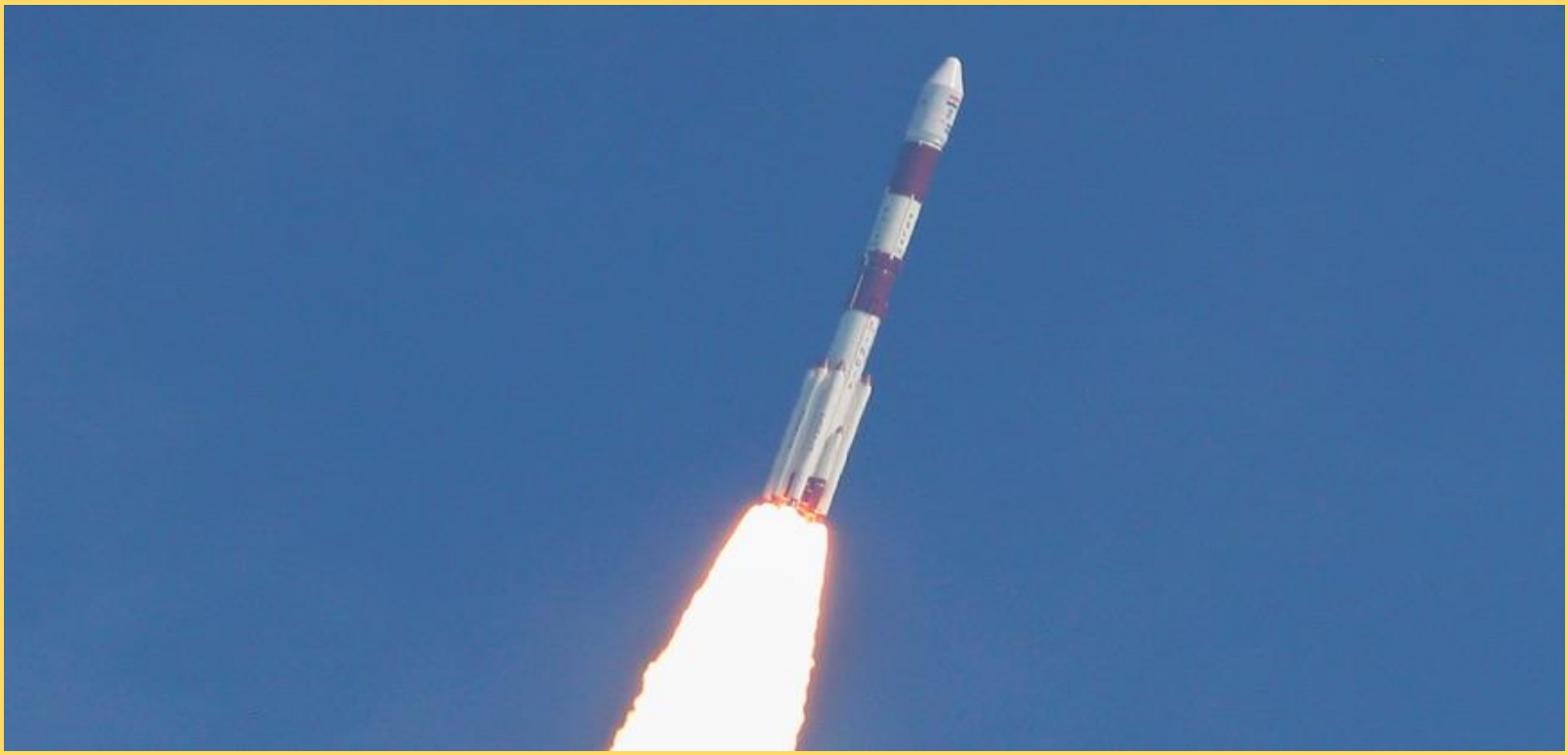
DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY: GANGURU

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING



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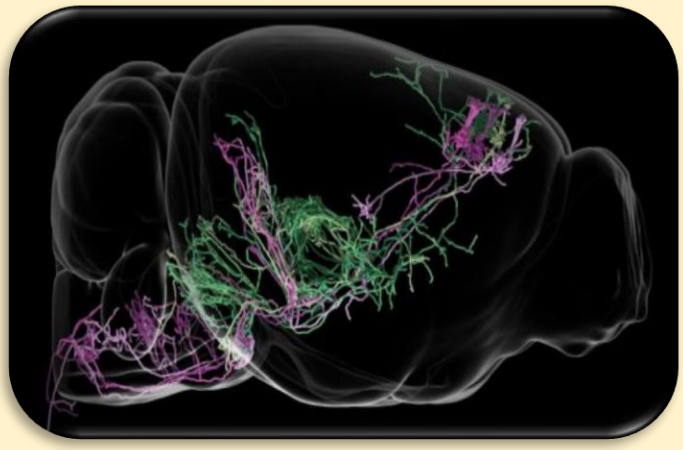
Decoding how brain circuits control behavior



The mouse brain contains roughly 80 million neurons, all packed into a space about the size of a hazelnut. Those cells come in a vast assortment of shapes and sizes, and their connections with one another number in the billions -- at least. The brain depends on this circuitry to interpret information about the world, learn from experiences, and control movements. Nerve cells are intermingled in this tight space to form an intricate network -- making it difficult for scientists to understand which cells are responsible for which tasks. Now, in two papers published October 31, 2018, in the journal *Nature*, researchers at the Howard Hughes Medical Institute's Janelia Research Campus and the Allen Institute for Brain Science have worked out how two types of intermingled nerve cells divide the labor to plan and initiate movements. By integrating cell-by-cell analyses of neurons' shapes, gene activity, and function, the team has teased out which brain cells are responsible for these distinct but closely related jobs. Combining such extensive analyses represents a major technical feat, says Janelia Group Leader Karel Svoboda. It's a new approach to understanding brain function, he says. The work required multiple teams of scientists at multiple institutes teaming up to solve a single problem. Svoboda thinks that this kind of approach will be necessary to help researchers crack the most complex questions in neuroscience.

Charting new neural territory

Around the world, researchers have embarked on efforts to build comprehensive neural maps to uncover truths about the brain. Neuroscientists are exploring the brain's elaborate networks from many different angles, charting cell structures, molecular features, and neural activities. Combining this disparate information to gain insights about brain function remains an outstanding challenge, Svoboda says. At Janelia, one long-term mapping effort involves neuronal anatomy. Scientists on the Mouse Light project team have been determining the precise structure of neurons in the mouse brain -- a massive undertaking that involves painstakingly tracing individual neurons' wiry paths across thousands of images of the brain. Complementary efforts at the Allen Institute are charting cells' gene expression, revealing key similarities and differences between cells and offering hints into cellular function. In the new work, Janelia scientists Mike Economo, Sarada Viswanathan, Loren Looger, Svoboda, and colleagues joined forces with Allen Institute scientists to create complete gene expression profiles of cells within the mouse neocortex. The neocortex is the largest part of the mammalian brain responsible for higher cognitive functions. The team focused on the anterior lateral motor cortex (ALM), an area involved in planning and executing movements. The Janelia and Allen Institute groups have been collaborating for years, Svoboda says. His lab has worked to describe how ALM neurons code information and control movements, and Allen Institute scientists used new single-cell RNA sequencing technology to analyze the molecular make-up of individual ALM neurons. BosiljkaTasic, Hongkui Zeng, and colleagues at the Allen Institute determined the full set of RNA molecules -- the transcriptome -- present in each of 23,822 neurons from the neocortex. This generated a complete picture of which genes were switched on in every cell -- about 9,000 genes per cell, on average. Within the vast dataset, the researchers identified more than 130 groups of cells that shared transcriptomes.

Role definition

Next, the team correlated their molecular findings with structural information obtained through Janelia's Mouse Light project. The scientists focused on large neurons in the ALM that carry information away from the cortex. Within this subset of neurons, two groups of cells defined by their transcriptomes also shared anatomic features. Their paths to other parts of the brain are distinct, the team discovered. One set connects to the

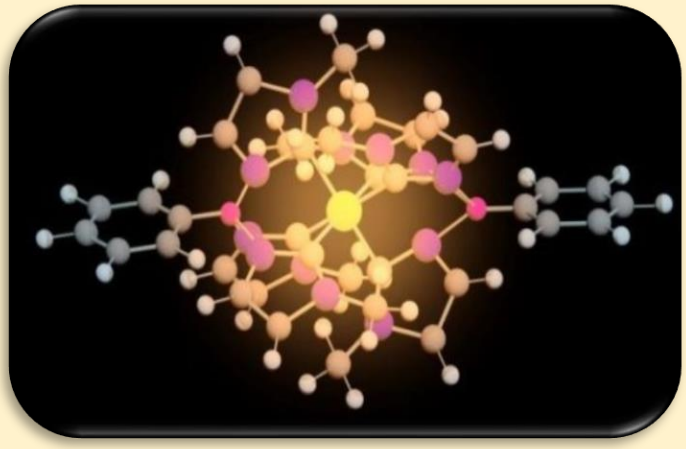
brainstem, where motor neurons that direct the body to carry out actions reside. The second set connects with the thalamus, a sort of central switchboard in the brain. Collectively, these cells have already received attention from neuroscientists because they are particularly vulnerable to neurodegenerative disease. "But it really hasn't been appreciated that these neurons come in discrete flavors and might play different roles," says Economo, a postdoctoral researcher in Svoboda's lab. To tease apart those roles, Economo targeted each cell class individually, manipulating and measuring activity as mice carried out a simple task -- moving in a particular direction at a particular time. One group of neurons, those that connect the ALM to the thalamus, are crucial for planning future movements, the experiments revealed. The other set of neurons, those that connect the ALM to the brainstem, are required to initiate movement. Simply put, the two types of neurons fall into two classes and have distinct behaviors, Svoboda says. "These cell types carry different messages to different brain regions to produce different functions."

By pulling together multiple data streams, he says, the team was able to bring clarity to a complex circuit question. "Scientists can always find ways to divide cells into groups," Tasic adds, but in this case, the groups offer a clear picture of each cell type's role in shaping movement. It's a key step in picking apart the complexity of the cortex. With the functions of more than 100 molecularly defined cell types in the visual cortex and the ALM alone still to be explored, scientists have a lot of complexity left to unravel, Svoboda says. But, he adds, with new research tools in development and large-scale mapping efforts accelerating, this type of neural decoding could soon be ramping up.

Mr.S.Chandrasekhar
Assistant Professor

Brilliant iron molecule could provide cheaper solar energy

For the first time, researchers have succeeded in creating an iron molecule that can function both as a photocatalyst to produce fuel and in solar cells to produce electricity.



The results indicate that the iron molecule could replace the more expensive and rarer metals used today. Some photocatalysts and solar cells are based on a technology that involves molecules containing metals, known as metal complexes. The task of the metal complexes in this context is to absorb solar rays and utilise their energy. The metals in these molecules pose a major problem, however, as they are rare and expensive metals, such as the noble metals ruthenium, osmium and iridium. "Our results now show that by using advanced molecule design, it is possible to replace the rare metals with iron, which is common in the Earth's crust and therefore cheap," says Chemistry Professor Kenneth Wärnmark of Lund University in Sweden. Together with colleagues, Kenneth Wärnmark has for a long time worked to find alternatives to the expensive metals. The researchers focused on iron which, with its six per cent prevalence in the Earth's crust, is significantly easier to source. The researchers have produced their own iron-based molecules whose potential for use in solar energy applications has been proven in previous studies. In this new study, the researchers have moved one step further and developed a new iron-based molecule with the ability to capture and utilise the energy of solar light for a sufficiently long time for it to react with another molecule. The new iron molecule also has the ability to glow long enough to enable researchers to see iron-based light with the naked eye at room temperature for the first time. "The good result depends on the fact that we have optimised the molecular structure around the iron atom," explains colleague Petter Persson of Lund University. The study is now published in the journal *Science*. According to the researchers, the iron molecule in question could be used in new

types of photocatalysts for the production of solar fuel, either as hydrogen through water splitting or as methanol from carbon dioxide. Furthermore, the new findings open up other potential areas of application for iron molecules, e.g. as materials in light diodes (LEDs). What surprised the Lund researchers is that they arrived at good results so quickly. In just over five years, they succeeded in making iron interesting for photochemical applications, with properties largely as good as those of the best noble metals. "We believed it would take at least ten years," says Kenneth Wärnmark. Besides the researchers from Lund University, colleagues from Uppsala University and the University of Copenhagen were also involved in the collaboration.

Mr.Ch. Mohan Sai Kumar
Assistant Professor

Isro satellite launch: Geo Eye over Indian Ocean, internet connectivity in J&K, NE

Indian Space Research Organisation (Isro) on Wednesday launched high throughput communication satellite GSAT-29 from the Satish Dhawan Space Centre at Sriharikota in Andhra Pradesh. The exercise was called GSLV MkIII-D2 mission. The Geosynchronous Satellite Launch Vehicle Mark III (GSLV Mk-III) carried GSAT-29 off the ground on its second developmental flight at 5.08 in the evening. The load carried by GSLV Mk-III included what is being called as Geo Eye to monitor sensitive regions along the borders

All about Isro launch in 10 points

1.GSAT-29 is the 33rd Made-by-India communications satellite. It is a multi-beam and multiband communications satellite. Once operational, GSAT-29 will provide internet connectivity in some of the remotest areas in Jammu and Kashmir, and the Northeast.

2.GSAT-29 is carrying an on-board unique high-resolution camera that is capable of tracking "enemy ships" in the Indian Ocean. This high-resolution on-board camera is being referred to as Geo-Eye. It is expected to aid agencies involved in strategic surveillance.

3.Indian Ocean has lately seen increased activities of major global powers. China has been aggressive in increasing its presence and influence in the Indian Ocean including recent strategic possessions in Sri Lanka, Maldives and Djibouti.

4.GSLV MkIII-D2 is the heaviest rocket of the Isro till date. It would inject the satellite into Geostationary Transfer Orbit (GTO) with required inclination to the equator.

5.GSAT-29 will be placed in its final Geostationary Orbit (GEO) using the on-board propulsion system, and it may take a few days after separation from launcher to reach its orbital slot.

6.GSLV Mk-III is the fifth generation launch vehicle developed by Isro. GSLV Mk-III vehicle is designed to place up to 4,000 kg in GTO. It is equivalent to 10 tons to Low Earth Orbit (LEO) or about twice the capability of GSLV Mk II.

7.GSAT-29 weighs about 3,423 kg and is designed for a mission life of 10 years. ISRO said the satellite carries Ka/Ku-band high throughput communication transponders intended to meet the communication requirements of users in remote areas.

8.In addition, several new technologies such as Q/V-band payload, data transmission through optical communication link will be demonstrated. This will help in realizing future advanced satellites.

9.The GSAT-29 launch is the 67th mission from Sriharikota Island. It is the 23rd launch from the second launch pad. GSLV Mk-III's Tuesday flight is the fifth launch mission of the Isro in 2018.

10.GSLV MkIII is a three-stage heavy lift launch vehicle developed by ISRO. The vehicle has two solid strap-ons as the first stage, a liquid propellant core as second stage and a cryogenic as third stage.

Mr. M.TulasiDasu
Assistant Professor

System on Chip (SoC)

A system on a chip or system on chip (SoC) is an integrated circuit (also known as a "chip") that integrates all components of a computer or other electronic system. These components typically (but not always) include a central processing unit (CPU), memory, input/output ports and secondary storage – all on a single substrate or microchip, the size of a coin.[1] It may contain digital, analog, mixed-signal, and often radio frequency signal processing functions, depending on the application. As they are integrated on a single substrate, SoCs consume much less power and take up much less area than multi-chip designs with equivalent functionality. Because of this, SoCs are very common in the mobile computing (such as in Smartphones) and edge computing markets.[2][3] Systems on chip are commonly used in embedded systems and the Internet of Things.

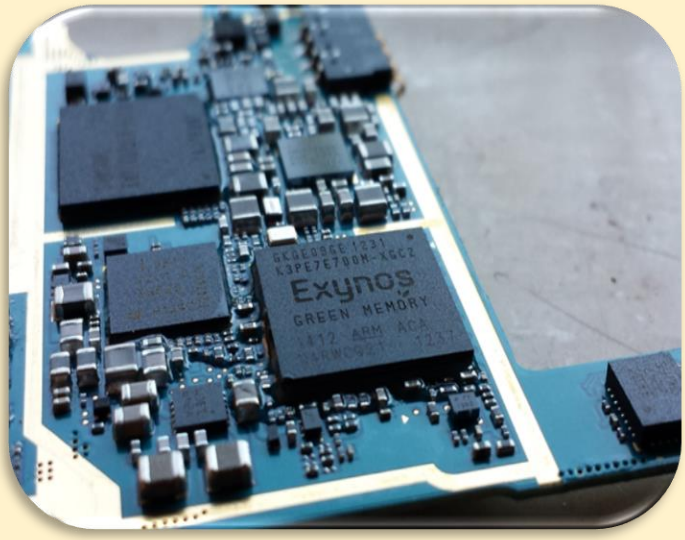


Fig: a. Exynos 4 Quad (4412) *System on a Chip*AMD b. Am286ZX/LX, SoC based on Intel 80286

Systems on Chip are in contrast to the common traditional motherboard-based PC architecture, which separates components based on function and connects them through a central interfacing circuit board.[nb 2] Whereas a motherboard houses and connects detachable or replaceable components, SoCs integrate all of these components into a single integrated circuit, as if all these functions were built into the motherboard. An SoC will typically integrate a CPU, graphics and memory interfaces,[nb 3] hard-disk and USB connectivity,[nb 4] random-access and read-only memories and secondary storage on a single circuit die, whereas a motherboard would connect these modules as discrete components or expansion cards.

More tightly integrated computer system designs improve performance and reduce power consumption as well as semiconductor die area needed for an equivalent design composed of discrete modules, at the cost of reduced replaceability of components.

By definition,SoC designs are fully or nearly fully integrated across different component modules. For these reasons, there has been a general trend towards tighter integration of components in the computer hardware industry, in part due to the influence of SoCs and lessons learned from the mobile and embedded computing markets. Systems-on-Chip can be viewed as part of a larger trend

towards embedded computing and hardware acceleration.
An SoC integrates a microcontroller or microprocessor with advanced peripherals like graphics processing unit (GPU), Wi-Fi module, or one or more coprocessors.[4] Similar to how a microcontroller integrates a microprocessor with peripheral circuits and memory, an SoC can be seen as integrating a microcontroller with even more advanced peripherals. For an overview of integrating system components, see system integration.

K.Namratha, 158T1A0462, IV ECE B

Workshops and Seminars in ECE

- The faculty member of ECE Mr.S.Chandrasekhar has attended the one-week Hands on Training workshop on "Fabrication & Characterization of MOS Capacitors" under INUP Program conducted during October 22-26, 2018 at IIT BOMBAY.

PLACEMENTS IN ECE DEPARTMENT

List of Selected students in Department of Electronics & Communication Engineering

A.Name of Company: Veda IIT

Date of Drive: 15-10-2018

Package: 3.40 LPA

Number of candidates selected: 01

S.No	Roll No	Name of the Student
1	158T1A0430	JAHNAVI GUVVALA

B.Name of Company: TCS

Date of Drive: 10-09-2018

Package: 3.36 LPA

Number of candidates selected: 2

S.No	Roll No	Name of the Student
1	158T1A0419	Deepika Challa
2	158T1A0451	Meghana Uppalapati

Semester Results Toppers:

IV-I ECE Results

S.No	Percentage	Roll No	Name of the Student
1	83.47	158T1A0446	P.Likhitha
2	80.93	158T1A0430	G.Jahnavi
3	80.40	158T1A0442	K.L.Prasanna Devi

III-I Results

S.No	SGPA	Roll No	Name of the Student
1	9.86	168T1A04A7	V.Pravallika Devi
2	9.29	168T1A04B1	V.N.Prathusha

II-I Results

S.No	SGPA	Roll No	Name of the Student
1	8.91	178T1A0411	B.Likhitha
2	8.77	178T1A0464	M.Tejaswi
3	8.5	178T1A0495	S.Ramyasree

Education is the most powerful weapon which you can use to change the world.

Dr.APJ Abdul Kalam

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