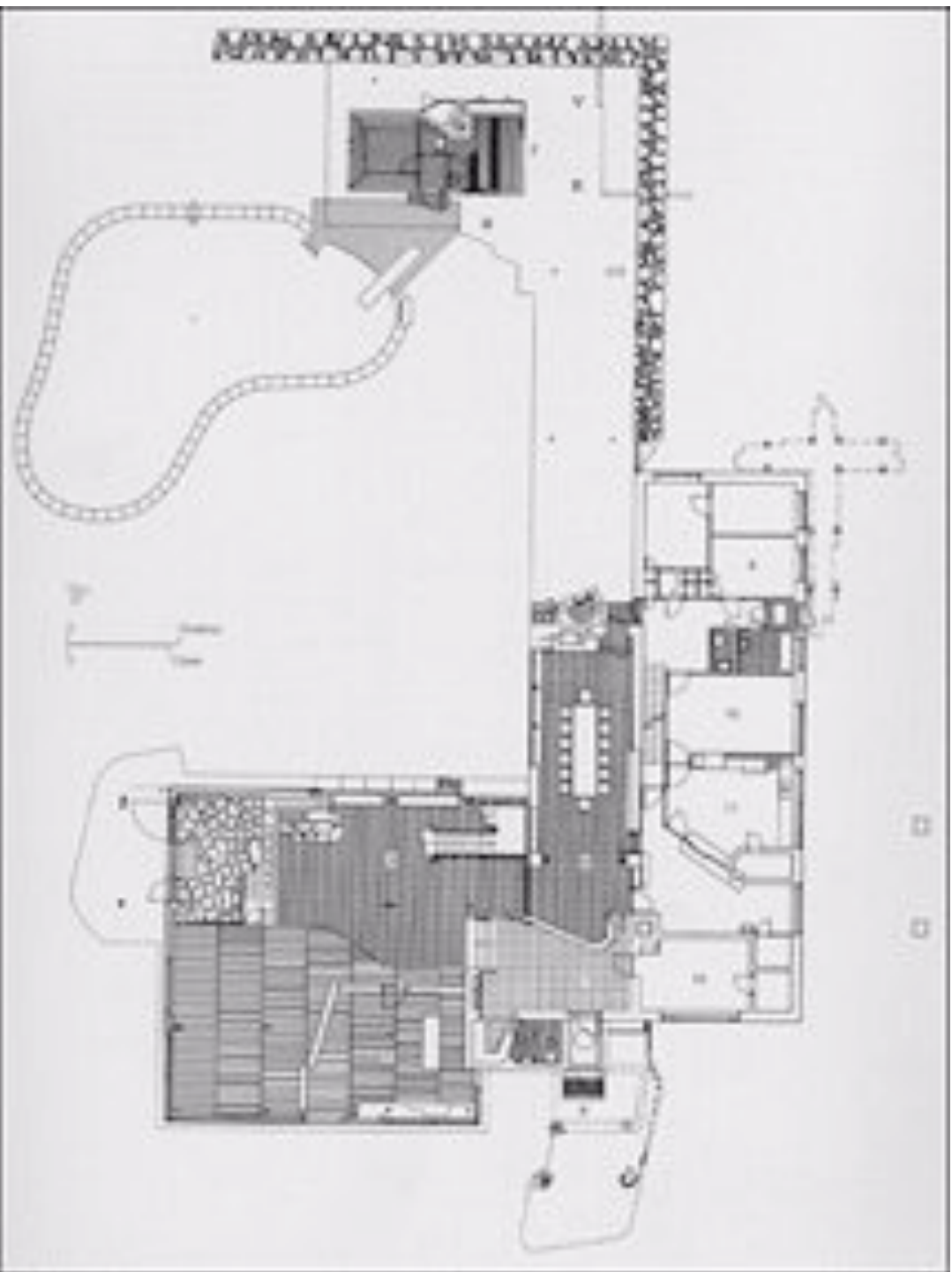
Example Three: Villa Mairea, Alvar Aalto

**PEOPLE**































Example Four: Katsura Imperial Palace, Kyoto Japan

# **POETRY**





