ARBiT
it happens here...

Mathematics Day

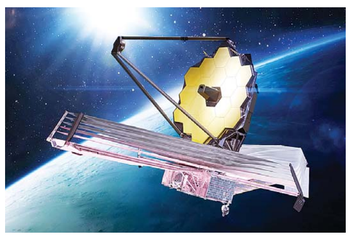
The study of mathematics helps people to learn better problem solving skills and serves as a way to help humans organize and think logically. Mathematics Day is here to celebrate and appreciate everything that this discipline has to offer to individuals and to the world at large. The reason Mathematics Day is set on December 22 is because it is the birthday of the country's most respected mathematician, Srinivasa Ramanujan. A math genius of the highest degree, Ramanujan was born in 1887 and spent his life under British rule in India.

राष्ट्रदूत
THURSDAY
22 December 2022
A-B

#SPACE

Distant Known Galaxies

"We've discovered galaxies at fantastically early times in the distant universe," said Brant Robertson.



An international team of astronomers has discovered the earliest and most distant galaxies confirmed to date using data from the James Webb Space Telescope (JWST). The telescope captured light emitted by these galaxies more than 13.4 billion years ago, which means the galaxies date back to less than 400 million years after the Big Bang, when the universe was only 2% of its current age.

Initial observations from JWST yielded several candidate galaxies at extreme distances, as had earlier observations with the Hubble Space Telescope. Now, four of these targets have been confirmed by obtaining long spectroscopic observations, which not only provide secure measurements of their distances, but also allow astronomers to characterize the physical properties of the galaxies.

"We've discovered galaxies at fantastically early times in the distant universe," said Brant Robertson, professor of astronomy and astrophysics at UC Santa Cruz. "With JWST, for the first time we can now find such distant galaxies and then confirm spectroscopically that they really are that far away."

Astronomers measure the distance to a galaxy by determining its redshift. Due to the expansion of the universe, distant objects appear to be receding from us and their light is stretched to longer, redder wavelengths by the Doppler Effect. Photometric techniques based on images captured through different filters can provide redshift estimates, but definitive measurements require spectroscopy, which separates the light from an object into its component wavelengths.

The new findings focus on four galaxies with redshifts higher than 10. Two galaxies initially observed by Hubble now have confirmed redshifts of 10.38 and 11.58. The two most distant galaxies, both detected in JWST images, have redshifts of 13.20 and 12.63, making them the most distant galaxies confirmed by spectroscopy to date. A redshift of 13.2 corresponds to about 13.5 billion years ago.

"These are well beyond what we could have imagined finding before JWST," Robertson said. "At redshift 13, the universe is only about 325 million years old."

Robertson and Emma Curtis-Lake from the University of Hertfordshire (U.K.) will be presenting the new findings on December 12 at a Space Telescope Science Institute (STScI) conference in Baltimore on "First Science Results from JWST." They are the lead authors of two papers on the results that have not yet been through the peer-review process (see links below).

The observations result from a collaboration of scientists who led the development of two of the instruments onboard Webb, the Near-Infrared Camera (NIRCam) and the Near-Infrared Spectrograph (NIRSpec). The investigation of the faintest and earliest galaxies was the leading motivation in the concepts for these instruments. In 2015, the instrument teams joined together to propose the JWST Advanced Deep Extragalactic Survey (JADES), an ambitious program that has been allocated just over one month of the telescope's time and is designed to provide a view of the early universe unprecedented in both depth and detail. JADES is an international collaboration of more than eighty astronomers from ten countries.

"These results are the culmination of why the NIRCam and NIRSpec teams joined together to execute this observing program," said Marcia Rieke, NIRCam principal investigator at the University of Arizona.

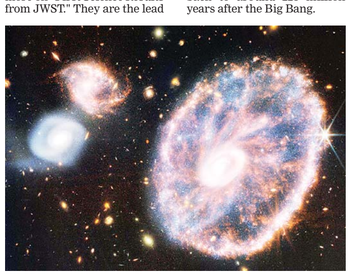
The JADES program began with NIRCam, using over 10 days of mission time to observe a small patch of sky in and around the Hubble Ultra-Deep Field. Astronomers have been studying this region for over 20 years with nearly all large telescopes. The JADES team observed the field in nine different infrared wavelength ranges, capturing exquisite images that reveal nearly 100,000 distant galaxies, each billions of light years away.

The team then used the NIRSpec spectrograph for a single three-day observation period to collect the light from 250 faint galaxies. This yielded precise redshift measurements and revealed the properties of the gas and stars in these galaxies.

"With these measurements, we can know the intrinsic brightness of the galaxies and figure out how many stars they have," Robertson said. "Now we can start to really pick apart how galaxies are put together over time."

Co-author Sandro Tacchella from the University of Cambridge in the United Kingdom added, "It is hard to understand galaxies without understanding the initial periods of their development."

According to Robertson, star formation in these early galaxies would have begun about 100 million years earlier than the age at which they were observed, pushing the formation of the earliest stars back to around 225 million years after the Big Bang.



Uttam Kumar in Chaoa-Paoa, Pathey Holo Deri, Alo Amar Alo, Saare Chuattar, Kamallata, the electrically charged feelings come across so forcefully and tangibly that we can almost stretch our hands to feel and touch them. Their films were famous for soft-focus close ups, lavishly mounted scenes of romance against windswept expanses, richly decorated interiors with fluttering curtains and such mnemonic objects such as bunches of tuberoses etc. The most popular films include Shap Mochan (1955), Sagarika (1956), Harano Sur (1957), Saptapadi (1961), Bipasha (1962) and Grihadah (1967). There was instant audience identification with the Suchitra-Uttam pairing and that is why it was such a hit. Yet, not once did they kiss.

Remembering Uttam Kumar

Dr. Shoma A. Chatterji
Film scholar journalist & author

#PERSONALITY

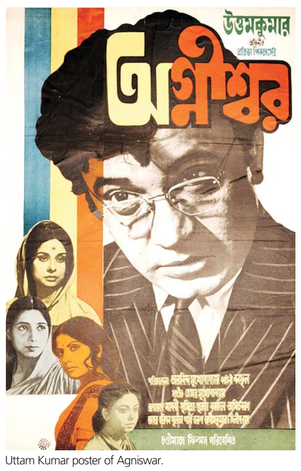
Uttam Kumar (1926-1980)

It is 42 years since Uttam Kumar passed away. But he is still alive in the minds of thousands of Bengalis across the world. In a rare tribute to Bengali cinema's greatest matinee idol, Uttam Kumar, Department of Posts, India, released a postage stamp on his 84th birthday in Kolkata on September 3 2009. Every year, in the month of September, when Uttam Kumar was born in Ahiritola in the northern parts of Kolkata, and also in July, when he passed away, people across West Bengal go wild with celebrations in tribute to Uttam Kumar though he passed away in 1980. The Tollygunge Metro station was christened Uttam Kumar Sarani some years ago. Born on 3rd September, 1926, Uttam Kumar would have been 96 years old today.

With Suchitra Sen, Uttam Kumar heralded the golden era of Bengali cinema. Their first film was Saare Chuattar, a rip-roaring comedy that became a box office hit. They did 30 films spanning two decades. They created a genre of romance that has never known anything before and after. Their last film Priyo Bandhabi (1975), was a flop. As we watch the young and beautiful Suchitra Sen emote a love scene with Uttam Kumar in Chaoa-Paoa, Pathey Holo Deri, Alo Amar Alo, Saare Chuattar, Kamallata, the electrically charged feelings come across so forcefully and tangibly that we can almost stretch our hands to feel and touch them. Their films were famous for soft-focus close ups, lavishly mounted scenes of romance against windswept expanses, richly decorated interiors with fluttering curtains and such mnemonic objects such as bunches of tuberoses etc. The most popular films include Shap Mochan (1955), Sagarika (1956), Harano Sur (1957), Saptapadi (1961), Bipasha (1962) and Grihadah (1967). There was instant audience identification with the Suchitra-Uttam pairing and that is why it was such a hit. Yet, not once did they kiss.

The Uttam Kumar Awards

Till this day, Bengalis across the state pay tributes to his memory by screening his films, through entertainment programmes, through the Uttam Kumar Awards given away to film personalities for their contribution to different areas of cinema every year. There is the Uttam Mancha in the southern parts of Kolkata that stages plays and screens films regularly. A life-size statue of Uttam Kumar stands tall near Tollygunge Metro station, close to the three studios, practically second home to this great actor.



Uttam Kumar poster of Agniswar.

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Uttam Kumar and Suchitra Sen in Bipasha.

His success lay in his total Bengali-ness for one. For another, he never ever tried to imitate the style or mannerism of any actor, Bengali, Indian or foreign. He treated every character he played as a Bengali first and as a character next. This made his portrayals original and inimitable. Uttam Kumar redefined the concept of masculinity that, placed in perspective, merges into the Bengali Bhadralok identity that found favour with his audience - male, and female, with equal appeal.

Chhobi Biswas, a great actor, delivered his English lines imitating the English spoken by the British. They came out distorted and unreal. Uttam Kumar delivered his English lines exactly like Bengalis speak English. Thirdly, his research and homework for every character, big or small, hero or cameo, is without parallel. If he took wrestling lessons in an akhada for a few scenes in a given film, he took riding lessons for another till he had almost mastered riding and did not need a double.

His smashing looks were conducive to any costume, be it a three-piece suit, a dhoti-punjabi worn Bengali style, a nightgown, a naval uniform or the elaborate costume of a Moghul emperor. He slipped under his costume and make-up and closeted himself in his make-up room, concentrating on the shot for the day, sometimes for hours at a stretch, till the spot-boy came to tell him that the lights were in place and the camera was ready to roll.

While he was working with Tapan Sinha in Jhinder Bondi, based on a Bengali novel adapted from The Prisoner of Zenda, he said, "I am not very educated Tapanda. My diction is not clear. So, my dialogues sometimes sound forced. If, at any time, you find that I am unable to speak a given line in the manner you desire, please change it for my sake." Where would one encounter such honesty in an industry filled with plastic smiles and crocodile tears?

Commitment to Acting

He would arrive on the sets much before time, repair to his make-up room, put on his make-up and costume and would sit in absolute silence, dwelling on the scenes to be shot that day. The director would summon him when the shot was ready and he would face the camera, living his screen character. "His commitment to acting- the sequence, the chronology of shots, the light arrangements, the make-up and costume, the character he was portraying - was total", said the late director Tapan Sinha who directed Uttam Kumar in Upahaar, Bicharak, Hansuli Baanker Upakatha, Jhinder Bondi and Jotugriha. This director-actor bonding cracked completely when Sinha dropped Uttam Kumar to pick theatre personality Manoj Mitra for Banchharaamer Bagan. Supriya Devi insists that it was this shock that brought about the heart attack that finally ended his life. "He heard it from others, not from Tapan-da. He was so totally involved in the role after long discussions with Tapan-da that all he could talk about at home was this film. So when he heard he was dropped, he could not cope," she says sadly.

Uttam Kumar sang beautiful Rabindra Sangeet. In fact, he fell in love with Gauri Debi when he was her music teacher. Stardom came later. An astrologer had predicted that his marriage to Gauri Debi held the golden key to his fame and affluence. Every year, for many years, he would celebrate their wedding anniversary on 1st June singing his favourite Tagore song, Shedin Dujone Dulechhinu Bone as an ode to their love. He would give himself a holiday to spend with his wife and would lay out a wonderful feast for his extended family. Whisky and champagne would flow like water. He would gift his wife with a beautiful red Benarasi sari picked up personally and jewellery he handpicked from the best shop at Park Street. Even after he went to live with Supriya Devi, he dropped in at his Bhawanipur residence on his way to the studio every day.

Uttam Kumar did not like Satyajit Ray presenting him in Nayak without make-up. He had never done this before. In mid-1965, when shooting for Nayak began, Uttam Kumar had just recovered from a bout of chicken pox. Ray asked him to touch up his face only in the flashback scenes as a younger man. When shooting was over, Uttam Kumar said, "I have discovered a new side to myself. Unhindered by make-up, I felt freer while expressing my emotions."

Universal Romantic Hero

Uttam Kumar's make-up room at New Theatres Studio is kept locked till this day. A studio boy, now an old man, opens the door every day and burns incense sticks in memory of his famous master. It is a simple, non-descript room with a small divan, a wall mirror, a dressing table, a chair, a clothes shelf and a pair of wooden sandals the actor wore as he waited for his shot. A portrait of the star stands on the table-top. He would slip into the character after make-up till he was called to the floors. No one had the guts to disturb him.

Nayak (The Hero) happens to be one of four digitally restored Ray movies that was shown in PVR cinemas in January some years ago. Though it is an outstanding film, it seems to have been ignored by critics and film scholars compared to the attention paid to Ray's other films. The storyline spans the time it takes for Rajdhani Express to travel from Kolkata to New Delhi. Almost the entire film is shot inside what appears to be a moving train compartment but in actuality, is a classic example of art director Bansi Chandragupta's magic creative powers. His design of the interior of a railway compartment for Nayak was so flawless that most viewers took it to be real.

Behind the veneer of his glamour, his fame and his star charisma, the narrative reveals that Arindam, the character portrayed by Uttam Kumar is a lonely, vulnerable and insecure young man with normal points of weaknesses and strengths like any other ordinary man of the street. During the journey, he tries to refrain from his usual addiction to cigarette and liqueur as a courtesy to his fellow passengers but after some time, he smokes and drinks openly and even teases an old man in a neighbouring coupe who keeps saying he cannot stand the smell of alcohol.

None other than Uttam Kumar could have gone into the skin and flesh and blood of Arindam Mukherjee the way he did. Sharmila Tagore as the journalist-editor Aditi Sengupta comes across with a low-key, subdued performance filled with restraint.

"He is the universal romantic hero of all time, the best Indian cinema has produced. No star anywhere in the country has been able to keep his memory alive in the minds of his fans like Uttam Kumar has," wrote Rabi Basu, a renowned critic. These are small vignettes from Uttam Kumar's life, one of the greatest actors Indian cinema has produced. No wonder then, that even 42 years after his demise on July 24, 1980, people who grew up watching his films, insist that there has been no one like him in Bengali cinema and that there will never be another Uttam Kumar.

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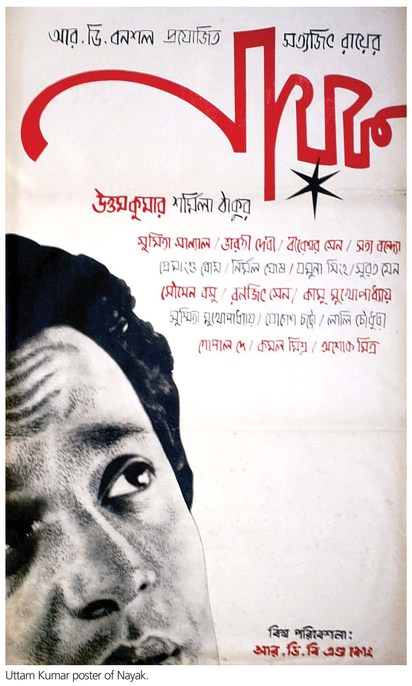
Dr. Shoma A. Chatterji is a film scholar journalist and author. She has authored 30 books. She won the National Award for Best Writing in Cinema as Best Film Critic (1990) and for the Best Book on Cinema (2002). She won the Lifetime Achievement SAMMAN from the Rotary Club, Calcutta-Metro City in July 2012. She contributes to around 12 online and print outlets. She has won around five Lifetime Achievement Awards over the years and has been on a jury of film festivals in India and abroad. She has also won a senior research fellowship from the ICSSR for research in cinema.

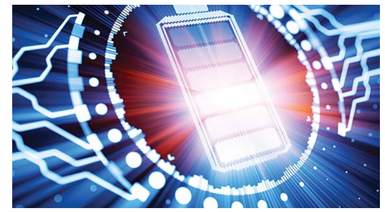


Uttam Kumar poster of Nayak.

#ELECTROLYTES

A Little More Salt

Lithium-ion batteries that contain a new non-flammable electrolyte can continue to function at high temperatures without catching fire.



Rechargeable lithium-ion batteries power phones, laptops, other personal electronics, and electric cars, and are even used to store energy generated by solar panels. But if the temperature of these batteries rises too high, they stop working and can catch fire.

That's in part because the electrolyte inside of them, which ferries lithium ions between the two electrodes as the battery charges and discharges, is flammable.

"One of the biggest challenges in the battery industry is this safety issue, so there's a lot of effort going into trying to make a battery electrolyte that is safe," says Rachel Z. Huang, a graduate student at Stanford University and first author of the study in the journal Matter.

The new electrolyte's secret? More salt.

A lighter tries to ignite a small, silver, circular battery to no avail.

Standard battery materials catch fire when exposed to flame, but the new material (shown here) does not.

Non-flammable Electrolytes

Conventional lithium-ion battery electrolytes are made of a lithium salt dissolved in a liquid organic solvent, such as ether or carbonate. While this solvent improves battery performance by helping to move lithium ions around, it's also a potential fire starter.

Batteries generate heat as they operate. And if there are punctures or defects in a battery, it will heat up rapidly. At temperatures above 140 degrees F, the small molecules of solvent in the electrolyte start to evaporate, transforming from liquid to gas and inflating a battery like a balloon-until the gas catches fire and the whole thing goes up in flames.

Over the past 30 years researchers have developed non-flammable electrolytes, such as polymer electrolytes, which use a polymer matrix instead of the classic salt-solvent solution to move ions around. However, these safer alternatives don't move ions as efficiently as liquid solvents do, so their performance has not measured up to that of conventional electrolytes.

The team wanted to produce a polymer-based electrolyte that could offer both safety and performance. And Huang had an idea.

She decided to add as much as she could of a lithium salt called LiFSI to a polymer-based electrolyte designed and synthesized by Jian-Cheng Lai, a postdoctoral scholar at Stanford University and co-first author of the paper.

"I just wanted to see how much I could add and test the limit," Huang says. Usually, less than 50% of a polymer-based electrolyte's weight is salt. Huang bumped that number to 63%, creating one of the saltiest polymer-based electrolytes ever.

Unlike other polymer-based electrolytes, this one also contained flammable solvent molecules. However, the overall electrolyte, known as Solvent-Anchored non-Flammable Electrolyte (SAFE), proved non-flammable at high temperatures during tests in a lithium-ion battery.

SAFE works because the solvents and salt work together. The solvent molecules help conduct ions, resulting in performance comparable to that of batteries containing conventional electrolytes. But, instead of failing at high temperatures like most lithium-ion batteries, batteries containing SAFE continue to operate at temperatures between 77-212 degrees F.

Meanwhile, the ample added salts act as anchors for the solvent molecules, preventing them from evaporating and catching fire.

"This new finding points out a new way of thinking for polymer-based electrolyte design," says ZhenanBao, a professor at Stanford University and investigator with the Stanford Institute for Materials and Energy Sciences (SIMES) who advises Huang. "This electrolyte is important for developing future batteries that are both high energy density and safe."

Gooey Electrolytes

Polymer-based electrolytes can be solid or liquid. Importantly, the solvents and salt in SAFE plasticize its polymer matrix to make it a goo-like liquid, just like conventional electrolytes.

One benefit: A gooey electrolyte can fit into existing, commercially available lithium-ion battery parts, unlike other non-flammable electrolytes that have emerged. Solid-state ceramic electrolytes, for example, must use specially designed electrodes, making them costly to produce.

"With SAFE there's no need to change any of the manufacturing setup," Huang says.

"This very exciting new battery electrolyte is compatible with the existing lithium ion-battery cell technology and would make big impacts on consumer electronics and electrical transportation," says Yi Cui, a professor at SLAC and Stanford and a SIMES investigator who also advises Huang.

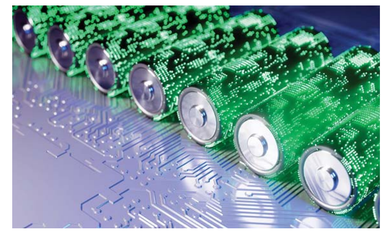
Next up: Electric Cars?

If the multiple lithium-ion batteries in an electric car sit too close together, they can heat each other up, which could eventually lead to overheating and fire. But, if an electric car contains batteries filled with an electrolyte like SAFE that is stable at high temperatures, its batteries can be packed close together without worry of overheating.

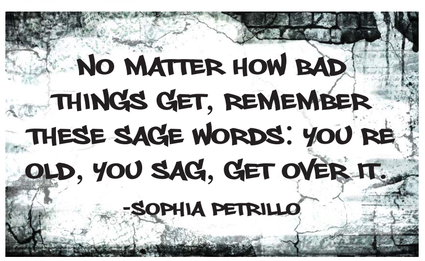
In addition to mitigating fire risk, this means less space occupied by cooling systems and more space for batteries. More batteries increase the overall energy density, meaning the car could go longer between charging.

"So it's not just a safety benefit," says Huang. "This electrolyte could also allow you to pack in a lot more batteries."

Time will tell what other battery-powered products could get a little SAFE-er.

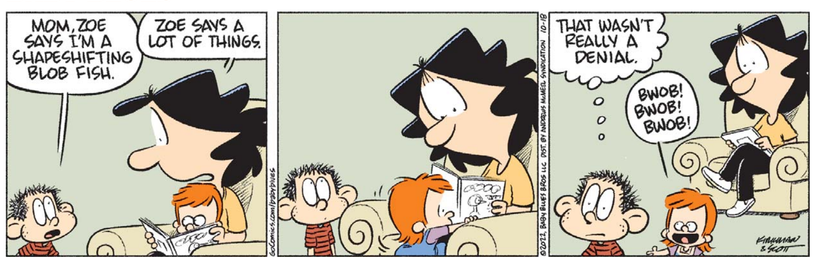


THE WALL



BABY BLUES

By Rick Kirkman & Jerry Scott



ZITS

By Jerry Scott & Jim Borgman