

# AVEI NEWSLETTER



Yasmine Terki, director of CAPTerre and commissioner of the Archi'Terre festival, walking along the roof of the Hospital of Adrar

## IN THIS ISSUE

- Research in Construction Waste Aggregates ..... page 2
- Archi'Terre 2015 ..... page 4
- New AVEI Book Chapter ..... page 6
- Visitors ..... page 6
- CRAterre Presentation ..... page 6
- 1st "Earth & Bamboo" Workshop ..... page 7
- New Team Member ..... page 8
- Recent AVEI Courses ..... page 8
- AVEI Training Course Schedule for 2015 ..... page 8

Summer has begun in Southern India, but luckily Auroville has been spared much of this year's heat wave, meaning that research, training courses, and work projects can continue as usual.

Lara and Satprem spent a month traveling to Algeria and France to take part in the Archi'Terre festival and visit CRAterre.

There have been significant steps forward in the development of the new motorized Auram equipment and new avenues of research for Poured Earth Concrete.

The first Earth & Bamboo workshop, co-taught with Auroville Bamboo Centre, took place at the end of May. Now in the coming months will be the bulk of the summer courses.

Please feel free to share this newsletter with your friends and colleagues as we spread the knowledge of earth architecture to the world!

Earthily yours,  
The AVEI Team

## Research in Construction Waste Aggregates

In February, the Earth Institute welcomed visiting researcher Taru Joshi for a short research residency connected with AVEI's on-going Poured Earth Concrete research. A graduate student at the National Institute of Design (Ahmedabad), Taru received of the Schmidt-MacArthur Fellowship for her proposal to develop a "circular economy" model for the construction sector in India, addressing construction waste. She approached the Earth Institute with the question of how to appropriately research the use of construction waste aggregate.

Earth as a building material is already one of the most recyclable materials at large, with the possibility to be fully reconstituted as a building material in its end-of-life



*Construction waste - informal systems of reuse*

stage. Therefore, stabilized earth is an excellent matrix for an "alternative concrete" with recycled aggregates, providing a very low carbon footprint building material with a remarkable circular economy and ecology.

Guided by Lara and Satprem, the field of research was narrowed to the use of Construction Waste Aggregates (CWA) in Poured Earth Concrete (PEC) for application in load bearing walls. Due to the high percentages of aggregates in PEC, it serves as an ideal vehicle for this research. Three types of Construction Waste Aggregates were selected for the study: CSEB waste (from damaged blocks, demolition, and research waste at the AVEI campus), Fired Brick waste (from kiln rejects and demolition in the Auroville and Pondicherry region), and Concrete debris (from a specialized Bangalore-based company selling recycled aggregates from demolition sites and landfill).

The aim of the research was to compare the behaviour and mechanical properties of PEC samples with different CWA,



*Sieving CSEB waste*



and optimize waste gradation according to mechanical parameters and the sizes available on the market. The base mix design was taken from the conclusions of AVEI's previous PEC research (see Issue 18). With the assistance of Satprem, Lara and engineering intern Ioan Lévi, preliminary work was done to determine the optimal grain size distribution, the specific and bulk density for aggregates and a set of experimental mix compositions. A total of 42 cylinders were cast, including control samples with pure quarried gravel aggregate and CWA samples of CSEB, fired brick, and concrete debris. Slump tests were used to determine the optimal characteristics of each mix (including general parameters for workability, strength ratio,

and shrinkage). In the coming weeks, after all cylinder samples have been fully cured and dried, the samples will be tested for water absorption and wet and dry compressive strength.

This research direction could be a great value proposition in the context of India, which has one of the most rapidly growing construction sectors in the world (e.g. growth at an "annual rate of 10 per cent over the last decade as compared to a world average of 5.5 per cent," according to Taru's figures). Traditionally, India has been a country with an excellent recycling/reuse culture driven by the informal sector. However, this has been rapidly changing along with India's overall economic growth. Now,

"new constructions generate about 40-60 kg of construction and demolition waste per sq. meter, with an average of 50 kg per sq. meter" (an enormous figure), and options of construction waste reuse are virtually non-existent. Meanwhile, the rapid depletion of raw quarried materials such as stone and sand for concrete construction has been putting tremendous strain on the market. By encouraging the industrial scale reuse of construction and demolition waste, with a systematic approach and targets for engineered structures, it may be possible to more sustainably manage both the valuable raw materials and waste resources in India. ■



*Preparing the PEC mix with CSEB aggregate*



*PEC cylinders being cast*

## Archi'Terre 2015

From the 19th to the 26th of April, Satprem and Lara participated in the 4th annual Archi'Terre festival in Algeria, organized by the Algerian Ministry of Culture. Archi'Terre offers a combination of cultural events, workshops, and lectures for attending students as well as a meeting point for dialogue and exchange between the specialists who come from disparate regions of the world to lead the workshops and conference panels.

The festival kicked off in Algiers with the screening of François Le Bayon's film "Les Révolutions de la Terre," showing how earth has been used for modern architecture in countries around the world. Over the following week, daily introductory workshops



*Satprem with some of the other Archi'Terre workshop facilitators*

were given on Arches, Vaults & Domes, Adobe, CSEB, Rammed Earth, and Plastering, with additional workshops specifically for children and for adolescents. This year, a one-day special workshop was given on the subject of "Earthen architecture: an ancient tradition at the service of modernity," intended to give architec-

tural professionals an overview of earthen architecture and its applicability in the modern context. There was also a roundtable discussion between visiting experts and Algerian professors working in earthen construction. A two-day conference was given with lectures presented by international experts. The conference was held a second time in the southern Algerian town of Adrar from the 25th to the 26th of April, situating the festival's vision of heritage architecture and contemporary construction with local materials of this remote desert context.



*Algerian youth taking part in the Archi'Terre workshops*

Throughout the festival, the intricate and delicate aspect of the earth medium was shown to advantage through the beautiful artwork of Mohammed Arifi, the festival's Artist-in-Residence. A native of Timimoun, Algeria, his decorative pieces made with earthen plasters shows his deep





heritage in masonry, sculpture, decoration, and drawing.

Satprem was the Special Guest of the festival and facilitated the CSEB workshop and gave a special lecture on "25 Years Dedicated to Research, Development, and Promotion of Earthen Architecture". Lara led the Arches, Vaults, and Domes workshops with the assistance of five other facilitators. For the first time, this included two young professionals trained by CAPTerre, the Algerian Center for Earth Architecture based in Timimoun. ■



*Oasis Rouge in Timimoun, made from adobe and intricate earthen plasterwork*



*Ksar of Ighzer with a marabout (shrine) in the foreground*

*This year, after the conference in Adrar, the Ministry of Culture organized a trip for us to visit some of Algeria's unique architectural heritage built with earth in Adrar and Timimoun. The group visited the Ksar of Tamentit (near Adrar), the seat of CapTerre in Timimoun, the Ksar of Timimoun, and made a circuit tour of the cliff around the Sebkhha of Timimoun (including the Ksars of Badriane, Ighzer Feraoun, Tindjelet). ■*

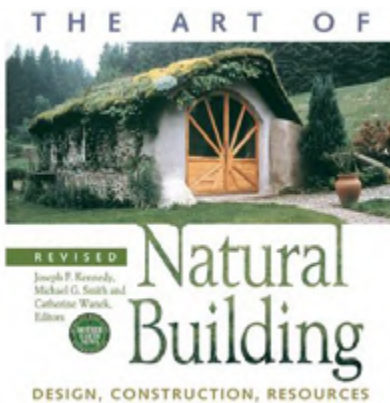


*Inside the hospital of Adrar, made from adobe in 1949*

**New AVEI Book Chapter**

The second edition of *The Art of Natural Building*, edited by Joseph F. Kennedy, Michael G. Smith, and Catherine Wanek, recently went to press. This Earth Institute was pleased to have the opportunity to update and significantly expand its contribution in this book. Satprem and Hilary co-authored the revised chapter, "Building with Earth in Auroville". This comprehensive book contains sixty four articles from worldwide experts in various techniques of natural building. To see the book, visit:

[www.newsociety.com/](http://www.newsociety.com/) ■



**Visitors**

A group of 14 students from the University of Texas at Austin, School of Architecture, visited the Earth Institute for a one-day Awareness Program on the 16th

March. The group was led by Coleman Coker, who is the Ruth Carter Stevenson Regents Chair in the Art of Architecture at UT Austin and principal architect of buildingstudio. A special course was organized on CSEB production and construction with the use of the Auram Press 3000, addressing constraints related to local materials, climate, and sociological factors in earthen construction.

The group has been working on the design of a school for Dalit villagers outside of Tiruvannamalai, in partnership with Mr. Gautama Prabu Naggapan of VIHARA, Venerable Pannavati-Karuna (Chairman of the Treasure Human Life Foundation), Prisca Weems (Principle architect of FutureProof New Orleans), and local Auroville architect Sonali Phadnis. The Dalit school design has been based on AVEI's CSEB system for walls and ferrocement panel system for roofs, and involves villager participation in the production of CSEB.

"Poetics of Building" is a design-build program for advanced design students, which fosters critical thinking through the hands, community engagement, and multi-disciplinary applied research. The studio aims to improve the resilience and adaptability of buildings, communities, and local environmental habitats.

[www.poeticsofbuilding.com](http://www.poeticsofbuilding.com)  
[www.futureproofsustainability.com](http://www.futureproofsustainability.com)  
[www.pannavati.org](http://www.pannavati.org) ■

**CRAterre Presentation**

During Satprem and Lara's visit to France, Satprem gave his lecture on "25 Years Dedicated to Research, Development, and Promotion of Earthen Architecture" to faculty and post-master degree students at CRAterre (International Centre on Earthen Architecture), at the National Superior School of Architecture in Grenoble (ENSAG). CRAterre is the global leader of scientific research in earthen architecture and the seat of the UNESCO Chair of Earthen Architecture. Satprem is an alumnus of the CRAterre earth architecture post-graduate program and retains close ties with the faculty and other alumni of the school.

This lecture was specially dedicated to a number of Satprem's most instrumental early teachers: Prof. Michel Paulin from Ecole d'Architecture de Lyon and Hugo Houben, Patrice Doat, and Hubert Guillaud from CRAterre.

[www.craterre.org](http://www.craterre.org) ■





**1st "Earth & Bamboo" Workshop**

*Earth and bamboo are two materials which have been used together for a wide range of traditional construction techniques in Southeast Asia. Both materials are locally abundant and affordable materials with a very low carbon footprint. Both are known to be materials of the people. And both are materials which can be used for crude self-construction or with highly engineered precision. Are earth and bamboo only materials of the past, or are they also materials for the construction of a sustainable future?*

This May, the Earth Institute co-taught a new experience course entitled "Earth & Bamboo" with the Auroville Bamboo Centre. Organized by the Auroville Green Practices Workshops, this workshop aims to initiate participants to a variety of earth- and bamboo-based building techniques



*"Sensitive analysis" of soils*



*Satprem demonstrating the cob technique*

through hands-on exercises. The first two days of the five-day workshop were spent at the Bamboo Centre, followed by two days at the Earth Institute, with a final day combining site visits and case studies of Auroville as a sustainable model for construction and community development.

During the two days at the Earth Institute, students were widely exposed to earthen building techniques, from the traditional to the modern. Participants had an introduction lecture on tradition and modernity of earthen techniques and then they learned basic principles of soil identification. This was followed by hands-on sessions with traditional raw earth and modern stabilized earth techniques: block production of sun-dried adobe & CSEB, construction of earthen walls with raw rammed earth, cob, and CSEB, and construction of arches with CSEB.

The Earth Institute, the Bamboo Centre and Auroville Green Practices plan to offer this course three more times this year. To find out more information, please see the following website:

[www.agpworkshops.com](http://www.agpworkshops.com) ■



*Learning to make sun-dried adobes*

**New Team Member**

The Earth Institute has welcomed a new member to the team.

**Ram**

I'm an architect who graduated in 2014 from MITS Gwalior (Madhya Pradesh). My interests lie in developing new ideas in design, materials, and spaces. Recently, I completed my own renovation and interior project. But after completing the project, I realized that there are so many things I have yet to learn.

That is why I came to Auroville and joined the Earth Institute. Because Earth Institute works on all things: design, structure, sustainability, and research.

I will be working at AVEI for one year. I would like to stay for more than one year in Auroville to experience different aspects of sustainable living. I am planning to do my Master's in Sustainable Design. So, I hope this experience will help me a lot to take a step forward toward sustainability. ■

**Recent AVEI Courses**

The Earth Institute gave a two-week training course on CSEB during the month of April. During the first week, from the 13th to the 18th of April, 32 students learned about CSEB production, including soil analysis, block composition, and block production using the Auram 3000 press. In the second week, from the 20th to the 25th of April, 29 students learned about CSEB masonry, with practical exercises on stabilized rammed earth foundations, walls, and small arches. Out of the 48 total students, there were 2 French, 1 Rwandan, 1 Brazilian, 1 Swiss, 1 Swedish, 1 Italian, 2 Germans, and 39 Indians. ■

The Earth Institute thanks **Sam Rodrigues** for spending over a year on the AVEI team. His diverse background and inquiring approach characterized his work on site and allowed him to tackle projects in the office such as the AutoCAD template with tenacity. ■

**AVEI Training Course Schedule for 2015**

July

6th to 11th: CSEB Design  
13th to 18th: CSEB Intensive  
20th to 25th: AVD Intensive

September

(Aug) 31st to 5th: CSEB Production  
7th to 12th: CSEB Masonry  
14th to 19th: AVD Theory  
21st to 26th: AVD Masonry

December

(Nov) 30th to 5th: Ferrocement  
7th to 12th: AVD Theory  
14th to 19th: AVD Masonry

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Editorial Team:  
Hilary D. Smith  
Lara K. Davis

Auroville Earth Institute  
Auroshilpam  
Auroville 605 101 T.N.  
India

Tel.: +91 (0) 413 - 262 3330  
/ 262 3064  
Fax: +91 (0) 413 - 262 2886

[www.earth-auroville.com](http://www.earth-auroville.com)

[info@earth-auroville.com](mailto:info@earth-auroville.com)  
[training@earth-auroville.com](mailto:training@earth-auroville.com)



*View from the Ksar of Ighzer, near Timimoun, Algeria*