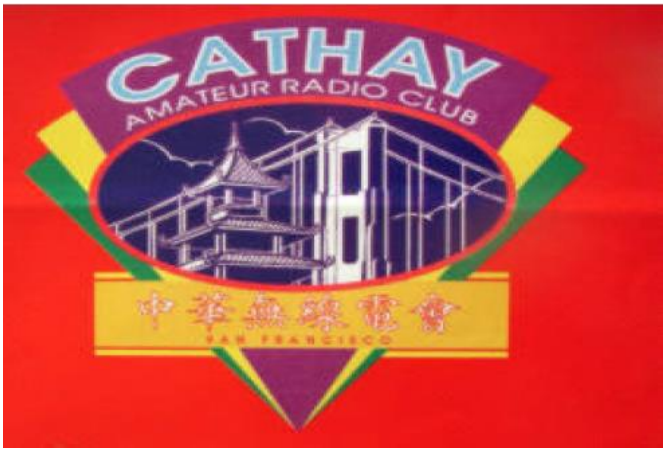

Cathay January 2015

www.cathayradio.org

revised 2/2/2015

President: George Chong, W6BUR **email:** *W6BUR@comcast.net*

Vice President North: Leonard Tom, *NX6E* **email:** nx6e@hotmail.com

Vice President South: Bill Fong, *W6BBA* - **email:** w6bba@arrl.net

Secretary/Membership: Rodney Yee, *KJ6DZI* - **email:** rodyee2000@yahoo.com

Editor: Rodney Yee, *KJ6DZI* - **email:** rodyee2000@yahoo.com

Treasurer: Vince Chinn aka Mingie, *W6EE* - **email:** vince@vincechinncpa.com

Web Master: Edison Fong – *WB6IQN* - **email:** edison_fong@hotmail.com

Mission: The Cathay Amateur Radio Club is basically an active social club of Ham Radio Operators and their spouses. We support local community requests for HAM emergency communications. Several of us are trained in CPR/ First Aid and are involved with community disaster preparedness.

Monday Night Net Time: 9 PM Local Time/PST, Frequencies: 146.67MHz -600KHz PL85.4 and 442.70 +5MHz PL 173.8. The repeaters are linked only during the CARC Monday night net.

Update: Link to repeater 442.70 is currently not active until further notice.

The CARC Monday night net is the best way to find out the latest club news.

All check-ins are welcome.

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Message from the President: George Chong, *W6BUR*

Hello CARC Members and Friends;

A belated Merry Christmas and Happy New Year to you all.

2015 is the **Year of the Ram,** which begins on Thursday, February 19, 2015 and ends on Sunday, February 7, 2016.

If you were born in 1919, 1931, 1943, 1955, 1967, 1979, 1991, 2003, and 2015 you are a Ram person.

Yes, it is time to think about celebrating Chinese New Year which will take place on Thursday, February 19, 2015 and will herald in the year of the Wood Ram.

Folks born in the year of the Ram tend to have a gentle calm nature, polite, reserved, quiet, wise, kind hearted, devoted, and loving. This inner calmness allows their creativity and intelligence to bloom and enables them to work well in a collaborative group effort.

The best mates for Ram folks are Ram, Rabbit, Horse, and Boar. It is best to avoid mates that are Rat, Ox, Dog, and Serpent, and Rooster.

CARC Chinese New Year Luncheon

Let us, CARC members come together and celebrate the Chinese New Year with a luncheon, from 10:30 am – 1 pm on Saturday, February 28, 2015. It will be held at KOME Restaurant in Daly City. Please arrive early to receive your name tag and collection of money for the luncheon.

Edison Fong is planning on some awesome raffle prizes, so you don't want to miss out on this event. The list of raffle prizes will appear in next month's newsletter (February 2014). We want to give Ed some time to secure the raffle prizes before we formally announce them.

I wish to express my many thanks to Ed for taking on this huge task on behalf of the CARC. Further CARC luncheon details and signup information are contained in the latter part of this newsletter.

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Additional CARC News

Ed Fong's (WB6IQN) Christmas Party held on December 13, 2014 was a huge success. There were lots of good food and good company. Ed wrote up a very nice summary and provided us with some fabulous pictures.

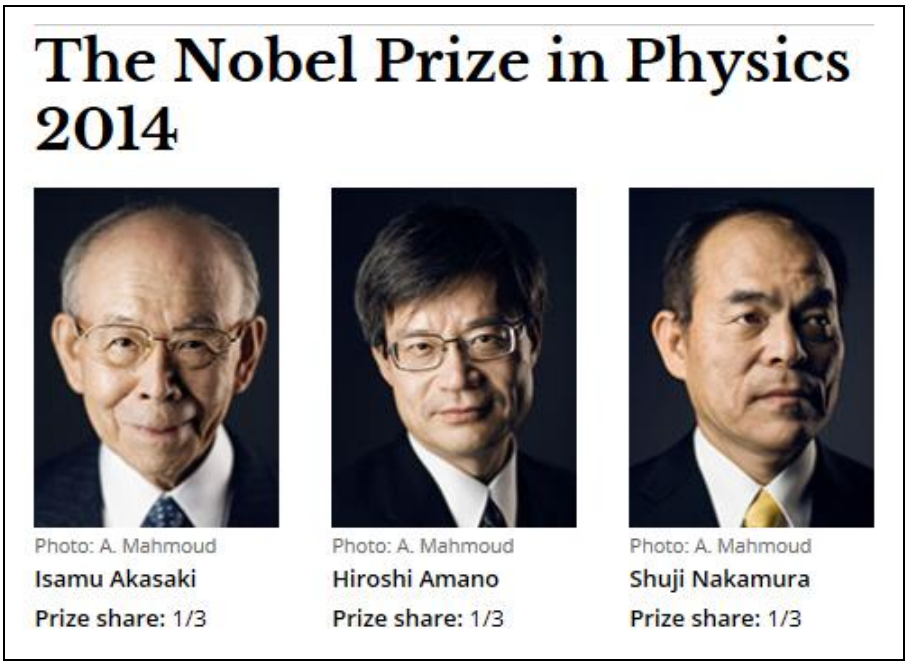
Featured Tech Article Intro

This month's article is about a device that is just about used everywhere around us.

The device I am referring to is the White Light Emitting Diode (LED). In 1962 with the development of the first practical visible light Red LED, it spurred on the ultimate goal toward the White Light LED.

The road to the White LED invention took another 32 years (1994) via the creation of the Blue LED. The addition of a yellow phosphor converts the BLUE LED output into the white light. Further refinements over the last 20 years have resulted in White LED becoming the ubiquitous light source that is rapidly replacing both the traditional incandescent and florescent lighting systems in our homes.

In recognition of the impact that the White LED has toward the betterment upon our society, the awarding of the 2014 Nobel Prize in Physics went jointly to three Japanese born scientists: Isamu Akasaki, Hiroshi Amano and Shuji Nakamura.



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The 2014 Nobel Prize monetary amount is set at Swedish kronor (SEK) 8.0 million per full Nobel Prize. At the current exchange rate, that comes to $1,028,080.00 US dollars.

Since the 2014 Nobel Prize for physics was split three ways, each award recipient received approximately $342,693.33 in US dollars and of course the priceless fame that comes with a Nobel Prize in physics.

Additional information:

Shuji Nakamura – "I had no confidence in inventing the blue LED, I just wanted my PhD"

Background Story of the Invention of Efficient Blue InGaN Light Emitting Diodes

http://www.nobelprize.org/nobel_prizes/physics/laureates/2014/nakamura-lecture-slides.pdf

Hiroshi Amano – "When I was a child, I could not understand why I should study"

Hiroshi Amano explains what brought him to science

http://www.nobelprize.org/nobel_prizes/physics/laureates/2014/amano-interview.html

CARC Final Wrap-up News

Chat sub s'em to all you CARC members! - George W6BUR.

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Public Service Announcements

HAM CRAM / HAM Licensing

For upcoming HAM Licensing locations please refer to:
http://www.arrl.org/find-an-amateur-radio-license-exam-session

Auxiliary Communications Service (ACS)

The Auxiliary Communications Service (ACS) was organized by the San Francisco Office of Emergency Services (OES) following the 1989 Loma Prieta Earthquake to support the communications needs of the City and County of San Francisco when responding to emergencies and special events.

The Auxiliary Communications Service holds General Meetings on the third Tuesday of each month at the San Francisco Emergency Operations Center, 1011 Turk Street (between Gough Street and Laguna Street), from 1900 hours to 2100 hours local time. All interested persons are welcome to attend.

The ACS Net begins at 1930 hours (7:30 p.m.) local time each Thursday evening, on the WA6GG repeater at 442.050 MHz, positive offset, tone 127.3 Hz. The purpose of this net is to practice Net Control skills, practice checking in with deployment status in a formal net, and to share information regarding upcoming ACS events. Guests are welcome to check in. ACS Members should perform Net Control duty on a regular basis. On the second Thursday of each month, the net will be conducted on the output frequency of the WA6GG repeater, 442.050 MHz no offset, tone 127.3 Hz, simplex.

For more information, please attend an ACS meeting or check in on a net, or call 415-558-2717.

Upcoming meetings: Tuesday 7pm, Jan 15, 2015
Tuesday 7pm, Feb 17, 2015

Gilbert Gin (KJ6HKD)

Free Disaster Preparedness Classes In Oakland:
http://www.oaklandnet.com/fire/core/index2.html

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CORE is a free training program for individuals, neighborhood groups and community-based organizations in Oakland. The underlying premise is that a major disaster will overwhelm first responders, leaving many citizens on their own for the first 72 hours or longer after the emergency.

If you have questions about the recertification process, you may contact the CORE Coordinator at 510-238-6351 or core@oaklandnet.com.

Free Disaster Preparedness Classes In San Francisco – NERT Taught by San Francisco Fire Department

RSVP to sffdnert@sfgov.org or call 415-970-2024 to register.
Visit www.sfgov.org/sffdnert to learn more about the training, other locations, and register on line.

Upcoming Special NERT Events.

January

10th: Staging area drill, 9:00am-1:00pm, SFFD DOT*
Put your neighborhood command center ICS to practice in preparation for the Citywide drill in April.
Register

20th: MLK Freedom Parade Assistance, South of Market, 8am-4pm (TBD)

24th: NERT sponsored Ham Cram. Get your amateur radio license in one day. ($30)
Register

27th: NERT Triage Drill. SFFD DOT* 6:00pm to 9:30pm.
Register as "Triage Rescuer" (NERT Grads Only) 6:00pm or "Triage Victim" (Non-NERTs) 5:30pm

30th: NEN Awards - City Hall, 6:00pm-8:00pm

February

7th: Intro to NERT Communications Team (NCT) 101-103, 8:30 a.m. - 3:30 p.m., SFFD DOT*

11th: NERT Communications 201: Emergency Messaging 6:30pm-9:30pm, SFFD DOT*

24th: NERT Communications 301: Hands-on buttons & knobs & antennas, 6:30pm-9:30pm, SFFD DOT*

25th: NERT Communications 401: Hands on message passing and Scribing,6:30pm-9:30pm,SFFD DOT*
Register

26th: NERT Communications 501: NET Control for NERT staging area, 6:30pm-9:30pm, SFFD DOT*

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Prerequisites: NCT 101-401 Register

21st: Neighborhood Coordinator/Leadership College, 8:30am-4:00pm, SFFD DOT*

28th: SFPD ALERT training
Early Pre-Registration Required

*** SFFD DOT is the Division of Training @ 19th Street/Folsom. (enter through yard on 19th and park along back wall) Division of Training classroom is in the 1-story building directly next to the Fire Station on the corner.**

San Francisco Police Department: Auxiliary Law Enforcement Response Team (ALERT)

The Auxiliary Law Enforcement Response Team (ALERT) is a citizen disaster preparedness program designed. The ALERT program is for volunteers 16 years of age or older, who live, work, or attend high school in San Francisco.

Graduates of the San Francisco Police Activities League (P.A.L) Law Enforcement Cadet Academy are also eligible to join.

ALERT volunteers will first complete the Fire Department's Neighborhood Emergency Response Team (NERT) (www.sfgov.org/sfnert) training and then graduate into an 8 hour Police Department course specifically designed for ALERT team members.

ALERT members will work closely with full-time and/or Reserve Police Officers in the event they are deployed after a disaster. The Basic ALERT volunteer will have no law enforcement powers other than those available to all citizens.

SFPD ALERT Training

The next ALERT training classes have been scheduled for Saturday, February 28th, 2015. The classes will be held at the San Francisco Police Academy, in the parking lot bungalow, from 8am-5pm (one hour lunch break).

IMPORTANT- All participants must complete the background interview process in order to be eligible to attend the ALERT training class.

Eligible ALERT participants may register for a training class by contacting the ALERT Program Coordinator, Mark Hernandez, at sfpdalert@sfgov.org, or by telephone at 415-401-4615.

SFPD ALERT Training Drill

All active/trained ALERT members are asked to join us for our next training drill, scheduled for **Saturday, January 31st, 2015**. The drill will be held in the Police Academy (350 Amber Drive)

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parking lot from 9am-12pm. Details will be emailed to active ALERT members, prior to the date of the exercise. Participation is not required, but strongly encouraged.

PUBLIC INFORMATIONAL MEETING

An informational meeting will be held at the San Francisco Police Academy, located at 350 Amber Drive, Parking lot bungalows, on **TBD**, at 7pm. All members of the public are welcome. Interested individuals will have their questions about the program answered at the meeting.

For more information on the San Francisco Police Department ALERT Program, email us at sfpdalert@sfgov.org, or call Sergeant Mark Hernandez (SFPD, Ret.), SFPD ALERT Program Coordinator, at (415) 401-4615.

For additional information on the web please refer to:
http://sf-police.org/index.aspx?page=4019

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Wrap up of Annual Christmas 2014 Party by Edison Fong

Our annual Christmas party on Saturday December 13, 2014 was a blast at my house in Sunnyvale. Got a chance to see old friends that that I hardly see. My friend Jim Walker KB6NRD and Austin Lew came by from Space Systems Loral (my last employer) so they shared with me all the things I am NOT missing out on. Thank God. It did not sound like fun. I'm too old to stay up all night, travel to far corners of the earth, and work weekends. Sixty hour work weeks were just too long. Sure I am glad I am retired (semi retired??)

Violet Fong, Alex Hutchins, Mei-lin Fong, and Kathrine Hutchins

Left to right: George Hughes - W0WEB, Ken Finnegan - W6KWF, Jim Walker - KB6NRD

Again, I did not have the chance to say hello to everyone. The big excitement was looking at my new triband (2 meters, 220 MHz and 70cm) prototype antenna. I have it down to NO radials, about 5 feet and fits into a ¾ inch pvc pipe. Each band has full ½ wave radiator. SWR is less than 1.3 to 1 to all bands. I'm going to be smart this time and have Ron Quan - KI6AZB help write up the patent for me before I publish it in QST. Unlike my DBJ-1 antenna that has copy cats selling them on ebay and at swap meets.

I'm glad Judson Chew W6WTY and his son, daughter in law and grandkids came by. Rodney KJ6DZI came by late and stayed until the party ended at 1AM. I had a long talk with Tony Sacco KE6EOD. Several of my graduate students also dropped by. One of my star students Chad Emers came by. Can you believe this smart fellow? Chad has BS and MS in mechanical engineering, a law degree, and is licensed to practice law and patent law in California. He took my class so he could learn about electronics to he could write patents in radio circuits and systems.

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Left to Right: Rodney - KJ6DZI, Ed - *WB6IQN,* Ron - KI6AZB - Note the glazed vacant looks after a hard night of partying until 1 am

Left to right: Diana- KG6IOH, David- NC6D, Judy – xyl , and Bob Vallio- W6RGG

ARRL – Division Director (Big Shot) Bob Vallio - W6RGG came by and had a great time.

George Hughes, W0WEB – helped me out on the raffle and my wife Sharadon picked out the winning ticket. Each person was given one raffle ticket at the door (no charge) and given a really cool LED solar flashlight. At the Christmas party everyone has an even chance of winning. We ended up giving away 40 solar flashlights.

Left to right: Sharadon Fong, George Hughes - WOWEB , Ron Quan - KI6AZB, Bob Vallio - W6RGG, Tony Sacco – KE6EOD

Tereas Shindler, Sharadon Fong, and George Hughes - W0WEB picking the winning ticket.

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Ron Quan - KI6AZB ended up winning the Beofeng UV5R+ dual band radio. Now there is one person that does not need another radio. He tells me he will put the radio in his car as a backup.

Bumkin (new member) and Austin Lew (SSL employee)

Jim Fayh - N6WKY and George Hughes - WOWEB

Picture of the delicious food at the Christmas Party, nobody went home hungry that night.

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The food was great. A newly licensed ham Bukim (don't even know his call or last name) but he lives down the street from me brought over a casserole that was just delicious. Alexandria Hutchins (harmonic of Jeff Hutchins WB6BVD) baked two fantastic homemade apple pies and also made a chicken dish. Again, thanks everyone for bringing over such great food. I always look forward to it.

Ed Fong, *WB6IQN*

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CARC Chinese New Year Luncheon

2015 CARC Annual Chinese New Year Luncheon

As for those of you that were able to attend the CARC luncheon last year, we enjoyed seeing each other and yakking it up. As word spread about our successful CARC luncheon get together, those who did not make it told us "We will be there for the next one". This year it will also be a great opportunity to meet up with our newest club members and to renew our old friendships.

The time and Date: 10:30 am - 1:00 pm Saturday February 28, 2015.

Location: KOME Japanese Seafood and Grill
1901 Junipero Serra Blvd.,#A
Daly City, CA 94104
650-992-8600

Parking: There is free parking in the adjacent five story garage structure.

Cost: Special CARC Adult cost will be $22.00 per adult.
Seniors over age 60 pay $21.00
Children Pricing:
Age under 3: Free
Age 3-5: $7.00
Age 6-8: $9.50
Age 9-11: $13.00

These Saturday prices includes: tax (9%), 15% tip, and reserved seating. As you know everything retail seems to goes up in price. So this year KOME Restaurant kept the same price for the food as last year but now charges for soda, tea and Juice for group luncheons/dinners.

Drink prices not include in the price:
Soda …….$1.99
Hot tea ….$1.25
Juice……..$2.25

Please note that any beverage other than water (Soda, Tea, Juice, beer, wine, sake) is not included with the price of the luncheon. If you order beverages not covered, you are responsible for paying the additional charges.

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For more info please see: www.komebuffet.com (The link appears to be currently down).

Money will be collected at the start of the luncheon, so please have exact change ready! Please put on name tags that will be provided.

Please email Bill Chin (bill.kc6pof@comcast.net) if you are planning to attend the luncheon. Bill has graciously agreed to help us out during this function. We need your name and the names of your guests to make the necessary names tags that you will be required to wear during the luncheon.

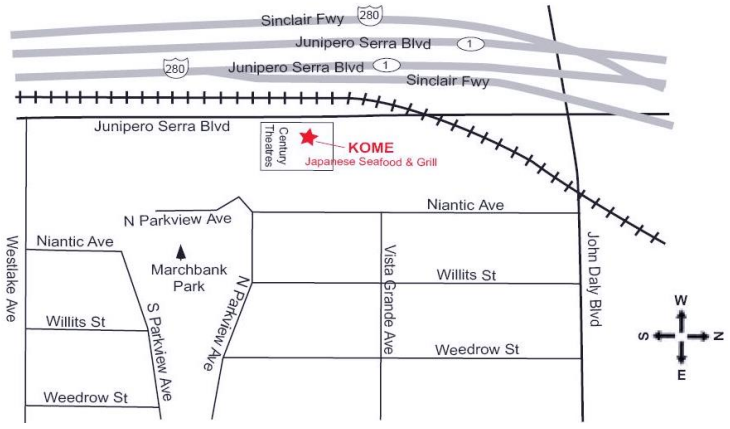
Driving Directions:

* If coming from Hwy 280 Northbound, take the John Daly Blvd/Junipero Serra Blvd exit and continue north on Junipero Serra Blvd and side drive past the Century Theater ticket office.
After a series of small restaurants on the right hand side there is a 5 story parking garage, the entrance will be about 50 feet past KOME restaurant entrance doors.

* If coming from Hwy 280 Southbound, take the John Daly Blvd/Junipero Serra Blvd exit. After crossing the traffic signal light intersection, in about 500 feet, turn left into the 5 story parking garage structure entrance.

Please refer to the KOME restaurant location map that follows below:

Map To KOME Restaurant



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We have reserved the back area room at the KOME restaurant for use of the Cathay Amateur Radio Club. **At the restaurant door please identify yourself as being with the CARC and a KOME hostess will escort you to the back room. Please check in with both Vince Chinn aka Mingie W6EE and Hetty WB6SHU so they can check your name off the attendee list and collect the money to pay the restaurant bill.** Hetty WB6SHU will make sure those senior citizens will get their dollar discount. Be aware that the early bird gets the worm, no feeding after 1PM; I hope we won't have to be booted out, hah-hah!

KOME restaurant is an all you can eat Asian buffet style dining offering a large choice of foods. KOME restaurant is where we held our previous Cathay Radio Club Chinese New Year Luncheon and it was a big hit with all the attendees. There is free parking at the adjacent 5 story parking structure. The Daly City Bart train stop is 2 blocks away.

Since KOME restaurant opens its door at 10:30 AM we need to have most of our people "camp" early (kidding) at the door to situate our "hold" of a spot (within the glass partition) at the rear room. **Another reason to arrive early is that the luncheon time (10:30 am-1pm) will quickly slip away while you are getting caught up with the latest news among our fellow club members.** The back room is fairly large is able to accommodate 150 guest. I doubt that our CARC members and friends would completely fill it, so feel free to invite additional guests.

The dining tables as I seem to recall were sort of like outdoor picnic types with individual chairs for seating. One other hint: If you are a great eater and love food, try not to choose any tables where the opposite end is against a wall. I found that it was really hard to maneuver quickly for more goodies!

Your Hosts:

George Chong (W6BUR)
w6bur@comcast.net

Mingie Chinn (W6EE)
vince@vincechinncpa.com

Volunteer - Bill Chin (KC6POF)
bill.kc6pof@comcast.net

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Featured Tech Article:

KUNGL. VETENSKAPS-AKADEMIEN
THE ROYAL SWEDISH ACADEMY OF SCIENCES

THE NOBEL PRIZE IN PHYSICS 2014

POPULAR SCIENCE BACKGROUND

Blue LEDs – Filling the world with new light

http://www.nobelprize.org/nobel_prizes/physics/laureates/2014/popular-physicsprize2014.pdf

Isamu Akasaki, **Hiroshi Amano** and **Shuji Nakamura** are rewarded for inventing a new energy efficient and environment-friendly light source – the blue light-emitting diode (LED). In the spirit of Alfred Nobel, the Prize awards an invention of greatest benefit to mankind; by using blue LEDs, white light can be created in a new way. With the advent of LED lamps we now have more long-lasting and more efficient alternatives to older light sources.

When Akasaki, Amano and Nakamura arrive in Stockholm in early December to attend the Nobel Prize ceremony, they will hardly fail to notice the light from their invention glowing in virtually all the windows of the city. The white LED lamps are energy-efficient, long-lasting and emit a bright white light. Moreover, and unlike fluorescent lamps, they do not contain mercury.

Red and green light-emitting diodes have been with us for almost half a century, but blue light was needed to really revolutionize lighting technology. Only the triad of red, green and blue can produce the white light that illuminates the world for us. Despite the high stakes and great efforts undertaken in the research community as well as in industry, blue light remained a challenge for three decades.

Akasaki worked with Amano at Nagoya University while Nakamura was employed at Nichia Chemicals, a small company located in Tokushima on the island of Shikoku. When they obtained bright blue light beams from their semiconductors, the gates

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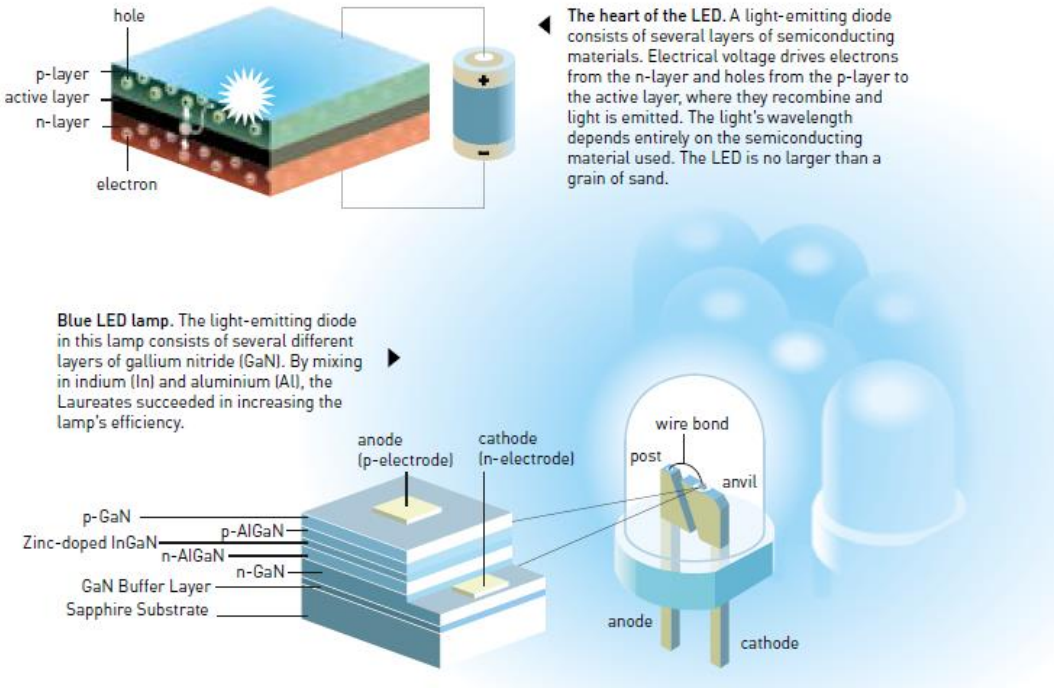
opened up for a fundamental transformation of illumination technology. Incandescent light bulbs had lit the 20th century; the 21st century will be lit by LED lamps.

Saving energy and resources

A light-emitting diode consists of a number of layered semiconductor materials. In the LED, electricity is directly converted into light particles, photons, leading to efficiency gains compared to other light sources where most of the electricity is converted to heat and only a small amount into light. In incandescent bulbs, as well as in halogen lamps, electric current is used to heat a wire filament, making it glow. In fluorescent lamps (previously referred to as low-energy lamps, but with the advent of LED lamps that label has lost its meaning) a gas discharge is produced creating both heat and light.

Thus, the new LEDs require less energy in order to emit light compared to older light sources. Moreover, they are constantly improved, getting more efficient with higher luminous flux (measured in lumen) per unit electrical input power (measured in watt). The most recent record is just over 300 lumen/watt, which can be compared to 16 for regular light bulbs and close to 70 for fluorescent lamps. As about one fourth of world electricity consumption is used for lighting purposes, the highly energy-efficient LEDs contribute to saving the Earth's resources.



The principle for a light-emitting diode – LED (upper left) and an example of a blue LED lamp.

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LEDs are also more long-lasting than other lamps. Incandescent bulbs tend to last 1,000 hours, as heat destroys the filament, while fluorescent lamps usually last around 10,000 hours. LEDs can last for 100,000 hours, thus greatly reducing materials consumption.

Creating light in a semiconductor

LED technology originates in the same art of engineering that gave us mobile phones, computers and all modern electronics equipment based on quantum phenomena. A light-emitting diode consists of several layers: an n-type layer with a surplus of negative electrons, and a p-type layer with an insufficient amount of electrons, also referred to as a layer with a surplus of positive holes.

Between them is an active layer, to which the negative electrons and the positive holes are driven when an electric voltage is applied to the semiconductor. When electrons and holes meet they recombine and light is created. The light's wavelength depends entirely on the semiconductor; blue light appears at the short-wave end of the rainbow and can only be produced in some materials.

The first report of light being emitted from a semiconductor was authored in 1907 by Henry J. Round, a co-worker of Guglielmo Marconi, Nobel Prize Laureate 1909. Later on, in the 1920s and 1930s, in the Soviet Union, Oleg V. Losev undertook closer studies of light emission. However, Round and Losev lacked the knowledge to truly understand the phenomenon. It would take a few decades before the prerequisites for a theoretical description of this so-called electroluminescence were created.

The red light-emitting diode was invented in the end of the 1950s. They were used, for instance, in digital watches and calculators, or as indicators of on/off-status in various appliances. At an early stage it was evident that a light-emitting diode with short wavelength, consisting of highly energetic photons – a blue diode – was needed to create white light. Many laboratories tried, but without success.

Challenging convention

The Laureates challenged established truths; they worked hard and took considerable risks. They built their equipment themselves, learnt the technology, and carried out thousands of experiments. Most of the time they failed, but they did not despair; this was laboratory artistry at the highest level.

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Gallium nitride was the material of choice for both Akasaki and Amano as well as for Nakamura, and they eventually succeeded in their efforts, even though others had failed before them. Early on, the material was considered appropriate for producing blue light, but practical difficulties had proved enormous. No one was able to grow gallium nitride crystals of high enough quality, since it was seen as a hopeless endeavour to try to produce a fitting surface to grow the gallium nitride crystal on. Moreover, it was virtually impossible to create p-type layers in this material.

Nonetheless, Akasaki was convinced by previous experience that the choice of material was correct, and continued working with Amano, who was a Ph.D.-student at Nagoya University. Nakamura at Nichia also chose gallium nitride before the alternative, zinc selenide, which others considered to be a more promising material.

Fiat lux – let there be light

In 1986, Akasaki and Amano were the first to succeed in creating a high-quality gallium nitride crystal by placing a layer of aluminium nitride on a sapphire substrate and then growing the high quality gallium nitride on top of it. A few years later, at the end of the 1980s, they made a breakthrough in creating a p-type layer. By coincidence Akasaki and Amano discovered that their material was glowing more intensely when it was studied in a scanning electron microscope. This suggested that the electronic beam from the microscope was making the p-type layer more efficient. In 1992 they were able to present their first diode emitting a bright blue light.

Nakamura began developing his blue LED in 1988. Two years later, he too, succeeded in creating high quality gallium nitride. He found his own clever way of creating the crystal by first growing a thin layer of gallium nitride at low temperature, and growing subsequent layers at a higher temperature. Nakamura could also explain why Akasaki and Amano had succeeded with their p-type layer: the electron beam removed the hydrogen that was preventing the p-type layer to form. For his part, Nakamura replaced the electron beam with a simpler and cheaper method: by heating the material he managed to create a functional p-type layer in 1992. Hence, Nakamura's solutions were different from those of Akasaki and Amano.

During the 1990s, both research groups succeeded in further improving their blue LEDs, making them more efficient. They created different gallium nitride alloys using aluminium or indium, and the LED's structure became increasingly complex.

Akasaki, together with Amano, as well as Nakamura, also invented a blue laser in which the blue LED, the size of a grain of sand, is a crucial component. Contrary to the dispersed light of the LED, a blue laser emits a cutting-sharp beam. Since blue light has a very short wavelength, it can be packed much tighter; with blue light the same area

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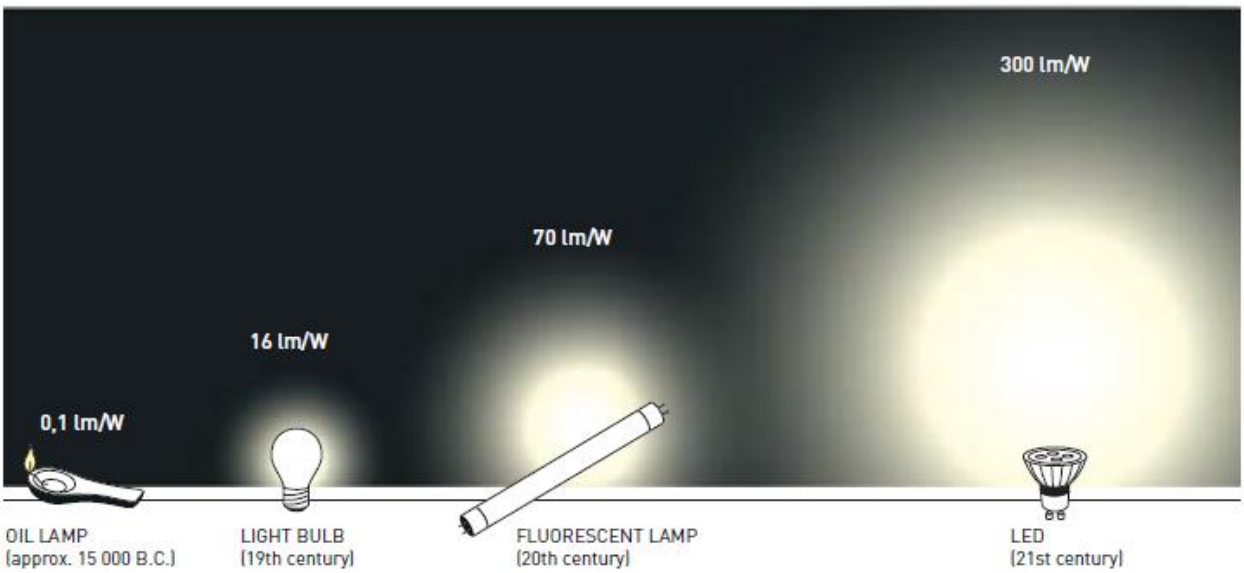
can store four times more information than with infrared light. This increase in storage capacity quickly led to the development of Blu-ray discs with longer playback times, as well as better laser printers.

Many home appliances are also equipped with LEDs. They shine their light on LCD-screens in television sets, computers and mobile phones, for which they also provide a lamp and a flash for the camera.



LED lamps require less power to emit light than the older light sources. Efficiency is denoted in luminous flux (measured in lumen) per unit added power (measured in watt).

As about one fourth of world electricity consumption is used for lighting purposes, the highly energy-efficient LED lamps contribute to saving the Earth's resources.

A bright revolution

The Laureates' inventions revolutionized the field of illumination technology. New, more efficient, cheaper and smarter lamps are developed all the time. White LED lamps can be created in two different ways. One way is to use blue light to excite a phosphor so that it shines in red and green. When all colours come together, white light is produced. The other way is to construct the lamp out of three LEDs, red, green and blue, and let the eye do the work of combining the three colours into white.

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LED lamps are thus flexible light sources, already with several applications in the field of illumination – millions of different colours can be produced; the colours and intensity can be varied as needed. Colourful light panels, several hundred square metres in size, blink, change colours and patterns. And everything can be controlled by computers. The possibility to control the colour of light also implies that LED lamps can reproduce the alternations of natural light and follow our biological clock. Greenhouse-cultivation using artificial light is already a reality.

The LED lamp also holds great promise when it comes to the possibility of increasing the quality of life for the more than 1.5 billion people who currently lack access to electricity grids, as the low power requirements imply that the lamp can be powered by cheap local solar power. Moreover, polluted water can be sterilised using ultraviolet LEDs, a subsequent elaboration of the blue LED.

The invention of the efficient blue LED is just twenty years old, but it has already contributed to creating white light in an entirely new manner to the benefit of us all.

LINKS AND FURTHER READING

Additional information on this year's Prizes, including a scientific background article in English, may be found at the website of the Royal Swedish Academy of Sciences, *http://kva.se,* and at *http://nobelprize.org*. They also include web-TV versions of the press conferences at which the awards were announced. Information on exhibitions and activities related to the Nobel Prizes and the Prize in Economic Sciences may be found at *www.nobelmuseet.se*.

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http://en.nagoya-u.ac.jp/people/distinguished_award_recipients/nagoya_university_distinguished_professor_isamu_akasaki.html

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