

First issue of Third volume of KMVPHY-Spectrum is ready to be in the hands of its readers. The faculty of Physics is very thankful to its readers. We are trying our best to make the news line a success and encouraging the students to understand the phenomenon in an easy and understandable way.

Visionary Physicist

This issue includes the names of the most influential scientists, but probably you are not aware of their achievements. Their efforts make India to proud. Their role in shaping the worldview of our culture is unrivaled.

RITU KARIDHAL: THE WOMAN BEHIND MANGALYAAN



Breaking the stereotypes, India's self-made women often remind us that any stream of study is not dependent on the gender. In this article, we celebrate the accomplishments of women in Science.

Three years back, as Indian scientists of ISRO successfully put a satellite into orbit around Mars, a photograph that went viral showed women dressed in gorgeous saris with flowers in their hair comfortable with their femininity, celebrating the event. Ritu Karidhal who was the deputy operations director of the Mars Orbiter Mission (MOM) was an avid sky watcher who "used to wonder about the size of the moon, why it increases and decreases. I wanted to know what lay behind the dark spaces".

Ritu grew up in a close-knit middle class family that placed a lot of emphasis on education and didn't have too many resources and tuitions or coaching institutions. she had to be self-motivated to succeed. Astudent of science who loved physics and maths, she scoured the daily newspapers for information about Nasa and ISRO projects, collected news clippings, and read every little detail about anything related to space science. Ritu Karidhal is an Indian woman scientist working in the Indian Space Research Organisation (ISRO), and was a Deputy Operations Director to India's Mars orbital mission; Mangalyaan. She has been referred to as the "Rocket Woman" of India. She was born and brought up in Lucknow and is an aerospace engineer. She has also worked for many other ISRO projects earlier and served as Operations Director for some of these. Rita Karidhal completed her graduation in Physics from University of Lucknow. She passed the Graduate Aptitude Test in Engineering (GATE) exam, and got the opportunity to enroll herself in Indian Institute of Science (IISc) to pursue her master's degree in Aerospace engineering and from there it was but one step for admission into ISRO. She quotes "That was the best moment of my life - getting a call from ISRO. It was like everything I had before was all for that one moment." Mangalyaan came as a surprise to her. "We had just finished a project and suddenly without warning we were plunged headlong into the next one," she said with a laugh. "But this was to be the most exciting project I had worked on so far."

Mangalyaan or launch of a space craft to orbit planet Mars may be the most stellar space project done by ISRO. Not only did it make India the fourth country in the world to reach Mars, but it was done flat out in 10 months time and at far lesser cost to the taxpayers than anybody else - only 450 crores. There are scams and swindles in the country, which have amounted to atleast three times the cost of Mangalyaan.

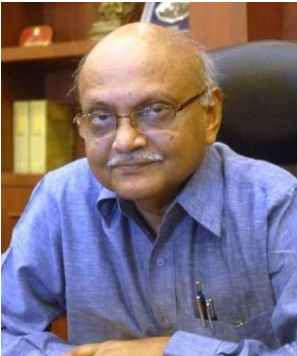
And Ritu played a pivotal role in its making detailing and the execution of the craft's onward autonomy system. What exactly it was is something that only Ritu can explain in her own words. "That's basically the brain of the satellite, a software system coded in well enough to function on its own, determine what and when to detach, anything that needs to be inflected. If there's malfunction, the system needs to be designed well enough to correct and recover on its own in outer space."

The project manager on the MARS Orbiter mission says she worked 24/7 for 15 to 18 months before the mission was launched. On the day the MARS Orbiter mission got inserted into the Mars orbit, excitement was running high at ISRO. With Prime Minister Narendra Modi in their midst it was bordering on nervous excitement. The launch mission though, changed her life in more ways than one as she has to involve in a lot of public interactions."

It's now been 18 years and Ms Karidhal has worked on several projects at Isro, including the prestigious Mars mission, which has thrust her and her colleagues into the limelight.

For Ritu, that moment of the launch would forever be imprinted in her memory, would forever be something she would relive over and over again.

RATANKUMAR SINHA: THE CHAIRMAN OF THE ATOMIC ENERGY COMMISSION OF INDIA



65 year old Ratan Kumar Sinha had served as the Secretary to the Government of India, Department of Atomic Energy (DAE) and Chairman of the Atomic Energy Commission (AEC), Government of India from April 2012 to October 2015. Prior to that, Ratan Kumar Sinha had served as 10th Director of country's premier strategic lab, Bhabha Atomic Research Centre (BARC), Mumbai from May 2010 to June 2012. He had been closely associated with the design and development of India's first thorium-based Advanced Heavy Water Reactor and Compact High Temperature Reactor (CHTR), two of the highly acknowledged technological innovations which are suitable for large scale deployment of nuclear power, particularly in Indian scenario.

He had also strengthened outreach activities of DAE for spreading awareness about the peaceful uses of atomic energy among the general public. Under his leadership, DAE displayed its first ever tableau in the 66th Republic Day Parade 2015. Dr. Sinha is nationally and internationally recognized expert in the field of nuclear reactor technology. He has contributed substantially to design and development of Indian High Temperature Reactors intended for hydrogen generation and has been instrumental in the guiding the design and development of Compact High Temperature Reactor (CHTR), which will serve as technology demonstrator for future larger high temperature reactors.

Ratan Kumar Sinha graduated in Mechanical Engineering from Patna University in 1972, securing the first position in the University. He joined the Reactor Engineering Division of BARC in the year 1973 after completing one-year training course at BARC Training School. He had been guiding the programmes for new advanced reactors, under design and development at BARC, Mumbai, to utilise thorium as fuel. These programmes include the Advanced Heavy Water Reactor (AHWR), which produces most of its power from thorium and has several innovative passive safety systems.

This first-of-its-kind design incorporates thorium based coated particle type nuclear fuel, a reactor physics design to achieve inherently safe neutronic characteristics, use molten lead-bismuth as coolant driven by natural circulation, passive emergency cooling systems that deliver core heat to atmosphere, passive shutdown device and passive control devices capable of operation at very high temperatures. These innovative features are unparalleled in any other reactor in the world. Ratan Kumar Sinha has strengthened outreach activities of DAE for spreading awareness about nuclear energy among the general public. He had coined the phrase $\bigcirc \bigcirc$ (Atoms in Service of the Nation) which has been imbued as the motto of the Department of Atomic Energy. Motto of DAE is a part of the new logo of DAE launched in January 2014.

Time Stops at the Speed of Light

According to Einstein's Theory of Special Relativity, the speed of light can never change—it's always stuck at approximately 300,000,000 meters/second, no matter who's observing it. This in itself is incredible enough, given that nothing can move faster than light, but it's still very theoretical. The really cool part of Special Relativity is an idea called time dilation, which states that the faster you go, the slower time passes for you relative to your surroundings. Seriously—if you go take a ride in your car for an hour, you will have aged ever-so-slightly less than if you had just sat at home on the computer. The extra nanoseconds you get out of it might not be worth the price of gas, but hey, it's an option. Of course, time can only slow down so much, and the formula works out so that if you're moving at the speed of light, time isn't moving at all. Now, before you go out and try some get-immortal-quick scheme, just note that moving at the speed of light isn't actually possible, unless you happen to be made of light. Technically speaking, moving that fast would require an infinite amount of energy

Answers to previous issue questions and puzzles

Palindrome Puzzle

SWIM

Think funny

1. The last girl took the apple in the basket
2. Stefen Grover Cleveland was the 22nd and 24th president of US
3. The plane was not flying
4. Because the boxers were women
5. The years are quoted in BC
6. It was stepney

Science Crossword Puzzles

Across: 2 Potential energy, 4 Convection 5. Radiation

Down: 1 Kinetic energy 3 Conductor 4 Conduction 5 Insulator



10 fish are in a tank!

- 2 Drown

- 4 Swim away!

- 3 Die

How many are left?

Name four days of the week that start with the letter "t"?

It is in a rock but not in stone, It is in marrow but not in bone. It is in a bolster but not in bed. It's not in the living, and not in the dead.

Workshop on Safety in Laboratories



A Workshop on the topic "SAFETY MEASURES TO BE TAKEN IN LABORATORIES" for the technical staff of all departments has been organized on 07/01/2017. Dr. Updesh kaur clarified the technical staff about the precautions taken during working with chemicals in chemistry laboratory and trained the staff to handle the hazardous chemicals. Er. Robin chadha and Mr. Harleen Singh explains how to save lab equipments and other electrical appliances from electrical hazards like short circuit. They also trained the staff with methods of first aid given to an electric shock victim.

KMVM.Sc. Physics girl topped in University Exams



Ms. Manpreet Kaur of M.Sc. Physics III Sem brings name and fame to PG department of Physics once again by securing first position in Guru Nanak Dev University Exams and qualifying GATE. She scored 493 marks out of 600 in the third semester. She was also topper in University in M.Sc. Ist and IInd sem exam.

A one day trip to Bhakra dam, Nangal



A group of M.Sc. Physics students from KMV visited Bhakra Dam to enhance their knowledge about the generation of electricity. They also visited another power generation house at Ganguwal near Anandpur Sahib. There they learnt basic working techniques, such as, rotation of turbines and coupling of turbine with generator and then synchronizing voltage and frequency of the electrical signal. They have also learnt how electricity is transmitted from the generation house to various power grids and then to various commercial and residential areas.

KMV Girls arranged FUN WITHSCIENCE



Fun with science was hosted by science students of student council to acquainted the students with the excitement, creativity & knowledge of physics. There were 5 games played by students like 'Blow Balloon', 'Pingpong balls', 'Balance the CD', 'Magnet Tracing' & 'Straw Hands' and results were concluded scientifically at the end of show. The program was followed by Quiz questions asked from gathering to check their IQ level. The entire programme was applauded by everybody present there & will always remain etched in the memory of one and all.

Sci-brations 2017 was organized on 3rd February



SCI-BRATIONS 2017, an inter college and inter school competition in which various events like Sci-Skit-The Drama Contest, Sci-Colours-The Rangoli Contest, Sci-Innovative- The Innovative Demonstrationst, Sci-Bhumika-The Fancy Dress Contest , Sci-Bauddhic-The Quiz Contest and Sci-Creative- The Poster Making Contest and Sci-On Stage Contest- Chorography was organized to enhance and develop scientific aptitude among the students. 220 Students from 17 schools and colleges participated in various events.

Power point presentation competition is held on the Science Day

A power point presentation competition on "Science and technology for specially abled persons" was organized to commemorate National science day. Science students from various science departments participated with great enthusiasm. Presentations includes various equipments invented and designed for the usage by specially abled persons and these has altogether changed their lives, thus making their lives comfortable and meaningful. The winners of the competition were Shikha BSc Comp Sc II Sem (first prize) Shweta BSc Non Medical IV Sem Lipakshi BSc Biotech II sem, Shymali BSc Medical Sem VI.



Extension Lecture by Er. Varun Sood on 18th Feb. 2017



An extension lecture on the topic "Optical Fibre communication" by Er Varun Sood Associate Professor at Guru Nanak Dev University, Amritsar was organised for the electronics and PG students of the department. Er. Sood explained the concepts of communication using optical fibre in a very interesting way. He also explained how optical fibres are fabricated and used for communication processes. He gave vast knowledge about advantages using the optical fibre rather than other cables.

KMV Girls bagged various university positions

GNDU declared the result of B.Sc. I Semester (Non Medical & Comp. Sc.) in which 4 students of The Heritage Institution ,Kanya Maha Vidyalaya got various university positions. Ms. Bharti Gupta stood 2nd in university by scoring 340 marks out of 400, Ms. Pallavi Badhan got 6th position (320/400), Ms. Manveer Kaur secured 10th position (316/400) and Ms. Deeksha Thakur grabbed 14th position by scoring 314 marks out of 400.



Extension lecture on "How to make materials with smart properties"



An extension lecture on "How to make materials with smart properties" was delivered by Dr. Sachin Tyagi, Scientist, Analytical Techniques Division, CSIR, Chandigarh to Physics students. He started the talk with classification of future materials with smart properties and explained the various levels of structure and development process. He explained different techniques to synthesis nano materials and explained about the criteria to enter in Ph.D. Programmes and summer training course at CSIO.

An Educational trip to IISER Mohali

A group of 50 students of B.Sc. Sem IV visited IISER, Mohali to enhance their knowledge about the various innovative demonstrations of Physics concepts. Firstly they were directed to e-room where they watched audio- visuals regarding establishment of various IISER institutes in all over India and role of IISER, Mohali toward the national research projects. Then they visited hi-tech Physics Labs equipped with sophisticated instruments, such as equipotential surface, SQUID, furnaces working at



different temperature and radon sampling of an A.C. source.

KMV Girls experienced Sky Gazing



P.G. Department of Physics organized an event 'Sky Gazing' for about more than 100 science students on campus. Mr. Akashdeep from Science City, Kapurthala along with his team was invited for the event. They gave an overview of the Universe and our Galaxy with the help of power point presentation and explained the formation of Universe starting from Big Bang Theory. After that students observed the surface of moon and largest planet Jupiter along with its 3 moons very clearly with the help of powerful telescope.

Achievers day celebration

Achiever's Day was celebrated on 29th march, 2017 to honor the university and merit position holders. 59 students of science department awarded with cash prize. The students who have participated in extra activities were also awarded based on their performances in various events. On this event students were also accompanied by their parents.



8 students of B.Sc. qualified NGPE exams

National graduate physics examination conducted by Indian Association of Physics Teachers was carried out by the Physics Department on 22nd Jan 2017. In this test more than 120 students participated. Our Eight undergraduate Physics students named Gagandeep , Minakshi Devi , Kritika Arya , Aarushi , Manvinder Kaur , Abha , Shaweta Sharma , Aashima Sharma qualified this national examination with Top 10% of merit.



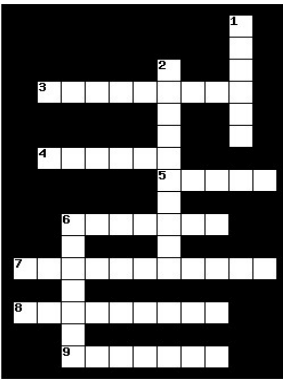
8 students attended online experimental workshop



Students of P.G. Department of Physics of Kanya Maha Vidyalaya, attended the short term online experimental workshop by H.C. Verma. Ms. Amandeep of B.Sc. VI Sem Non Medical , Ms. Ritika , Ms. Mandeep and Ms. Jaspreet of M.Sc. Physics Sem IV got certificate of attending this workshop.

Fun Times with Physics

Science Crossword Puzzles



Across

- The Big Dipper is part of this constellation.
- The Twins', its brightest stars are Castor and Pollux.
- The Hunter', it is one of the most easily recognizable constellations.
- The mythological hero who slew Medusa.
- The Archer', its brightest stars form a shape that looks like a teapot.
- Contains Polaris, the North Star.
- The name of its brightest star, Antares, means 'the rival of Mars'.

Down

- 'The Bull', it contains a star cluster known as the Seven Sisters, or the Pleiades.
- The brightest stars in this constellation form an 'M' or a 'W'.
- The winged horse belonging to 6 across.

Story time

The Comet

Duttada is invited to the secret conference.

How to change the course of Comet Dutta is the scientists' hidden agenda.

Duttada and the Defence Advisor become close friends, and share a secret.

BY the time they finished their deliberations and Sir John dropped him at his hotel off Regent Street, it was 1 a.m. There was hardly any crowd on the street but when James looked up from his window a star-studded night sky greeted him. Somewhere amongst these stars was Comet Dutta heading for a collision with the Earth. It was hard to believe the calamity of the future on such a peaceful night. For a moment James wondered if he had done his sums right.

Whatever doubt James may have had about Sir John's efficiency were quickly dispelled when he reported for the conference and found that all the experts listed by him were there. Astronomers, computer scientists, nuclear physicists, spacetechnologists,

Biologists, all were there. And as Sir John's special invitee was present the man who had started it all—Manoj Dutta. The conference lasted one week and went on under total cover of secrecy. First the experts checked and rechecked James Forsyth's calculation with the latest observations of Comet Dutta. He was right: there was no escape from the direct hit predicted by him.

There was a small chance that the comet may just graze the atmosphere of the Earth and not collide. In that case the loss of life and property would not be total. But this slight respite was hardly reassuring enough for taking no action. Having decided that some action was needed, what form should it take? The experts dismissed defensive measures like living in underground bunkers. It was simply not a practical proposition.

So the only course was to take offensive action. Comet Dutta could be marginally deflected from its path by giving it a push. The experts calculated that the bulk of destructive nuclear power available on the Earth would be needed to achieve this mammoth task. A gigantic nuclear explosion suitably placed, suitably directed and suitably timed could do the trick. This could be done by placing the nuclear payload in a spaceship, sending it to intercept the approaching comet and detonating it by remote control. Success or failure, secrecy must be preserved. Finally a time-table was drawn up for the operation which was code-named 'Project Light Brigade'. The important dates in it were:

October 10: Despatch the spacecraft with the payload unless by then the comet is already destroyed by natural causes or has changed its path due to unforeseen reasons.

November 15: Rendezvous with the comet and detonation of the payload.

December 15: If the experiment failed this was the day the comet would hit the Earth. If it succeeded, this was the day the comet would pass by at a near but safe distance.

The success of the experiment depended on how massive the comet was. Nobody could estimate; everybody hoped that it was not very massive.

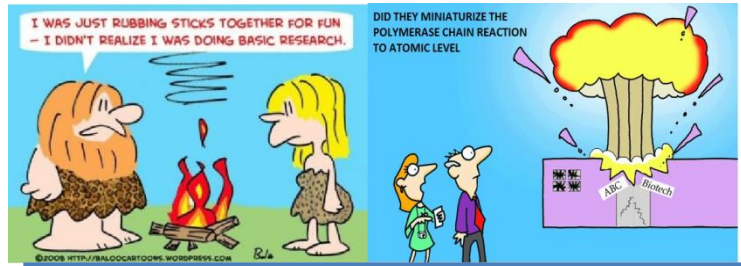
"Do you think we will succeed?" Duttada asked Sir John Macpherson for his opinion. During the week the two had developed considerable affinity for each other. "Mr Dutta, I will give you an honest answer! I am not buying any Christmas presents till December 15."

Duttada toured the British Isles for two weeks after the conference and he had a pleasant time visiting observatories and exchanging views with amateur as well as professional astronomers. On his return he was greeted by the The man was crowd of friends, social leaders, students and the usual hangers-on. Loaded with garlands and which intrigued him. bombarded by questions from the press he somehow made his way to the waiting car. Duttada returns home to a warm welcome and a ceremony, which is not a scientist's delight. A secret communication sends him rushing to the local sweet shop.

Indrani Debi says that Khoka, their eight-year-old grandson, has saved the world. Her husband is seriously puzzled. Arriving home he found another crowd gathered under a pandal. He glanced questioningly at Indrani Debi. Surely technology. He hated crowds. Indrani, obviously uneasy, offered the explanation: "I have arranged a yajna and design. One day, while Spencer was working on building magnetrons for radar sets, he was standing in front of an active radar set when he noticed the candy bar he had in his pocket melted. Spencer wasn't the first to notice something like this with radars, but he was the first to investigate it. He and some other colleagues then began trying to heat other food objects to see if a similar heating effect could be observed. The first one they heated intentionally was popcorn kernels, which became the world's first microwaved popcorn. Spencer then decided to try to heat an egg. He got a kettle and cut a hole in the side, then put the whole egg in the kettle and positioned the magnetron to direct the microwaves into the hole. The result was that the egg exploding in the face of one of his co-workers, who was looking in the kettle as the egg exploded.

Duttada was outwardly calm. "The comet you have discovered will not cause any ill effects on the Earth." At this remark Duttada blew up. "Don't you know that this is all superstition? It could be condoned in the olden times when man did not know what comets were. Not so in modern times. Comets are known for what they are, their movements are forecast precisely by mathematical calculations and it is clearly established by statistical studies that visits have no correlations with disasters on the Earth... All this is of course futile on my part to explain —you box, and the likes of you never read even the elementary books on Science." Sibaji babu gently interjected, "But our wise forefathers recommended such yajnas." Since his return from London, Duttada was in regular correspondence with Sir John Macpherson. Their friendship had grown out of their appreciation of each other's virtues. Sir John admired Duttada's scientific outlook while the latter admired the former's discipline and efficiency. Their correspondence never mentioned the Project Light Brigade although once in a while Sir John would hint at its progress in a subtle manner that Duttada would understand. Meanwhile Comet Dutta was following its predicted path. In due course it developed its tail. It circled round the Sun without breaking apart; nor did it evaporate. The scientists on Project Light Brigade therefore knew that the threat of collision was now very much real. In the middle of October, Duttada got a letter from Sir John. In the midst of descriptions of the meeting of the Royal Astronomical Society, the unseasonably warm weather, the opening matches of the football season and a recent bye-election, Duttada spotted the sentence he was eagerly looking for: "The charge of the Light Brigade has begun. Let us hope for the best." So the spacecraft had been launched on time. But will it achieve the rendezvous in time and at the right place? Will the remote control detonation work? What if the gigantic nuclear pile fails to fire? Duttada could not share his anxieties with anyone around him. He had to participate in and outwardly enjoy the Puja ceremonies, the Diwali celebration and other festivals. His sole daytime relaxation was in the company of Khoka, his eight-year-old grandson, and of course at night looking through Dibiya. He was regularly monitoring the comet, now clearly visible even to the naked eye. On November 18 a special messenger on a scooter from the British Council brought in an urgent telex message for him. The telex operator in Calcutta had wondered what was so special about it to make it so urgent. But on reading it Duttada lost all his lethargy and rushed to his favourite rasagolla shop. The message read:

"I am confident now of buying my Christmas presents on December 15 — John Macpherson."



One day national seminar on recent trends in Science and Technology was organized

Science faculty organises One day National seminar on Recent Trends in Science & Technology on 21st march, 2017. 5 resource persons from various parts of india were invited to deliver their talk on various scientific topics and acquaint the audience with their expertise.



On December 15 Comet Dutta came closest to the earth — at a distance of 80,000 kilometres. Millions saw it and admired it. Only a handful knew how close they had come to totalannihilation.

When the comet had gone far away and was seen no more, Duttada felt it safe to make the following comment to his wife: "Now that the comet came and went, are you satisfied that no major disaster took place that can be attributed to it?"

"I agree that there has been no major disaster; but there could have been some. Do you know how they were averted?" Indrani Debi said with quiet confidence. Duttada looked at her. Did she know? How could she? He had never mentioned Project Light Brigade to her. He probed cautiously, "I don't understand what you mean."

"It is very simple. There were no disasters because of the yajna at our house."

"But I never performed the yajna. Don't you remember, I refused to have anything to do with it?"

"Of course, I do. But we found a way out — at least Guruji did. He said that if you were unwilling to perform the yajna, it would be all right if a descendant of yours did it. So we got Khoka to deputise for you. And it has worked! Isn't Guruji clever?" Indrani's voice had a ring of triumph.

Duttada formed a mental picture of Khoka performing the yajna uttering mantras dictated to him which he did not understand, pouring ghee at specified intervals into the fire, offering flowers...

And then the picture changed to an assembly of scientists at the conference analysing the problem, devising solutions and executing them rationally and efficiently.

It seemed hard to believe that both pictures were different aspects of contemporary human society. Duttada was aware of the gulf that separates the rich from the poor, the educated from the illiterate, and the privileged from the unprivileged. But this gap between the rational and the superstitious seemed to him far wider, far more sinister. Will human society ever succeed in eliminating it?

Duttada did not know the answer.

JAYANT NARLIKAR

Riddles

- I am found on the sea and on land but I do not walk or swim. I travel by foot but I am featureless. No matter where I go, I am never far from home. Who am I?
- I don't have lungs or a chest but I need air. I am not alive but I grow. I don't have a mouth and I don't like water. What am I?
- My name is something that's used in an instrument that determines how hot you are. I am also the name of a planet. Who am I?



Accidental Discoveries in Physics

Percy Spencer. At the age of 16, he heard about a nearby paper mill that was "electrifying", inevitable vast given that few in his town, a remote community in Maine, knew much of anything about electricity, he began learning what he could about it and managed to become one of three people who were hired to install electricity in the plant. At the age of 18, Spencer decided to join the U.S. navy after becoming interested in wireless communications directly following learning about the wireless operators aboard the Titanic when it sank. While with the navy, he made himself an expert on radio technology. Fast-forward to 1939 where Spencer, now one of the world's leading experts in radar tube she knew design. One day, while Spencer was working on building magnetrons for radar sets, he was standing in front of an active radar set when he noticed the candy bar he had in his pocket melted. Spencer wasn't the first to notice something like this with radars, but he was the first to investigate it. He and some other colleagues then began trying to heat other food objects to see if a similar heating effect could be observed. The first one they heated intentionally was popcorn kernels, which became the world's first microwaved popcorn. Spencer then decided to try to heat an egg. He got a kettle and cut a hole in the side, then put the whole egg in the kettle and positioned the magnetron to direct the microwaves into the hole. The result was that the egg exploding in the face of one of his co-workers, who was looking in the kettle as the egg exploded.

Spencer then created what we might call the first true microwave oven by attaching a high density electromagnetic field generator to an enclosed metal box. The magnetron would then shoot into the metal their box, so that the electromagnetic waves would have no way to escape, which would allow for more controlled and safe experimentation.

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