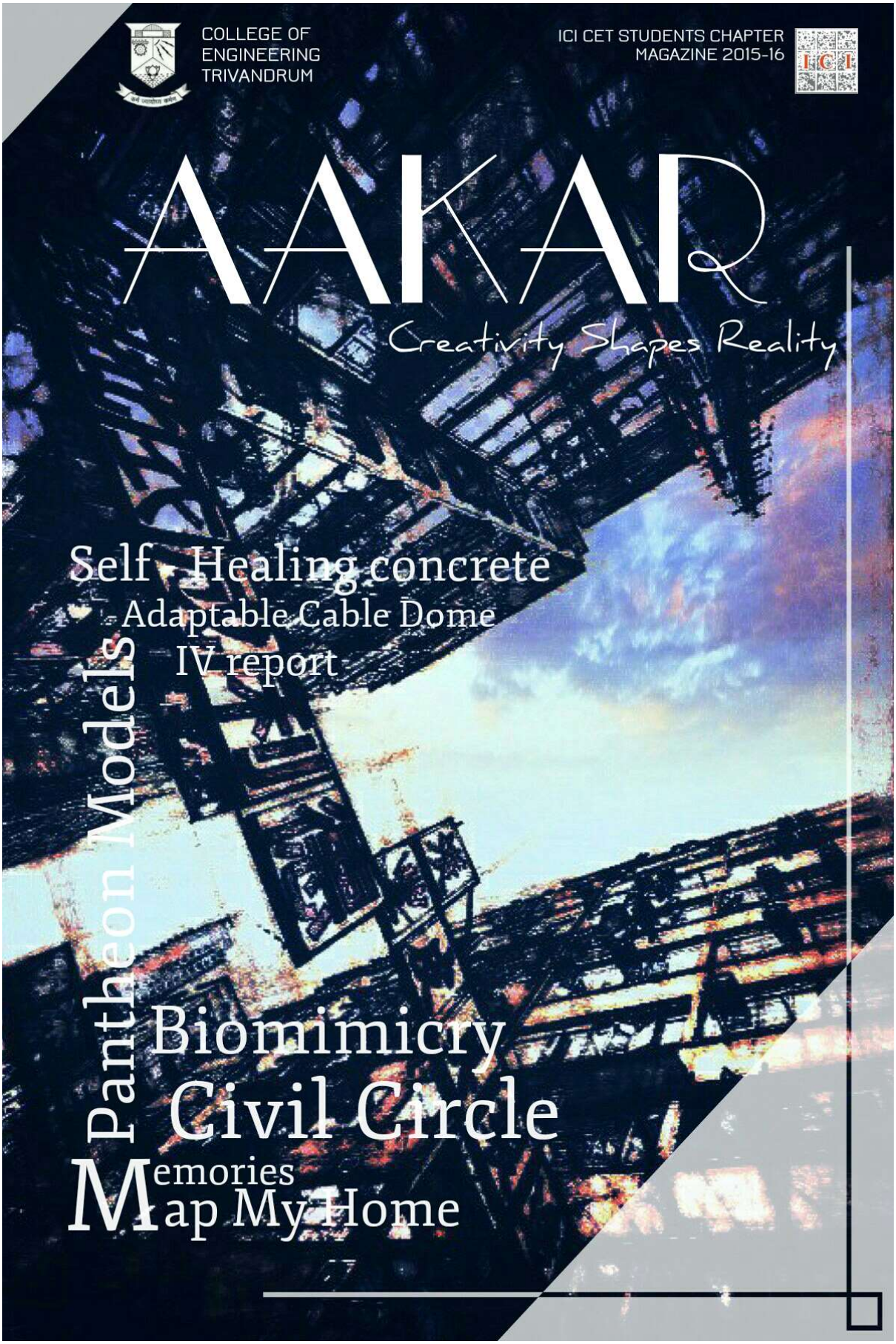
COLLEGE OF
ENGINEERING
TRIVANDRUM
ICI CET STUDENTS CHAPTER
MAGAZINE 2015-16
ICI
AAKAR
Creativity Shapes Reality
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PANTHEON

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ICI CET CHAPTER
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A REPORT ON THIS YEAR'S ACTIVITY BY ICI SECRETARY NIKHIL R V

The ICI CET Chapter was formed under the leadership of Dr. Ruby Abraham, on February 2013, with Kiran K as Secretary. The main objective was to develop leadership skills, practical tactics, and to inspire creative outlets through activities and competitions. ICI CET Chapter achieved most of its initial goals in the first two years itself under the leaderships of Kiran K and Manu Krishnan. Due to the success of previous years, the number of members this time reached as high as 276.

This year, Ruby Mam handed over the charges to Dr. Mini Soman and Prof.Biju V. The Chapter's this academic year's activity was inaugurated by Architect G.Shankar, HABITAT Group. He delivered a talk on Sustainable Construction and his experiences. Other talks included 'Introduction to Revit and STAAD in Civil Engineering' by Sri. Shiyas Shafi , and 'Role of Admixtures in Mix Design for Concrete' by Sri. Satya Kumar, BASF. Former CETIAN, Sri. D. Harikrishnan , IRS talked on 'Civil Services For Engineering Students' which was very inspirational to the students.

We were able to organize a few Industrial Visits as well, during this academic year. IVs were conducted to POABS M-Sand Unit, Aruvikkara Water Treatment Plant, Koodamkulam Nuclear Power Plant , Mathur Aqueduct , House Lifting at Manacaud , Science City Visit and Howrah Bridge.

This academic year we also conducted a few courses for ICI Students. This included a 20 hour training program on STAAD PRO and 4 sessions on "How to Face an Interview & Group Discussion" by Prof Abhilash Daniel, CET School of Management.

We also conducted competitions to improve the technical knowledge of ICI Students. This included 'Get Me a Job', Paper Presentation, Innovative Articles, Quiz Competition and Exhibition.

Annual Inter College National Festival PANTHEON 2016, conducted on March 18, was a grand success and received a total participation of over 350 students from various colleges all over South India. The events included Best Engineer, Tech Hunt, Situation Management and Paper Presentation. We also conducted two workshops: Mix Design using Admixture and STAAD Workshop on the same day. The online exhibition event conducted as a build up for Pantheon was also a great success. Prizes worth 52 K were distributed during the closing ceremony which was attended by Shri. Mir Mohammad, IAS and various other ICI and college dignitaries' .The event helped in building organizational skills in students. A Charity event was also conducted as a part of Pantheon 2016.

Due to the outstanding performance by ICI CET Chapter during the last year, we were nominated for best ICI Students Chapter. Unfortunately after a close contest we lost the grand prize to another chapter but we were awarded with 'ICI Special Appreciation Award For Best Emerging Students Chapter' at ICI Annual Meet held in Kolkata.

We initially planned a lot of events for this academic year, but due to some unfortunate incidents in college we had to limit our activities. I thank, ICI Staff Coordinators Mini Mam and Biju Sir, who supported us in all matters and put forward their valuable suggestion for the smooth conduct of various activities. I thank all my fellow ICI office bearers and ICI members for their valuable support they gave me.

I wish all the success for my juniors for the successful run of ICI CET Chapter and for getting it to reach new heights.

Memories……

DIVYA CHANDRAN

S8

I am not sure whether this is the right kind of article to be written for a technical magazine. But being a final year student, somewhere I felt that, this is probably the last chance I would get to share the memories of our journey with ICI. So, I decided to write a non technical article for the technical magazine AAKAR.

The first year of our college was mostly like an extension of school days. Apart from a few happenings here and there, it was just a boring fight with ten subjects. But third semester introduced us to something very fresh, full of energy and with new ideas. That was the 'ICI CET STUDENT CHAPTER'. We heard this name for the first time probably from Alex, who was the main chord that connected us with the ICI team in those days. He explained in detail about ICI and asked us to take membership. Credits to his marketing skills, at least three-fourth of our class joined the chapter, without even knowing exactly what was awaiting us next. I don't know whether it was the monotony of first year or the infectious energy imparted by ICI, it didn't take much time for us to get interested and involved in its activities.

Industrial visits, technical competitions, workshops, and talks and so on, we made sure our participation in each and every event possible. Industrial visits were opportunities to see and experience in real what we mugged up from text books. Even when we were just second years and the youngest members of the chapter, there was never a point of hesitation in making a try in every competition conducted by ICI. We formed teams and prepared together, boosted each other's confidence, and even challenged our friends with filmy dialogues on a funny note. For us winning was never a question. We enjoyed even the mere participation to the fullest.

When we were in third year, the idea of conducting the technical fest, 'PANTHEON', came up. There were doubts initially, since it was the first technical fest conducted by ICI. But the enthusiasm and confidence shown by Ruby madam and our seniors were enough to drive away all the fears. Alongside our seniors and juniors, we also made each and every possible effort to make the event a success. I remember the way my friends worked day and night painting the walls, preparing models for expo and assisting the seniors. The huge response that we received for the fest, inspired us to conduct a second part of it this year. PANTHEON 2 was a different experience, since this time we had to do the duty of being seniors and give guidance to our juniors. The efforts didn't go in vain for we received an overwhelming response this time also.

ICI was like a little family functioning within the four walls of our department. But now, it has grown to this magnitude of being acknowledged on a national level. While receiving the best performance award, at Kolkata, we remembered the inspiration that we got from our

seniors, the relentless efforts of Ruby madam, the support we are still receiving from Mini madam and Biju sir and of course the hard work of each and every ICI member. For us, ICI was not just a technical organization. Truth is that ICI didn't confine itself to being one of those sorts. When it gave us chances to learn technical subjects, it equally gave us opportunities to know the life beyond engineering. Here we learned to face challenges, to work as a team, to shoulder responsibilities confidently… ICI taught us too many things that no soft skills training programme can ever accomplish. I don't know whether our college life would have been the same if ICI wasn't here. It was definitely a journey of fun and friendship. Now it's time to say good bye, but I am sure ICI will always have a special place in the memories of our college life.

History of the London Bridge - An unusual narrative for Arizona attractions

ABHIRAMI VASANTHAKUMAR

S4

How did the world-famous London Bridge come to make its unusual home in Arizona and become a top destination among Arizona attractions? The tale of how the bridge came to Lake Havasu City, began over 5,400 miles away in London, England.

The bridge's storied past includes previous structures that spanned the same section of the Thames River before the current bridge was built. The old London Bridge of nursery-rhyme fame was built by Peter of Colechurch between 1176 and 1209, replacing an earlier timber bridge. Due to uneven construction, the bridge required frequent repair. The bridge survived more than 600 years.

One of the more grisly periods of the bridge's history was at the southern gateway between 1305 and 1660, when it was customary to display the severed heads of traitors, impaled on pikes and dipped in tar to preserve them against the elements.

The head of William Wallace was the first to appear on the gate. Other famous heads on pikes included those of Jack Cade in 1450, Sir Thomas More and Bishop John Fisher in 1535, and Thomas Cromwell in 1540. A German visitor to London in 1598 counted over 30 heads on the bridge. The practice was finally stopped in 1660, following the Restoration of King Charles II.

By the end of the 18th century, it was apparent that the old London Bridge needed to be replaced. It was narrow and decrepit, and blocked river traffic. Designed in 1799 by Scottish engineer John Rennie, the new London Bridge was completed in 1831.

As time passed, the new bridge began sinking at the rate of an inch (3 cm) every eight years. By 1924, the east side of the bridge was some three to four inches (102 mm) lower than the west side. The bridge had not been designed to withstand 20th century automotive traffic.

In 1967, the Common Council of the City of London began to look for potential buyers for the London Bridge. Lake Havasu City founder and entrepreneur Robert P. McCulloch placed the winning bid of $2,460,000 on April 18, 1968.

McCulloch came by this figure by doubling the estimated cost of dismantling the structure, which was $1.2 million, bringing the price to $2.4 million. He then added on $60,000 – a thousand dollars for each year of his age at the time he estimated the bridge would be reconstructed in Arizona.

Each block was meticulously numbered before the bridge was disassembled. The blocks were then shipped overseas through the Panama Canal to California and trucked from Long Beach

to Arizona. Following reconstruction of the London Bridge, Lake Havasu City rededicated it in a ceremony on October 10, 1971. Since then, it has consistently remained a favorite among Arizona attractions, drawing in visitors from around the globe.

In addition to its popularity as an Arizona attraction, it's also a popular stroll for people on romantic getaways in Arizona.

The Lake Havasu City Visitor Center conducts a 90-minute walking tour of the London Bridge. Arizona tourists can see the strafing scars from WWII that mar the bridge's granite surface and stroll over sparkling Bridgewater Channel. The bridge is also a popular hangout for the Arizona boating crowd. You'll see all kinds of boats anchored in the shadow of this piece of history and icon among Arizona attractions.

MATRIMANDIR-MARVEL CRAFTED IN SHAPE OF DOME

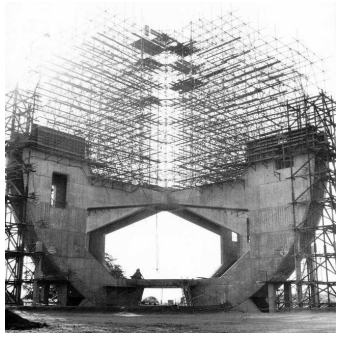
CHITHIRA

S6

Civil Engineering plays a subtle part in creating a new world. Every few minutes, ideas are being crafted in the minds of civil engineers and the architectural and structural outcomes succeed quite often. And one such marvel is the Matrimandir situated in Tamilnadu. It is an edifice of spiritual significance for practitioners of integral yoga, but for a civil engineer this crystal globe signifies the history in the technical aspect of the components used in the construction.

The Matrimandir is in the form of a huge sphere surrounded by twelve petals. The geodesic dome is covered by golden discs and reflects sunlight which gives the structure its characteristic radiance. Inside the dome is a meditation hall called the inner chamber, which contains the largest optically-perfect glass globe in the world.

The casting of the dome at Schott's in Mainz took fifteen hours and was done in a special form of refracting stone held together by seven metal bands, which was placed on top of a platform built of iron and steel. The dome with a diameter of 80-85m and weight 1100kg was then polished to test quality of glass and then delivered to its destination. The columns of the Matrimandir were 24-inch diameter, galvanised, seamless steel pipes, 8.64m long, weighing 830kg each. There is an average of fifteen coats of paint on each column with finer and finer sanding between coats after which the final polishing was done. There is 1415 number of discs made of stainless steel sheets. There are specifications for the focal length of the lenses used.


A new world is being carved by the civil engineers and this marvel is yet another example of technical skill and creative art work.

BIOMIMICRY IN STRUCTURAL ENGINEERING

ROSHNI CHANDRAN

S8

"When we look at what is truly sustainable, the only real model that has worked over long periods of time is the natural world."-Janine Benyus

Humans are clever, but without intending to, we have created massive sustainability problems for future generations. Fortunately, solutions to these global challenges are all around us. Biomimicry is an approach to innovation that seeks sustainable solutions to human challenges by emulating nature's time-tested patterns and strategies. The goal is to create products, processes, and policies—new ways of living—that are well-adapted to life on earth over the long haul. The core idea is that nature has already solved many of the problems we are grappling with. Animals, plants, and microbes are the consummate engineers. After billions of years of research and development, failures are fossils, and what surrounds us is the secret to survival. As its name suggests, (bios and mimicry coming from Greek meaning life and imitation respectively) the aim is to mimic nature in order to provide efficient solutions to engineering problems.

The science of biomimicry is considered to be relatively new. In fact, it has been applied for centuries—Daedalus, who tried to mimic a bird flying in order to escape from King Minos's island of Crete, is well known in Greek mythology. Before the industrial revolution and the development of applied mathematics and design codes for engineered structures, pioneering engineers and architects, such as Antoni Gaudi searched in nature to find model solutions for their work. In those days, the absence of heavy machinery and other fuel-powered resources forced practitioners of the building industry to base their designs on what was achievable for the given circumstances. This is precisely what natural models aim to do—use the available resources and materials to perform their function as minimum energy consumption systems. Later, the increased availability of fuel and technology side-lined biomimetic principles as these options seemed more expensive, at least in the short-term construction stage. Now that science and technology have reached a stage where the carbon-based economy needs

replacing, because of source depletion and awareness of its environmental hazard, stakeholders are calling for new methodologies that will minimise resource consumption provide cleaner power production and less environmentally impacting construction and manufacturing processes.

The use of biomimetic designs has been successfully applied to engineering challenges in disciplines such as materials science, fluid dynamics, computer science, and biomedical engineering, among others. Despite this demonstrated effectiveness in other engineering disciplines, biomimetic research and applications in structural engineering are scarce. There are, however, a handful of architectural designs that intentionally borrow from nature. The Eastgate Centre in Zimbabwe mimics *Macrotermesmichaelseni*(mound-building termites) nests by employing self-regulating heating and cooling systems through natural air circulation. Other examples of using biomimicry to heat and cool buildings include the 30 St Mary Axe building(nicknamed the "Gherkin") in London, which imitates the sponge Euplectella, and Singapore's Art Centre, which has a building envelope inspired by the way polar bear hairs regulate light and heat absorption. Apart from these existing structures there are many examples in nature that can be adopted for structures. For example in the case of bones maximum reinforcement is in the areas of higher level of stress, that is why they are thicker at ends. This principle can be adopted for column design. Similarly there are many examples in nature that can be used in structural design. So for a sustainable living, observe nature and get inspired from nature.

THE CIVIL CIRCLE

JASIN G BALAKRISHNAN

S8

It was the time when everyone in our department was thinking about what they were going to do during CETEX 2015. We, a group of six, Nidhin, Diljith, Malavika, Haneena, Ajay and I, wanted to do something which would leave a mark in our campus. When Nidhin came up with an idea for making something useful from the waste generated from civil engineering laboratories, we didn't have to think twice. That's how we decided to make a park bench in front of the busy and crowded Civil Canteen.

Civil Canteen is one of the most easily accessible recreational snack bars available in the college which is a place of interest to many students and teachers of different departments of the college. The premise of the civil canteen was devoid of any seating facility which is a very important issue for the users. The park bench constructed using concrete waste not only provided an outlet to make use of non biodegradable waste but also provided beautiful seating facility in front of the canteen near the parking space. It didn't disturb the nature as no trees or plants were harmed and also allowed students to feel the comforts of the shade the trees provided, as well as fresh air. The Park bench truly provided a solution to the problem as it satisfied the space and money constraints.

We first came up with a triangular design, but later we changed it to circular shape, since we found it more user friendly. The selected site was first cleared and bed concrete was placed. This concrete was made using old cement from concrete lab and tested aggregates from transportation lab. Tested concrete cubes and cylinders were taken and brought to site. Cubes were placed in position using mortar in the shape of a circle. The central table was made using cylinders. A circular granite piece was placed on its top. At the top of the bench a small layer of concrete was provided. Plastering and pointing were then done to obtain beautiful finish. We then painted the whole thing. This park bench we made was one of the main attractions of Cetex 2015.

All the objectives of the project were met by the hard work and enthusiasm shown by the students. The premises of the concrete and transportation lab became clean as the waste was taken and used for the work. The responses from both faculties and students were overwhelming. The bench was utilised by a lot of students within a few days. It also acted as a place to rest for the visitors of cetex-15 and attracted a lot of people. With the support from all cetians the park bench was named as "CIVIL CIRCLE" and was inaugurated by the principal. All these responses made sure that the civil circle was going to be one of the attractive spots of CET.








We felt so happy that we did something for our college. Whenever we find someone sitting in our civil circle, the joy and satisfaction we feel is beyond explanation. And now we often hear students say “we are at the civil circle”. For us, this wasn’t just a park bench. This was much more. This meant friendship to us. We felt very happy that many teachers supported us and wished us best luck. As we all wanted, we finally left a mark in our campus. A lot of wastes are generated from our labs today as well. It will be really good if our juniors could do something like this. I hope that in the coming future our bright civil engineering students will come up with such beautiful ideas to make our campus a better place.

GENERAL TIPS ON INTERIOR DÉCOR

P REVATHI

S8

1. **Paint smaller rooms in softer, lighter colors to help make the room feel larger**. Conversely, darker colors will make a room feel smaller. Even with the abundance of natural light and the strategic placement of the mirrors, a room in a darker shade would have a more boxed-in feel to it.
2. **Know how to arrange furniture on a rug.** There are basically three ways you can arrange furniture on your rug:
    a) **All on:** The rug is large enough to place all of the furniture legs on top of it. This creates a more luxurious feel. For this, bigger is better. Just be sure to leave at least 12 to 18 inches of floor surface on all four sides of the rug's borders.
    b) **All off:** If you have a small room, keeping all legs off the rug is a great cost-effective choice. The rug should appear as though it could touch the front legs of each of the seating pieces. This approach is best suited when you're layering a pattern over a larger solid or textured rug.
    c) **Front on:** Put just the front feet of all your seating pieces on the rug to tie the arrangement together visually and create a well-defined space while lending a feeling of openness.
3. **Hang artwork at the right height.** Galleries and museums hang artwork so that the midline (center) of each piece is 57 inches to 60 inches from the floor. (The average human eye level is 57 inches.) In a room where the ceilings soar, there might be a tendency to hang the art higher. But remember: It needs to relate to *human* scale, not the structure's scale.
4. **Don't drape curtains right above the window frame**. Curtains that run from floor to ceiling give the window in a small room a dramatic and spacious vibe. Often use two to three times the fabric in comparison to the width of a window.
5. **Don't push the furniture against the wall.** You will have a much more interesting space if you allow breathing room around your pieces of furniture. Allow the furniture to float in the room, away from the walls. This will help create a conversation grouping. Keeping chairs, sofas, and tables close to each other creates a more interesting and intimate setting.
6. **Do use color and texture.** Furniture, walls, and floors can benefit from a little something extra. Texture can make the dullest room turn into something exciting! The easiest way to add these are through fabrics - pillows, cushions etc. Accessories and picture frames are another simple way to bring in color.
7. **Don't paint first.** Most of us want to choose the paint color first. We want to have a freshly decorated room before we start bringing new furniture in. The problems arise when you try to match cushions and fabrics to your paint color. If your paint has been selected, it's much harder to find these items in the right shade. If however you buy

the fabrics and cushions first, then you have a virtually infinite choice of paint shades to choose from. You can always find a color to match a sofa, curtains, or a painting. Make your decision on curtains, carpet, and furniture first, and then choose your wall color.

8. **Do find a focal point.** Don't start decorating without knowing what your focal point is. A focal point is something you want to focus on and draw attention to. It should be interesting and attractive; it can be something that is already part of the architecture, such as fireplace or a window with an amazing view, or else something that you add, like artwork.
9. **Don't rely on overhead lighting.** While it's good to have, it doesn't offer enough lighting, and it's not particularly flattering. It's better to have a mix of accent, ambient and task lighting. Use table lamps, floor lamps etc. Just be sure to use a mix. It will provide more light as well as make the room and everyone in it look better.
    a) Ambient lighting: This is one of the most common types of lighting. Ambient light is a soft glow that blankets your space just enough for you to function without causing a harsh glare.
    b) Task lighting: This is a smaller more concentrated light. You want task lighting around when you're working. In fact, some people call it *office lighting*. Task lighting is meant to help you see when you're doing projects in which you need a finer light, such as, reading, cooking, writing, sewing and many other things. Task lighting only works well when it is used as a contrasting light.
    c) Accent lighting: This is a very concentrated light with the intention of drawing the eye to its focal point. Accent lighting is a way of adding style and drama to your home. This will help you illuminate the pieces you want on display, while shadowing dull areas. People use accenting for wall washing, artwork, bookcase displays, pieces of furniture, collections and the general architecture of their homes. Outdoor accent lighting is when you highlight parts of the architecture of your home or yard.
10. **Don't be timid.** People are often afraid to use bold colors in their houses because they think the shade might be too intense. Painting one or two walls a brilliant shade while leaving the others a softer color is a great way to be bold without overwhelming yourself.

    Be confident in following your own personal style. One of the most important things about your decorating job is that it connects to you and your family.

SELF HEALING CONCRETE OR BIOCONCRETE

ROHIT RAVIKUMAR

S4

For a civil engineer concrete is one of the backbone of the industry. It is the most widely produced and consumed material on earth other than water. It has been used from the Roman times when they build pantheon 2000 years ago, since then it has been used in many forms and different names. But concrete has never been more popular than today compared to the last century. Concrete is one of the most widely used materials in the world, but at some point, no matter how it is mixed, it will have cracks, shrinkage, deterioration and ultimately loss of strength.

This was a problem that needed urgent attention to. It was to this problem that a brilliant microbiologist Hendrik Jonker set his mind. Jonker compared the bones of a body to concrete of a structure, both of calcium origin. He theorized that if a cracked bone can repair itself through mineralization, cracked concrete can be repaired in a similar method. In a trial mix he mixed the concrete with limestone producing bacteria and a test specimen was made. In the specimen he found that any cracks that formed in the concrete were patched over within a week. For this invention, Jonker was a finalist for the European Inventor Award of 2015.

The bacteria, either Bacillus pseudofirmus or Sporosarcinapasteurii, are found naturally in highly alkaline lakes near volcanoes, and are able to survive for up to a staggering 200 years without oxygen or food. This guarantee the cracks free concrete for more than 20 decade. In the concrete specimen which had a crack of 0.2-0.8mm the bacteria gets activated when they come into contact with water that sweeped through the cracks. In order to keep the bacteria dormant until it is needed, it is placed in small, biodegradable capsules containing the nutrient. When the concrete cracks, and water enters the gaps, it comes into contact with the bacteria and the food source, setting the healing process off. The bacteria then feed on the

calcium lactate, joining the calcium with carbonate to form limestone, fixing the crack. The process has been proven to work effectively, and can even be added to a liquid that could then be sprayed onto existing buildings. This method however has less efficiency than the actual method. More tests are done to increase the repairing of cracks having more width. Researchers predict that in the future this technology can even heal the large potholes in concrete roads and pavement.

The problem however, as always is the price. It is currently twice the cost of traditional concrete. This is mainly due to the price of the calcium lactate. Since the costs involved for maintenance and repair of concrete structures are usually high, this self-healing concrete even though requires more capital, but in the long run they are the most economic choice. Self-healing of cracks in concrete would contribute to a longer service life of concrete structures and would make the material not only more durable but also more sustainable.

This method of making better concrete is a more feasible approach to sustainable building than shifting to an entirely new building material. One of the most important applications to this comes in vulnerable environments such as coastal communities or tropical regions that are increasingly experiencing extreme rainfall. It can also be use in urban highway infrastructure, where the use of de-icing salts is notoriously detrimental to concrete-paved roads. If they can sort out the pricing, then little would stop the incredible self-healing material from being used in bridges, tunnels, roads and other buildings, with the bacteria laying dormant for centuries and only 'coming to life' when needed!

ROTATING HOUSE

P REVATHI

S8

Perched high on the northern slop of Mt. Helix is the luxurious 5,300+ square foot home that rotates through 360 degrees displaying views from the Coronado Bridge, downtown San Diego, the Ocean north to La Jolla, Mission trails park and the Laguna Mountains.

This home is an example of the future of architecture ,"Kinetic Architecture". It is the only structure in the world that we know of, that is a fully functional rotating structure with all the utilities in the rotating portion (unlike the Space Needle and rotating bars located in some hotels) along with many other unique features.

MECHANISM OF ROTATION:

The second rotating floor rides on top of the 50' in diameter first floor on 40, 8" bearings that each have a 50,000 pound capacity, a main bearing in the center of the elevator shaft carries 1,364,000 pounds and the drive wheels (two 16" x 3" wheels) are in pillow block bearings that carry 150,000 pounds each - that's a 3,664,000 pound capacity, the second rotating floor weighs 600,000 pounds. It is driven by a 1.5 horse power DC motor, it takes .8 hp to start and .75 hp to run the house in either direction anywhere from one revolution in 33 minutes up to one revolution in 24 hours, it can rotate in either direction as many times as one would want (it doesn't have to unwind). The motor drives the drive wheels through a 1564 to 1 dual worm gear transmission very smoothly.

OTHER FEATURES:

The home has a stationary 600 sq. ft. basement and a stationary first floor with a garage that has turntables for two cars to turn 180 degrees so they never have to back out, it also has a rec. room, kitchenette, full bath and the entry, it is 2,100 square feet and has a central elevator (to be installed in 2011) that will serve as a front door to the main portion of the home. There is a patio and putting green off the first floor. The main structure is 80 feet in diameter, 5,100 square feet and rotates; it is 3,700 square feet of living space, 1,400 square feet of rotating deck and has a living-dining room, kitchen, great room, office, laundry, pantry, elevator equipment room, 3 bedrooms and 3 baths.

Equipped with state of the art technology, finger print locks, 4.8KW of photo voltaic panels, gas and electric tank less water heaters, computerized lighting system that can be operated from cell phones from anywhere in the world and a roof that can be flooded in case of fire or a Santa Ana condition (local warm weather condition) for extra insulation and then recycled into the gray water system to water the yard. The second rotating floor also has 1,200 square feet of fixed deck all with stunning views. The glass is all laminated glass that provides excellent security for the home. The outside over hang over the rotating deck varies from 5' to 10' and because the house turns it creates shade or sun for additional help with heat and cooling

ADAPTIVE CABLE DOME

MALAVIKA I MANOJ

S8

Since time immemorial, domes have been structures that fascinated human beings. Domes are curved structures that have no angles or corners and enclose an enormous amount of space without the use of a single column. Despite their thinness, domes are some of the strongest and stiffest structures in existence today. By virtue of this quality, they have been considered as the "the kings of all roofs".

The influence of dome structures in the imagination of mankind can be traced back to prehistoric period. Around 100 A.D, the Roman builders rotated an arch of a circle and discovered that it created a strong three-dimensional shape -the monolithic dome. It is believed that use of dome in India became widespread after the establishment of Turkish rule in the 13th century. Islamic rule over northern and central India brought with it the use of domes constructed with stone, brick and mortar. In the 1950s, a radical new design -the geodesic dome changed the way engineers looked at domes for the first time in 2,000 years. Invented by American engineer and architect Buckminster Fuller, the geodesic dome is a partial sphere shape structured from a series of triangles, rather than a series of arches. Advancements in mathematics, materials, and production techniques since then resulted in new dome types.

The cable dome was first proposed by Geiger and first employed in the roofs for the Olympic Gymnastics Hall and the Fencing Hall in Seoul. Due to their innovative forms and lightweight, cable domes have become popular as roofs for structures including arenas, stadiums and sport centers over the past two decades. The largest existing cable dome is the Georgia Dome designed for the Atlanta Olympics in 1996.

These lightweight, prestressed cable domes, composed of tensioned cables and compressed struts, offer economical and efficient structural solutions for large-span roof systems. Their implementation is very promising, especially in projects that require active or adaptive systems.

An active structure (also known as a smart or adaptive structure) is a mechanical structure with the ability to alter its configuration, form or properties in response to changes in the environment. The term active structure also refers to structures that, unlike traditional engineering structures (e.g. bridges, buildings), require constant motion and hence power input to remain stable. The advantage of active structures is that they can be far more massive than a traditional static structure: an example would be a space fountain, a building that reaches into orbit. The result of the activity is a structure more suited for the type and magnitude of the load it is carrying. A good example of an adaptive structure is the human body where the skeleton carries a wide range of loads and the muscles change its configuration to do so. An active structure consists of three integral components besides the load carrying part. They are the sensors, the processor and the actuators.

Cable domes are sensitive to asymmetric loads and changes in prestress. Adaptive cable systems equipped with sensors and actuators provide shape-control potential that adapts the structure to changing loads and environmental condition.

Cable domes can be used as large span roofs, especially in areas like stadiums and sports centers. Even without the use of active members, cable domes have been effectively used many a times. But they require constant monitoring to prevent the slackening of the cables. Use of active members and hence the adaption of the dome structure prevents the slackening of the cables. This in turn increases the serviceability and reliability characteristics of the dome. Adaptive cable domes have not yet been used except for research works. The main limitation of these domes is the high initial cost and requirement of electric power for the adaption process.

A Bridge for all occasions

-AISHWARYA H.

S6

Looking at the many models exhibited in Pantheon this year, my mind went back to the model we exhibited in our second year, 'The Government Bridge', Mississippi. A lot of hard work and turmoil had gone into it. Here's a short recap of the back-scene action, starting with a brief introduction to the real deal.

Govt. Bridge/arsenal bridge

The Govt bridge or arsenal bridge /Rock Island bridge, Mississippi is 1608 feet (490 m). Bridge that spans from Davenport, Iowa and Rock island Arsenal, Illinois. It is the first Govt Bridge to span the Missippi river. The current one is the 4th crossing. It is a slim deck structure that carries both rail (top level) and road traffic (bottom level).

For the first ever Pantheon, we had shortlisted our options to two, Government Bridge and Gateshead Millennium Bridge. We chucked the former, because it was a tilt bridge and the four of us-Drisya, Kanjana, Karthika and I were mechanical engineering retards.

We spent a lot of time researching the Govt. Bridge, Mississippi. At first glance, it seemed like a simple steel thread that stretched over 8 spans. But we were so wrong. There were 2 types of

trusses. The span consisted of two riveted Pratt trusses, five riveted Baltimore trusses and one pin connected Baltimore swing truss. Back then, we barely had an idea what “truss’ meant. The hardest part of among the model was making the truss. We used toothpicks wound together by tape. Then we tried making them stand using fevicol, instant failure was the result. We tried modelling clay. Failure repeated. Our last alternative was cyanoglue, the shadiest variant of glue in the market (it is called for God’s sake). Worked like a charm. Drisya had to glue the whole thing, because the rest of us were too scared to touch the glue.

Except for the toothpicks and the glue our entire model was made by recycling card board boxes lying around our homes. The modelling clay was used to cover up any flaw ranging from uneven edges to firming up the whole model.

The generator that was used for running the portion was recycled from our seniors serving bridge model. As a matter of fact we found the bases for the spans by picking through worn out models in the model room or attic. Aside from the cyano glue, our model was quite ecofriendly, now that I think about it.

Before assembling the parts, we had to paint it out. We did this at the LAC(Ladies Amenities Center). We painted the base, the supports, the gates and finally the trusses. The image is still vivid in my memory. Black acrylic dripping down onto the LAC floor. My team mates yelling at me to clean it up. Here’s my advice to anyone making models. Lay out newspapers on the floor so that you won’t have to mop up the paint afterwards.

All the components were painted and assembled. Our model was long, so we could only exhibit it on the platform floor.

I still remember Kanjana and Karthika sitting on the floor and pressing the switch and waiting for the bridge to swing. It took some time and cello tape to get it swinging.

From then on it was smooth sailing. Any time a group of students entered our room we’d make the bridge swing and they’d hover around us. The teachers were impressed too. They were generous with their compliments and advice.

We were runners up for best model in the exhibition. It was bittersweet moment for all of us. Bitter because we did not get the first place and sweet because our hard work had paid off.

Cetex came a few months later. The same team was busy with the innovative expo. But there were about 10 others who wanted to exhibit the govt, bridge again. The model was modified. Repainted, new gates added, new solid resting berths etc. added. The model however, had worn down quite a bit by the stagnancy in the Model room. It did not have its initial glory. That’s when we realised we had milked our bridge for all its worth. It was with a pang of sadness that we decided not to re-exhibit our bridge further. But I’ll continue to stretch this bridge of ours; be it in exhibitions or articles like this.

LITRACON

JERIN REJI KOSHY

S8

In today's developed world our built environment takes energy; energy to make the materials that go into the buildings, energy to construct them (Embodied energy) and energy to heat, cool & light them (Operating energy). The brightness of indoor environment is entirely maintained by artificial lighting, which has consumed a large number of resources. While the economic growth is a kind of extensive growth: high input, high consumption and high pollution, for that the energy saving technology is low, especially in developing countries like India. Moreover civil engineering structures always suffer from external environmental effects, economic loss and casualties are serious once damaged.

Nowadays, construction of energy saving and safer structures have attracted much attention. And the traditional image of concrete as something solid, heavy and monolithic is changing. Translucent concrete is a type of concrete material with light-transmissive properties**.** The idea of casting translucent concrete aims at reducing the operating energy by exploiting vast amount of potential energy in the form of sunlight. Another additional feature is its pleasing aesthetics that can change the image of the concrete which is generally perceived as dull, pale, opaque grey material. In 2001, the concept of transparent concrete is first put forward by Hungarian architect RonLosonzi, and the first transparent concrete block is successfully produced by mixing large amount of glass fibre into concrete in 2003, named as LiTraCon. LiTraCon ("light transmitting concrete") is a translucent concrete building material made of fine concrete embedded with 5% by weight of optical glass fibres. Litracon presents the concept of light transmitting concrete in the form of a widely applicable new building material. It can be used for interior or exterior walls, illuminated pavements or even in art or design objects. By impregnating the concrete with optical glass fibres, light can be transmitted from the outside in or inside out. This concrete has the same strength as regular concrete and will continue to transmit light through walls up to twenty meters (twenty-two feet) thick. A wall made of "LitraCon" has the strength of traditional concrete and an embedded array of glass fibres that can display a view of the outside world. Thousands of optical glass fibres form a matrix and run parallel to each other between the two main surfaces of every block. Shadows on the lighter side will appear with sharp outlines on the darker one. Even the colours remain the same. This special effect creates the general impression that the thickness and weight of a concrete wall will disappear. The hope is that the new material will transform the interior appearance of concrete buildings by making them feel light and airy rather than dark and heavy

ADVANTAGES OF TRANSLUCENT CONCRETE

This material presents innovative technical solutions, semi-natural and ecological, for the traditional construction problems allowing a wide area of applications in construction, architecture, decoration and even furniture.

Some of the possible applications for this new material are spread over several areas creating new

possibilities to various products such as:

1. Translucent concrete blocks suitable for floors, pavements and load-bearing walls.
2. Facades, interior wall cladding and dividing walls based on thin panels.
3. Partitions wall and it can be used where the sunlight does not reach properly.
4. In furniture for the decorative and aesthetic purpose.
5. Light fixtures.
6. Light sidewalks at night.
7. Increasing visibility in dark subway stations.
8. Lighting indoor fire escapes in the event of a power failure.
9. Illuminating speed bumps on roadways at night.

The Inca civilization in South America made use of rope bridges in the Andes Mountains before the Europeans colonized in the 1500's. These rope bridges spanned canyons and gorges, allowing easy access to otherwise difficult to reach areas. While they were strong and reliable, repairing the bridges was a dangerous job that often ended in death.

Ferrocement : relevance and properties

NEETHU N

S4

Ferro-cement is a relatively new construction material consists of wire meshes and cement mortar. It was developed by P.L.Nervi, an Italian architect in 1940. Ferro cement is widely used due to the low self weight, lack of skilled workers, no need of framework etc. Quality of ferro-cement works are assured because the components are manufactured on machinery set up and execution time at work site is less. Maintenance cost of ferro-cement is low. Ferro-cement construction has come into widespread use only in the last two decades.

What is Ferro-cement?

It is a type of thin reinforced concrete construction, in which large amount of small diameter wire meshes uniformly throughout the cross section. Mesh may be metal or suitable material. Instead of concrete, Portland cement mortar is used. Strength depends on two factors: quality of sand/cement mortar mix and quantity of reinforcing materials used.

Although discontinuously used on the market, ferrocement is a contemporary material of reinforced concrete. According to Shah's published works, the Lambot was the first small boat made of ferrocement in 1849. Incredibly, this boat was still afloat in 1949, that is to say a hundred years after it was constructed. Since then, it has been exhibited in the Brignoles Museum. Pier Luigi Nervi, who considered ferrocement as a boatbuilding material, started using it in Italy during the last century. He also built ships, due to the flexibility and exceptional resistance of this material. One of these ships called "Irene", had 165 ton of displacement and her hull had 1.38 inch (35 mm) of thickness. According to Nervi, the ship was 5% lighter and 40% cheaper than a similar hull made of wood. Nervi also builds a shed with a span of 321.64 feet (98 m) for the Turin Exhibition in 1949. This shed had 1.58 inch (40 mm) thickness ferrocement prefabricated ribbed assembled shells.

Properties of Ferrocement

The engineering properties of ferrocement structure are equivalent to normal concrete, and in some applications it performs better. The tensile strength of ferrocement is a result of the volume of reinforcement used in the structure. Apart from the volume of reinforcement, the direction of its use in line with the force direction and tensile stress direction is also important. The tensile performance of the ferrocement concrete or structure can be grouped into three, namely, the pre cracking phase, post cracking phase, and finally the post yielding phase. A ferrocement member subjected to upwards tensile stress behaves something like linear elastic material, until the first crack appears. Beyond this, the member will enter the multiple cracking and eventually continuing to a point where the mesh starts to experience yielding. Once at this stage the number of cracks will continue to grow with the increase in the tensile force or stress. The specific surface area of ferrocement member or element has been found to influence the first crack in tension, as well as the width of the cracks. The maximum stress at first crack for ferrocement matrix increases in proportion to the specific

area of the element. The behavior of ferrocement element under compression mainly depended on mix design properties. The well distributed and aligned reinforcement has made the ferrocement to behave like steel plates. Ferrocement is also has other outstanding properties besides its engineering properties compared to normal concrete. Ferrocement exhibits a very easy mold-ability characteristic, that it can be used to produce any desired shape of structure. Besides that due to superior tensile behavior and water tightness, the material is widely used for lightweight construction and water tight structure as well as for potable structure. Some of the successful application of ferrocement includes boat, sampan, pipes, shell roofs, wind tunnel, modular housing, sandwich pools, permanent form of concrete structure etc.

The world's largest office building by floor size is the Pentagon in Virginia, USA, with over half of its 6500000 square foot (604000 square metre) floor area used as offices.

INTERLINKING OF RIVER IN INDIA- IS IT A BOON OR A BANE?

NIKHIL R V

S8

Water is one of the principal elements which not only governs life on earth but also influences economic, industrial land agricultural growth of mankind. There is a general perception that with growing human population and rising standards of living, the available supplies of fresh water on the planet are becoming insufficient to meet the demand. India has a monsoon climate. Except for a small coastal area in the South, almost the entire rainfall occurs during three to four monsoon months. Thus cultivation during non-monsoon months is irrigation dependent. A characteristic of the monsoon climate is variability of rainfall from year to year. India has an average of one in five below-normal rainfall years. India is basically an agricultural country, and all its resources depend on agricultural output. In India, 55% of agricultural output is from irrigated lands. Moreover, average farm incomes have increased from 80-100%as a result of irrigation, while yields have doubled compared with those achieved under the former rain-fed conditions. Water will no longer be cheap and plentiful. It will be scarce, expensive to develop and maintain and valuable in use.

Keeping in mind the increasing demand for water, the government of India has developed a new National Water Policy which claims that water is a prime natural resource, a basic need and a precious national asset. India's National Water Development Agency (NWDA) has suggested the interlinking of rivers of the country. This proposal is better known as the Inter-River Linking Project (IRL). It is a mega project that engages money, resources, engineering, management and human understanding. It is designed to ease water shortages in western and southern India and aims to link 30 major rivers. It will also involve diverting the Ganges and the Brahmaputra – two of India's biggest rivers. It is estimated to cost US $ 123 billion (nearly 600000 crores of Indian Rupees) and, if completed, would be the single largest water development project anywhere in the world. It is expected that properly planned water resource development and management could alleviate poverty, improve the quality of life, and reduce regional disparities, better law and order situation and manage the integrity of the natural environment.

WHY INTERLINKING OF RIVERS?

The dense network of fluvial channels, both active and abandoned, numerous types of stagnant water bodies such as lakes and ponds of varying dimensions, characterizes Indian geomorphology. Their distribution is also varied in different parts of the country. The northern, north-central and eastern parts have mountainous topography and many glacially as well as ground water-fed rivers, that receive a major portion of SW monsoon, while the western India faces the water scarcity and peninsular part have mixed picture ofwater availability and scarcity. In India the distribution of rainfall is highly erratic and uneven over space and time. Out of the total annual precipitation, as much as 75% is received during the monsoon (June–September).

India currently stores only 30 days of rainfall, while developed nations strategically store 900 days worth of water demand in arid areas river basins and reservoirs. India's dam reservoirs store only 200 cubic meters per person. India also relies excessively on groundwater, which accounts for over 50 percent of irrigated area with 20 million tube wells installed. About 15 percent of India's food is being produced using rapidly depleting groundwater. The end of the era of massive expansion in groundwater use is going to demand greater reliance on surface water supply systems. Proponents of the project suggest India's water situation is already critical, and it needs sustainable development and management of surface water and groundwater usage

INTERLINKING RIVER PROJECTS

The National Perspective Plan envisions about 150 million acre feet (MAF) (185 billion cubic metres) of water storage along with building inter-links. These storages and the interlinks will add nearly 170 million acre feet of water for beneficial uses in India, enabling irrigation over an additional area of 35 million hectares, generation of 40,000 MW capacity hydro power, flood control and other benefits.

The National Perspective Plan comprised, starting 1980s, of two main components:

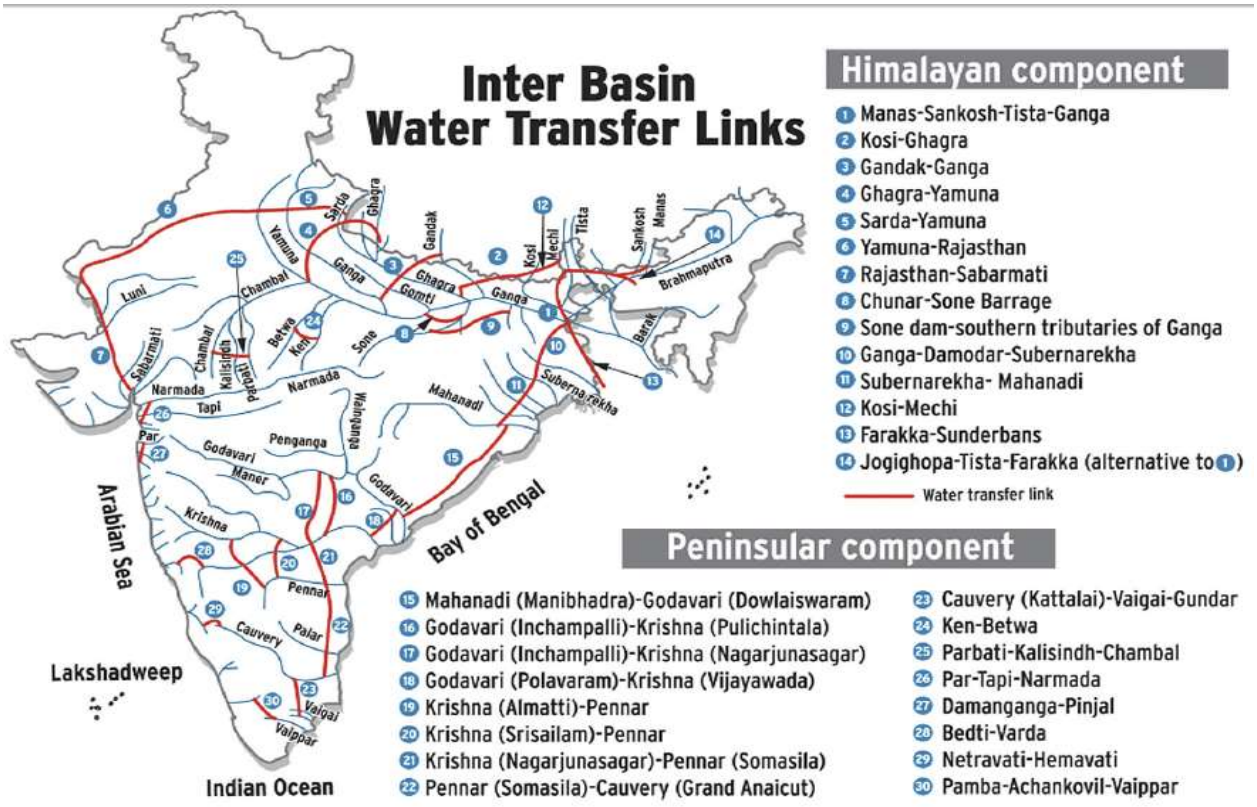
Himalayan Rivers Development, and

Peninsular Rivers Development

An intrastate component was added in 2005.

The inter-basin transfer project is to be funded mainly by the Government of India, international agencies and market borrowings. The interlinking of rivers, therefore, will bring

relief to utilize surplus water flow to water deficit regions in southern and western India, control twin problem of flood and drought, irrigate additional areas, help to produce additional food grain to cater to the needs of country's ever growing population and generate electricity to an otherwise energy starved country. However, inter-linking of rivers alone may not solve all the water related problems of the country. Some other ways to conserve water like rainwater harvesting, water reuse, watershed management and regulating the optimal exploitation of underground water resources need to be developed at a much faster rate and efficient way than what is existing today.



MAKING OF SOMETHING BIG

NANDU

S6

('Map My Home' is a pilot project by the Dept of Survey/Land records, Govt. of Kerala to record and upload the details of the various commercial, educational, financial and other miscellaneous establishments that function all over the state onto Google Maps. Participation by the student community is the most crucial element in this endeavour. Students of Dept. of Civil Engg., College of Engineering Trivandrum were their first partners in this process. This article illustrates the initial effort by the students.)

Well, to begin with, I don't know where to start. A prologue is necessary I guess. What made Map My Home Project (MMHP) a hit among third year civilions, well it's a question of doubt even now. Maybe everyone saw in it as door to break out of the oppression, mental agony and depression they were going through at that point of time or maybe it was the Google hash tag that created the buzz. Whatever be it, it's not the point of discussion here, but as far as I am concerned what made me interested in MMHP is two things. #1 my love for geography or may be my so called love for geography as I am down here studying civil engg. 3rd year and boasting about geography is not a fair deal. #2 the person who conveyed me the idea of MMHP.

So now for the time being let me recollect the series of things that had happened in October 2k15 that lead to the arising of MMHP, or should I saw the month which transformed the face of history (at least partly). When did it all happen? As far as I can recollect, it all began few days before the second series exam when a notice was read out class saying survey dept. needs enthusiastic students to help them with google maps survey. Everyone was like "what the …." "For google us? We?" Anyways the notice did have an effect. Fortunately or unfortunately, 50 odd people gave their names. There are times when being a good student counts, may be at least in theory, but as far I am concerned it worked for me. I got the ticket to meet Director of Survey. One among the 4 selected. Was that a turning point? Maybe, yes.

Coming to day one of MMHP. the day Map My Home was born. As usual series exams are a hurdle when something new comes. So the birth date of MMHP also got postponed to 12-10-2015 due to our series exams. And even that day morning, I was clueless on what it is all about and of course when you are oddly curious about something, you tend to be all excited

when you hear you are going to know more about it. I will say I was in cloud nine or may be eleven when I was told we were to meet the Director of Survey that day at 12:30pm.

Tada! You are going to meet an IAS official holding a top position! Tension along with excitement. And to make matters worse you are sent by teachers with a note saying you guys should keep up CET brand name.

The meeting: Let's say chapter 2. As instructed 5 proud guys with CET ID cards (something we people don't wear usually) reached the Director`s office at Indian Standard Time i.e. 10 minutes late. There we met Mr Mir Mohammed Ali, IAS, Director of Survey and land records. For the time being, since I am lazy enough to type such a long name, I will call the godfather of MMHP Mir Sir from now on. Simple as it is.

So coming back, after the first 10 minute of conversation I was like "What? You called upon us to go collect data from each and every shop in the town? Come on dude. We are the cream of the state". Rest has been cut short by censor board. By the by I guess I didn't tell why I came down to cloud -25 from cloud 11. The reason is this, we had a formal introduction, and then of course Godfather unveiled his unworldly, never-been-tried-before idea in front of us. Basically it had nothing to do with Google or survey. In simple words, I was like plinggg! So no Google, no survey. Only data collection, no way man.

But I would say at least my attitude changed over the next half an hour. Again being lazy and also due to difficulty in joining the jigsaw pieces of past, I can't exactly remember what heavenly or satanic words changed my attitude, the few words I can remember is "community knowledge pool". And of course somewhere down the line, a reference about future google partnership may be. Or was it the coffee which was served in between made the difference? Anyways the conclusion was simple, next meeting will be held after we collect and add 100 data to mapmaker. Of course the omnipresent person of the decade, "Whatsapp" was also called in. And there began my life as a group leader .It is really cool, right? To be a group admin with one IAS officer in your group. It was the first opportunity that I utilized properly.

The name, the logo and 560 entries: now this is the most complicated part, I still can't figure out how all this happened over a span of 6 days. Well again recollecting my otherwise weak memory, after returning from Mir`s office we created a group, told the staff coordinator

Manju madam about it and called upon a meeting of all interested people for the next day afternoon.

Day 2 ,Tuesday 13th of October 2015- As stated earlier the meeting was held, and of course thanks to the Google hype about 50 turned up. The then second in command, Revathy was speaking out in grand refined words that it was something great and all that. And the fact that you will be given government certificates. As far as I myself was concerned, I think the effect of yesterday's coffee had begun to subside down and hence was again skeptical over it. So when Manju Madam told me to go over and speak for the new comers as well as oldies, I was like "should I speak? Ok then I will speak,"

"Good afternoon ladies and gentlemen" (By the by, I don't like addressing in Malayalam though I boast about 12 years of ISC syllabus schooling. So naturally, it was in Malayalam.) First of all, it has nothing to do with survey or Google. It's just simply a data collection process experiment and we are the test rats. Being the cream of Kerala it is assumed that we give better performance for unit input. Now what we gain from this I don't know, to be frank, but all I can ensure is a certificate from Govt. of Kerala. Those who are interested can give their names. Rest we will figure out". Well that was it I guess, and that figure out part was one part I had no idea. or rather no one had any idea, what we were going to do.

I think that's it with day 2, I can't remember any other thing except for the fact that around 60 gave name, and a Whatsapp group was separately started with all of them.

So this is how things unravelled. On the same Tuesday i.e. 13th of October , I was there standing with 50 odd names in hand, thinking what to do with them and the second in command Revathy. By coincidence, we were having survey lab in the afternoon and at some point of time while standing underneath the blistering heat of sun an idea struck. EUREKAAA!!

So what was the idea? As usual all ideas when struck are primitive, but in the case of MMHP it was different, the same idea has been in experimentation from day 2. So coming back, the idea was simple: divide and rule in layman's in language. Speaking more professionally, divide the 50 into 10 groups of 5 members each, and give one kilometre stretches for each of them and of course a common group leader for every 3 groups, that's how democracy goes right.

Anyway Revathy supported my idea, and Manju Madam, who was also our survey lab-in-charge also gave an thumps up. With that thumps up came a lottery too, both of us were allowed to leave early. Ok don't take me wrong, we left only 15 minutes earlier than others. So what did we do in that 15 minutes? Well, we went to DCF(department computer facility), took the Google maps, found 10 sections, each of about one km length around college. And guess what? The framework of MMHP phase 1 was completed in 20 minutes. Now arose the big question of all, how to divide groups? I will say it was the toughest part, to make groups which wouldn't develop internal revolts and leadership challenging.

13th October 2015 16:00 hours, ok this had nothing to do with MMHP, but without this nothing would have happened. So what was it?

Well, on my way back to the mysterious bus bay, after the DCF encounter, one of my best friends in college,came up to me to tell something disappointing. That she can't make it , as she and her friends were going home that weekend. So she wanted to quit from MMHP. Well in reality it wasn't a big deal, as the only issue was that I would have to reduce one section. But I don't know why, I reacted quite cruelly. But it is something for which I will never apologize, because the next day evening, she and her friends became the first batch to do field survey for MMHP. The front runners. They were indeed the front runners because, no one including the coordinators knew what to do while surveying, or how to collect data. They were the only batch to do survey without Google maps (they had printouts of Google maps in hand) and University Topper (UT) is always an UT. So a group with UT in it always will be different and it was different. Thursday morning 15th of October, I was presented with 3 pages of well-prepared tables with shop names, phone numbers, working hours etc.

Rewinding back to 14th of October 2015, it was a day of activity. At least for 3-4 of us. Intense debates, group discussions, arguments, heated word exchanges. It all happened as a part of dividing people into 13 groups. By the way, you might be thinking how 10 became 13 all of a sudden, reason for that is obviously more people, joined so we created more sections. A special thanks for teachers who didn't come to class on that day, as we got free hours to finalize things or rather debate out things and find a best fit line of groups mathematically. One thing I will like to mention here – for all those who may lead groups in future- never

So coming to the conclusions of day 3- 13 groups were formed with around 70 people, groups were divided. Of the 13, 1 group surveyed in day 3 itself , 4 in day 4, another 4 in day 5 and remaining people in day 6.

Day 4, 15th of October 2015: Well I would say that, it was the most important day of mapping, as the day produced an output of nearly 150 entries and around 50 entries into mapmaker. First most productive day probably. So coming to how the day unravelled, like I mentioned earlier, the day started with a data bank of 75 entries from the group that surveyed the last day.

I think 3 groups did survey on that day morning from 12-2. One group was my group. So I will describe about my group's experience. So we kick started at around 10:45am IST, as usual 10 minutes late, but this time it was due to my problem, lost my specs in between. So we were group of 6, Rahul,Rahna,Milan,Shijith,Niviya and myself. To be frank we were one of the most unproductive groups. Not because we weren't efficient but because there were under 25 shops in the entire stretch we surveyed. First issue we faced was, how to save the GPS coordinates and finally after minutes of research we found out a solution: share the location on to Whatsapp and then later retrieve it. Another benchmark in MMHP, and the idea of using Whatsapp web in surveying. Well for us it was an easy task which took under one hour to collect the details of all shops in that one kilometre stretch. But for others it wasn't , anyway I didn't knew beforehand that it was a dry stretch but all together we enjoyed it a lot if the effect of sun was subtracted. That's it from day 4.

Coming to day 5, It was a day of supervision as far as I am concerned. We did about 100 entries into mapmaker, 4 groups were surveying, collected live updates from them etc. It's really nice when you have no job other than just supervising the data entry works of others, watching over the survey works by going around in a car and of course eating the sandwich from Subway. So you might be thinking what I am talking about, let me explain in detail. Friday afternoon was meant to be free time for my class. But unfortunately the presence of a demon in the name of MMHP meant that all of them were out walking in the hot afternoon sun collecting data from shops. My role? Well, I was the guard of demon whose duty was to ensure that all were out in the sun. How did I ensure that? I had our MMHP`s local car boy Rahul ready with his car to drive me around the regions in which they were working hard. There were 22 of them to be precise. And it was really hot moving around during afternoon time, so we (ok,only Rahul and Me) chilled out in Subway at Technopark and discussed about the future of MMHP.

The MMHPs`s godfather was really pleased with our works and called us for a meeting to appreciate us for our works and to discuss about the future. The thought of free coffee in

mind came in to me, so we pushed others to make things faster and set a deadline to finish all data entry works. I don't have much inputs about day 6 to give, because I wasn't involved in it. All I can give is the day's update: 220 shop details collected from 5 kilometres and 140 shops data entered.

A final round up on data collection

Day 3:- 78 places Chavadimukk to Diamond Jubilee Hall.

Day 4:- 150 places Diamond jubilee to Manvila, Chavidimukk to Pangapara, Sreekariyam to Elamkulam

Day 5:- 120 places Manvila-Kulathoor-Technopark

Day 6:- 210 places Pangapara-Karyavattom-Technopark & Chavadimukk to Sreekariyam

SLOPE FAILURES & REMEDIAL MEASURES IN HILLY TERRAIN

LALAWMPIA

S8

Gravitational forces are always acting on a mass of soil or rock beneath a slope. As long as the strength of the mass is equal to or greater than the gravitational forces, the forces are in balance, the mass is in equilibrium and movement does not occur. An imbalance of forces results in slope failure and movement in the forms of creep, falls, slides, avalanches, or flows. Slope failures are a major issue for the highway safety and stability.

Slope failures are the result of gravitational forces acting on a mass which can creep slowly, fall freely, slide along some failure surface, or flow as slurry. As stresses are usually highest at the toe of the slope, failure often begins there and progresses upslope. The basic factors that must be considered in the evaluation of slope instability are the type and distribution of geologic materials in the slope, the geologic structure, existing ground water conditions, and the potential for future rise in seepage pressures during rainy periods and the inclination and height of slopes. Over the geologic long term, slope stability can be decreased naturally by tectonic movements, decomposition of the geologic materials and by earthquake forces.

Land slide is triggered if the shearing (tangential) stresses appearing in a soil mass due to one cause or another exceed the magnitude that the soil is able to resist. In the majority of situations, slope failures are caused by water either acting on the surface or through the subsurface. On the surface, heavy flows result in erosion down slope or along the toe of slope, increasing slope angles and instability.

Protection measures

Increased stability will result by eliminating or minimizing the effect of any contributing factor for sliding, particularly that of the effect of the force of gravity. Water is also a contributing factor in practically all landslides.

Correction measures for a landslide can be by elimination or control. The elimination method avoids or removes the land slide.

Methods taken in elimination methods include:

i. Removal of the land slide entirely or partially at the toe. All the slide material should be removed, drains placed to intercept seepage and the area is backfilled with appropriate material.

ii. Bridging, whereby the landslide area is avoided by a bridge between the two solid extremities of the moving area.

iii. Cementation of loose material. The material to be cemented should be permeable. Cement grout is injected into the moving area in order to achieve stability.

The Zhaozhou Bridge is the oldest standing bridge in China and the world's oldest stone segmental arch bridge. Built in 605 AD, it is still standing strong today, over 1400 years later.

Mathoor Aqueduct and Padmanabhapuram Palace

ALEX ABRAHAM
S8

As a part of developing the technical know-how of students on various construction methods and civil structures, ICI used to conduct industrial visits regularly. One such IV was conducted by clubbing Mathoor aqueduct, a house lifting programme and Padmanabhapuram palace.

Mathoor aqueduct is the one having the highest elevation from the mean sea level among the aqueducts in Asia. An aqueduct is a structure, which is build when a canal has to cross a natural drain and the bed level of the canal is above the high flood level of the drain. The aqueduct is having a rectangular cross section, while the canal section is having a trapezoidal cross section. A hyperbolic transition is provided at the entrance and exit of the aqueduct section. The drainage water way is unaffected due to the construction of aqueduct. It helps to avoid the mixing of drain water and canal water. During the seventh semester, we had studied the design of aqueducts. Because of the IV, the students got a chance to observe and identify various component parts of the aqueduct.

Another destination of the industrial visit was the Padmanabhapuram palace. It is considered as one of the oldest palaces of south India, famous for its architectural beauty. As a part of the subject of Urban Planning and Architecture, the students were already familiar with various structural and architectural elements used in construction of ancient palaces. Special wood works such as doors, windows, furniture etc used by the king helped to know more about the life style during that period. More than an informative session, the visit to the palace proved to be a refreshing session for everyone.

The next site was at a house lifting location at Trivandrum city itself. The problem was to shift a two bedroom house completely from one place to another. Actually the structure was more than 50 years old and the owner wanted to preserve the structure as it is, but due to a construction of a new road in front of the structure and subsequent deposition of materials , it became difficult to live inside the house. So the owner decided to move it. The superstructure was them separated from the foundation and supported on a horizontally movable jacks. Thus the whole structure can be moved to some safer position, where it can be supported on a new foundation.

The IV was an informative, interactive and refreshing session for everyone. Seventy students participated in it which included students from third, fifth and seventh semesters. We were accompanied by Biju sir, Mitra sir, Mini madam and Ajitha madam at various locations of the IV.

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