

# AVEI NEWSLETTER



Royal Palace of l'Almudaina, Mallorca - Fortified rammed earth structure clad in stone

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In the heat of this record-breaking summer, it has been a time of honoring accomplishments and developments. We are pleased to congratulate CRAterre's Patrice Doat on the recognition of his pedagogical oeuvre and to see AVEI alumnus Rosie Paul joining the CRAterre ranks as a DSA student.

Two noteworthy initiatives, the Auroville-based Sustainable Livelihood Institute and Spiti Projects from its support base in the UK, hosted special events to commemorate their activities.

The newsletter content counter-balances this reflective tone by also offering new informational resources in the way of a report on the safety of fly ash building materials and a review of two new books: the Earth Institute's own revised AVD manual and an INTACH publication on the history of Pondicherry under the French.

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

## Health Risks of Fly Ash in Building Materials

Fly ash has been in use in concrete and many other construction and consumer products since the casting of the Hoover Dam (USA) in the 1930's. It has become a common additive in the construction industry, principally in cement, concrete, gypsum wallboard and lightweight blocks such as Aerocon. Yet the US Environmental Protection Agency (EPA) has done nothing – until recently – to regulate or address the safety of this material.

### What Is Fly Ash?

Also known as Coal Ash or Coal Combustion Residuals (CCR), fly ash is a by-product of combustion from coal-fired power plants. Depending upon the source of the coal, its components vary considerably. All fly ash includes principally silica and burnt lime. It can also include a wide and varying range of highly toxic and carcinogenic trace elements such as arsenic, barium, cadmium, chromium, lead, mercury and selenium. Other sources show the high prevalence of radioactive isotopes in fly ash (Navroz). This industrial waste material is stored in wet and dry landfill storage ponds, and is also recycled into a wide range of products.

### “Beneficial Use”:

The EPA defines “beneficial use” of fly ash as recycled use which can “produce positive environmental, economic, and product benefits”, including “reduced use



Coal production creates the by product Fly Ash ( © stateofthenation2012.com)

of virgin resources, lower greenhouse gas emissions, reduced cost of coal ash disposal, and improved strength and durability of materials”. There are many technical arguments for engineered use of fly ash (e.g. improved mechanical performance of concrete). The environmental argument is that fly ash, as a “pozzolan”, can supplement cement in concrete, while providing a use for an otherwise super-abundant toxic landfill material. This has been challenged by independent experts, as the carbon footprint of fly ash is much higher than that of Portland cement. Some have even pointed out that the EPA’s qualification of “beneficial use” is used to “aggressively promote unregulated recycling” (HBN).

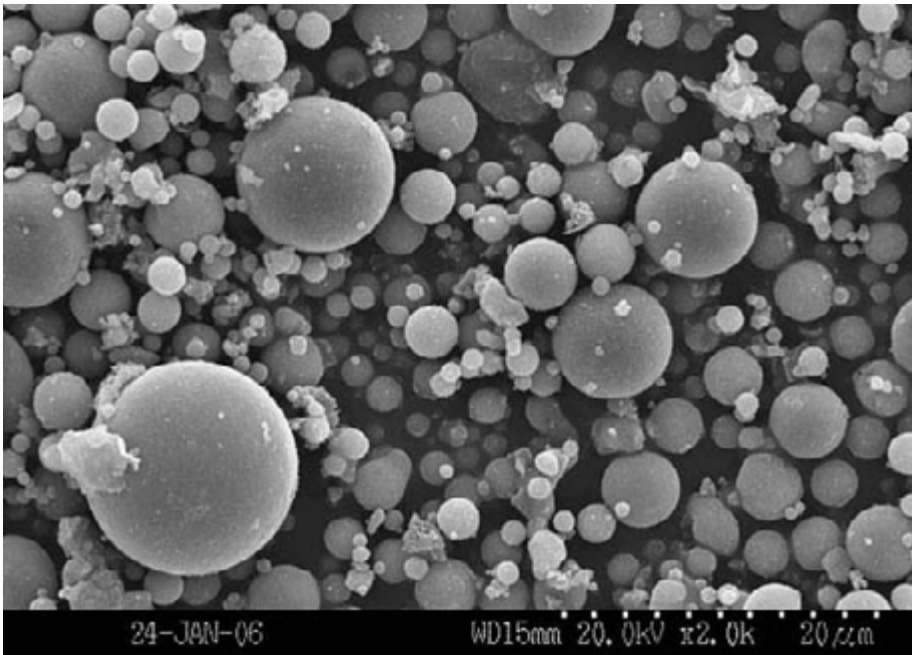
### Hazards for Environmental and Public Health:

Physicians for Social Responsibility & EarthJustice have produced an independent investigation, which is among the most detailed publications of the medical risks of toxins in fly ash. Pharos,

an independent organization advocating for transparency in consumer building products, lists known chemicals and elements in products along with the scientifically verified human/environmental health risks. It lists for fly ash:

**PERSISTENT BIO ACCUMULATIVE TOXICANT:**  
Very high (Polycyclic Aromatic Compounds)  
**CARCINOGENS:**  
High (Arsenic)  
**DEVELOPMENTAL TOXICANTS:**  
High (Lead)  
**REPRODUCTIVE TOXICANTS:**  
High (Lead)  
**GENETIC MUTAGENS:**  
High (Polycyclic Aromatic Compounds)  
**ACUTE AQUATIC TOXICANTS:**  
Very high (Polycyclic Aromatic Compounds)  
**ENDOCRINE DISRUPTORS:**  
Medium (Aluminum)  
**RESPIRATORY SENSITIZORS:**  
High (Cobalt)  
**MAMMALIAN TOXICANTS:**  
Very High (Bromine)  
**SKIN/ EYE IRRITANTS:**  
Very High (Bromine)  
**SKIN SENSITIZORS:**  
High (Mercury)  
**ORGAN TOXICANTS:**  
High (Cadmium)  
**CHRONIC AQUATIC TOXICANTS:**  
High (Arsenic)  
**ECOTOXINS (e.g. to terrestrial vertebrates):**  
High (Arsenic)  
**FLAMMABLES:**  
High (Aluminum)  
**REACTIVES (e.g. spontaneous combustion):**  
Very High (Magnesium)  
**EYE IRRITANTS:**  
High (Butoxypropanol)  
**NEUROTOXICANTS:**  
Potential concern (Manganese)





*Fly Ash at 2000x magnification (© Perkins+Will)*

### **Exposure:**

The EPA states that exposure may occur through various routes, including “ingestion, inhalation, or dermal contact,” and that the primary concern is “the potential for waste leachate to cause ground-water contamination.” The recommended methodologies for “risk evaluation” are extremely vague and inadequate. There is little published information about exposure routes from products that fly ash is recycled into. The question remains: How to determine risk??

### **“Encapsulated” Re-Use:**

“Unencapsulated use” is the re-use of fly ash in an unaltered form (e.g. fill, soil amendment, anti-skid material and blasting grit). Conversely, “encapsulated use” refers to the incorporation of fly ash in products that may “alter or provide long-term containment of hazardous contaminants” (e.g. filler or lightweight

aggregate in concrete, plastics, rubber, raw material in wallboard production) (PSR & EJ). It has been a common belief for many years that “encapsulated use” can prevent trace toxins and carcinogens from leaching out. However, there is little to no scientific research which justifies this (Perkins+Will).

### **Government Regulation & Corporate Interest:**

The EPA has historically supported the “beneficial” use of fly ash as “Sustainable Materials Management”. Nevertheless, its “Final Rule” (2014) lists it as a “Special Waste” subcategory of “Hazardous Waste”. As the Chesapeake Climate Action Network explains, “Coal ash, in EPA’s new leach tests, certainly behaves like a hazardous waste in terms of the deadly chemicals that leave the ash when exposed to water. In fact, EPA admits that for some coal ashes the levels of arsenic,

barium, chromium and selenium leached from the ash exceed hazardous waste standards—sometimes by 100s of times.” By the EPA’s own explanation, this decision was taken due to the concern of lobbies that “the stigma associated with regulating the disposal of CCR as a hazardous waste would “cripple” the current beneficial reuse market.” CCR landfills and surface impoundments are now more heavily regulated; however, “EPA is deferring its final decision” on re-use of fly ash in consumer products on account of “regulatory and technical uncertainties”. The energy industry currently benefits from the sale of fly ash as a marketed “green product”, whereas the safe storage and containment of fly ash is a multi-billion dollar liability.

The default ruling is that “encapsulated” use of fly ash should be safe. However, there is no evidence whatsoever that toxic trace elements are chemically neutralized in this form. There is also no consideration of construction, renovation and post demolition phases of a building. E.g. What about health of workers working with these materials, toxic dust in residential environments during renovations, or water tables once a building has been torn down and landfilled? Documented research addressing these concerns is non-existent.

As the debate begins worldwide about whether or not fly ash should be banned and/or how it can be safely regulated for use in building materials, etc., regula-



tion has been deemed by independent scientists as completely inadequate in the US. In India, there is virtually no research or regulation. As 65% of India's electricity is produced by coal (and growing fast!), this is an urgent question. 154 million tons of fly ash were produced in 2011-2012 alone and state governments already mandate fly ash inclusion in nearby cement manufacturing plants! Almost all cement on the local market has fly ash in it.

This material is not new, yet this debate now seems to present itself: whether encapsulated fly ash poses zero risk, or whether it poses such a hidden risk, on the order of the human health impact of asbestos and lead in buildings. Only extensive, unbiased research can treat this topic appropriately. ■

This abridged article on fly ash written by Lara Davis was previously published in the Green Column in the Auroville News & Notes, June 23rd (Earth Day). Please feel free to request the full technical report on this material from the Auroville Earth Institute:  
[lara.earth@gmail.com](mailto:lara.earth@gmail.com)



Green  
column

### Visit from Michel Paulin

In March, Michel and Madeleine Paulin came to India to visit the Earth Institute. Satprem's first professor in earthen architecture, and—along with Patrice Doat — among the most influential people in Satprem's early career, Michel has focused his pedagogy on integrating the professional educations of architects and engineers and developing in students better structural and constructional intuition. Michel was a key person responsible for the special dual-degree program taught at Ecole d'Architecture de Lyon, and was among the team of people responsible for "Les Grands Ateliers" in the Lyon region. He has published *Vocabulaire illustré de la construction (Illustrated vocabulary of construction): Français-Anglais*, an elegant illustrated dictionary of structural and constructive systems.

During their visit to Auroville, Michel and Madeleine also visited INTACH Pondicherry and had an excellent exchange with lead preservation architect, Ashok Panda, who has an immense knowledge of historical French construction.

[www.amazon.fr/Vocabulaire-illustré-construction-Michel-Paulin/](http://www.amazon.fr/Vocabulaire-illustré-construction-Michel-Paulin/)

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

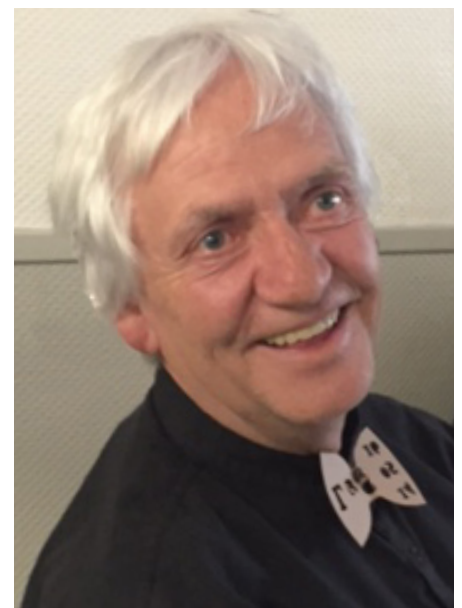
### Global Award for Sustainable Architecture to Patrice Doat

The Earth Institute is pleased to applaud CRAterre's Patrice Doat for being one of the 2016 recipients of the Global Award for Sustainable Architecture in recognition of his foundational role in the "Architecture and Constructive Cultures" program at the Ecole Nationale Supérieure d'Architecture de Grenoble (EN-SAG), where he dedicated over 30 years to teaching and mentoring young architecture students who came through the program, including the Earth Institute's own Satprem.

More about Patrice Doat and the award can be found at the following links:

[craterre.org/actualites](http://craterre.org/actualites)

[locus-foundation.org/](http://locus-foundation.org/) ■





Vault construction progressing on the Sharanam Phase II buildings

### Rural Development at Sri Aurobindo Society

The Sri Aurobindo Society (SAS), founded in 1960 by Mirra Alfassa (known as the Mother), is an important community activator in the Pondicherry region and throughout India and the world. Among its diverse actions in the fields of education, research, and development, it has spearheaded integral rural development through the Sri Aurobindo Rural & Village Actions & Movement (SARVAM). In the past decade, SARVAM has expanded from its inauguration in two villages in the Villupuram District to a broad zone of action with projects in education, health care, housing, and livelihood creation.

The philosophy of SARVAM is to provide a platform for integral village development incorporating internal vision and grassroots leadership, opportunities for ap-

propriate livelihood and infrastructure development, and an evolved social and spiritual consciousness.

A large step forward in this project has been the conception of Sharanam - Center for Sustainable Rural Transformation, for which the Earth Institute has taken on the design and construction of Phase II (see Issues **24 & 26**). Sharanam will be able to provide a dedicated space for the SAS activities, hosting training programs and leadership workshops.

[www.aurosociety.org/](http://www.aurosociety.org/)



**SRI AUROBINDO SOCIETY**  
Creating the Next Future

### Spiti Projects to the Forefront

Spiti Projects and the Eco-Community Centre are gaining more attention with a recent article in UK monthly magazine *Geographical* about Joan Pollock, her discovery of the rampant poverty in the Spiti Valley, and the beginning of construction on the Eco-Community Centre in Kaza.

Additionally, the Royal Geographical Society hosted a screening of "Saving Spiti", a documentary about Spiti Projects produced by Hugh Purcell on 12th April. In conjunction with this film screening, the Royal Geographical Society also presented a month-long photo exhibition entitled "Spiti. A Himalayan Story", which brought together photos taken by Joan Pollock during her years of work in the Spiti region.

[geographical.co.uk/magazine/](http://geographical.co.uk/magazine/)

[www.rgs.org/WhatsOn/](http://www.rgs.org/WhatsOn/)

Sponsored by  
INDUS experiences

Spiti. A Himalayan Story

# SAVING SPITI

An outstanding documentary film about **Joan Pollock** and her work with the Spiti Projects Charity

**Tues 12 April 2016 at 7pm**  
at the  
**The Royal Geographical Society**  
1, Kensington Gore, London SW7 2AR

**Produced by HUGH PURCELL**  
Former Managing Editor of BBC Documentary Department.  
Hugh is a BAFTA award winner.

**photographed and edited by**  
Zena Merton MA  
One World award winner 2012

**Tickets £20.00. Under 16 £10 (Fund raising event for Spiti Projects Charity)**

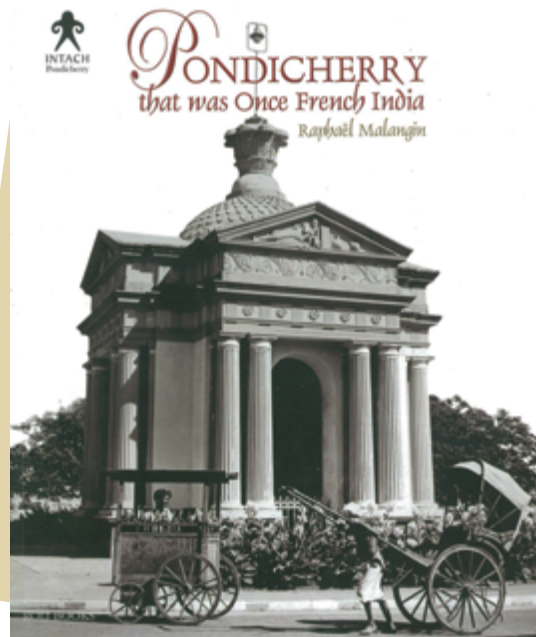
Available from:  
Suraya at Indus Experiences.  
t: 020 8901 7320 e: Suraya@indusexperiences.co.uk www.indusexperiences.co.uk  
Avana Harrow, 79 College Road, Harrow - HA1 1BD, UK

**Doors open at 6pm** with craft stall, raffle and photographic exhibition.

Spiti Projects Charity Registration No: 1105720 www.spiti.org

Hilary's Book Corner

Raphaël Malangin, historian and teacher at Pondicherry's Lycée Français, has teamed up with the Pondicherry chapter of INTACH (the Indian National Trust for Art and Cultural Heritage) to publish *Pondicherry: that was once French India*, a comprehensive study of Pondicherry's history under the French. By combining thematic chapters with relevant illustrations, maps, and contemporary artifacts, the book depicts the early beginnings of this coastal town, the arrival of Europeans, the forces driving the French to develop Pondicherry and its other colonial territories in India, the tempestuous history it had as priorities and political power changed.



But most especially from an architectural perspective, this book helps to elucidate the particular architecture of Pondicherry, created by a mixture of climatic necessity, geographical constraints, cultural preferences, racial segregation,

and repeated war and destruction. The evolving contemporary maps of the Pondicherry settlement show how buildings sprung up and fell to ruin as the community expanded, but also faced economic hardship and military attacks. Diagrams of houses from the European "White Town" and the Indian "Black Town" show how differently houses would be built depending upon the social expectations and cultural needs of the inhabitants as well as the geographical location within the settlement.

Closing with a short section on modern-day Pondicherry, this book does a valiant job at encapsulating the convoluted and complex history and diverse characters who contributed to the reality of Pondicherry today.

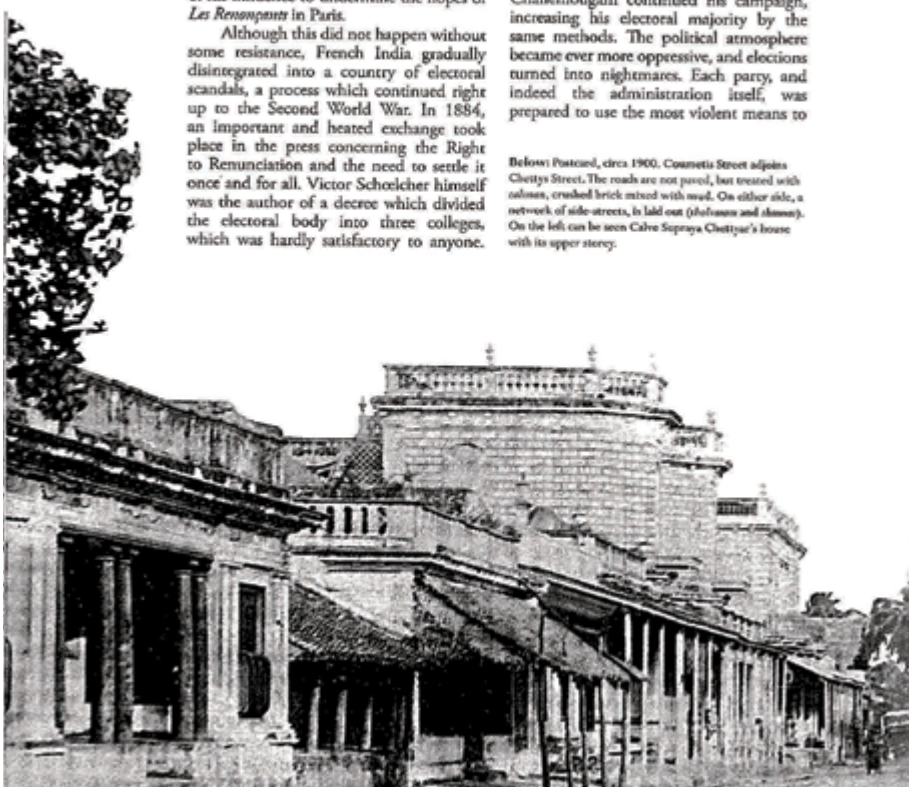
This book can be found on [Amazon.in](https://www.amazon.in).

of his influence to undermine the hopes of *Les Remparts* in Paris.

Although this did not happen without some resistance, French India gradually disintegrated into a country of electoral scandals, a process which continued right up to the Second World War. In 1884, an important and heated exchange took place in the press concerning the Right to Renunciation and the need to settle it once and for all. Victor Schoeicher himself was the author of a decree which divided the electoral body into three colleges, which was hardly satisfactory to anyone.

Chanemougam continued his campaign, increasing his electoral majority by the same methods. The political atmosphere became ever more oppressive, and elections turned into nightmares. Each party, and indeed the administration itself, was prepared to use the most violent means to

Below: Postcard, circa 1900. Cosmeite Street adjoins Chetty Street. The roads are not paved, but treated with caluses, crushed brick mixed with mud. On either side, a network of side-streets, is laid out (shades and slanes). On the left can be seen Calre Supraya Chetty's house with its upper storey.



**Workshop on  
“Housing for All (Rural)”**

Satprem and Lara were invited to participate in the National Workshop on “Housing for All (Rural)”, which was organized by the Ministry of Rural Development (MoRD), Government of India and held on the 13th of April in New Delhi. Reflecting the Government’s vision of providing “Housing for All by 2022”, the workshop announced the government approval for the launch of the Pradhan Mantri Awas Yojana (Gramin) (PMAY-G) housing program. PMAY-G aims to emphasize universal access to housing in rural areas, construction of quality, disaster resilient houses through a homeowner driven process, with the use of cost effective, appropriate and innovative construction technologies. The workshop was envisioned by MoRD to provide a common platform for stakeholders and experts in the field of rural housing for the exchange of views and ideas regarding implementation of the scheme.

Among the attendees was Kirtee Shah of KSA Design Planning, one of the most respected and committed activists and critics of government housing programs. Kirtee has continually argued that critical engagement from the community of socially motivated architects, engineers and planners is direly needed to improve such programs.

In Shah’s writing on Indira Aawas Yojana (IAY), he points out that it is the largest scale housing program in the world, yet that there are certain fundamental weaknesses in the ideological perspective of a housing welfare program. In emphasizing the accomplishments of housing programs, there is commonly a failure to acknowledge important prevailing realities: “It is seldom noticed that a large portion of the existing housing stock in rural India is self-built, self-managed and community financed.” He also notes that such programs typically lack an institutional approach to repair, up-gradation and extension of houses, “thereby ignoring a local tradition of maintaining the old housing stock”, which in fact encourages neglect of existing building stock and local traditions, in favor of the acquisition of “new houses” .

Kirtee would have us ask more deeply how housing programs interface with the culture of the Indian village, how they express sensitivity for local constructive techniques, cultural habitations patterns, and ways of living, how they reflect the climatic realities, and how they improve the *quality* of homes. He has argued persuasively that it is only by “internalizing the bottom up nature of the process” and putting the people in the centre of the process that a positive transformation of the rural housing sector can occur.

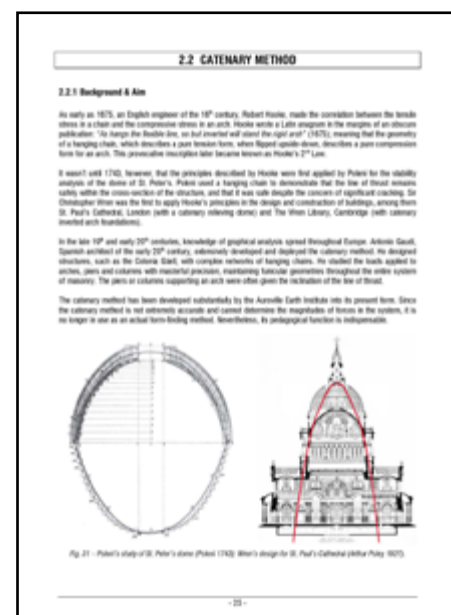
Shah 2013, “Indira Awas Yojana & the Rural Housing Scene in India” [www.ksadps.com/](http://www.ksadps.com/)

**Revised Edition of the  
AVD Manual**

The Earth Institute has published a new edition of its manual *Building with Arches, Vaults and Domes: Training manual for architects and engineers*. While periodic revisions have been incorporated into the manual over the years since its first publication in 2003, this new 2016 edition displays significant structural and content changes. Among the changes are substantial revisions to the texts, restructuring of chapters and annexes, more extensive explanations of terminology and formulas, additional figures and photographs, and expanded references in the bibliography.

If you would like to order this revised 2016 edition of *Building with Arches, Vaults and Domes*, write to:

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



## 1st Anniversary of the Sustainable Livelihood Institute

The Sustainable Livelihood Institute (SLI) celebrated its one-year anniversary on the 24th March. Located in Auroville, this collaborative effort between the Auroville Foundation and the Tamil Nadu government aims to promote the social and government infrastructures necessary for sustainable livelihoods in rural areas as well as to provide training to unskilled workers in appropriate and economically viable activities.

In this first year, the SLI has conducted 59 training courses with the result of equipping 816 rural community members and 140 government officials to initiate sustainable livelihoods within their communities.

[sli-av.blogspot.in/](http://sli-av.blogspot.in/) ■

## New Team Member

The Earth Institute has welcomed a new team member!

### **Deovrat Dwivedi**

"A house can have integrity, just like a person; and just as seldom."  
- **Howard Roark, Architect**

These words coming from the closest approximation to an ideal architect have been refueling my

energy supplies and inspiration for long and heavens know you need it. I am a Bachelor of Architecture, fourth year student from Indian Institute of Technology Roorkee, aiming to grasp the innate sensitivity to the built environment perfected with European precision and attention to detail.

This is an era of energy crisis and building designs must reflect it. Building technology today should be a comprehensive and intelligent thought process of the subconscious of the designer which inculcates energy efficiency (starting from the stage of material selection itself) as a spirit and not something appended to a building design for star rating agencies. Being in the process of evolving my design language I wish to do away the repercussions of the industrial revolution on building technology and seek low embodied energy materials for a start. I've had some past experience working with earth as a building material like cob, adobe, earth-crete, rammed earth, hemp-crete and now CSEB.

Auroville gave me the chance to explore and understand spaces. Not boxes. But actual habitable spaces those are fit and designed for the chunk of humans species living in the tropical climate. Auroville for me as an architect has been a monocle to look at the future though the past. And that is beautiful.

Those who find beautiful meanings in beautiful things are the

cultivated. For these there is hope. They are the elect to whom beautiful things mean only beauty... Those who find ugly meanings in beautiful things are corrupt without being charming. This is a fault. ■

## CRAterre DSA Program for Rosie Paul

Former Earth Institute head architect, Rosie Paul, will be joining the DSA program at CRAterre this coming school year. After three years at the Earth Institute, Rosie went on in 2012 to co-found an architectural studio called Masons Ink with another Earth Institute alumnus, Sridevi Changali, in Bangalore. Rosie is now taking this next important step toward earth architecture mastery and forging this new link between Indian earth builders and the experts in Grenoble.

Congratulations, Rosie! ■

## Recent Training Courses

The Earth Institute conducted two weeks of CSEB workshops in the month of April., with one week of CSEB Production and one week of CSEB Masonry. A total of 36 students participated, coming from all over India, but also Australia, Italy, France, the UK, Lebanon, and Nepal. ■





*A mixture of soils from guests from around the world for "Unity through the earth" at Satprem & Lara's wedding in Lyon, May 2016*

### **AVEI Training Course Schedule for 2016**

June

13th to 18th: AVD Theory  
20th to 25th: AVD Masonry  
27th to 2nd (July): CSEB Design

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**

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