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Beït al-Hikma

# ‘Raw Earth Architecture’

1/14

Friday 06th February 2015

Wednesday 21st January 2015



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## Preamble

According to the language, the culture, the positioning and the reference, the discipline<sup>1</sup> of **Architecture** can include various dimensions.

For example, in the Arabic language :

عمارة  
هندسة معمارية

The meanings that emerge from it include geometrical, conceptual, and technical dimensions, as well as concepts of construction, abstraction, planning and a visionary aspect.

In the Greek language :

**arckhe : mastery**

**tekton : art of framework**

The sense is much more bound  
to the mastery of a skill than to knowledge.

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Through this series of annual conferences around and on **Architecture**, we will attempt to merge the civilizational universe and their extensions in a contemporary world where geopolitical issues are substantial.

## Architecture vs. Tectonic

We mean, by this general topic, the approach and reflection on the discipline of **Architecture** from the entry point of Tectonic (which specifies *Architecture* by the expression of its technique).

**Raw Earth Architecture** will be the first conference.

**Architecture and Constructive System** would be the second conference.

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1 - Tunisia Architecture is not considered so "Academic" as a discipline in its own right. But its civilizational and anthropological practice is inherent in the "human fact."

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## Introduction

Dwellings in **Raw Earth Architecture** represent one-third (1/3) of the world population<sup>2</sup>.

If the 1970s' oil shocks and the ecologist movement of the 1980s helped to "occidentalize" (dangling or moving) the spotlight of world news to "alternative" constructive ways and conceptual architectures of "unique" post/beam and reinforced concrete, **Raw Earth Architecture** is one of the key links of the chain<sup>3</sup> of "sustainable development".

Our ancient architectures, worldwide, are based on a direct report, dependent and unaware of the "Earth Matrix". We just watch with more precision and objectivity our cities, our homes, our streets, our stone-pits, our fields, our craftsmen and rediscover, in our own interests, our common history, so ourselves.

From Tamorza to Jammel, from Nefta to Byrsa, from Matmata to Jerba, from Sijnene to El Haouaria, Tunisia is full of human and architectural heritage rooted in the Earth Matter, material and immaterial.

A responsibility is needed towards our ancestor builders and our future generations of actors<sup>4</sup> of the "human settlements" in Tunisia.

We no longer know how to prioritize our relationships with our "Earth". We do not distinguish any more between the "Earth" as a planet, a common and shared<sup>5</sup> environment, from the "Earth" as a matrix of materials.

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If we have chosen to name this conference **Raw Earth Architecture** and not *Earthen Architecture*, it is because we wish to highlight the importance of the third term (Raw) that specifies better the type of architecture, the anthropological and geopolitical contexts and finally, the type of material / matter, and also construction technique / knowledge and know-how. Moreover, if the theme was *Earthen Architecture*, it would have no importance since the Earth is the "matrix" of all materials and the support of all the architectures of the world.

The conference has no claim to a comprehensive summary on the question of **Raw Earth Architecture**, either in Tunisia or in the world. It aims especially to give new light directed from the point of view of the **Extensions** that this whole field might have in the architectural issue.

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2 - Estimation of CRAterre, UNESCO's pulpit for raw earth world's heritage : <http://craterre.org/>

3 - Even of the economic market, much more than action on the mentalities of populations and future generations.

4 - Architects, urban designers, engineers, archaeologists, historians, anthropologists, demographers, etc.

5 - We put the same footing the ancient cosmogony called the animal, mineral and vegetable kingdom. Whereas the state of current scientific research perpetuates a diagram according to us "eugenics" who considers man atop a pyramid of living beings on Earth.



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With globalization, the architectural practices are increasing but becoming uniform, paradoxically. **Raw Earth Architecture** could be seen and perceived as one of the last bastions of “resistance” against standardization (against nature) of the human fact (inherently varied). However, in order to give a different perspective, we will try, through this event, to address the issue by its **Extensions** in a fractal<sup>6</sup> trilogy :

## Praxis - Research - Education<sup>7</sup>

The **Extensions**, themselves, are in different orders : anthropological, architectural, urban, lawful, energy, territorial, technique, geophysical, historical, educational, economic, etc...

From there, we can advance a few questions :

- How is the issue of **Raw Earth Architecture** seen from the point of view of discipline **Anthropology** through Praxis, Scientific Research and Academic Teachings ?
- What do trainers / teachers / educators think of it? Do they see **Architecture** in general and **Raw Earth Architecture** in particular, as an essential component of the human fact or otherwise ?
- What role can legal and technical legislators take in response to this **revival** of social fact ?
- Is there a regional and / or a local **Raw Earth Architecture** approach ?
- How far is the professional corporation (space built : specifiers, contractors, developers, other) engaged in this global approach to **Raw Earth Architecture** ?

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6 - Fractal, the unit comprises a set as the same set comprises the same unit. Read the work and researches of Mandelbrot 1974.

7 - Trinity developed by Dr Dorra Ismaïl in her book « la pensée en architecture au 'risque' de l'événementialité », éditions de l'Harmattan, 2009.



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Thus, we propose to organize this conference trying to highlight **three interrelated axes** :

**Level – 1:** Today, in which measurements is **Raw Earth Architecture** practiced everyday in the professional discipline of *Architecture* ? How do architects lead their projects in a particular lawful context, with pre-established knowledge and know-how?

**Level – 2:** Through what devices / canals is **Raw Earth Architecture** transmitted / taught to future generations of architects, archaeologists, historians, engineers, anthropologists, etc.? According to what educational programs is this **initiation** done?

**Level – 3:** Where are statements of scientific research on **Raw Earth Architecture**, whether primitive or contemporary ? What would be the reasons for the disappearance (extinction / annihilation, etc.) of all knowledge and know-how?



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## The Speakers

### - **Salma Samar Damluji (Iraq /United Kingdom)**

Professor of Architecture at the American University of Beirut in Lebanon, Salma Samar Damluji will discuss her vision and work as architect, in resuscitating vernacular architecture (traditional, contemporary, local, urban heritage, etc.) through her projects in **Raw Earth Architecture**, covering countries of the Arabian Peninsula and more.

### - **Claire-Anne De Chazelles-Gazzal (France)**

Archaeologist at CNRS in France, Claire-Anne-de Chazelles-Gazzal will discuss her vision on the assumption of the presence of ancient architectural works that may have been the first **Rammed Earth** ones in North Africa. Her hypothesis is based on certain texts of Pliny the Elder, overlapping with other texts.

### - **Joseph Dahmen (USA)**

Architect degreed from MIT in 2006, where he studied **Rammed Earth** with his advisor John Ochsendorf and the architect Yung Ho Chang. He is currently faculty member of the School of Architecture and Landscape at the University of British Columbia in Vancouver, Canada, as well as a Faculty Associate of the Peter Wall Institute of Advanced Studies. Co-founder and Director of Sustainability at Watershed Materials LLC, an earth block manufacturer based in California, US.

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### - **Fouad Ghomari (Algeria)**

Engineer and Professor at the University of Tlemcen in Algeria, Fouad Ghomari will discuss his vision of the development of the **Raw Earth** / architectural heritage in Tlemcen and the local means implemented.

### - **Abdelamlek Ghannem (Tunisia)**

Academic, international trainer in leadership skills JCI University (USA), Senator of Junior Chamber International since 2006, President of the Junior Chamber of Tunisia in 2007, Founder and CEO of Industrial Society for **Earth Blocks** SOIB-SA.

### - **Karim Ladjili (Tunisia)**

Architect in the USA, Karim Ladjili will expose his experience as a designer of contemporary **Rammed Earth** Architecture in Tunisia. He will cite to the colleagues who are concerned by this issue, the solutions he has fined as well as the means he has implemented to come over certain anthropological and technical barriers.



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## Abstracts

- **Salma Samar Damluji (Iraq/UK)**

### EARTH ARCHITECTURE IN HADRAMUT- SOUTH YEMEN (2013-2014)

The phenomenon of hundreds of deserted buildings in Ḥaḍramūt has created the need to work with these buildings and bring life back to the towns and villages. This is no ordinary situation either, nor is it exceptional to Yemen where the loss of vernacular architecture has been slower than in other countries, where urban fabrics were wiped out, rebuilt, or left to deteriorate and crumble (e.g. Oman). In neighbouring countries, new cities such as Sharja and Doha have reinvented their heritage, in the absence of any. Yemen is also the richest urban civilisation of the Arabian Peninsula with a sustained integral composition, and its vernacular architectural repository, which is unmatched elsewhere<sup>8</sup>

Ḥaḍramūt is the largest province in Yemen. I first visited Wadi Ḥaḍramūt in 1981 where the city of Shibām is located. Given the sobriquet Manhattan of the Desert by European travellers in the early 20th century, and constructed several centuries before New York was founded. Shibām was on the incense and spice route, and was established as the commercial capital of ancient Ḥaḍramūt. I worked there and in another distinguished city there, Tarīm up until the mid 1990s. Since 2005 I have been working in the towns of Wādī Daw'an, a tributary of Wādī Ḥaḍramūt.

Yemen as a country is terribly rich in supreme examples of Earth architecture: where several hundred towns and villages, including the capital Ṣan'ā', are constructed in earth. According to the region, province and building techniques, different materials are used that include mud (rammed or pisé, sundried and baked bricks), stone and shale.

Highrise multi storey housing in earth, have been constructed and continue to be built in different areas most notably those of Ḥaḍramūt, Ṣan'ā' and Yāfi', not to exclude other historic towns.

With the time available for this intervention, I shall simply present two recently completed projects carried out by Daw'an Architecture Foundation (with the Prince Claus Fund for Culture). The first is in Shibām and the second in Wādī Daw'an. Both highlight the problematic of keeping the building industry alive, and working with the builders and craftsmen to sustain a coherent system of design, building and planning that is ecologically and architecturally viable.

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- **Claire-Anne De Chazelles-Gazzal (France)**

ORIGINS OF RAMMED EARTH CONSTRUCTION IN MEDITERRANEAN WESTERN COUNTRIES

Rammed earth construction (*pisé, tàpia, tabiya*) differs from other building techniques based on raw materials by the use of wooden formworks and the strong compression of a poorly moistured earth. *Pisé* construction, as it is known in north Africa, Spain and south of France from the Middle Ages, shows common and very special features.

Considering that some Latin texts prove the factuality of formed walls in Africa and Hispania and, besides, observing that this building process has still being in use there during two thousand years, unlike in other regions of Africa, Near East and Europe, one must suggest that this very original technique could originate from Africa and/or Spain. Though historical, archaeological and linguistic clues look scarce through space and time, they do converge to support this hypothesis.

Created before the roman period, *pisé* construction may have been spread elsewhere, first within the process of romanisation, then with the Islamic expansion.

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- **Fouad Ghomari (Algeria)**

EARTH CONCRETE: A CONSTRUCTION MATERIAL WITH A VARIABLE GEOMETRY

For millennia, many civilizations throughout the world have chosen the material " raw earth ", as a building material, using scholarly techniques appropriate to its nature and its constituents. The early twentieth century sounded the death knell for this material to which was attributed the label of the "socially incorrect" (material for the poor) at the expense of a new building material, concrete of Portland cement used hegemonically, for the mechanical performance it offers; although its first applications hardly predestined it to be the conventional material used par excellence, so far in the field of construction. However, the material "Earth" has not so far been buried, since over 30% of the world population continues to live in earth-built houses.

The twenty-first century and its issues related to sustainable development have shown that the construction industry and public works are responsible for the issuance of approximately 30% of greenhouse gas, responsible for climate change. The control of environmental impacts in construction requires an eco-management, based on a new approach called " performance-based " which takes into account the sustainability of building materials in their environment.

In this context, the cement concrete showed its limits, because on the one hand the processes used in its





manufacture are highly energy-intensive and polluting and on the other hand, it is aging badly since many diseases are attributed to it.

Nevertheless, the research, funded by strong international lobbies, insists on finding alternatives for making ecological cement concrete. These actions sound vain in comparison with the material "earth" which reveals on this regard the place of choice for its environmental record proved by the analysis of the Life Cycle Assessment (LCA) which is unbeatable and therefore predestine it to the level of 'friend nature ' material; but also its insulating properties correspond to the ecological qualities recommended for the building according to the new requirements of comfort and health.

We thus find the meaning of things. Evidenced by the many actions initiated on the five continents, since the end of the twentieth century by various academic networks and community organizations working together for the promotion and standardization of earthen architecture. Thus more and more small and medium sized companies invest in this new market. The example of Kräuterzentrum (house plants), the largest rammed earth construction in Europe (100 meters long and 11 meters high) approved in May 2014 by the Swiss company Ricola, shows that the technique of rammed earth, finds its place in contemporary architecture.

The action of promotion of earthen architecture can not be dissociated from the actions to preserve the built heritage for the development of knowledge and know-how. The history of the building in the Mediterranean highlights different earth building typologies, including the technique of rammed earth (Tabia) where structures are monolithic. The Tlemcen region inherited beautiful monuments built for the majority in the Middle Ages by various civilizations that have succeeded. This real earth concrete which has proven its value in terms of sustainability , was used for the construction of ramparts, mosques, palaces, hammams, etc., which walls could reach ten meters in height and a thickness varying from eighty centimeters to two meters depending on the nature of the work, civil or military.

With mechanical stabilization (compacting), the rammed earth in Tlemcen was also chemically stabilized in its mass, incorporating a mixture of lime and ash in order to provide it with long-term resistance.

The valuation of this heritage legacy has been the subject of several restoration operations beginning with those undertaken by the French government at the beginning of the last century to the present day, particularly those carried out for the preparation of the event : Tlemcen, capital of Islamic Culture in 2011. A critical review is made on the methodological approach of the act to restore some examples of books, compared with a case study in order to capitalize on these experiences.

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- **Joseph Dahmen (USA)**

#### BUILDING IN RAMMED EARTH TODAY AND ITS PROSPECTIVE

Rammed earth has grown considerably in the past half-century in the developed world, where countless new buildings and spreads in architecture magazines attest to its increasing popularity. The perception of rammed earth as an environmentally sustainable construction technique accounts for a large measure of its popularity. However, significant changes to materials and installation techniques have accompanied its transition to the mainstream. These changes include the use of chemical stabilizers and highly mechanized construction systems, both of which provide reliable performance at the cost of increased embodied energy. How can we adapt one of the world's first building technologies to the architecture in the 21st century without losing what attracted us to it in the first place?

This presentation assesses the current methods and future technologies of building with rammed earth in the developed world, tracking the increase in popularity of rammed earth as well as the effect of recent changes through a review of pertinent literature and the construction of a rammed earth test wall on the campus of the Massachusetts Institute of Technology. The presentation offers recommendations for future research that will create a more nuanced understanding of the environmental effects of stabilized and unstabilized rammed earth in the developed world context.

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- **Abdelamlek Ghannem (Tunisia)**

#### RAW EARTH ARCHITECTURE THROUGH EARTH PRESSED BLOCKS TECHNOLOGY

Earth as a building material is available everywhere. In developing countries, earth construction is economically the most efficient means to house the greatest number of people with the least demand of resources. Traditional earth construction techniques such as adobe bricks suffering from water attack and cracks, thus they need continuously maintain it in order to keep them in good condition. This presentation will study the relationships between soil properties, several stabilizers and their compressive strength and density using local soil taken from site at city of Penang in Tunisia.



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- **Karim Ladjili (Tunisia)**

**BUILDING WITH EARTH IN TUNISIA TODAY**

Noting with interest the renewal of earth building in the world, I decided to find my own intimacy with the architecture following a training in CRATerre laboratory at the School of Architecture of Grenoble. As part of this training, I realized a first small building in 2002.

In 2012, I built a rammed earth house in the region of Cap Bon. This project was first of all a human experience. Relations with the workers and masons' leaders, were instructive. Some similar experiences of comeback to traditional materials were undertaken simultaneously in Tunisia and the project was also an opportunity for exchange both in academic and practical terms. I will describe the different stages of construction, speaking about the foundations, the supply of the material 'Earth' and its implementation, the finishes and the roof.

Finally, I will finish by mentioning the economic aspects of the project and raising the question about the place that could have the 'Earth' in the construction field in Tunisia and the need to keep the flame of this adventure.

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## The Programme

The speakers are invited to scrupulously respect the 30 minutes (max) communication to allow more time for discussion with the audience.

Here is a theoretical schedule of the conference day :

09.00 : Opening Speech of the Conference by Mehdi Mahmoud Dellagi

09.15 : Session 1 – Mediator Mr Naceur Fantar

09.15 : Salma Samar Damluji

09.45 : discussion (15mn to 30mn max)

10.00 : coffee break

10.15 : Claire Anne De Chazelles

10.45 : discussion (15mn to 30mn max)

11.00 : Fouad Ghomari

11.30 : discussion (15mn to 30mn max)

11.45 : Synthesis 1 by Naceur Fantar

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12.00 : Lunch

14.00 : Session 2 – Mediator Mrs Rabia Chérif

14.00 : Joseph Dahmen

14.30 : discussion (15mn to 30mn max)

14.45 : coffee break

15.00 : Abdelmalek Ghannem

15.30 : discussion (15mn to 30mn max)

15.45 : Karim Ladjili

16.15 : discussion (15mn to 30mn max)

16.30 : Synthesis 2 by Rabia Chérif

16.45 : General Synthesis by Daouda Sow

17.00 : Closing Speech of the Conference by Mehdi Mahmoud Dellagi