On Design: Field Report

An Instance of Critical Regionalism: New Yaodong Dwellings in North-Central China

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For the last six years, China’s historic yaodong cave dwellings, still home to millions of people, have been a focus of work by the Green Architecture Research Center (GARC) of Xi’an University of Architecture and Technology. To date, the GARC, working intimately with the local people of Zao Yuan Village outside of Yan’an in Shaanxi Province, has designed and constructed more than one hundred new yaodong units using the principles of “green architecture.” This report suggests that these efforts represent an exemplary application of Kenneth Frampton’s notion of “critical regionalism.” Specifically, in contrast to the rampant and largely unreflective importation of Western architectural styles common to new construction in many of China’s urban centers, the new yaodong units result from a sensitive effort to merge the old with the new and maintain vernacular values.

The yaodong cave dwelling is a form of vernacular housing found across six provinces, covering some 400,000 km² in north-central China (Fig. 1). The term (pronounced yow-DOAN) means an arched tunnel or cave. In China the yaodong is one of the earliest housing types, dating back at least to the Qin dynasty (c. 221 B.C.). Today, the six-province region boasts a population of some 40 million people, and outside of the urban areas more than 80 percent of rural residences are yaodongs or derivatives thereof. In other words, a staggering number of people, easily numbering in the millions, live in yaodongs.

This report describes the efforts of the Green Architecture Research Center (GARC) of the Xi’an University of Architecture and Technology to design a new generation of sustainable
yaodong dwelling units. As of this writing, some 100 such units had been built in Zao Yuan Village — the site of the team’s design intervention, located immediately outside Yan’an City, Shaanxi Province, some 350 kilometers north of Xi’an. The work has been in progress since 1996. This report evaluates the efforts of the GARC through the lens of Kenneth Frampton’s call for a “critical regionalism” in architectural design in the face of an advancing “world culture.” It suggests that the new yaodongs represent a tangible instance of Frampton’s theory.

THE GARC APPROACH

One of the most distinctive aspects of the GARC program is its combination of traditional vernacular elements with reflective external intervention. As such, it would seem to embody conflicting priorities. On the one hand, the GARC approach is based on recognition of the value of dwellings made by a local population without input from external “design professionals.” Many commentators, such as Adolf Loos, Bernard Rudofsky, and Amos Rapaport, have noted how such vernacular production is often distinguished in terms of aesthetic honesty and geo-climatic appropriateness. On the other hand, the GARC approach clearly entails intervention into vernacular processes. In this regard, GARC holds that sensitive input from external experts may not necessarily be detrimental to native processes; indeed, it can be beneficial.

Such a tension between lay veracity and expert knowledge raises important questions for the discourse on sustainable design. For instance, it may indicate a need to re-examine Rapaport’s notion that cultural forces motivate vernacular forms in addition to (or perhaps in spite of) climate and geological considerations. Such an effort should take specific note of the emerging reality that most cultures are now enmeshed to some degree with “world” culture, and can no longer be said to derive solely from local roots. This is certainly the case with yaodong villages, where many products of universal technology — concrete planks, ceramic floor tiles, Sony televisions, etc. — have already been fully integrated. In light of this, one might ask whether informed external input might not actually be a “conservative” rather than a disruptive strategy — especially when its aim is to help harness such products within a larger desire to retain, and perhaps even enhance, original vernacular tendencies toward sustainable design.

Elsewhere, Rapaport has suggested that a useful measure of what constitutes a primitive or vernacular architecture is the presence of a high level of congruence between physical forms and the cultural values of a native community (what he calls “schemata”). Such a notion is particularly helpful here, since it avoids any rigid requirement that vernacular expression be devoid of input from outside experts. In fact, the new yaodongs described in this report offer a perfect illustration of Rapaport’s point, in that they preserve a high congruence between cultural meaning and built form, even though they involve external intervention.

In addition to the philosophical basis described above, the GARC approach involves a concerted effort to not only maintain a high level of communal involvement, but to understand current cultural priorities and values. Toward this end, it makes use of a range of tools, such as ethnographic engagement, participant design, questionnaires, and surveys. For instance, the fact that the new “caves” are largely free-
standing (as opposed to embedded in the mountainside) did not result from the imposition of foreign concepts. Rather, it reflected autochthonous values arising out of the community. Indeed, it represented the type of outgrowth of the cave tradition that is necessary if yaodong culture is to continue into the future in an organic — and hence, “vernacular” — way.

Somewhat lost in the English translation is also the fact that the very notion of a freestanding “yao-dong” (again, meaning “tunneled cave”) has been received by the local community as a totally sensible proposition. This alone is a fascinating example of how “high congruence” between form and meaning can be expressed. We will return to this point shortly, since it provides an instance of the historical element of Frampton’s theory. The accompanying image provides a diagram of the GARC intervention strategy (fig. 2).

To best apply the tools listed above, the GARC team has made a point of living in the yaodong community for significant periods of time at key points in the design process (the team traveled several times a year from Xi’an to Zao Yuan Village to do this). While there, the team, sometimes comprising as many as fourteen people, has held meetings with both the village leadership and lao biaxing (citizens) with the aim of generating designs that bear the imprint of the residents. It is in this context that participant design sessions have been held.

One particularly important aspect of this process has been the ability of local residents to overrule design suggestions made by the team. In one memorable instance, a greenhouse front, proposed by GARC as a means of improving thermal performance, was rejected by the residents. Their reason? The structure did not “look like a cave.” From exchanges like this, the team has come to appreciate the high symbolic value of the arched cave front for the community. In fact, the team has learned the arched front is an even more critical factor within the indigenous value system than that the “cave” actually be embedded in the mountain — which has not been the case for generations. (The historical emergence of the cave from the mountain will be explained below.)

One final feature of the GARC approach has been the use of questionnaires at the beginning and end of the design and construction process for each new cluster of yaodong units. Findings from these questionnaires have been used both to inform this process and evaluate its results. In addition, experiments have also been conducted to measure the performance of the new units in terms of such environmental factors as ventilation, humidity, noise, and interior temperature. It is not the intent here to review this technical data in detail. Suffice it to say that GARC’s interventions have resulted in a continuance of all the positive attributes of older, in-mountain units, while improving on ventilation and light quality. The only reduction in resident satisfaction has concerned a slight increase in noise level (fig. 3).

We believe that this type of sensitive expert intervention represents a positive force in the struggle to maintain vernacular housing forms, even as globalization makes purely local expressions of housing culture less and less common. We further suggest that Frampton’s notion of a critical regionalism may be used to assess this admixture of expert advice and local value. The yaodong project described here may serve as an illustration of this theory put into practice.

CRITICAL REGIONALISM AS APPLIED TO THE GARC APPROACH

Frampton coined his term “critical regionalism” to describe design approaches that would defend regional meaning from a “world culture” that threatens to replace regional distinctiveness with a globalized sameness of form and technological excess. He wrote that the rise of this world culture was bringing about a clash between “universal civilization” and “the peculiarities of a particular place.” And he followed Paul Ricoeur in lamenting that a common result of this clash would be the emergence of a “subcultural” mediocrity, expressing itself everywhere in “the same bad movie, the same slot machines, the same plastic or aluminum atrocities. . . .” In architectural terms, one could add “the same tract house” to this list. For example, the accompanying image of a detached Western house, complete with shutters and a sign proclaiming “family” placed in the lawn, was taken from an advertising placard on a Beijing taxi (fig. 4). The image is an expression both of the power of Western values and the rejection of attempts to uphold particularly Chinese meanings of house and home.

In contrast to such cultural forces, Frampton called for “an architecture of resistance” by means of critical regionalism. Taking the term from Tzonis and Lefaivre, he argued that the design of built forms should be approached with criti-
cultural self-consciousness. He had two tactics in mind. One was to “deconstruct the overall spectrum of world culture” — that is, for the designer to detach him- or herself from the tendency to employ universalized forms that have little connection to regional agendas. The other was to “mediate universal technique” — by which he meant to self-consciously place limitations on the use of all industrial and postindustrial materials and methods in order to achieve a more regional expression. According to Frampton, adopting such an approach would not require designers to turn their backs on all that world culture or universal civilization could offer (he was not exactly clear as to the difference between “world culture” and “universal civilization,” but his thrust was clear). Rather, he intended that the designer should translate that material into expressions of bounded space and form, light and tectonics, that were regionally meaningful — in other words, that were locally defined in terms of native history and culture.

Such an approach clearly fits with the theoretical underpinnings of the Green Architecture Research Center and its sustainable yaodong work. Early on, the GARC recognized that many of the principles of “green” design were inherent in the traditional yaodong. For instance, the cave interiors were thermally stable, and the land of the Loess Plateau (the geologic region where the yaodongs are located) was high in clay content, providing an ideal natural structural element. Also in place was a tradition of (lay) community effort at construction; that is, residents traditionally “pitched in” to help neighbors construct yaodongs. In short, the autochthonous reality of the yaodong type already resonated with criteria that Brenda and Robert Vale, for instance, have outlined as descriptors of “green design.” In fact, the Vales’ six principles [1) conserving energy, 2] working with climate, 3] minimizing new resources, 4] respect for users, 5] respect for the site, and 6] holism] were explicitly used by the GARC as a guide so as not to overstep its role as a sensitive intervenor in the design of the new yaodong units.

On the other hand, the GARC team had identified several deficiencies with traditional yaodongs. In particular, older yaodong units had no cross ventilation, no means of discharging unpleasant air from cooking and waste, and were often damp. Thus, the aim of the GARC intervention was to develop a more robust, sustainable yaodong prototype that could enhance the

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**Figure 3.** One of many drawings of new yaodong design concepts generated by the GARC.

**Figure 4.** An advertising poster for a Western-style house. The image was affixed on the back of the driver’s seat in a Beijing taxi.
positive, sustainable qualities of the old *yaodong* typology, but which would eliminate these negative qualities. In doing so, the hope was to produce new designs that could further the *yaodong* tradition as a vital solution to China’s rural housing needs, thus keeping the *yaodong* from becoming obsolete.

This goal was not as simple as it first may have seemed, because, among other things, “the past” has never been a static condition. For example, the *yaodong* type had already evolved over the centuries from being embedded in the mountainside to being comprised of freestanding walls abutting a mountainside (called *kao shan* *yaodong*, or literally “leaning against the mountain caves”). The change had been tied to such factors as increased building know-how and/or priorities for expressing economic standing. Furthermore, in the twentieth century, the *yaodong* had acquired important political connotations, having been adopted as a refuge by the young Mao Zedong prior to his rise to power. This occurred when the Yan’an area was the terminus of the Long March of 1935. In fact, Zao Yuan Village, itself, had served as the de facto seat of Communist power into the late 1940s. Today, the *yaodongs* which Mao and his associates had been made into museums. But the more important result is that the *yaodong* type has become a symbol of the peasant roots of Communism. This populist theme is embedded in the awareness of the local people — even though, prior to the Communist revolution, no such symbolic value would have been attached to the cave dwellings.

Finally, “preserving the past” has meant addressing the *yaodong*’s traditional agricultural roots in light of the new realities of village life. This is particularly important in the face of the trend among the younger generation today to leave the community to find work in more Western venues in the city. In this regard, with the full support of village leaders, the GARC was attempting to design *yaodongs* that would appeal to “upwardly mobile” young people. While 70 percent of the population of Zao Yuan Village (680 persons) are still farmers, this design goal reflected the perceived threat to the continuity of the community from within due to modernization.

It was precisely within the parameters of these challenges that Frampton’s argument for a “critical” regionalism took on such relevance and energy. Many of the forces of change described above are indigenous forces, which were bringing pressure on the culture of the *yaodong* to meet the conditions of the present world. To again use Rapaport’s term, these challenges were located precisely at the level of “cultural schemata.” And responses to them needed to be inscribed in new physical forms if a high congruence was to continue to be maintained between the *yaodong* and communal meaning.

In Frampton’s terms, it is in the very answering of these challenges that the opportunity to exercise an architecture of resistance emerges — that is, to practice a critical regionalism. On the other hand, to fail to meet these challenges competently would be to open the door to “mediocrity” and the sameness of world culture. According to the GARC philosophy, one way of failing to meet these challenges would be to fail to intervene. Another way would be to apply “expert” intervention only in a negative sense, by imposing formal vocabularies that were not indexed to autochthonous factors in the region. In the *yaodong* project’s case, however, sensitivity to the regional agenda, along with moderation in blending universal technology with local materials and methods, has yielded a better result.

THREE SPECIFIC FACTORS: HISTORY, LIGHT/TECTONICS, AND TACTILITY

Frampton cited three specific factors with which a critical regionalist process must engage. First, the process must inscribe the history of the region in its built forms. Second, it must allow a sensitive handling of the light and tectonic qualities of the region (here he seems to be saying it is the light of the region that lends quality to its tectonics of form). Third, a critical regionalist process must retain the region’s “tactile” attributes — the importance of which will be explained shortly. In discussing these three attributes, Frampton recalled Heidegger’s emphasis upon boundedness, a quality of place that allows “something (to) begin its presencing.” Clearly, this refers to more than just physical boundaries — although it includes that consideration. We suggest that a key to reifying Heidegger’s cryptic formulation lies in achieving Rapaport’s “high congruence” between cultural values and built form.

In the case of the *yaodongs*, as alluded to earlier, one element of “presencing” was surely the signature arched cave entrance, a feature that has stayed the same through many centuries of *yaodongs*. The distinctiveness of the form, as well as the situation of the units within a confined stretch of land at the base as well as on the slope of the mountain, clearly fits with Frampton’s emphasis upon built form and topographical fit (refer to fig. 3). For the people of the village, the arched front not only transmits the symbolic sense of continuity with past generations, but it expresses the essence of the *yaodong* as fundamentally “of the earth,” an archetype of primordial shelter (fig. 5).

Each of Frampton’s three factors is fulfilled in its own way by reflectively responding to the arched frontal openings. Consider the historical factor. We have already mentioned that the GARC *yaodong* unit is largely free-standing, and that this seemingly contradictory characteristic did not disrupt the communal sense of what a *yaodong* should be. The reason is the historical process which, in Frampton’s words, “has a capacity to embody, in built form, the prehistory of the place, its archeological past and its subsequent cultivation and transformation across time.”

In fact, the GARC research identified five stages in the development of the *yaodong* through history. The first was the original cave dug into the mountainside (these we must
The second was the same cave, but now with a masonry front (a development presumably reflecting increased prosperity). In the third stage, the *yaodong* became semi-detached from the mountain, and began to have a three-dimensional presence of its own. The fourth stage was a more or less fully detached “cave,” constructed of masonry. Finally, the fifth stage is the new sustainable *yaodong* dwelling, the fruit of “critical self-conscious” collaboration between the GARC team and the native Zao Yuan population. It is essential to appreciate this progression if one is to understand both how the current freestanding *yaodongs* may be considered an organic outgrowth of a long tradition, and how the new structures may still be considered “caves” by the local residents.

Frampton’s second factor involves respect for the local “climate, light and tectonic form.” According to Frampton: “fenestration (has) an innate capacity to inscribe architecture with the character of a region and hence to express the place in which the work is situated. . . .” What Frampton has in mind here is that a region’s tectonic qualities can be highlighted by strategic handling of the local natural light; such an approach stresses a tectonic rather than scenographic use of light. Again, the arched front is key to fulfilling this requirement in the *yaodong*. Even though the new units are largely freestanding, their sole source of light remains their front arched openings (the masonry side walls — and, of course, their party walls — are not fenestrated, although a small rear window is added in the new units for ventilation). By means of the light through the arched front, the physical settings are highlighted for their true-to-place nature, rather than lit in such a way that make them amount to being stage sets.

Here, Kimberly Dovey’s notion of authenticity can help enhance Frampton’s point. Dovey posited three requirements for authenticity in terms of built form. First is undisputed origin: the thing and the process that produced it should be a natural operation (this has to do with a form’s connectedness with the past). Second, the form must be genuine — that is, it must have depth of material (e.g., wood should be wood, not veneer made to look like wood). Third, the form must be reliable and trustworthy, and this quality should emerge not out of mechanical cleverness but because its origin is undisputed and its makeup is genuine. The *yaodong* arched front meets these criteria. The light it allows into the interior is a diffuse and muted light that gives the spaces and surfaces a timeless quality (Fig. 6).

Frampton’s third factor is “tactile sensitivity.” Here he argued essentially that a sense of place emerges not only as a result of visual awareness but through whole-body engagement with the environment. “One has in mind a whole range of complementary sensory perceptions which are registered by the labile body: the intensity of light, darkness, heat and cold . . . the aroma of material; the almost palpable presence of . . .”

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**Figure 5.** New *yaodongs* under construction. This view emphasizes connectedness with the land. In the foreground is farmland tended by the community.

**Figure 6.** This image shows the muted quality of light that typical of a traditional *yaodong*, lit only through the arched front opening.
herence of masonry as the body senses its own confinement.”

In this regard, it is remarkable how the new yao dong units preserve many of the sensual-tactile attributes of the original dwellings, even though they are freestanding and two stories high. The series of arched-front bays retains the same formal typology as the older yao dongs. In the older units, a one-family unit was typically comprised of three bays, each with an arched front, and this theme of multiple-bayed units was carried on in the new units. Furthermore, the interiors of the new units retain some of the signature formal traits of the older units. For example, they retain the traditional built-in elevated sleeping area, beneath which heat from the kitchen cooking unit is still piped for warmth.

In open-ended questioning during post-occupancy interviews, new residents rated the “historic continuity” between the new and the old yao dongs very highly.19 At the same time, they conveyed a sense of excitement because the new units brought a “contemporary tempo” to their village. Such a result affirmed Rapaport’s “high congruity” between built form and cultural meaning. (On the other hand, stairs in the two-story units were viewed negatively, since they were “inconvenient.”) Additionally, the GARC team questioned thirty young people who were no longer living in the village about the new yao dongs. They responded that the new units were more comfortable than apartments in the city. This result was very important to local leaders (not to mention the GARC) because of their concern to attract some of the younger generation back to the village. Such an appeal has been framed as a “return to nature” by the mayor of Zao Yuan Village, Cheng Wei, himself a thirty-year-old native of Zao Yuan. At the time this report was being prepared, he and his family were readying themselves to move into one of the new yao dongs developed with the help of the GARC.

THREE LESSONS IN THE GARC APPROACH

It is true that the very principles of sustainable design are themselves becoming increasingly embedded in the “inherited” way of design thinking worldwide. In this sense, they are themselves taking on “universal” attributes. This result has emerged thanks in part to a host of “pro-green” policy positions issued in recent years by a variety of international agencies (UN, UIA, UNESCO, NSTA, AIA, and so on). Such views have also been promoted at the academic level worldwide. For instance, the recent (1999) student design competition sponsored by the twentieth UIA Congress held in Beijing emphasized sustainable housing, and faculty at the Xi’an University of Architecture and Technology were actively involved in this effort.

On the other hand, even as the awareness of sustainability becomes more universal, concern for it can act as a safeguard against kitsch expressions of universal culture. Respect for local geo-climatic factors, promotion of natural modes of ener-
new built environments are ultimately intended. Such a view adds collaboration and participant design more explicitly into the scope of what should be considered sustainable design. As mentioned above, the intent is to shift the emphasis from sustainable objects to sustainable processes. Ultimately, however, the latter may lead to better expressions of the former.

In conclusion, we return to the view that a “critical regionalism” can encompass (or perhaps should encompass) both a respect for in situ means, methods and ways of thinking, along with expert critical reflection in the design and construction of built environments. In the case of the new yaodongs, the GARC team provided the latter component of this formula, with the explicit goal of assuring the possibility of the former. To put it another way, the native population alone could not have realized the new yaodong units. But with the help of outside experts, the new yaodong units have enriched the community’s sense of historic continuity and symbolic meaning — in short, its “sense of place.”

REFERENCE NOTES

1. Yaodongs are found in Shaanxi, Henan, Shanxi, Gansu, Ningxia, and Inner Mongolia. Of these, more than 50 percent of yaodongs are in Shaanxi Province, which is where Zao Yuan Village, the site of the work to be discussed in this paper, is located.


4. Rapaport, House Form and Culture, pp.18-45.


6. The technological agenda can be summarized here as follows. First, retain the excellent thermal qualities of the original dwellings; this is accomplished by the use of masonry exterior walls, and through arrangements that allow a series of units to share “party walls” (resonant with the in-series nature of the older, three-cave family units which were tunneled into the hillsides).

Second, solve ventilation and humidity problems by means of fenestration and by use of buried tubes to exhaust heat and improve indoor air quality. (For instance, in the summer months, hot fresh air may be made to pass through the tube into a pebble bed to decrease its relative humidity.) Third, utilize both active and passive solar methods for heating and cooking. Fourth, in order to save land and adapt to the hilly terrain, the new yaodongs are two stories; this also increases the ability to bring light into the interior. Flowers and vegetables are planted on the top of the yaodong units to adjust the microclimate.


8. Ibid., p.25


14. Ibid., p.21. Sensitivity to topography is contrasted elsewhere in Frampton’s article with modernization’s tendency to bulldoze a site to make it flat for construction. He calls such gestures “technocratic” and suggests that they are one cause of “placelessness” (p.26).


19. Due in part to the passage of time between when these interviews were done, pre-design and post-occupancy questioning did not involve exactly the same people. On the other hand, the population of Zao Yuan Village remained largely the same. And, as explained, the villagers largely share an agrarian lifestyle. These factors render differences in sample of limited consequence. The aim of the questionnaires was to supplement the experimental data by trying to capture affective reactions, such as levels of preference. Forty families were surveyed using pre-design questionnaires, with the gender distribution being 40 percent male and 60 percent female. Ages of the respondents ranged from the teens to 77 years old (5 percent teens, 50 percent in their twenties and thirties, 37.5 percent in their forties to sixties, and 7.5 percent in their seventies). A total of 41 individuals from the original group participated in the post-occupancy questionnaires.

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