Arch 464
ECS
Spring 2001 Name_____

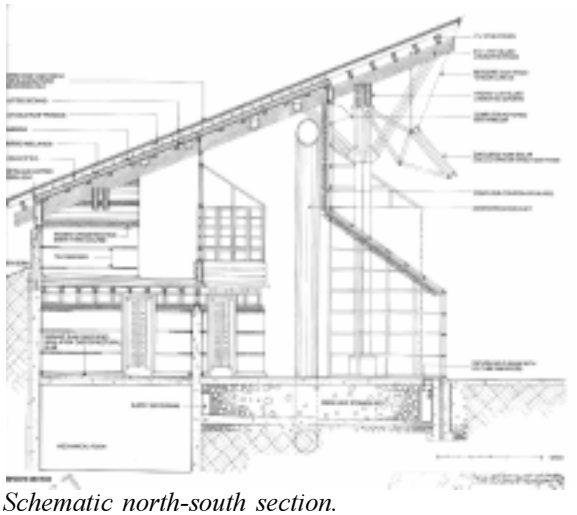
Quiz #1

"Award-Winning and Sustainable?"

View of the south facade..

For this problem you are the sustainable architecture critic for the *Environmental Building News*. Your topic is "Award-Winning Energy-Efficient Houses of the Past." Your assignment is to use Malcolm Wells' "Wilderness-Based Checklist for Design and Construction," which was published before the house was designed, to rate the Arne Bystrom-designed Sun Valley House that was awarded a *Progressive Architecture* Citation in the 32nd Annual P/A Awards program in January 1985 and was featured as the cover story in April 1987. The $7 million, 8,600 square foot house is occupied yearround by a caretaker. The owners who live in San Francisco occupy the house for about a month each year. The site is xeriscaped for low maintenance in Sun Valley's arid climate.

The original P/A citation described the house thusly, "Program: An extended-family house for winter and summer use with an integrated active and passive solar energy system designed to function after major snowfall, and zoned by functional priorities into three separate areas. Site: One acre bounded by a road, a valley, and a series of hills, with views up the valley. Solution: With its great overhangs, layered beams, and bracketed column supports, the roof structure is reminiscent of traditional Asian houses and those of the Swiss Alps, as well as of the mast-framed stave churches of Norway and the houses of Greene & Greene. The idea of the house as shelter is further heightened by shaping, cutting, and berming of earth, and with concrete terracing, where the sources are Wrightian, but also influenced by the detailing of Carlo Scarpa. Throughout the progression from entry to the final cavelike spaces, the scale continuously decreases and the detailing increases. An innovative heating and cooling system using solar energy includes state-of-the-art evacuated tube collectors, radiant hydronic floor heating and cooling, evaporative pond cooling, computer-controlled venti-



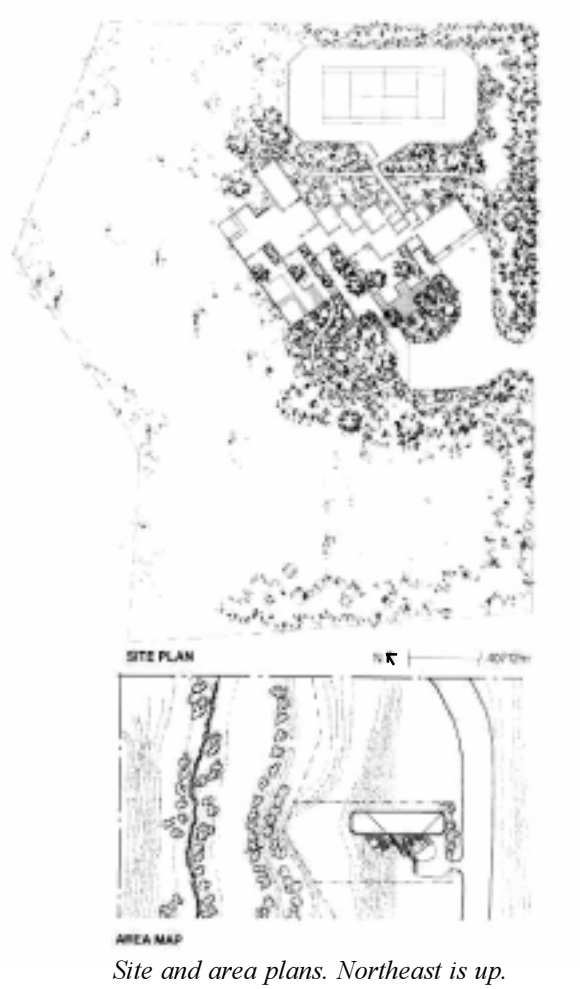
Schematic north-south section.

lation and shading, rock-bed thermal storage, and passive solar applications. The system is assembled in a manner that could be applied also to commercial buildings, and it is expected to reduce energy use by 81%. Construction: Concrete walls, concrete floors and terraces, wood structure [laminated beams and posts], wood walls inside and out [redwood], standing seam copper roofing, a layering of sash-type glazing including some with thermal resistance over R-5." Juror Eric Owen Moss declared, "On the other hand, it has a kind of rational dimension that one doesn't really believe; the solar component takes it out of the realm of I-made-this-object-and-isn't it wonderful."

The follow-up cover article, written after construction was complete added more particulars about the house's systems. "Craft permeates the entire building, while the technology is most directly expressed by the white glazing frames and suspended solar collectors; the rest of the intense solar and energy measures are much less evident. Berms on the northeast perimeter of the house, and the broad, sloping copper roof protect against the snow season, and passages through the berms are simply not used at that time of year.

"In plan, the rooms are arranged in an offset, sawtooth configuration. This allows the best solar orientation, and an autonomy for each of the [five] bedroom/bath/dressing suites on the upper and lower levels…All of these suites are basically self-contained and front on a "solar gallery" encapsulated by the greenhouselike glazed south facade elements, Although it might not be done frequently, it is possible to let each zone, the bedroom units and the solar space, float in terms of temperature, independent of each other. The bedrooms have their own windows and shades overlooking the gallery to the view beyond; the angle-topped shades withdraw into pockets below each opening. Operable sash in both the gallery side and and the north (outside) wall permit independent cross-ventilation or fresh air. …

"…The greenhouse forms and the plane above them are designed to allow ample view of the spectacular mountain scenery and still be efficient, by using a complex array of special features. A dual-pane glazing system with "Heat Mirror" and

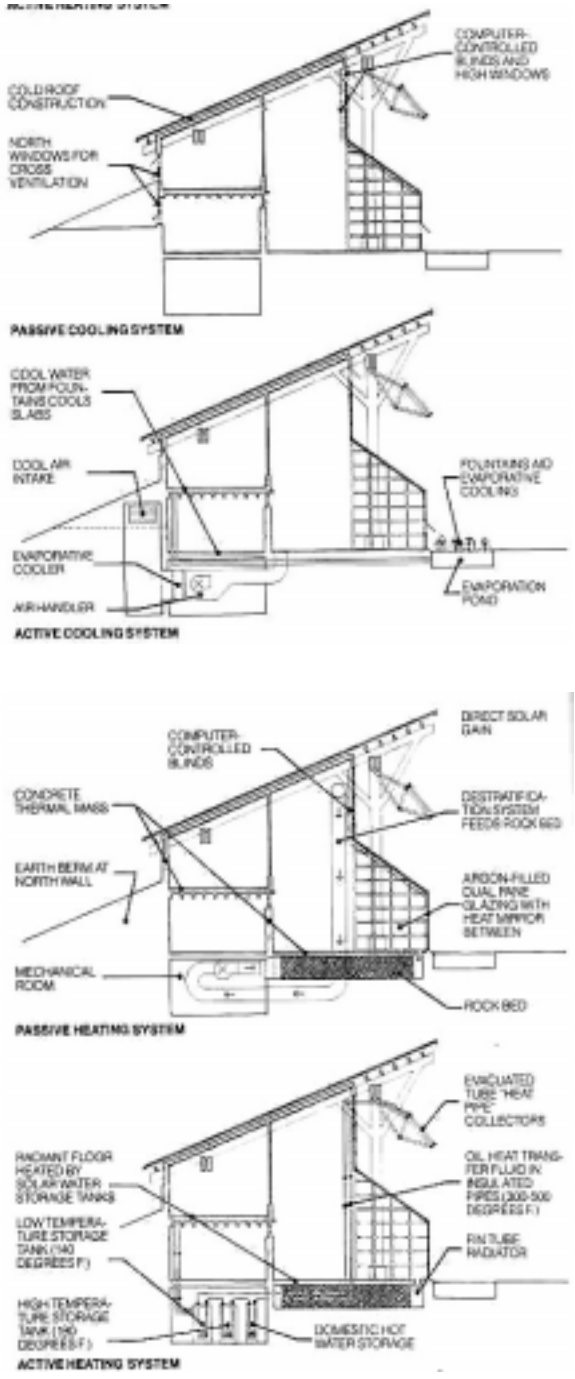


Site and area plans. Northeast is up.

The living room occupies the west end of the house.

argon gas between the glass is employed; computer-controlled slat blinds and awning windows at the top of the window wall operate automatically to control sun and temperature. …Along the same wall are two other elements of the energy system, representing the combined approach to solar usage in the house. The most obvious is the collector array, a bank of evacuated nonsilvered tubes (efficiency was sacrificed here for aesthetic and view reasons) which exchange heat from air into a manifold and into a heat-transfer oil; this medium [is used to heat domestic hot water and water for hydronic radiant slabs.] … The second system is a combination of destratification tubes, which draw heated air from high in the gallery space into a rock bed storage provided below the gallery floor, and the thermal mass of the floors themselves. … For cooling, a carefully thought out cross-ventilation system is augmented by the same radiant floors, cooled with water form the decorative fountain in the courtyard outside, which doubles as an aid to evaporative cooling. A mechanical evaporative cooling unit draws cool outside air from the bermed side of the building; … The double "cold roof" construction (see section) protects against heat gain in the cooling mode as well as heat loss in the heating mode, since it isolates the snow-covered copper several times from the interior T&G decking. The R-40 rigid insulation above the decking obviously helps."

An operable north-side living room window protected by the overhanging roof.



Heating and cooling sections.

1. Based on the text and photos from *Progressive Architecture*, rate the house using Wells' checklist. Point out which ratings you're making educated guesses on and give a rationale for your guesses. *2 pts*

	A	B	C	D	E	F	G	H	I	J
1	**Malcolm Wells' Wilderness-Based Checklist for Design and Construction**									
2										© M. Wells 1969
3	**Project:**									
4										
5		-100 always	-75 usually	-50 sometimes	-25 a bit	25 a bit	50 sometimes	75 usually	100 always	
6	destroys pure air									creates pure air
7	destroys pure water									creates pure water
8	wastes rainwater									stores rainwater
9	produces no food									produces its own food
10	destroys rich soil									creates rich soil
11	wastes solar energy									uses solar energy
12	stores no solar energy									stores solar energy
13	destroys silence									creates silence
14	dumps its wastes unused									comsumes its own wastes
15	needs cleaning and repair									maintains itself
16	disregards nature's cycles									matches nature's cycles
17	destroys wildlife habitat									provides wildlife habitat
18	destroys human habitat									provides human habitat
19	intensifies local weather									moderates local weather
20	is ugly									is beautiful
21										
22		negative score				positive score				
23		1500 possible				1500 possible				
24										
25										
26										
27		final score:								
28										
29										
30										

2. Explain why you agree or disagree with this rating. *3 pts*

3. Re-evaluate the building using the newer SBSE Regeneration-based checklist. Annotate assumptions you made in your ratings, giving your rationale. *2 pts*

	A	B	C	D	E	F	G	H	I	J	K	L
1		**tegeneration-Based Checklist for Design and Constructio**										
2												® SBSE @ Tadoussac 1999
3		**Project:**										
4		degeneration				sustainability						regeneration
5			-100 always	-75 usually	-50 sometimes	-25 a bit	0 balances	25 a bit	50 sometimes	75 usually	100 always	
6	the site	pollutes air										cleans air
7		pollutes water										cleans water
8		wastes rainwater										stores rainwater
9		consumes food										produces food for others
10		destroys rich soil										creates rich soil
11		dumps its wastes unused										consumes its own wastes
12		requires fuel-powered transportation										requires human-powered transportation
13		destroys wildlife habitat										provides wildlife habitat
14		intensifies local weather										moderates local weather
15	the building	excludes natural light										uses natural light
16		uses mechanical heating										uses passive heating
17		uses mechanical cooling										uses passive cooling
18		needs cleaning and repair										maintains itself
19		produces human discomfort										provides human comfort
20		uses fuel-powered circulation										uses human-powered circulation
21		pollutes indoor air										creates pure indoor air
22		cannot be recycled										can be recycled
23		serves as an icon for apocolypse										serves as an icon for regeneration
24		is a bad neighbor										is a good neighbor
25		is ugly										is beautiful
26												
27			negative score					positive score				
28			2000 possible					2000 possible				
29												
30												
31												
32			final score:									
33												
34												
35												

4. Explain why you think this rating is more or less accurate than the wilderness-based rating. Defend your rating for row 23, *serves as an icon for the apocalypse* or *serves as an icon for regeneration.* *3 pts*