Association of Chemistry Teachers (ACT)

C/o. Homi Bhabha Center for Science Education (HBCSE), TIFR, Mumbai-400 088

News Letter Issue 3 / September – December, 2015

Presidential Address - National Convention of Chemistry Teachers (NCCT 2015), 8-10 Oct 2015, Lucknow

I am very happy to welcome all the fellow teachers, scientists, and other delegates to this National Convention of Chemistry Teachers (NCCT-2015), in Lucknow, the city of Nawabs or Constantinople of India; known for courtly manners, beautiful gardens, poetry, music, and fine cuisine. NCCT is an opportunity to all of us to come together to share our views and experiences.

On this occasion, I would like to put before you a few of my thoughts for deliberations during and after the NCCT. My first point is regarding chemistry education, about which the ACT is very much concerned. I am happy that this year we have a symposium on 'Innovative methods in chemistry education', along with the NCCT.

Educationists generally agree that, learners of science do not develop an appreciation of science as a human endeavor. Science teaching has traditionally embraced little or no reference to the cultural, personal and historical contexts in which science occurs. History and Philosophy of science (HPS) humanizes science and also motivates students to learn it. Science needs to be connected to its social and historical roots. This is applicable to Chemistry as well.

Chemistry is about structure and composition of matter, and the objective of Chemistry Education is to make students to construct a meaningful understanding of the nature of matter and changes in matter. Hence, how different ideas were constructed over time should be in a part of chemistry education. This is a weak area in our curriculum. And we should take a serious note of this.

Our Chemistry teaching is like listing conclusions and learning of conceptual outcomes as final words. We neglect the learning of strategies that enabled knowledge growth in chemistry; how Chemistry knowledge was developed and is structured; or how do we know what we know? For example, it took chemists 40-50 years to develop the concept of structure of organic compounds and to represent the structure using formulae. Today we spend only a few lectures to introduce these concepts. Obviously students find it difficult to understand such ideas and connect with them. This gives rise to misconceptions.

A new branch of philosophy of chemistry has emerged recently and it needs to be studied by the teachers. Do we teach our students how the knowledge base in chemistry is different than those of other branches of science? How our laws and models are different. Exclusion of philosophical perspective in chemistry education is a significant deficit which hinders the teaching and learning of the nature of chemical knowledge. Our teachers have very little exposure to these issues. Content knowledge and knowledge about how this knowledge was developed; both are important. We should organize chemistry education workshops to create awareness with respect to these issues. Is it possible to undertake to frame chemistry curricula, with these ideas and mould teachers' education accordingly? Can we develop the resources towards this goal?

The second issue is regarding how chemistry is taught and practiced in isolation. I feel chemistry teaching and academic research have suffered as we gradually segregated ourselves from other steams of knowledge; many times they all share some basic purpose and overlap greatly. Somebody called this as scientific tribalism, based on specialization. This kind of thinking may not help in tackling the kind of great problems we are facing and our students have to solve in future.

Though the base of higher education is expanded; unless it is a mission oriented work, we are either shy of collaboration or do not trust it. Often we work undirected AND undirected work often becomes directionless. Our accountability parameters are either absent or weak. We are more conservative, individualistic, and competitive. In many universities research is considered as a source of income in the form of "overheads", and that is all.

We talk much about industry-academia interactions. Interestingly, historically chemistry was developed initially much in industry. It was a creative force and produced chemicals on a large scale. In industry scientists and engineers work together on big relevant problems. Do we have this culture? Gradually we should dissolve the differences between chemistry and other fields and on research side fundamental and applied research. To solve great problems we need to collaborate and work together. In our curricula this should be reflected. Some of us have experimented on these lines and we should share their experiences.

Another point is regarding the changing nature of chemistry itself.Chemistry is a central science and has contributed immensely towards the way we live. In last 60-70 years, particularly after WWII, Chemistry experienced a very prolific phase. A flood of breakthrough discoveries were made, from fuels to catalysts, instruments, quantum chemistry, complex molecules, materials, polymers and so on. Many people believe that this phase is now over. Now the chemistry is facing new challenges which are more close and relevant to society.

Chemistry so far is about atoms, molecules and their reactions. AND now chemistry must extend its scope from molecule to everything that involves molecules. This may require a new structure of chemistry. Our teachers should be aware of these changes and study them. We should teach the students the skills necessary to solve problems; besides knowledge of the subject; even to solve problems which do not exist today.

ACT is a body of teachers working for teachers. We are 15 years old and we should take a review of our activities. We have six strong zones each headed by a Vice-President. We have instituted Zonal committees. Let us make these committees very effective.My appeal to all of the members is that, they should take active part in spreading the messages of the ACT. Identify talented manpower as resources. Let us generate a database of such experts. We have to increase activities at the zonal level; like workshops for teachers, research scholars' meet, and chemistry popularization. Identify suitable activities workable ate local and national level. There is a need to collaborate with institutions havening similar mandate.

Concept Test in Chemistry (COTECH) is one such national activity. I am thankful to Prof. Subhash Singh for shouldering this responsibility. I wish that this test will be useful to all of us in understanding strong points and weak points in our higher education system.

ACT is responsible for the first level examination; National Standard Examination in Chemistry (NSEC), leading to participation in the International Chemistry Olympiad. Here we need your help in setting quality questions.

Popularization of Chemistry is another area. Prof. Brijesh Pare has done wonderful job by conducting a series of workshops all over the country with the support from DST. We appreciate his efforts and we have requested him to make a new proposal. We welcome your ideas and views.

We have been getting a very strong support from Homi Bhabha Centre for Science Education, which is a part of TIFR, Mumbai. Without this many things would not be possible. We are thankful to the centre

For this NCCT we have a battery of experts to share their experiences. I am sure the three days ahead will be an enriching experience for all of us. I wish NCCT a great success.

Thank you
Prof. S. D. Samant, President, ACT

Kawah Ijen Burn Blue

Electric-blue molten streams run down the side of an Indonesian volcano, periodically bursting into blue flames that shroud the black night in otherworldly colors. This unique volcano, Kawah Ijen on the eastern edge of Java,erupts molten sulfur and presents tourists with a nighttime show.

Why Does Kawah Ijen Burn Blue?
You may remember from chemistry class that sulfur is flammable and when burned produces a neon blue flame. This is essentially the same reaction that occurs at Kawah Ijen but with different environmental factors that I'll address below. The combustion of sulfur produces sulfur dioxide and sulfur trioxide in the following chemical reactions. The sulfur acts to replace wood or hydrocarbons in type of combustion.
$S(s) + O2 (g) \longrightarrow SO2 (g)$
$2S(s) + 3O2 (g) \longrightarrow 2SO3 (g)$

This unique volcano erupts blue molten sulfur http://onforb.es/1X1EkDI

Origin of Kawah Ijen & Source of Sulfur

Kawah Ijen is part of a volcano complex of East Java in Indonesia. This grouping of stratovolcanoes lie within the 20km wide Ijen caldera formed 50,000 years ago from many explosive eruptions. Since then, small eruptions have created stratovolcanoes including Kawah Ijen within the larger Ijen caldera. This caldera complex is underlain by Miocene limestone.

There is a permanent solfatara that produces native sulfur and multiple fumaroles that allow volcanic gas to escape to the atmosphere along fissures in the volcano. Within the Ijen crater there is the world's largest highly acidic lake with a pH<0.5. For reference, that's somewhere between the gastric acid within your stomach and battery acid. This acidic lake was produced by the reaction of hydrogen chloride gas with water to form hydrochloric acid.

A miner carries sulfur from the Ijen volcano complex, East Java, Indonesia. (Credit: Getty Images)

To speed up this process of sulfur mineralization, miners have installed a number of pipes to vent the sulfur and cool it quickly to form liquid sulfur, which then forms sulfur mats. This allows the miners easier access to sulfur deposits and provides a constant rejuvenation of supply. Miners make less than 25 U.S. cents per pound according to Grunewald and often times carry 200-pound baskets 1 to 2 times a day.

"Our families worry when we come here. They say working here can shorten your life," says Haltom, a 34-year-old sulfur miner of 12 years.

Trevor Nace is a geologist, writer, and tech blogger at Appomattox

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It's a wonderful thing doing research. From research comes understanding. From understanding may come new applications and uses.So, research is not a luxury; it's really a great investment in our future." - George Olah, Nobel Laureate.

A Brief on CONTECH – 15

CONTECH-15 has been successfully conducted on 31st August, 2015 at 72 centers across the nation, and a total of 5, 187 students participated in this event. Zonal-wise distribution of these examination centers is as follows: West Zone -29; North Zone – 14; East Zone – 11; South Zone -09; North-East Zone -07; and Central Zone -02. The details of student scores are as follows:

Sl. No.	ACT-Zone	Address of the College Coordinator	Name of the Student	% Scored	No. of students in the 1st Divisn. from the college
1	East	Dr Kiran Pradhan, St. Joseph's College, Darjeeling kiranpradhan1@rediffmail.com	Anmol Chhetri BSc III	75	19
2	East	Dr Manoj Kumar, Gopeshwar College, Hathua kumarmanoj1921990@gmail.com	Nazil Hussain BSc I	75	02
3	South	Dr Ch. V. V. Satya Vani V. S. Lakshmi Women's Degree & PG College, Kakinada 09032231750 kvvsatyavani@yahoo.com	B. Hemica, BSc III	88.75	09
4			K. Prudhvi Chowdary BSc III	87.75	
5			S. Laxmi Sri Parna, BSc II	82.50	
6			P. Mounika BSc II	80.00	
7			I. Ramya, BSc III	76.25	

Certificates were issued to 54.71% of the students who scored 30% or more marks;and book prizes were given to 1.36% of the students who scored 60% and above. It is a proud moment for all of us that more and more chemistry teachers and students are taking interest in this competitive test. Based on the feedback received from different zones of ACT, it is decided that, from next year onwards this competitive examination will be held during the second-half f September of each year to facilitate more student participation. For easy fee transaction, from next year onwards the examination fee will be deposited through Bank's NEFT system. To encourage active participation of more teachers to take part in this National event, ACT has decided to issue Certificates on this count.

SPECTRUM OF ACT ACTVITIES

- Dr. Mannam Krishnamurthy represented the organization 'Varsity Education mgmt Ltd' as Chief Executive Dean and also ACT as Life member, yesterday on THE NATIONAL ENEGRY CONSERVATION DAY at Sree Velagapudi Ramakrishna Memorial College, Nagaram, Guntur Dist., A.P.

- Dr. Mannam Krishnamurthy organized "National Chemistry Day Celebrations" on 10th December 2015 at Dharma Appa Rao Degree College, Nuzvid, Krishna District, Andhra Pradesh. An essay writing competition on 'the role of chemistry in modern life' was held on 8th December 2015 at 2 P.M. for U.G. Students. There were 96 students participated from six different degree colleges in and around Nuzvid.

  Essay writing competition was also held on 9th December 2015 at 2 P.M. for P.G. Students on the same topic. Participation was there from 56 students from three post graduate chemistry departments of Nuzvid town. Three best performances were recognized from U.G. and two from P.G. These performances were considered to give prizes.

- Two invited talks were arranged on 10th December 2015 at 2 P.M. to commemorate this occasion. Dr. Mannam Krishnamurthy, Executive Dean, Varsity Education Management Limited, Hyderabad gave a presentation on "Chemistry in our community". Dr. K. Surendra Babu, Director, S.V.R.M. College, Nagaram gave a talk on "Role of chemistry in modern life".

- At 4 PM on 10th December 2015, a meeting was organized at DAR College, Nuzvid. Dr. G.V. Rama Rao, Principal of the DAR College presided over the function. Prof. M.V. Basaveswara Rao, Special Officer, Krishna University, Machilipatnam was the Chief Guest, Dr. Mannam Krishnamurthy and Dr. K. Dhaveji were guests of honor. Students with best essay writing were given prizes.

  On behalf of ACT, a memento was presented to Mr. M.M.R.V.A. Rao, President of DAR College, by M.V. Basaveswara Rao. Mr. A.V. Ramana, Lecturer in his 50th year of teaching in chemistry was felicitated on behalf of ACT, by Dr. M. Krishnamurthy.The celebrations were a grand success. They have created awareness on theobjectives and soles ofchemical universe. These celebrations were covered well by the press in the regional language Telugu.

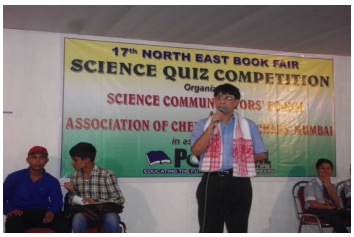

నూతన ఆవిష్కరణలతో కాలుష్యం!


రసాయన శాస్త్రానికి ఎంతో ప్రాధాన్యం

- **National Chemistry Day celebrations were held on December 10th, 2015 at P. R. Government College (Autonomous), Kakinada under the banner of ACT. Dr. L. Giribabu, Senior Scientist, Institute of Chemical Technology (IICT), Hyderabad was the Chief Guest. Dr. P. V. S. Machiraju, Secretary, ACT-Southern Zone was the Guest of Honor. Dr. M. Satyanarayana, Principal, P. R. Government College (Autonomous), Kakinada presided over the function. Dr. M. M. Pacha, Director – P. G. Courses and Shri E. V. S. Subrahmanyam, Head, Department of Chemistry, P. R. Government College (Autonomous), Kakinada were the Organizing Secretary and Convener, respectively. Active participation of Life Members of ACT - Shri T. Vara Prasad and Shri D. Rama Rao; all chemistry fraternity of the college; UG and PG student community made the event a grand success. Essay competitions, Elocution Contest and Quiz programs were organized on this occasion. Students from High Schools and Colleges of Kakinada City participated in this program. Prizes and certificates were given to the winners of these competitions.**

- **The following events were successfully organized by ACT – North east Zone:**
  - **Science Communicators Forum (SCF) N.E. a leading NGO on Science popularization and Entrepreneurship development & Association of Chemistry Teachers, Mumbai in association with Potential organized a Prize money Science Quiz Competition for the students of North East during 17th North East Book Fair on 3rd November, 2015. Altogether 10 groups consisting 2 members in each group participated in the quiz competition. The first, second and third cash prize winners are : 1st - Dikhow Team- Rajibulawal (Cotton College) &RishirajSen (B. Baruah College). 2nd- Subansiri Team- UtpalJyotiDebaSarma& Siddhartha Kalita of SaiVikash Junior College and 3rd –Kopili Team –**

KallolKashyap&RitwickSinha of Don Bosco School (Panbazar) respectively. The excellent performance of other participants from Assam JatiyaVidyalaya, KendriyaVidyalaya (Khanapara), VikashVidyaNiketan, MaharshiVidyaMandir, Guwahati Medical College and Assam Engineering College was a high voltage significant of N.E. Science Quiz Competition. Five rounds of Quiz including one rapid fire round were conducted by Quiz masters Prof. DibakarDeka of Chemistry Department, G.U. and Dr. Hitesh Barman of Rangia College.



- National Chemistry Day on 10th December 2015 at Tinsukia College, Tinsukia, Assam; and at Imphal, Manipur.

- National Chemistry day was celebrated on December 10, 2015 by organizing quiz competitions, elocution contest, and essay writing competitions for Undergraduate and Postgraduate students of Visakhapatnam region under the aegis of Gayatri Vidya Parishad, Visakhapatnam and prizes were distributed to the winners.

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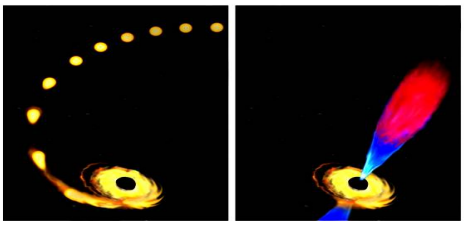
livescience

Monster Black Hole Eats Star, Returns Leftovers
By Sarah Lewin, Space.com Staff Writer | December 03, 2015 11:20pm ET

New observations depict a super massive black hole devouring a star and then emitting jets of high-energy plasma from the star's debris — the first time scientists have observed these phenomena at the same time.



Credit: Johns Hopkins University/Modified from an original image by Amadeo Bachar
A super massive black hole anchoring the center of a nearby galaxy has been caught in a rarely seen double act: ripping apart a nearby sun-size star and shooting out jets of debris from its center at close to light speed.

When a star wanders too close to a black hole, especially the ultra heavy kind that lurks at the center of many galaxies, the black hole's intense gravitational forces pull apart the star and form a disk of orbiting debris. By looking carefully at the unusual galactic moment, researchers were able to also spot a jet of material blasting out from the black hole as result of the star's demise — the first time both the star's destruction and resulting jets have been observed together around this type of black hole, researchers at the International Centre for Radio Astronomy Research (ICRAR) said in a statement.

"It's very unusual when a super massive black hole at the center of a galaxy actually eats a star — we've probably only seen about 20 of them," said Gemma Anderson, an astrophysicist from ICRAR's Curtin University node, in Australia, and co-author of the new work.

"Everything we know about black holes suggests we should see a jet when this happens, but until now, they've only been detected in a few of the most powerful systems," Anderson said in the statement. Now, we finally found one in a more normal event."

Lead author Sjoert van Velzen, a researcher at Johns Hopkins University in Maryland, heard about the star's destruction observed by a radio telescope in Hawaii in December 2014 (announced via Twitter) and, just three weeks later, joined with a team of 13 other scientists to follow up with other telescopes and track the black hole's progress. While black holes are known for pulling matter in, not releasing it, the researchers hoped to see the hole emit a fast-moving plasma jet after its stellar meal, as predicted in black hole models.

"Previous efforts to find evidence for these jets, including my own, were late to the game," Van Velzen said in a statement released by Johns Hopkins University.

By catching it early enough, and because of its nearby location (just 300 light-years away), the international team of researchers had a chance to observe the star's destruction, and then the jets escaping from inside the black hole, over the course of several months. Measurements of the unusual process confirmed astrophysicists' predictions of how black holes function.

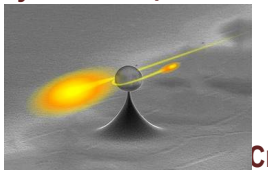
The researchers presented their observations of the star's destruction in early November at the Jerusalem Tidal Disruption Event (TDE) workshop, joined by another group, from Harvard University, that had simultaneously investigated the star.

"The destruction of a star by a black hole is beautifully complicated, and far from understood," Van Velzen said. "From our observations, we learn the streams of stellar debris can organize and make a jet rather quickly, which is valuable input for constructing a complete theory of these events."

The new work was described Nov. 26 in the journal Science.

'Plucking' Light Particles from Laser Beams Could Advance Quantum Computing

By Edd Gent, Live Science Contributor | December 14, 2015



Credit: Weizmann Institute of Science

A novel method for "plucking" individual particles of light out of a laser pulse could lead to major breakthroughs in quantum computing, researchers say. Using a combination of super cooled atoms and cutting-edge optical technology, physicists from the Weizmann Institute of Science in Israel was able to extract a single photon from a beam of light.

Individual photons are of great interest to physicists because they are governed by the laws of quantum mechanics rather than the rules of classical physics (which normally apply to light). Many scientists also see photons as a promising candidate to carry information in future quantum computing systems.

Latest Scientific Advancements:

- A study published in Science shows evidence that a protein partially assembles another protein without genetic instructions. Defying textbook science, amino acids (the building blocks of a protein) can be assembled by another protein and without genetic instructions.
  Ref. Staff (2 January 2015), "Defying Textbook Science, Study Finds New Role for Proteins", University of Utah, Retrieved 3 January 2015
- Researchers at Eindhoven University of Technology create the world's smallest temperature sensor; powered by radio waves, which they say could be used in developing the Internet of Things.
  Ref."The world's tiniest temperature sensor is powered by radio waves" EurekAlert!. 7 December 2015. Retrieved 10 December 2015
  "Tiny chip that powers itself from radio waves", BBC 8 December 2015, Retrieved 10 December 2015
- A new "Polarized 3D" system developed by MIT can increase the resolution of conventional 3-D imaging devices 1,000-fold
  Ref."System boosts resolution of commercial depth sensors 1,000-fold". Science Daily, 1 December 2015. Retrieved 3 December 2015
- In a world first, gene-edited immune cells are used to treat ‘incurable’ leukemia in a one-year-old girl
  Ref. "Stem-cell scientists redefine how blood is made, toppling conventional 'textbook' view from 1960s" Science Daily 5 November 2015. Retrieved 8 November 2015
- Sulfur-limonene polysulphide is used to synthesize a new material able to cheaply and efficiently absorb mercury pollution from soils and water.
  Ref: "Flinders researcher’s new material lays waste to mercury pollution". Flinders University 20 October 2015. Retrieved 22 October 2015
  "New material created from orange peel cleans up mercury pollution". Gizmag, 19 October 2015. Retrieved 22 October 2015
- IBM announces a breakthrough that could accelerate the replacement of silicon transistors with carbon nanotubes and work down to 1.8 nm node sizes.
  Ref: "IBM Research Breakthrough Paves Way for Post-Silicon Future with Carbon Nanotube Electronics" IBM. 1 October 2015. Retrieved 3 October 2015
- Researchers at Queen Mary University of London demonstrate a self-assembling organic material that grows and changes shape, which could lead to artificial arteries.
  Ref: "Self-assembling material that grows and changes shape could lead to artificial arteries". Queen Mary University of London. 28 September 2015 Retrieved 1 October 2015.
  "Self-assembling material could lead to artificial arteries". KurzweilAI, 29 September 2015. Retrieved 1 October 2015

The Health Benefits of Spinach

It is a well-known fact that spinach is good for you - earning its right as a nutritious vegetable from the Popeye series. And while he predominantly used it to make himself strong, you may be surprised to discover that he may have also been helping to protect himself against inflammatory problems, blood pressure issues, bone problems and stress-related issues (among others) too.

Spinach ranks at the top for nutrient richness. It contains a wealth of vitamins and minerals and is also concentrated in health-promoting phytonutrients such as carotenoids (beta-carotene, lutein, and zeaxanthanin) and flavonoids - all of which provide us with powerful antioxidant protection.

Fact File: Nutritional Breakdown of Spinach

This is what 1 cup of spinach will provide you with:

- **839 milligrams of potassium per cooked cup (more than a banana, which contains about 539mg).**
- **A fantastic source of iron (6.4mg). A lack of iron affects how efficiently your body uses energy.**
- **A great source of dietary magnesium (24 milligrams). This nutrient is essential for energy metabolism. Magnesium also maintains muscle and nerve function, heart rhythm, a healthy immune system and maintains blood pressure.**
- **It also contains vitamin K, fiber, phosphorous and thiamine.**
- **27 calories**

The Health Benefits of Spinach

Helps in overcoming anemia: Spinach is a great source of iron - a mineral that is essential in preventing anemia. Half a cup of spinach contains 3.2mg of iron which accounts for about 20 percent of the iron requirement for a woman's body.

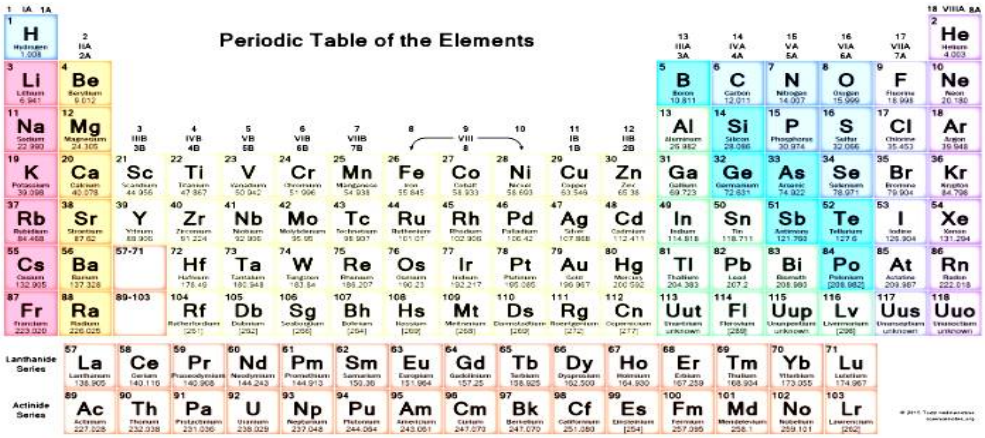
Helps prevent asthma: Studies have shown that people who consume high amounts of certain nutrients - including beta-carotene (an antioxidant) have a lower risk for developing asthma. And spinach is an excellent source of such a nutrient.

Helps lower blood pressure: Research has shown that a diet low in potassium may be just as much of a contributing factor to high blood pressure as a diet high in sodium. Spinach contains high levels of potassium which helps negate the effects of sodium in the body.

Promotes bone health: Spinach contains a wealth of Vitamin K, which research suggests is beneficial for maintaining bone health. Spinach is also an excellent source of bone supporting nutrients including calcium and magnesium.

Has an anti-cancer property: Spinach contains high levels of phytonutrient content (including flavonoids and carotenoids) that function as anti-inflammatory and anti-cancer agents. In fact, studies have shown that spinach may slow down cell division in human stomach cancer cells and may reduce the risk of skin cancer.

Four new elements added to Periodic Table



Last year ended with good news for Chemists: on 30th December, the Joint Working Party (JWP) of the IUPAC announced officially the verification of the discoveries of four new chemical elements, and thus, their addition to the Periodic Table, and asked the teams which discovered each one to propose new names and symbols for them. Temporarily names and symbols are: Ununtrium (Uut, Z=113), Ununpentium (Uup, Z=115), Ununseptium (Uus, Z=117) and Ununoctium (Uuo, Z=118). These new four elements, considered with Flerovium (Fl, Z=114) and Livermorium (Lv, Z=116), complete both the sublevel p of the 7th period and the whole 7th period.

http://www.iupac.org/news/news-detail/article/discovery-and-assignment-of-elements-with-atomic-numbers-113-115-117-and-118.html

According to IUPAC announcement, Ununtrium has been discovered by the Japanese RIKEN institute, and becoming thus the first element discovered in Asia. All the remaining elements have been discovered in European or American countries. On the other hand Ununoctium has been discovered by a consortium formed by the Joint Institute for Nuclear Research in Dubna (Russia), and the Lawrence Livermore National Laboratory in California (USA). Finally, the laboratories which collaborated in the discovery of Ununpentium and Ununseptium were the also the Joint Institute for Nuclear Research in Dubna and the Lawrence Livermore National Laboratory, but this time in cooperation with the Oak Ridge National Laboratory in Tenesse (USA).

Names of the elements will be given in the future, but it is expected that Uut will be Japonium or Rikenium, and one of the others, Moskovium, as Dubna laboratory is placed near Moscow. The names of the Dubnium, Lawrencium and Livermorium have been given to previous elements (Z=105, Z=103 and Z=116, respectively). I would like that one of them receive the name of Daltonium, as I consider that the chemist who started the atomic theory should have one element with his name. Erwin Schrödinger also deserves an element for his quantum-physical atomic model: Bohr and Rutherford have elements nowadays due to their atomic models. Other good names could be Berzelium or Scheelium, as both Berzelius and Scheele discovered several elements separately.

Unfortunately, none of these new elements has practical applications as all of them are artificial and strongly radioactive, having thus very short half-lives: they suffer immediate Alfa-decay or nuclear fission processes. In fact, only Ununtrium and Flerovium have isotopes with half-lives longer than 1 second (19.6 s, 66 s, respectively). The most stable isotopes of Ununpentium, Livermorium and Ununseptium have half-life between 50 and 220 milliseconds; and Ununoctium is the most unstable element known so far as its unique known isotope discovered has a have half-life of 0.89 ms.

In the heavier radioactive elements and in all the artificial elements the tendency is that the half-life of the most stable isotope decreases with Z. For example, the half-lives of the elements are in the following ranges:
-Z from 92 (Uranium) to 98 (Californium): thousands/millions of years.
-Z from 99 (Einsteinium) to 101 (Mendelevium): from 1 month to 1-2 years.
-Z from 102 (Nobelium) to 105 (Dubnium): from 1 h to 1 day.
-Z from 106 (Seaborgium) to 112 (Copernicium): 1-9 min (with the exception of Meitnerium (a few seconds).

At the sight of these results, if the tendency continues, the unknown elements of 8th period should be even more unstable and we can consider that the periodic table is complete, because next elements should have half-lives in the order of the microseconds. This result is logical, as heavier elements have a bigger positive charge (more protons) at the atomic nucleus, having thus a bigger electrical repulsion, which makes the atom more unstable. It is a pity, because in spite of being recognized as elements, and despite their inclusion in the Periodic Table, we cannot study their chemistry. Consequently it is not possible to use them in novel and amazing materials.

However, there is a remote probability that any of them could be more stable due to unknown nuclear or quantum effects. Although it is quite probable they will not have useful applications, until researchers discover the elements of the 8th period, and until the measurement of their properties, questions and dreams are open! I hope that in the future we will be able to study and apply the chemistry of currently unknown heavier elements.

Enrique Domínguez Álvarez
Postdoctoral Scientist in Organic, Medicinal and Analytical Chemistry

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Forthcoming Events

- **"Think Out of the Box" – District-Level Science Exhibition, SDSM College, PALGHAR, January 8th& 9th, 2016.**
- **National Conference on "Chemical Sciences: Emerging Scenario & Challenges (NCCS-2016)" is being held during January 29-30, 2016 on the eve of Silver Jubilee Celebrations of the Department of Chemistry, Sant Gadge Baba Amravati University, Amravati (Maharashtra).**
- **National Science Day Celebrations – February 28, 2016.**
- **Two days seminar on "Science & Technology of Advanced Materials", Gayatri Group of Institutions, Visakhapatnam, August – 2016.**
- **Two days seminar on "New Trends in Chemical research", University of Karnataka, Gulbarga, September, 2016.**
- **National Convention of Chemistry Teachers (NCCT – 2016), October – 2016, Midnapore.**

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The Story of Gerhard Domagk (1895 – 1964)

"In 1925, I married Gertrud Strube.
We had three sons and one daughter.
In that sense, we were a normal family.

But family illness forced us to face a critical decision.
In 1933, my daughter became seriously ill.
She had a fulminating infection of the hand.
It was called erysipelas.

The prescribed and only treatment at the time was amputation.
Without that drastic procedure it is likely she would have died.

However, I had a scientific secret that I thought might help her.
In my work, I had discovered a drug.
But it had not been tested on people.
It was called prontosil.

I lay awake at night asking myself questions -
Should I give it to her?
Would the side effects be worse than the illness?
Would the new drug work a miracle?

As a scientist by training, I knew it was risky.
But the alternative was not risk free, so I decided it was worth a try.
My daughter took a small sample of prontosil.
Immediately, she started to improve, and recovered.
Was this a major breakthrough against infection?
Doctors in the 1930s had few remedies against diseases.
Despite emerging scientific effort, prevention was easier than cure.

Remedies included - aspirin for rheumatic fever,
Digoxin assisted heart problems,
Salvarsan for syphilis,
Bromides acted as sedatives,
Barbiturates for epilepsy,
Thyroxine and insulin were used for diabetes,
Morphine for pain.

However, the major killers were bacteria.
They had been identified 50 years earlier.
Still no clue existed.

My eyes had seen the horror that infection causes.
During the 1st World War I witnessed many deaths.
More from infection than instant death on the field of battle.
I was also wounded and fortunate to recover.

The army sent me to Russia to treat cholera patients.
Conditions were dreadful and there were many other diseases.
Surgery had little value against the bacteria.

After the war, I qualified as a doctor and conducted research.
In 1923, I became a University lecturer in Pathological Anatomy.

Following this, in 1927, I moved to I. G. Farbenindustrie at Wuppertal.
It was a move that gave me a new laboratory to study bacteriology.

In 1932, I looked at dimethyl benzyl dodecyl ammonium chloride.
It was launched with 10% solution under the trade name Zephirol.
Its anbtibacterial effect and skin compatibility quickly made it a success.
It is a skin disinfectant used for disinfecting hands and instruments.

I was also asked to assess the impact of chemical dyes.
It may not sound exciting, but it proved a turning point.
Josef Klarer synthesized chemical dyes and sent them to me.

Mice infected with deadly diseases were tested with the dyes.
Day after day, I disected the mice for evidence.
No visitors, no calls, no time to waste.
We desected till we could not stand on our feet.
We looked through microscopes till we could not see.
Then one drugshowed promise.

Mice infected with streptococcus survived if they had the drug -
we called it Prontosil.

Despite the recovery of my daughter and the arts I did not publish.
More evidence was needed.

It was not until 1935 that I wrote a scientific paper.
Further work at the Pasteur institute showed it was not the dye - it was
a new chemical related to it.
Sulphaonamide was the name given to it.
This was a start in the fight back against deadly bacteria.
A fight to save people from early death.

Over 1000 women a year were still dying of puerperal fever.
Prontosil reduced the mortality from 2.5 per 1000 births to 0.50.
The same success was achieved against erysipelas.

Sulphonamides were effective against throat infections.
Death from meningitis, childbed fever and pneumonia declined sharply.

They helped to save the life of Winston Churchill, from pneumonia in 1943.
Before, penicillin, they were the only real defence against infection.

Other scientists then got to work.
They found uses for it in treating diabetes, malaria and other disaeases.
If they were bleeding they had to put the poder on the wounded area.
That prevented the spread of infection.

After the war, research produced more synthetic drugs.
these included - leprosy, glaucoma, and strokes.

Hitching and Elion then opened up new therapeutic cures.
The attack on cancers, gout and viral illness began.
It continues today, thanks to sulphonamides, a chemical
Foundation for medical solution.

Inaddition, I worked on the chemotherapy of tuberculosis.
This led to thiosemicarbazones.
This work became more important as I saw it could save lives.

Many honors came in my way.
In 1939, I was awarded the Nobel Prize for Medicine.
They cited my work on antibacterial research.
In particular, they mentioned weapons of war I had developed.
'Weapon that is effective against many infectious diseases'.
Ironically, it was other weapons of destruction that were causing problems.

Germany was invading various countries.
The Nazi government refused to allow me to accept the Nobel Prize.
They were concerned that I would use the platform for political purposes.
Instead of going to Sweden, I was imprisoned for a week.

Only in 1947, did I receive the prize.
But the monetary reward had elapsed and I could not use it for research.

My work on tuberculosis and chemotherapy against cancer continued.
That research helped many people.

The control and cure of carcinomas was a major challenge.
In due course, other awards were made for my work.
That included the Paul Ehlich Gold Medal in 1956.
Invitations from many countries flowed in.
As a result, I visited and taught at many universities.
This meant assignments in Italy, Spain, Peru, and Argentina.
Recognition in Britain and Japan also followed.

But, none of us are immune to age.
There was no drug I could invent to prevent it.
Source:
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