AVEI NEWSLETTER

"Modern Earthen Houses: Building Tomorrow" Exhibition, at Musée des Confluences, Lyon

IN THIS ISSUE

Auroville Earth Institute
UNESCO CHAIR EARTHEN ARCHITECTURE

UNESCO unitwin CRAterre ENSAG

It has been conference season this summer, and we are pleased to report on two conferences that Satprem and Lara took part in: Terra 2016, the XIIth World Congress on Earth Architecture, in Lyon and Alternative Traditions in Roofing Systems in Delhi. The Terra 2016 conference brought to the forefront the important debate on the continued relevance of stabilized earth, particularly in the developing world.

The vaulted roofing theme continues with a contribution from a recent AVEI intern about the life and achievements of Anil Laul, whose work included funicular shells, as well as a review of Alfonso Ramirez Ponce's new book on the "Leaning Brick" technique.

The newsletter wraps up with a nod to some former AVEI construction projects recently showcased through case studies.

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

Terra Lyon 2016: Session on "Research, Experimentation, Innovation" ; Hugo Houben presenting

TERRA 2016 Lyon

Terra 2016 Lyon – the XIIth World Congress on Earthen Architecture was held from the 11th to the 14th July. The congress was hosted by the city of Lyon, proclaimed *"Capitale de la Terre"* by virtue of its rich constructive heritage in earthen building.

Experts from around the world presented papers in the three official conference languages – French, English, and Spanish – on the six principle themes of:

1. Heritage Inventories & Studies
2. Heritage Conservation & Management
3. Local Culture & Development
4. Research, Experimentation, Innovation
5. New Dynamics
6. Knowledge Transfer & Capacity Building

Satprem presented "Twenty Seven Years of Applied Research at AVEI" in a panel on the theme of "Research, Experimentation, Innovation", focusing his twelve-minute presentation on the Auram equipment, stabilized earth technologies, disaster resistance, and arches, vaults, and domes.

Lara presented on the final day of the congress in a session with the theme of "Knowledge Transfer & Capacity Building". Her presentation, entitled "AVEI School of Earthen Architecture", detailed the unique curriculum planned for the upcoming AVEI School that would bring together masons, technicians, and architects for joint educational programs, as well as the design for the school campus itself.

'Red thread' themes which ran throughout the congress include:
- The role of communities as guarantors of the continuity of constructive cultures (earth building traditions and cultural heritage).
- The need for scientific research to inform policymaking and community stakeholder involvement.
- The debate over the costs and benefits of stabilizing earth (see **p. 4** for an editorial on the subject of stabilization in the Indian context).

With representation from 70 countries – including ~140 presenters and ~700 participants – and a very high quality of scientific papers and discussions, the congress was an unequivocable success.

LYON 2016
CAPITALE DE
LA TERRE

Exhibition at the Musée de Confluences (note AVEI's Deepanam vault!)

We thank all the organizers who made this conference possible: main organizer CRAterre, under the aegis of the ICOMOS-ISCEAH International Scientific Committee on Earthen Architectural Heritage, in the framework of the UNESCO World Heritage Earthen Architecture Programme (WHEAP) and the UNESCO Chair "Earthen architecture, building cultures and sustainable development", and in collaboration with ENSAG/ Labex AE&CC, Les Grands Ateliers de l'Isle d'Abeau/amàco, ICOMOS France, Getty Conservation Institute, ICCROM, WMF, Escola Superior Gallaecia, Portugal, Facolta di architettura università di Cagliari, Italy, INSA de Lyon, ENTPE, LRMH, CSTB, ENSAL, Maison de l'Orient et de la Méditerranée, AsTerre and PROTERRA.

Numerous exhibitions and other events were concurrently offered for the conference attendees and the general public. These included an interactive exhibition called "Modern earthen houses: Building tomorrow", which challenged adults and children to consider the properties of raw earth and how individual grains of soil can be combined to build earthen structures. Another exhibition presented "Earthen Architecture of Today", while another introduced the public to the experts around the world, "Earthen architecture: Pioneers of modernity". In contrast, the exhibition "ArcheoTERRA" displayed the challenges of conserving archaeological sites with earthen buildings, with additionally, a 13-minute animated film describing the properties of soil.

An awards ceremony for the Terra award, the first worldwide prize for contemporary earthen architecture, was held on the final day.

A prototype building called "Terra Nostra" built by Team Auvergne-Rhône-Alpes, a group of students from several universities in the region, demonstrated innovative building techniques for modular and expandable earthen housing options.

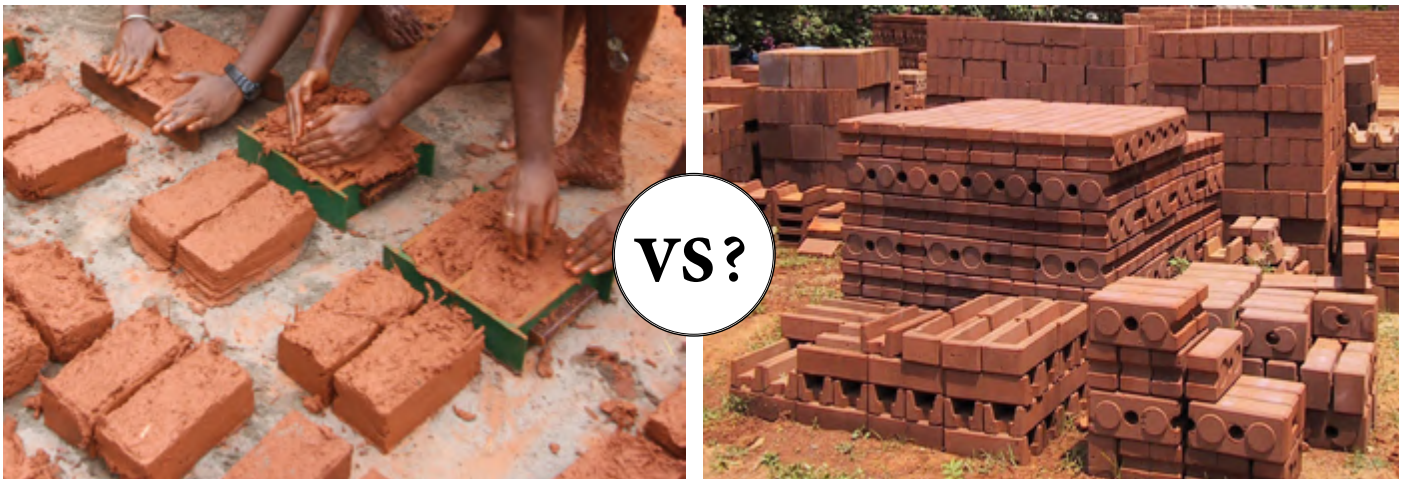
Conference attendees were also invited on guided and self-guided tours of historic and heritage buildings built with earth in the greater Lyon region. ■

terra2016.sciencesconf.org

terralyon2016.com

www.museedesconfluences.fr/en/events/modern-earthen-houses

terra-award.org



NO Stabilization (e.g. adobe) *Stabilization (e.g. Compressed Stabilized Earth Blocks)*

"To Stabilize or Not to Stabilize?" – That is the Question

An editorial by Lara Davis

One memorable – and very important – highlight from Terra 2016 is Henri Van Damme and Hugo Houben's presentation "Should raw earth be improved? An environmental look". This excellent study presented a cost-benefit evaluation of stabilized earth materials, investigating the relative gains in mechanical properties vs. the relative losses by virtue of increased embodied energy (from cement stabilizer).

The study concluded that the increase of mechanical strength achieved by adding stabilizer to certain techniques (such as adobe and rammed earth) was negligible and that its environmental cost was by comparison quite high. The only earth technique with sufficiently improved mechanical strength properties to justify stabilization is Compressed Stabilized Earth Blocks.

This begs the question: To stabilize or not to stabilize? This research reinforces in all of us working with earth the urgent need to move towards lower embodied energy applications – or away from stabilization at all, whenever possible. Ways forward include use of super-plasticizers to improve workability and reduce water content in earth mixes, geo-polymers, etc. But as a community we must be very cognizant of extremism, calls by raw earth builders to scratch stabilized earth off the list. Why? Let us look at how this "stabilization"/ "no stabilization" dialogue plays out in India:

A principle constraint in India is its monsoon climate. i.e. (TN):
- Cyclones, winds up to 155 km/h
- Max. rainfall per day: 260 mm
- Max. rainfall per hr: 90 mm

Yet while raw constructive traditions have existed in great numbers in India, both realities are part of a broader context of socio-economic development issues and major change overtaking the country.

China and India now stand at the forefront of rapidly developing countries and climbing – in fact, among the leading – global emissions. While this is mainly due to the extension of global corporations and the export of dirty emission production, many factors have influenced an unprecedented growth. Government housing projects in India are aiming at the greatest surges in development in recorded history (i.e. the government just released details of its new housing program of 4 crore houses – 40 million houses – in rural India in a 3 year period!). The traditional Indian village has already been going through a process of dramatic change since some years, influenced by one of the most enormous appetites for cement in the world. If we simply accept that all large-scale development in the country will be in concrete and country fired brick, we are accepting the inevitable surge of carbon emissions to reach a tipping point of global levels, beyond limits in which some climate experts describe the →

world as a viable, habitable planet (i.e. beyond the classic quota 2 degree temperature rise).

So – which way to go? To the extreme right: Do we make ourselves obsolete in the field of earthen architecture (because pro-raw earth European colleagues insist that stabilized earth is not earth)? To the extreme left: Do we make ourselves obsolete in India (as foreigners insisting that Indian villages go back to the way they were built 50 years ago)? Even if with the tidal forces of development in India, there *was* broad, grassroots level acceptance (which could not be further from the prevailing realities), there are other aspects we are overlooking:

Namely, the existence of scalable solutions in earthen construction, which are appropriate for the climate(s) of India (mostly monsoon climates), responsive of the demand of a socio-economic base, which have the hope of acceptance by government policy-makers, and which can be implemented by people (not only architects). The reality is that cement stabilization can be taught to people (with admitted difficulties at times); stabilization with lime, geo- or bio-polymers, etc. really cannot.

Secondly, most villages in India have already lost their traditional knowledge in earthen building.

Thirdly, can traditional village constructive systems (e.g. raw earth cob houses) scale to address the growing need and trend of urbanization, for peri-urban development? Even medium-rise raw earth solutions in such extreme monsoon climates have extreme technical challenges and cannot scale. True, there are a few rare examples in India, if they still exist. After doing one set of calculations for load-bearing requirements of a 2 and 3 story raw cob house, I cannot believe that the government would ever allow this in codes or mainstream practice. I also cannot believe with the risk of monsoons that people will accept it at large.

No vernacular earth constructive systems have ever in fact attempted to build 4+ stories in Indian monsoon climates. Note that Yemen does not have monsoons. Does that mean India should not urbanize? Earth should have no role in strategic densification, even in rural villages?

At best, raw earth caters now only to a.) the poorest people, e.g. Dalits and other untouchable castes who have zero resources (not even permission to use soil to maintain their earth homes), and b.) to an economic elite class, who can afford the best quality roofing, paid maintenance staff, and full lime plaster on their raw earth walls.

Do we like this trend? – absolutely not. Is it hard for us to accept? – certainly. But villages have been moving away from raw earth construction for more than 3 decades, along with a massive lobby of global corporations and ignorance of post-disaster implementation agencies who have convinced village people that their homes are somehow unhygienic. Common people do not want the extensive weekly, monthly, and annual maintenance rituals so that their houses do not slowly fall apart in monsoon rains and storms (of ever greater intensity, some unprecedented, arguably influenced by climate change). For many, this is a liability of poverty which the culture at large is happy to move rapidly away from.

We encourage the continuation of village constructive cultures in whatever way we can. But who are we to say that Indian development *should* continue as it did in the traditional Indian village? This approach is totally out of touch with reality. Honestly, I don't really expect ardent raw earth architects to grasp this. Do they maintain raw earth homes in this climate?

The reality is that this is the exact same conversation that is playing out since the late 1980's in every climate change discussion involving the world's richest and the world's poorest countries; something like "the unfetter capitalism of the wealthiest nations made this mess, why should developing countries compromise on development to pay for it?"

If we cease to work with stabilized earth, we accept that almost all development in the foreseeable future will be done with exclusively concrete and →

1 Basic 50m² House (country fired brick): 16.55 tons CO_2 emissions
x 13.33 Million houses (Expected annual no. in Indian Gov't project)
= ~221 Million tons CO_2/year → Intolerable growth model.

1 Basic 50m² House (CSEB): ~1.86 tons CO_2 emissions
= ~11.3 % of this figure → Tolerable? No. But better than the first figure.

country fired brick (with the obvious impact on embodied energy and carbon footprint). If we accept some compromise in our preference to build with raw earth – in the interest of more viably scalable models – then we have the ever-so-slight possibility to reduce what will otherwise be an intolerable contribution to global carbon emissions.

We will obviously still continue to support initiatives to maintain vernacular raw earth knowledge where ever we can/ where they still exist; better even, to creatively appropriate and sensitively re-invent the vernacular. E.g. the Spiti community centre is a modest project which is making an impact in endemic development with an extraordinary traditional Tibetan raw rammed earth constructive culture, carried on by local Buddhist craftsmen.

We will keep searching for better solutions for sustainable and scalable stabilization methods. But if we have even the outside hope of mainstreaming CSEB or other cement-stabilized earth techniques (and impacting a market headed for un-countable metric tons of emissions annually), then that market/ that public will be more educated and receptive when better, more sustainable solutions do become available. I think that is precisely what stabilization has afforded the world… the broad expansion in the application of stabilized earth, until people grasp that it must be done better, without stabilization. I don't believe that CRAterre and other key institutions would have achieved as much without stabilizing.

We have to keep looking beyond ourselves – to see the bigger picture, and for us that means to understand the issues of development in our context, here in India. We know that the possibility to impact a huge explosion of construction (and huge plume of emissions) with a marginalized technology has risks. And we must accept that one of those risks means being ostracized and criticized by "pure earth" architects and builders. These are ethical questions we must ask ourselves and try to better understand. ■

Hunnarshala's Alternative Traditions in Roofing Systems

On the 21st July, "Alternative traditions in roofing systems – A consultation on shallow masonry domes" was held at India Habitat Centre, New Delhi. Organized by Hunnarshala Foundation and Building Materials & Technology Promotion Council (BMTPC), and supported by Development Alternatives (DA), the workshop was attended by many respected practitioners, academics and government figures (many of the "who's-who" of appropriate building technologies in India). The workshop was meant to investigate and discuss the local building tradition of shallow masonry domes in Haryana and Uttar Pradesh, called *'daant ki chat'*. The workshop included sessions on the history and context of shallow domes, structural performance, a discussion panel on contemporary practice with artisans, and a discussion on future directions.

The first session on history and artisanship of flat domes in north India, chaired by Zeenat Niazi of DA, was a very moving session addressing living craft, with precedent studies of flat domes by INTACH, as well as examples and basic method of construction in Muzaffarnagar by Hunnarshala. →

Traditional craftsmen participating in the consultation workshop

Flat domes older than 50-60 years (up to ~300 years) are examples which have stood the test of time against seismic issues by virtue of their massiveness (i.e. extremely thick walls and abutments). This dome typology is inspired from the past and also part of a living tradition. However, much has changed: reduction of wall thickness, introduction of ring-beams with very little steel, use of cement rather than lime-surkhi mortars for speed, casting technique for mortar rather than coursed masonry, much larger mortar joints, and addition of new materials for waterproofing. The participation of the Muzaffarnagar artisans was extremely valuable, on both a technical and a symbolic level.

During the session on structural performance of shallow domes, chaired by Prof. K.S. Jagadish (professor emeritus, IISc Bangalore), Prof. Yogandanda presented on the load testing he set up and supervised and Mahavir Acharya presented on Hunnarshala's efforts. This testing provides valuable data for the performance of these domes. Lara sat on the expert panel for this session, and summarized the work of MIT Civil Engineering researcher Samuel Wilson, whose thesis bridged a gap between masonry analysis, constructional issues affecting stability, environmental impact, cost, and impact on local economy. This led to a discussion on the key structural issues, namely: shape description of the dome, ring-beam reinforcement, lateral loading/ abutment displacement associated with foundation issues and/or seismic conditions. Wilson's work had presented a very good 1st order approximation of the performance of such domes in seismic conditions (i.e. for a 12' span, 9" rise dome, a ¾" displacement of the ring-beam could cause collapse). The expert panel agreed in general that it's clear the system could be advantageously built in Zones below Zone 4, but that further testing is required to implement anything in seismic zones.

For the final session on similar case studies in contemporary practice, Satprem lectured on best-practice in flat dome construction for multi-story buildings. He presented the key design elements of cloister domes at AVEI, describing the relationship of vault form and corresponding forces through graphical analysis, with extensive discussion on ring-beam design.

The workshop mobilized a lot of interest in further study of this typology. Sandeep Virmani, director of Hunnarshala, potential for the government to fund research and to streamline a process that could allow for validation of these domes. This could ensure better practice and safety standards, and possibly lead to better incorporation of compression structures in Indian building codes or in government housing schemes. The latter is particularly interesting for the *Pradhan Mantri Awaas Yojana-Gramin* housing program, which needs to learn a great deal from vernacular building traditions and constructive cultures to realize beneficiary-led construction with the intelligence and cultural value of traditional local architecture.

Sadly, missing from this gathering was Prof. Anil Laul of Anangpur Building Centre, leading expert on funicular shells. See **p. 8**

www.hunnarshala.org

www.hunnarshala.org/uploads/2/5/9/5/25955121/quarterly_hunnarshala_newsletter-issue_iv.pdf

Anil Laul Remembrance

By recent AVEI intern, ***Sarth Khare***

Prof. Anil Laul, a great proponent of low cost building technologies, passed away on the 5th of July 2016. He practised for over forty years and was also a member and advisor to Indian National Trust for Art and Culture (INTACH), Delhi Urban Arts Commission (DUAC), Housing and Urban Development Corporation (HUDCO) and many other esteemed organizations.

Prof. Laul was the founder of the Anangpur Building Centre and Academy for Sustainable Habitat Research and Action (ASHRA), in Faridabad, a centre for the diffusion of knowledge in appropriate building technology and sustainable planning strategies.

His work epitomized his experimental attitude toward building material technologies and his constant endeavours to incorporate social, economic, environmental and cultural aspects into design. Prof. Laul advocated that a building should be simple, economical and affordable by all. He criticized the various green building ratings, labelling them as mere fads. He also pointed out that the real problem was the shortage of industrially processed materials and the failure of professionals to use alternatives instead. A few of his well-known projects are Jaunapur Slum Resettlement in Delhi, Deepalaya

© *Anangpur Building Centre*

School, Anangpur Building Centre and Residence, Katha School for Slum Children, Lucknow Housing Uttar Pradesh, Jhalawar Housing in Rajasthan, Prince Ashokraje Gaekwad Pre-school in Gujarat, Bhartiyam Gram in Delhi, Bhoomiheen Camp in Delhi. Prof. Laul is also widely known for his books titled 'Threads of Sustainability' (2005) and 'Green is Red' (2013).

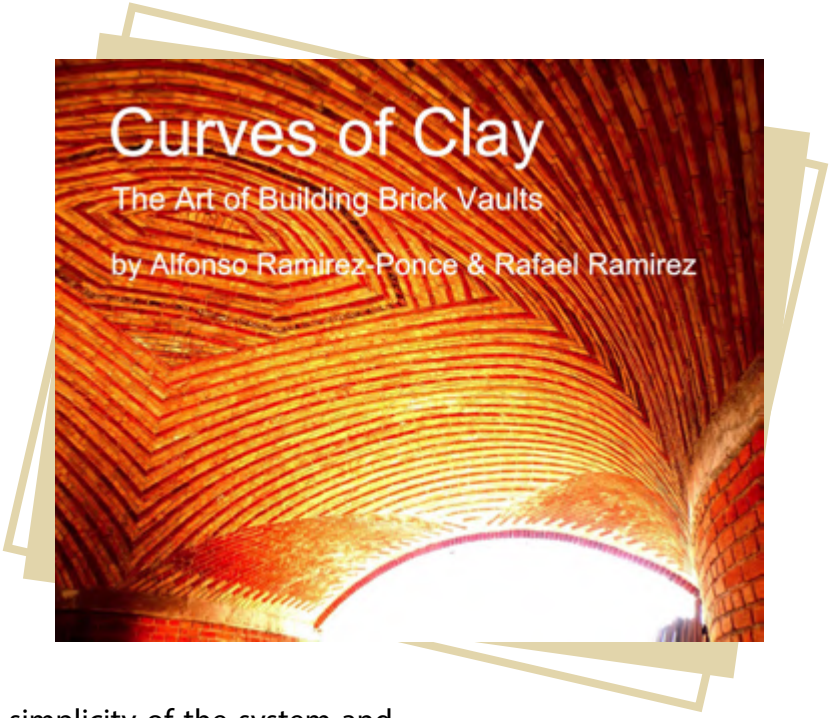
He developed "Surface Engineered Blocks" for non-load bearing walls where crushing strength is less critical. These compressed blocks are made using mud, paper-mache or even rice husk and may have a hollow core for electrical conduits and pipes. These are then covered on the sides with an impermeable, non-erodible finish using rich cement slurry. These finishes contain PVC chips or waste materials like stone or broken ceramic tiles on the surface to protect from weathering. Prof. Laul encouraged these finishes to be aesthetically designed and hence also created the opportunity to incorporate the work of an artist, an artisan, an architect and an engineer into creating something unique and beautiful.

His work on steel welded truss members in A-Frame structures, as a substitute for timber slope roofing, has been adopted in many areas due to scarcity of timber. His work with Funicular shells for roofing, which follow the concept of a flat arch, eliminates the use of RCC roof and saves on steel reinforcement. This technique also encourages the use of waste materials for roofing in aesthetically designed textures and patterns which further reduce the use of internal plaster. Simplifying joinery details for geodesic domes, he was able to reduce the high cost which also eventually helped in utilizing a roofing material over the geodesic dome.

Prof. Laul always encouraged that a building should respond to more than just client requirements and government regulations. An amiable mentor to generations of architects in India, his work in the field of low cost building technologies and sustainable habitat will inspire many more in the years to come. ■

www.anangpur.org

Hilary's Book Corner



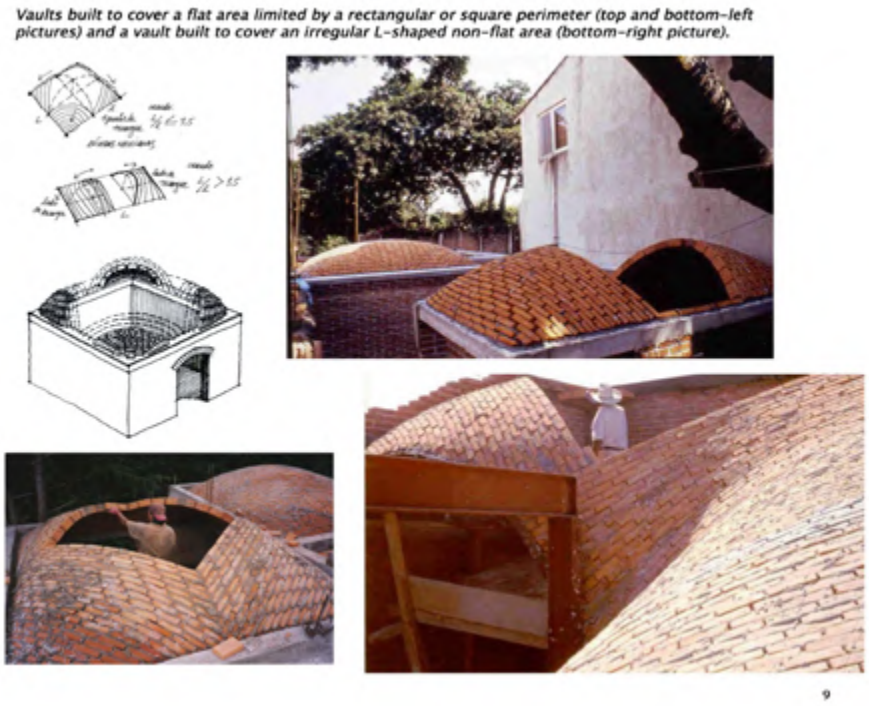
Mexican professor emeritus, vault builder and architect Alfonso Ramírez Ponce has published *Curves of Clay : the Art of Building Brick Vaults*, an introductory guide to the "Leaning Brick" masonry vaulting technique in conjunction with Rafael Ramírez Meléndez. Geared toward both architects and self-builders, this book endeavors to lay out the foundational concepts behind this building technique, which allows the builder to simply and economically build shelter with vaulted masonry without the use of scaffolding or other supports.

The book begins by covering the philosophical basis of this building technique, explaining the simplicity of the system and design guidelines required. This is followed by a photographic overview of various buildings using the leaning brick technique, inspiring the reader with intricate bond patterns, soaring ceilings, and spectacular interior spaces. The book concludes by detailing the calculations required to determine the vault surface area.

During Ponce's long career as a professor and educator, he has trained countless students throughout his native Mexico and the world with his philosophy of economical and sustainable building, which aims to bring to light the relevance of vernacular traditions in the modern day. The Earth Institute's co-director Lara Davis had regular exchange with Ponce during her years at MIT and ETH Zurich.

Curves of Clay is now available through Blurb for purchase in both print and digital form. ■

www.blurb.com/b/5088085-curves-of-clay



An excerpted page from Curves of Clay, *illustrating the transition from traditional vaults to freeform vaulted shapes*

NEW COURSE

Bioclimatic Earth

Design Workshop

31 October - 12 November 2016
Auroville Earth Institute

The immemorial tradition of building with earth proves the capacity of versatile earth construction techniques to adapt to varied bioclimatic regions. This two-week design workshop will reinvestigate earth architecture predominantly through environmental reasoning. During the first week, students will: 1- Be introduced to the characteristics of the different climatic zones. 2- Establish an understanding of the principles of bioclimatic architecture. 3- Study examples of vernacular earth architecture acclimated for environmental comfort. 4- Practice methods and use tools of weather analysis, establishing initial design guidelines for different environmental conditions. 5- Gain a basic understanding of a few environmental design simulation tools. Then, during the second week of the workshop, students will apply the gained theoretical knowledge and practical skills in a design project; a challenge to design examples of innovative earth architecture adapted to the environmental conditions of different regions. This intensive design workshop aims at providing designers with the knowledge needed to evoke their sensibility to simultaneously design with earth and with climate.

Conducted by Omar K. Rabie (SMArchS MIT, MSc AA)
With guest lectures and jury participation from Satprem Maïni (DSA CRAterre), Lara Davis (MArch MIT, ETH Zurich), and other Auroville architects.

Please contact **training@earth-auroville.com** for more information.

www.earth-auroville.com/bioclimatic_earth_en.php

Cold Temperate Hot&dry Warm&Humid

Tropical Building Case Studies

In the intervening year since the Expert Group Meeting on Economy & Energy Efficiency of Buildings in the Tropics organized by Auroville Consulting in conjunction with the French Environment and Energy Management Agency (ADEME) in February of 2015 (see **Newsletter Issue 21**), dialogs have continued between the collaborating organizations from India, Sri Lanka, Réunion (France), Vietnam, and Thailand. Auroville Consulting has provided the public with an informative platform at www.tropicalbuildings.org for the public with information about case studies of buildings in the tropical region, building codes and building rating systems, and other resources and tools for engineers and architects.

The Earth Institute has contributed two case studies of its housing projects, Vikas and Realization communities. These projects received positive feedback during the two expert group meetings held in May and June in Vietnam and La Réunion.

www.tropicalbuildings.org

TROPICAL BUILDINGS

New Team Members

The Earth Institute has welcomed two new and one returning team members!

Liju George

Liju George has returned to the Earth Institute in July as a junior architect. Liju, who is originally from Thrissur (Kerala) and who did his architecture studies at R.V.S. School of Architecture in Madurai, was previously an intern with the architecture department for six months from 2013-2014.

After finishing his B.Arch, Liju joined a firm in Bangalore, but the architectural style was not inspiring to him, and so he decided to return to the Earth Institute, where he had been so inspired by his work on the Spiti Community Centre, among other projects.

Now, Liju has begun helping with the service drawings for the Sharanam dormitory units.

Manikandan S.

Manikandan grew up close to Auroville in the village of Edayan Chavadi. After finishing Udavi School, an Auroville village outreach school, he began his B.E. in Civil Engineering at Dr. Paul's Engineering College, close to Tindivanam. During his studies, he did his final project on the structural design of a guest house and spent summers gaining experience in the field by working on construction with his father, a contractor with Auroville architect Dharmesh of Dustudio.

Now that his studies are finished, Manikandan has joined the Earth Institute team as a junior engineer and looks forward to gaining engineering experience in site supervision and calculations.

Shaghayegh Rajabzadeh

As an architect, I have always believed that construction should be regional with admiration for the environment and with consideration for low energy consumption materials and high efficiency structures.

Today we live in a time dominated by montage and industrial production; the craftsmen of days past have become the workers in industrial companies to produce prefabricated materials for which a lot of energy and budget are required to import them over long distances to the construction sites. Whereas thousands of years ago, in many parts of the world, masonry was the only solution for constructing stable structures, with the materials used strongly depending on the location.

Following my ideas on construction methods, I started my survey on masonry vaulting as a common element between oriental and occidental architecture and I accomplished my architectural →

doctorate thesis on masonry vaulting in contemporary architecture at the university Politecnico di Torino in Italy, where I developed a new digital tool to aid architects in their early design phase of free-form masonry vaults.

During my studies, I became familiar with Auroville Earth Institute and I found their activities to be good examples of constructing efficient buildings with local materials by local people.

I believe that my collaboration with Auroville Earth Institute will be a great opportunity for me to expand my knowledge not only of masonry techniques but also of social sustainability in the construction field, because I think masonry is the answer to today's requirements and problems. It is a cooperative method in which masons and craftsmen use their skills and meticulousness, aid each other, manipulate materials, and—with very simple tools such as trowels and shovels—build a complex structure. ■

Recent Training Courses

The Earth Institute conducted two weeks of AVD workshops in the month of June, followed by one week of CSEB Design. Thirty seven students participated in AVD Theory and AVD Masonry, composed primarily of Indian architecture students, but also including one French trainee. CSEB Design included 34 trainees with a larger mix of students and professionals from all over India, and one from Germany. ■

Vikas Community, one of AVEI's projects presented in the Tropical Buildings case studies
© Sarth Khare

AVEI Training Course Schedule for 2016

August
1st to 6th: CSEB Intensive
8th to 13th: AVD Intensive

September
5th to 10th: CSEB Production
12th to 17th: CSEB Masonry
19th to 24th: AVD Theory
26th to 1st (Oct): AVD Masonry

December
5th to 10th: CSEB Intensive
12th to 17th: AVD Theory
19th to 24th: AVD Masonry

AVEI Newsletter
Issue 29 - July 2016
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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

info@earth-auroville.com
training@earth-auroville.com